Grand Teton National Park, Wyoming

2001-2005

VEGETATION CLASSIFICATION AND MAPPING

APPENDICES

Technical Memorandum 8260-06-02
Remote Sensing and GIS Group
Technical Service Center
Bureau of Reclamation
Denver, Colorado

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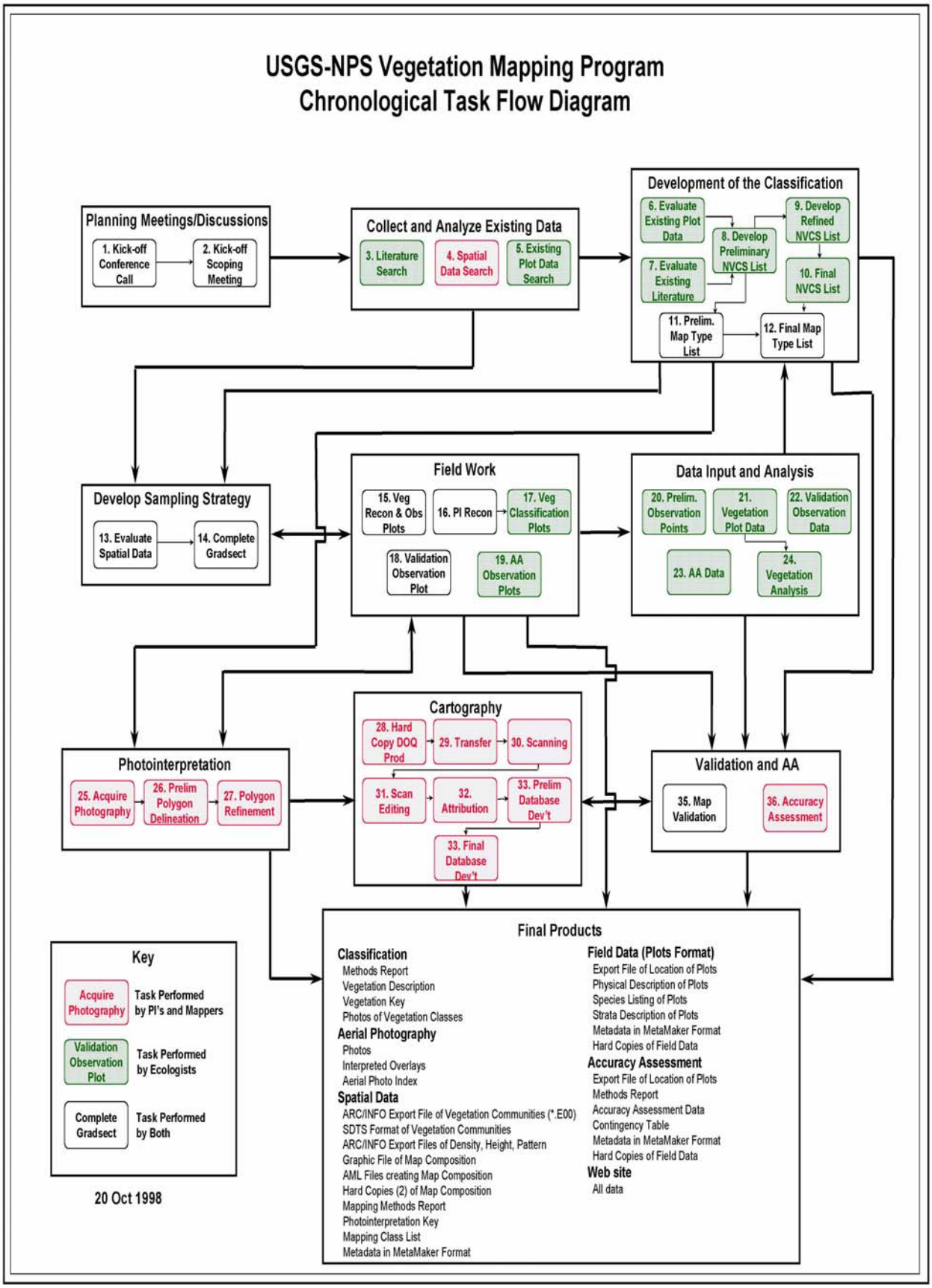
APPENDIX A: Flow chart for the USGS-NPS Vegetation Mapping Program

Chronological Task Flow Diagram

(Developed by Tom Owens USGS – BRD)


USGS-NPS Vegetation Mapping Program
Chronological Task Flow Diagram
Planning Meetings/Discussions
1. Kick-off Conference Call
2. Kick-off Scoping Meeting
Collect and Analyze Existing Data
3. Literature Search
4. Spatial Data Search
5. Existing Plot Data Search
Development of the Classification
6. Evaluate Existing Plot Data
7. Evaluate Existing Literature
8. Develop Preliminary NVCS List
9. Develop Refined NVCS List
10. Final NVCS List
11. Prelim. Map Type List
12. Final Map Type List
Develop Sampling Strategy
13. Evaluate Spatial Data
14. Complete Gradsect
Field Work
15. Veg Recon & Obs Plots
16. PI Recon
17. Veg Classification Plots
18. Validation Observation Plot
19. AA Observation Plots
Data Input and Analysis
20. Prelim. Observation Points
21. Vegetation Plot Data
22. Validation Observation Data
23. AA Data
24. Vegetation Analysis
Photointerpretation
25. Acquire Photography
26. Prelim Polygon Delineation
27. Polygon Refinement
Cartography
28. Hard Copy DOQ Prod
29. Transfer
30. Scanning
31. Scan Editing
32. Attribution
33. Prelim Database Dev't
33. Final Database Dev't
Validation and AA
35. Map Validation
36. Accuracy Assessment
Key
Acquire Photography
Task Performed by PI's and Mappers
Validation Observation Plot
Task Performed by Ecologists
Complete Gradsect
Task Performed by Both
20 Oct 1998
Final Products
Classification
Methods Report
Vegetation Description
Vegetation Key
Photos of Vegetation Classes
Aerial Photography
Photos
Interpreted Overlays
Aerial Photo Index
Spatial Data
ARC/INFO Export File of Vegetation Communities (*.E00)
SDTS Format of Vegetation Communities
ARC/INFO Export Files of Density, Height, Pattern
Graphic File of Map Composition
AML Files creating Map Composition
Hard Copies (2) of Map Composition
Mapping Methods Report
Photointerpretation Key
Mapping Class List
Metadata in MetaMaker Format
Field Data (Plots Format)
Export File of Location of Plots
Physical Description of Plots
Species Listing of Plots
Strata Description of Plots
Metadata in MetaMaker Format
Hard Copies of Field Data
Accuracy Assessment
Export File of Location of Plots
Methods Report
Accuracy Assessment Data
Contingency Table
Metadata in MetaMaker Format
Hard Copies of Field Data
Web site
All data

APPENDIX B: Field Data Forms and Instructions

2002 Plot Collection Protocols

Wyoming Natural Diversity Database University of Wyoming Sampling Methods

Field sampling methods

Three different sampling methods were used: Modified-Whittaker sample plots, Detailed Descriptions, and Observation Points. Modified-Whittaker plots and Detailed Descriptions of vegetation were used to define vegetation types. Observation Points, along with the results of the other two methods, will be used by the photointerpreters to increase the accuracy of the vegetation map created from aerial photographs. Vegetation types were nearly always sampled using Modified-Whittaker plots (Stohlgren et al. 1995; Figure 1). Ranges of cover values are recorded and averaged for all herbaceous species present within the 10 microplots within the macroplot. After these cover values are recorded in the field, presence of any new species is documented (but not cover values) in successively larger plots. Reported cover values are the average values of the 10 microplots, which are then reported as the midpoint of cover ranges. Cover values of plant species present in the macroplot, but not present in any of the 10 microplots, are recorded as 'less than 1 percent.' The Modified-Whittaker sampling method was advocated by WYNDD, because it was believed to be a more accurate, quantitative, and reproducible method of vegetation cover estimation than estimates of cover across a macroplot alone. Detailed Descriptions of vegetation were done when Modified-Whittaker plots were not appropriate for certain vegetation, such as wetlands. In these cases, vegetation zones were described and illustrated on the data sheets, and cover values of individual species were estimated within each zone. In each case, there was a large, central zone ringed by 2-3 linear zones. Only cover values of plant species within the large, central zone were reported.

WYNDD conducted the vegetation sampling, along with 2 Park-hired personnel. The additional personnel were hired by the Park to help sample fuels at the same locations where vegetation was sampled for the vegetation mapping project. All crew members were trained to collect both vegetation cover data and fuels data to allow for maximum efficiency in the field. Fuels sampling methodology was directed by the Park, and fuels data will be analyzed by the Park and is not included here.

Provisional classification of plant associations

Vegetation types were classified in a hierarchical fashion, beginning at the Formation Class level within the National Vegetation Classification. Formation Class categories are: Forest, Woodland, Shrubland, Dwarf-shrubland, Herbaceous, and Sparse Vegetation. Within Formation Classes, vegetation is classified into the appropriate alliance, usually based upon a minimum percentage of plant species present in the tallest stratum. Examples of alliances include the *Abies lasiocarpa* Forest Alliance, the *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance, and the *Salix geyeriana* Seasonally

Flooded Shrubland Alliance. Each alliance then contains a number of plant associations, which are the most basic category of the National Vegetation Classification. Association names often reflect the dominant overstory and understory plant species of a vegetation type, although some associations are based on the presence of a particular species, regardless of whether it contributes the highest cover. Examples of associations within the *Abies lasiocarpa* Forest Alliance include the *Abies lasiocarpa*/*Arnica cordifolia* Forest Association and the *Abies lasiocarpa/Vaccinium membranaceum* Rocky Mountain Forest Association.

When possible, vegetation types were assigned an association name from the list of associations in the National Vegetation Classification System (NatureServe Explorer, 2001). Initially, a search for an association with the name of the dominant overstory and understory species present in the plot was conducted. At the time this report was submitted, only the dominant plant species of most plots had been identified; the rest will be identified by March 1, 2003. If an association of that name existed and either did not list a description of the type or the description indicated that this type was based on the dominant overstory and understory species, then the vegetation type was assigned to that association. In cases where a description of an association was provided and indicated that it was not based on a dominance type, but upon the presence of a different understory species, the species composition of the plot was checked for a match. If no association with the dominant plants was listed, then alternative sources were consulted when possible. An association name followed by a question mark indicates uncertainty concerning the accuracy of placing a given vegetation type in that association. Where there were no associations that adequately described the vegetation sampled, the association was listed as 'Unknown.' The result is a provisional list of plant associations sampled during the 2002 field season.

The provisional classification was compared to the preliminary list of plant associations, created before field sampling was conducted and containing a list of plant associations thought to possibly occur in Grand Teton National Park with varying degrees of probability.

2002 Plot Collection Data Form

I. PLOT METADATA

Plot Identification and Location

Coordinates (record one): UTM: _____m E _____m N Zone_____ Datum_____

Lat _____N, Long_____W T_____N, R_____W, Sec_____, _____1/4 _____1/4.

_____PM

Map Name_____ Scale_____ BPU: _____

Nearby topographic feature and azimuth from plot _____

Elevation: _____ft / m (circle one) GPS Rover file_____
Aspect in degrees:_____ Slope in degrees:_____

Sampling Method, Plot Description and Documentation
Plot Type. (Check all that apply.)

Modified Whittaker. Plot size: 10m x 25m 20m x 50m

Observation Point. Accuracy Assessment Point.

Mature tree density plot. Dimensions _____ x _____ m

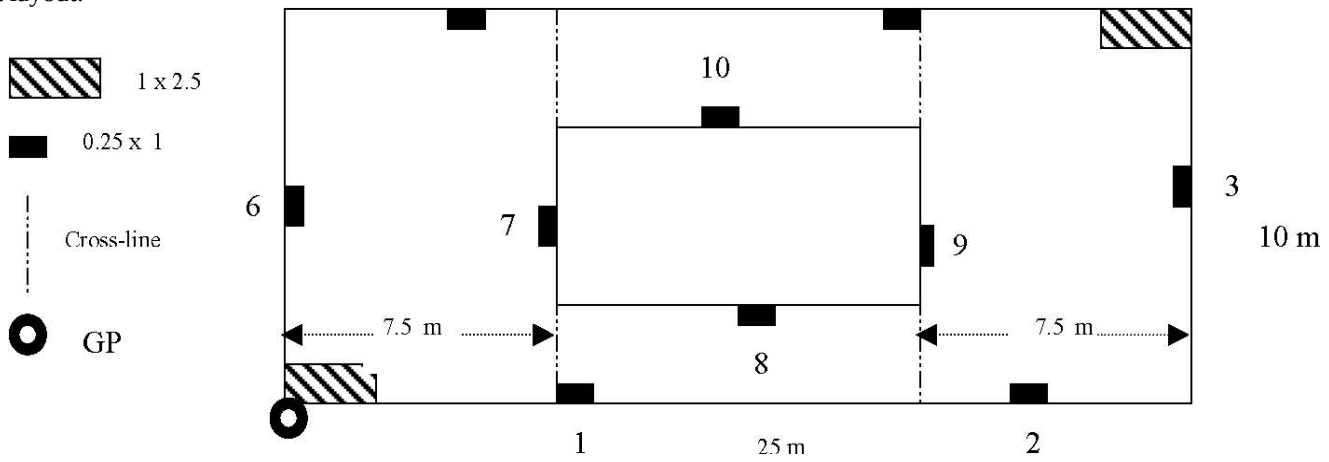
Sapling/seedling tree density plot. Dimensions _____ x _____ m

Photographs (number and brief description)_____

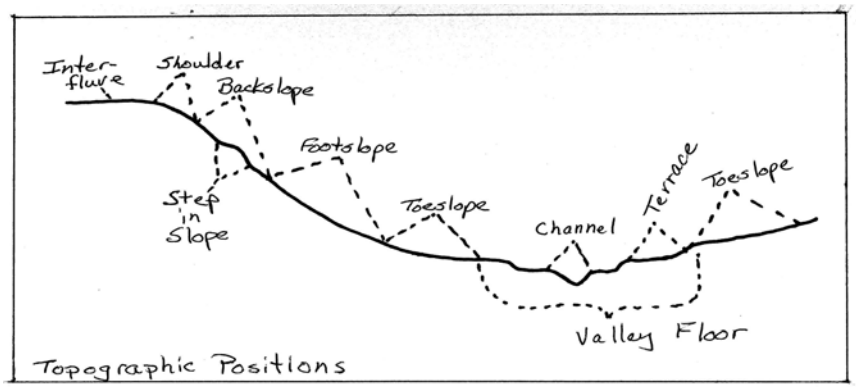
Why was this plot done? What does it illustrate?_____

Taxonomic Authority for Species_____

Sketch sample unit layout:



II. PLOT ENVIRONMENT



Topographic position (circle all that apply):

Interfluve Shoulder Backslope Footslope Toeslope Step in slope Valley floor Terrace Channel

Describe if necessary:_____

Hydrologic Regime (circle one): Permanently flooded Periodically flooded Saturated Mesic Dry Xeric Soil features (texture, rockiness, salt, etc.):_____

Bedrock (office):_____

Surface deposit (circle one): Residual Colluvial Aeolian Alluvial Glacial Outwash (Surface Notes)_____

Disturbance evidence
Fire scars Livestock grazing Windthrow Insects Mistletoe

Cultural _____

Disturbance Notes _____

Weed Notes (number, distribution) _____

General Notes _____

Accuracy assessment
Uncertainty about measured or estimated values_____

Completeness of species lists, by stratum_____

III. PLOT VEGETATION DATA

A. GENERAL DESCRIPTION

Table V1. Canopy Cover by Stratum.

Code	1	3	10	20	30	40	50	60	70	80	90	98	100
Cover Classes for Strata (% cover):	<1	1-5	5-15	15-25	25-35	35-45	45-55	55-65	65-75	75-85	85-95	95-99	100

Life Forms: TEnl, TCDbl, SEnl, SEbl, SEmi, SCDbl, SCDex, Fann, Fper, Gann, Gper, Succ, Lian, Fern, Lich, Moss, Cupl, Epip

Stratum	Height	Cover Class by Life Form and Total* for Stratum (Record only distinct stata, usu. with > 5% cover.)
I. Lichen/ Moss		
II. Herbaceous		
III. Tall Herb. (> 50 cm = 20 in)		
IV. Dwarf Shrub (< 50 cm = 20 in)		
V. Shrubs (> 50 cm = 20 in)		
VI. Tree Subcanopy		
VII. Tree Canopy		
Total*	NA	**Total Canopy Cover***

*Estimate cover of all vegetation within macroplot. This is NOT simply the sum of values for separate strata

Description of Vegetation: Incl. structure, dominants, heterogeneity of strata_____

Successional Stage (describe):_____

III. PLOT VEGETATION DATA

C. MODIFIED WHITTAKER PLOTS

Table V3. Cover by Species, Modified Whittaker Plot (Sheet ___ of ____)

Cover Classes for Species: Code	1	3	10	20	30	40	50	60	70	80	90	98	100
% cover	<1	1-5	5-15	15-25	25-35	35-45	45-55	55-65	65-75	75-85	85-95	95-99	100

SPECIES	NESTED PLOTS Macroplot size, square meters (circle one): 250 1000				STRATUM (1)
Lichen/ Moss					
Dead, rooted vegetation					
Soil (<2 mm) Gravel (2-64 mm)					
Cobble (64-256 mm) Boulder (256-4096 mm)					
Bedrock					
Litter (<0.25”) Wood (>0.25”)					

**Don't forget to write in canopy cover for each tree species within the macroplot.

2002 Fuels Data Collection Protocols

Surface Fuel Characterization

For each plot, surveyors will assign a fuel model from Anderson's (1982) field guide. Anderson's guide classifies fuels into four groups: grass, brush, timber, and slash. The differences between the groups are related to fuel loadings and fuel size class distributions.

When choosing a fuel model, consider the fuel stratum most likely to carry fire:

- grass (models 1-3),
- shrubs (models 4-7),
- timber litter (models 8-10),
- slash (models 11-13)

Read through the fuel model descriptions carefully and refer to the photographs – keep in mind the photos represent only a few possible field situations. The species depicted in the photos may be different than those present in your plot. It may be difficult at first, but when assigning a fuel model, try to visualize the vegetation in the photos and in your plot merely as different layers of fuels and choose the best fit among the 13 fuel models.

Next, make a determination as to how well the fuel model chosen matches the fuel loading present in the plot (higher than the chosen fuel model, about the same, or lower). In the comments section, note how the fuel loading in the plot differs than the chosen fuel model description/photo (e.g. is the fuel bed depth higher/lower, dead fuel loading higher/lower, etc). If you're making your determination relative to one of the photographs, please record the photograph number. To get a feel for different fuel loadings, compare the photos for different fuel models and compare the values given for fuel loading at the top of the page (tons/acre).

Surface Cover

For all plots, estimate the percent of the plot surface covered by the following categories: non-burnable (e.g. bare ground, rock, ice), herbaceous vegetation (herbs, forbs), shrub vegetation, and litter (e.g. needlecast, deciduous leaf litter). Estimates should be made for the entire plot and should add up to 100%.

Burgan and Rothermel Fuel Inventory

Herbaceous fuel layer

For all plots with herbaceous fuels, surveyors will assign a type and class using Burgan and Rothermel's (1984) photos as a guide.

Type (1-4) – Classify herbaceous fuels (both herbaceous plants and grasses) into one of four types according to general morphology.
1 = Fine, e.g. cheatgrass (*Bromus tectorum*)
2 = Medium, e.g. mountain brome (*Bromus carinatus*)
3 = Coarse, e.g. deergrass (*Muhlenbergia rigens*)
4 = Very Coarse, e.g. sawgrass (*Mariscus*) – probably nothing in Rocky this coarse

Density Class (1-6) – For each type, further divide into one of six density classes.

Avg. Depth – Estimate the average depth (height) of the herbaceous layer.

Shrub fuel layer

Assign a type and class for the shrub fuels in a plot in a similar fashion as the herbaceous fuels classification.

If there are small trees (under 2 m in height) that would not be captured on the canopy fuel load data sheet, please treat these as shrubs (e.g. seedlings, saplings, krummholz). In the case of small trees, it is only necessary to record species, height, and percent cover.

Genus – record the genus of the dominant shrub species in each plot (it is not necessary to record a comprehensive species list – just record the dominant species).

Type (1-5) – Classify shrub fuels into one of five types according to general morphology.
1 = Fine stems, thin leaves, e.g. huckleberry (*Vaccinium*)
2 = Medium stems, thin leaves, e.g. currant (*Ribes*)
3 = Medium stems, thick leaves, e.g. ceanothus (*Ceanothus*)
4 = Densely packed thin stems and leaves, e.g. bitterbrush, sagebrush (*Purshia tridentata, Artemisia tridentata*)
5 = Thick stems, thick leaves, e.g. kinnikinnick (*Arctostaphylos uva-ursi*)

Density Class (1-6) – For each type, further divide into one of six density classes.

Avg. Depth – Estimate the average depth (height) of the shrub layer.

Avg. % Dead – Estimate the percentage of the shrub layer that is dead – record the average percent of dead material within each living shrub, not number of individuals that are completely dead.

% Cover – record the percent cover of each of the major shrub types found within the plot.

Litter Fuels

For all plots where tree leaf and or needle litter is present on the ground, estimate the percentages of long needle litter [e.g. ponderosa pine (*Pinus ponderosa*)], short needle litter [e.g. Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*)], and deciduous leaf litter (e.g. aspen (*Populus tremuloides*)]. All percentages must add up to 100%.

Fuel Loading – Dead and Down

For each plot, surveyors will estimate the loadings of dead and downed fuels. Dead and downed fuels are classified into three groups based on the diameter of the fuels. Ten-hour fuels consist of dead branchwood between 0.6 cm and 2.5 cm (0.25" – 1.0") in diameter. Dead branchwood between 2.5 cm and 7.6 cm (1" – 3") in diameter constitute the one hundred-hour fuels. Dead branchwood larger than 7.6 cm (> 3") in diameter make up the thousand-hour fuels.

To estimate the dead and down fuel loading, surveyors will assign a photo from the photo series guides that best represents each size class of fuels. Do not try to represent all size classes of dead and down fuels in a plot with a single photo. Choose one photo that best represents each size class of fuels. As with the fuel model photo guide, keep in mind that the photos represent only a few possible field situations. The species depicted in the photos may be different than those present in your plot; focus attention on the dead and down fuels in the plot and for each fuel size class, choose the photo that best depicts the fuels present.

If you are unable to determine a suitable match between the photo series and the fuels on your plot, please enter "SEE PLOT PHOTOS" in the comments section.

Litter and Duff Loading

Within each plot, 5 litter and duff measurements (depth) will be taken. For square or rectangular plots, take one measurement at the plot center, and at the midpoint of each of the four plot boundary lines. If you are using a circular plot, take one measurement at the plot center and one measurement in each of the cardinal directions (north, south, east west) 10 meters from the plot center.

Using a trowel, expose a profile of the forest floor and measure the depth of the litter and duff layers. Litter refers to the freshly cast material that makes up the top layer of the forest floor. The duff layer lies between the litter layer and mineral soil and consists of the fermentation and humus layers.

Fuels Photos

From the plot center, take a photo in each of the 4 cardinal directions (north, south, east, and west). In each photo, be sure that a card indicating the plot number and direction is visible.

Canopy Fuel Loading

Information on stand structure and canopy characteristics is necessary to model the potential for crown fire behavior. This information is of great importance in making fire management decisions.

For each tree (greater than 2 meters in height) within a plot, surveyors will record the following information:

- diameter (in cm) at breast height (1.4 m),
- tree species,
- tree height (in meters, measured with a clinometer; only representative trees need be measured, other trees can then be estimated),
- crown ratio (ocular estimate of the ratio of crown length to total tree height),
- crown base height (in meters, height of the lowest live branch which when burning would cause vertical movement of the fire into the crown),
- tree structural stage
  - ◊ **1:** Dominant (trees with crowns extending above the general level of the crown cover, receiving full light from above and partly from the side; larger than the average trees in stand)
  - ◊ **2:** Codominant (trees with crowns forming the general level of the crown cover, receiving full light from above, but comparatively little from the sides)
  - ◊ **3:** Intermediate (trees shorter than those in preceding classes with crowns below or extending into crown cover formed by dominant and codominant classes, receiving little direct light from above)
  - ◊ **4:** Suppressed (trees with crowns below the general level of crown cover, receiving no direct light from above
  - ◊ **5:** Open growth (trees receiving full sunlight from above and all sides, trees widely spaced and/or isolated)
- snag structural stage
  - ◊ **6:** Recent snag (trees that are recently dead with bark still intact, branches and needles may also be intact
  - ◊ **7:** Loose bark snag (trees that have been dead several years, bark partially deteriorated, tops often broken)
  - ◊ **8:** Clean snag (trees that have been dead several years with no bark left, usually most branches are gone, tops often broken)
  - ◊ **9:** Broken above DBH (trees that have been dead a long time with no bark, broken above DBH)
  - ◊ **10:** Broken below DBH (trees that have been dead a long time with no bark, broken below DBH)
  - ◊ 11: not applicable
  - ◊ **12:** Cut stump (stump resulting from human disturbance)

References

Anderson, H.E. 1982. Aids to determining fuel models for estimating fire behavior. USDA Forest Service, General Technical Report INT-GTR-122.

Burgan, R.E. and R.C. Rothermel. 1984. BEHAVE: Fire behavior prediction and fuel modeling system – FUEL subsystem. USDA Forest Service, General Technical Report INT-GTR-167.

2003 Plot Collection Protocols

PROTOCOLS FOR VEGETATION SAMPLING AT GRAND TETON NATIONAL PARK

A Basic Guide for Field Work

Prepared for the 2003 Field Season, USGS/NPS Vegetation Mapping Program

This document is intended to give you general instructions and guidelines for conducting your field work at Grand Teton National Park. Detailed, field-by-field coding conventions for the primary form you'll be completing in the field (the Plot Survey form) are provided in the 'cheat sheet' at the back, along with an example of a completed form. A completed Fuel Inventory form is also included at the back for reference.

OVERVIEW

The data that you collect in Grand Teton this year will be used to create a relatively fine-scale delineation of vegetation pattern in Grand Teton National Park and its environs. The range of habitats, and the corresponding diversity of vegetation types, found here is extremely complex. The understanding of finer-scale, ecologically distinct vegetation types that you will help create may be used by the Park to plan appropriate management activities, monitor the results of these activities, track long-term changes in vegetation, direct searches for rare species, model fire behavior, and portray the wealth of natural diversity on Park lands to the public.

Establishing a field sampling strategy that captures—in only two or three field seasons—sufficient data on all the distinct vegetation types in an area as large, diverse, and rugged as Grand Teton is an ongoing challenge. To make the sampling as efficient as possible, the key environmental variables thought to be driving vegetation pattern were identified. These included factors such as elevation, aspect, fire history, and soils (see TNC 1998). The geographic locations of various classes of these environmental factors were then overlaid and areas with unique combinations (called biophysical units or BPUs) were mapped. (For example a 7000 foot elevation, south-facing site with wet soils was identified as a different biophysical unit from 7000 foot elevation, north-facing site with alluvial and floodplain soils.) The basic idea being that by identifying and placing samples in the range of BPUs we would be likely to sample the range of vegetation types. Next, wherever possible, areas with clusters of these different BPUs in close proximity to each other *and* in close proximity to roads and trails were located, so that getting to these places could be as easy as possible.

In the next (ongoing) step, photo interpreters are examining aerial photos of the areas identified by the (as yet unsampled) BPUs and will make an educated guess about what types of vegetation will be found there. The photo interpreters will eventually supply mylar overlays with polygons delineated and labeled with vegetation types. The vegetation "types" they are choosing to tag their polygons are those included in the preliminary classification of Park vegetation created using the U.S. National Vegetation Classification system (Grossman et al. 1998). For the 2002 field season, a relatively coarse level of this classification hierarchy (formation group level) was used (e.g. evergreen woodland, mixed deciduous-evergreen shrubland). The coarse level of interpretation is necessary because the photos are relatively small scale (1:24,000) which limits finer level interpretation, and because the photo interpreters have yet to do extensive ground-truthing.

The interpreted overlays, when attached to the photo prints, are useful in the field to help find the vegetation types to sample. The delineated polygons provide a perspective of accessibility to selected points and also indicate the size of homogenous stands so that sampling can be placed to best advantage within the types. The photo interpreters will give the selected, delineated polygons labeled with U.S. National Vegetation Classification types to the Field Coordinator, who will be keeping a running tally of the number of plots that still need to be established and sampled for each type.

The Field Coordinator will give you and your field partner your assignments based on the tally. You, your crew, and the Field Coordinator will be evaluating the data you collect in the field, assigning a second (still preliminary) vegetation type, and updating the tally of vegetation types x number of plots still needed. This tally will be updated approximately every two weeks during the field season. The goal of this constant feedback and revision is to use *your* time as efficiently as possible: we are trying our best to avoid oversampling of some types and undersampling

of others. Deciding where to sample to capture the full range of diversity over the Park is going to be very much an iterative process as the field season goes along!

Getting There

Before you leave... check that you have all the materials needed to complete your field work (Please see the checklist and "considerations for mission planning" at the end of this document to help you).

Every single morning... check your GPS receiver to make sure it is set to NAD 27. Make sure the previous rover files have been downloaded, and that the batteries are fully charged. Check your field camera to make sure the previous photos were downloaded, and the battery is charged.

Along the way...look around. Digital data layers are great, but they do ***not*** replace human perception. If, on the way to one vegetation type, you see an assemblage of plants that seems unique and that you think is not included on the list of vegetation types to be sampled, use your judgment to decide whether to do a plot there, take an observation point, or radio or phone to contact the field coordinator. If there are multiple teams working and you may potentially overlap with vegetation types they are sampling on a given day, be sure to contact them using your radios and discuss what you have found, so that efforts are not duplicated or opportunities missed. You and the field coordinator or other team may decide to change your plans and sample the vegetation pattern you discovered. This will be more likely to occur as the season progresses and you become more familiar with the vegetation types and how they can look on the ground.

Once There

Establishing a Plot

1) Figure out where to place your plot. This is a subjective process. You'll want to place your plots in areas that seem to be both relatively **homogenous** and **representative** of the vegetation of the polygon as a whole. In other words, avoid areas where the vegetation appears to be transitioning from one type to another, and areas with anomalous or heterogeneous structure or species composition. Take some time to do this carefully, because the plots you set up will be *permanent*; relocated and resampled over time in order to determine responses to management. Look at *all* the vegetation strata to determine if the area is structurally and floristically uniform and generally try to place your plots at least 30 m from what you see as the 'boundary' between this vegetation type and any neighboring, distinctly different types. During the training period this step will be emphasized and discussed in detail. However, the rule-of-thumb is to conduct a reconnaissance of the plot if time and topography allows. If not, rely on the polygons from the aerial-photo interpreter as a guide to where you should place your plot.

Note: In cases where a polygon is very heterogeneous, more than one plot may be needed. Again, look around, use that human perception, and contact your Field Coordinator via radio or cell phone if you need guidance about whether or not to establish more than one plot.

2) Bury a permanent plot marker with the plot number inscribed on it into the ground. This will be the most **NORTHWEST** corner of your plot. Run your measuring tapes out from this corner in a clockwise direction. Record the azimuth of the first leg of the plot.

3) Using your GPS receiver, record the UTM of this corner of the plot under the **Field UTM X** and **Field UTM Y** on the field form. Remember that this is about to become a permanent plot, so being able to *find* it again will be key: use the GPS, rather than estimating! (If you cannot get a GPS reading, estimate the coordinates from the topo map and note on the form that you had to resort to this method.)

4) The default plot shape will be square but it may make more sense to establish rectangular plots in linear vegetation types (e.g. riparian or ridgeline types). Stand at the permanent corner with your compass and direct your partner, who has the tape measure, to measure plot boundaries to the east. Then standing in the northeasterly corner, direct your partner with the tape to the next corner, and so on until a square or rectangle is formed. Leave the tapes down as borders while working. Standard plot sizes should be as follows:

If you're in a ...	**You should usually make your plot...**	**Giving you a plot area of...**
Forest (i.e., trees have their crowns overlapping, usually forming 60-100% cover)	20 m x 20 m	400 m^2
Woodland (i.e., open stands of trees with crowns usually not touching. Canopy tree cover is 25-60% Or exceeds shrub, dwarf-shrub, herb, and nonvascular cover).	20 m x 20 m	400 m^2
Shrubland (i.e., shrubs greater than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, dwarf-shrub, herb, and nonvascular cover)	20 m x 20 m	400 m^2
Dwarf-shrubland (heath) (i.e., Shrubs less than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, shrub, herb, and nonvascular cover).	10 m x 10 m	100 m^2
Herbaceous (i.e., Herbs dominant, usually forming more than 25 percent cover OR exceeding tree, shrub, dwarf-shrub, and nonvascular cover).	10 m x 10 m	100 m^2
Nonvascular (i.e., nonvascular cover dominant, usually forming more than 25% cover).	5 m x 5 m	25 m^2

Note: You can deviate from the standard plot *shapes* where that makes sense, but the total plot *area* encompassed by the boundaries should be as listed above for each major class of vegetation. For example, forested riparian vegetation, may be sampled in a more linear, 10 x 40 m (400 m^2) plot; herbaceous riparian or ridgeline vegetation in a 2 x 50 m (100 m^2) plot.

5) Once the plot is established, it is generally a good time to fill out the **Identifiers/Locators** part of your Plot Survey Form (see the cheat sheet) and take the plot photos.

Taking photographs

Write the plot number on the white board, and have someone stand at the permanent corner (NW corner) with the board and the survey pole. Make a note on the data sheet regarding which direction the photo was taken.

Next, have the person stand in the center of the plot and take a picture of the overall vegetation of the plot.

Finally, as part of the fuels data collection, write the transect number on the white board and have your partner stand (with the board and the survey pole) on the transect line. (See fuels protocols for more details.)

If photos of the plot have been taken at the time of sampling, indicate their numbers from the ones the camera assigns. Photos will be taken in the following order: 1) Permanent plot corner; 2) View of the vegetation plot from the outside looking in; 3-6) Views down the fuels transects.

Data Collection

Environmental Description

If the GPS unit isn't working, fill in this section by hand. Note: There is space to make extra notes regarding topography, such as "The plot is on the toeslope of a moraine." See the coding instructions at the end of this document for guidance on the specific fields.

Vegetation Description
For guidance on the specific fields on the second page of the form, see the coding instructions.

As you begin to collect the species, DBH and cover information, keep these four rules in mind—they will speed your data collection considerably:

1) Except in very diverse plots, don't spend more than **20 minutes** looking for new and different species to record. Remember that the plot data is used to classify the overall vegetation of the Park, not to make a complete species list for it. If you have to spend much more than 20 minutes to *find* a species, it probably isn't going to be important in characterizing the vegetation type. *For diverse plots with over 25 taxa you may take up to 30 minutes on the listing process.*

2) If you can't identify a plant to species, record the species on your form as "Carex unknown sp. 1," "Brassicaceae yellow fls #2", "Aster Fred", or as a last resort "unknown species #1," etc. The more information you record about the unknowns, the easier it is to keep track of them. Record associated cover class and other data for the unknown as you would for any other species.
Then collect a specimen. Take a sample of the species with as much of the plant as possible, (including roots and intact sexual parts). Place the sample in a baggie, and label the baggie with the plot code and the name you gave it on the data form.

When you get back to the office, if you need the species identified right away because it appears to be dominant or diagnostic (you're seeing it all over the place or you're seeing much more in this particular vegetation type than in others), key it or get it identified by the field coordinator before going to the field again.

If you don't need the plant keyed right away, press it. Mark the pressed specimen with the plot code, the name of the collector, the date, and the name you gave it on the data form. When pressing plants, remember to spread them out as much as possible. *Put only one species in each newspaper!!!!* Label the paper on the OUTSIDE, so the information can be read without opening the paper to the specimen.

Give all your specimens, bagged and pressed, to the Field Coordinator for keying. You can, of course, key some of these out yourself if you want to, but don't let plant keying get in the way of your primary responsibility: *field data collection*. No one expects you to identify every plant; that's why keying is considered part of the Field Coordinator's routine responsibilities. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular plot. If the species has a high cover value (>1%) it is more of a priority to identify.

A sample completed Plot Survey form is provided at the end of this document.

Fuel Inventory
In addition to the Plot Survey form, you'll also be completing a fuel inventory for every plot you establish. This information will be in another document.

Observation Point Form
Occasionally, you will need to collect some plot-free data. This will happen when:

1) The photo interpreters can't tell what kind of vegetation is in a particular part of a photo.

2) The photo interpreters were wrong about what kind of vegetation is in a biophysical unit polygon *and* sufficient plot data has already been collected for the kind of vegetation that is actually there.
(Check with your Field Coordinator via radio if you think this is the case.) *or*

3) You want to document the presence of a community, but don't have time for a full plot.

In these cases, there is no need to establish a plot. However, you will help the photo interpreters identify this type in the future if you collect some data. You will navigate to the polygon as usual, scout out the polygon briefly to get a feel for what it is like, and record some general data to characterize it on an Observation Point form. This is an abbreviated version of the Plot Survey form, and the same cheat sheet can be used to help with filling it out. GPS points may be taken at any part of the polygon as long as it is >30 m from its edge, to verify its location.

A sample completed Observation Point form is provided at the end of this document.

We hope you find your field season at Grand Teton enjoyable and rewarding. Best of luck!

Literature Cited

Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

The Nature Conservancy [TNC]. 1998. An environmentally-driven approach to vegetation sampling and mapping at Yosemite National Park. Report prepared for the U.S. Department of the Interior, National Biological Survey and National Park Service. The Nature Conservancy, Arlington, Virginia.

Instructions for filling out fields in the PLOT SURVEY FORM (Grand Teton version, 2003)

IDENTIFIERS/LOCATORS

Plot Code
Code indicating the specific plot within the vegetation polygon. For the 2003 field season, the codes will be in the format "03-A-001". The "03" refers to 2003. The letter refers to crew "A", "B", "C", or "D". The crew's letter designation is based on the letter emblazoned on the crew equipment box, on the GPS unit, and on the camera. The last three digits refer to the plot number.

Surveyors
Names of surveyors, with principal surveyor listed first. Separate the names into veg and fuels based on who is doing which parts of the data collection.

Date
Date the survey was taken; year, month, day.

BPU Code
The biophysical unit identified—will be provided by your Field Coordinator. This is a less important field this year and can be filled in based on a post processing of GIS data from the GIS analysts (Dirk Shupe).

Provisional Community Name
Using the provisional classification of the Park with which you've been provided, assign the name of the vegetation type which most closely resembles this type. Enter the finest level of the classification possible. What you put here may or may not agree with the photo interpretation. In fact, *none* of the names may be a good fit; you may have found a new type. *If you have a new type, name it based on the two or three most dominant species in the plot.* The Field Coordinator will review the 'provisional community name' in light of the data you collect and her knowledge of the Park vegetation and of the classification. The 'provisional community name' that is assigned will be used to update the tally of types x number of plots needed.

Quad Name
Appropriate name/scale from survey map used; use 7.5-minute quadrangle if possible.

Park Site Name
Provisional name assigned by field worker that describes where the data were collected. It should represent an identifiable feature on a topographic map.

GPS Rover File
Record the number of the file from the GPS unit.

Field UTM X
Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Field UTM Y
Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Error
Record this off the GPS unit. Might change to PDOP. (Explained later.)

Plot Length and Plot Width
Enter width and length dimensions for square or rectangular plots. Choose the appropriate plot size based on the following:

Vegetation Class	Standard Plot Dimensions	PLOT AREA
Forest	20 m x 20 m	400 m^2
Woodland	20 m x 20 m	400 m^2
Shrubland	20 m x 20 m	400 m^2
Dwarf-shrubland (heath)	10 m x 10 m	100 m^2
Herbaceous	10 m x 10 m	100 m^2
Nonvascular	5 m x 5 m	25 m^2

Photo numbers
If photos of the plot have been taken at the time of sampling, indicate their numbers from the ones the camera assigns. Photos will be taken in the following order: 1) Permanent plot corner; 2) View of the vegetation plot from the outside looking in; 3-6) Views down the fuels transects.

Plot Permanent
Check off that the plot has been permanently marked.

Plot Azimuth
Record the azimuth of the first line from the permanent plot marker to the next corner, heading clockwise.

Plot Representativeness
Does this plot represent the full variability of the polygon? If not, were additional plots taken? Note: we distinguish in this section the plot's ability to represent the stand or polygon you are sampling as one component, and the ability of this sample to represent the range of variability of the association in the entire mapping area. The former comment may be ascertained by reconnaissance of the stand. The latter comment comes only after some familiarity with the vegetation type throughout the mapping area and may be left blank if you have no opinion at this time.

ENVIRONMENTAL DESCRIPTION

Elevation
Elevation of the plot. In general, we have determined that the reading you get from a topo map (provided you are certain where you are) is more accurate than the average reading from the GPS unit. Thus, please attempt to estimate your elevation with the topo map.

Slope
Measure the slope in percent using a clinometer.

Aspect
Measure the aspect using a compass (be sure compass is set to correct for the magnetic declination).

Topographic Position
Choose one:

INTERFLUVE (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two fluves (drainageways) that sheds water to the drainageways.

SHOULDER (shoulder slope, upper slope, convex creep slope). Geomorphic component that forms the uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.

BACKSLOPE. Subset of midslopes that are steep, linear, and may include cliff segments (fall faces).

FOOTSLOPE (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between backslope, and toeslope.

TOESLOPE (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, commonly gentle and linear and characterized by alluvial deposition.

TERRACE Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

CHANNEL (narrow valley bottom, gully arroyo). Bed of single or braided watercourse commonly barren of vegetation and formed of modern alluvium.

BASIN FLOOR (depression). Nearly level to gently sloping, bottom surface of a basin.

Describe Topographic Position (Optional)
Give more details here, such as “This is the toeslope of a moraine.”

Cowardian System
Indicate “upland” if the system is not a wetland. If the system is a wetland, check off the name of the USFWS system which best describes its hydrology and landform.

- Riverine: Below the high water mark on a moving water system (a creek bed). A community of *Eleocharis* on a sand bar would be in this category.
- Palustrine: In the riparian zone. Plants regularly have wet roots through much of the summer. A community of willows and sedges would be in this category.
- Lacustrine: Below the high water mark of a lake. The marshy stuff on the edge of Jackson Lake would be in this category.

Assess the hydrologic regime of the plot using the descriptions below (adapted from Cowardin et al. 1979).

PERMANENTLY FLOODED - Water covers the land surface at all times of the year in all years. Equivalent to Cowardin's “permanently flooded.”

SEMIPERMANENTLY FLOODED - Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. Includes Cowardin's Intermittently Exposed and Semipermanently Flooded modifiers.

SEASONALLY FLOODED - Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. Includes Cowardin's Seasonal, Seasonal-Saturated, and Seasonal-Well Drained modifiers.

SATURATED - Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. Equivalent to Cowardin's Saturated modifier.

TEMPORARILY FLOODED - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. Equivalent to Cowardin's Temporary modifier.

INTERMITTENTLY FLOODED - Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations. Equivalent to Cowardin's Intermittently Flooded modifier.

UNKNOWN - The water regime of the area is not known. The unit is simply described as a non-tidal wetland.

Unvegetated Surface
Estimate the approximate percentage of the *total* surface area covered by each category.

Soil Texture
Using the key below, assess average soil texture.

Simplified Key to Soil Texture (Brewer and McCann 1982, with edits)

1. Soil does not remain in a ball when squeezed.....sand
1. Soil remains in a ball when squeezed.....2

Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you can push up over your finger.

2. Soil makes no ribbon.....……..……loamy sand
2. Soil makes a ribbon (may be very short).....3

3. Ribbon extends less than 1 inch before breaking.....4

Add excess water to small amount of soil:

4. Soil feels smooth.....silt loam
4. Soil feels at least slightly gritty…….……..…5

Squeeze a moistened ball:

5. Cast is formed which can be handled CAREFULLY without breaking…….…….. sandy loam
5. Cast is formed which can be handled FREELY without breaking…….……loam

3. Ribbon extends 1 inch or more before breaking.....6

5. Soil makes a ribbon that breaks when 1 to 2 inches long; cracks if bent into a ring.....7

Add excess water to small amount of soil:

7. Soil feels at least slightly gritty.…….....clay loam
7. Soil feels smooth.....silt

6. Soil makes a ribbon 2+ inches long; does NOT crack when bent into a ring……..…….……8

Add excess water to a small amount of soil:

8. Soil feels at least slightly gritty.....……..clay
8. Soil feels smooth.....silty clay

HANDBOOK ON SOILS

In the field, soil texture is determined by the feel of a moist soil when it is rubbed between the thumb and fingers. Since sand particles feel gritty, silt particles have a smooth velvety feel and clay is both sticky and plastic, an estimate of the relative proportions of the separates may be made. This procedure, of course, will not give the exact percentage of sand, silt, and clay, but, with a little practice on samples of known composition, the relative proportions of the individual separates can be closely estimated. Practice with known samples is the only way to acquire this facility. The ability to determine texture in the field by this method is one of the most valuable practical skills a student of soils can possess.

The outstanding physical characteristics of the main textural grades as determined by the feel of the soil are described below.

1. Sandy Soil. A sandy soil is loose and single grained. The individual grains can be seen readily or felt. Squeezed in the hand when dry, it will fall apart when pressure is released. Squeezed when moist, it will form a cast, but will crumble when touched.

2. Sandy Loam Soil. A sandy loam soil contains much sand, but has enough silt and clay to make it somewhat coherent. Individual sand grains can be easily seen and felt. Squeezed when dry, it will form a cast which will readily fall apart; but if squeezed when moist a cast can be formed which will bear careful handling without breaking.

3. Loam Soil. A loam soil is about an equal mixture of the sand and silt with the clay content being between 7 and 27 percent. A loam is mellow with a somewhat sandy feel, yet fairly smooth and slightly plastic. Squeezed when moist, it will form a cast which can be handled freely without breaking.

4. Silt Loam Soil. A silt loam soil, when dry, may appear cloddy, but lumps are readily broken, and when pulverized, it feels soft and floury. When wet, the soil readily runs together. Either dry or moist, it will form casts which can be handled freely without breaking, but when moistened and extruded between the thumb and fingers, it will not form a ribbon, but will give a broken appearance.

5. Clay Loam Soil. A clay loam soil is fine-textured and usually breaks into clods or lumps that are hard when dry. When moist and extruded between the thumb and fingers, it will form a thin "ribbon" which will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will bear much handling. When kneaded in the hand, it does not crumble readily, but tends to work into a heavy, compact mass.

6. Clay Soil. A clay soil is fine-textured and usually forms very hard lumps or clods when dry and is plastic and sticky when wet. When the moist soil is ribboned out between the thumb and fingers, it will form a long flexible strip. A clay soil leaves a "slick' surface on the thumb and fingers when rubbed together and tends to hold the thumb and fingers together due to the stickiness of the clay.

The characteristics described above are suggestive only, and will only apply to a group of similar soils. The characteristics of clay vary with the kind of clay mineral. For this reason, textural grades may exhibit different properties from region to region. For instance, clays of the montmorillonite group are very sticky and plastic; those of the oxide group are plastic and waxy with relatively little stickiness.

The preceding discussion has been directed to those soil particles whose diameters are less than 2 millimeters--the sands, silts, and clays. Soils may also contain larger sized particles that may be collectively called coarse fragments. These large particles may on occasion exceed the smaller soil particles in volume, thus a loam soil containing rounded rock particles less than three inches in diameter, would be caSoil Drainage

The soil drainage classes are defined in terms of (1) actual moisture content (in excess of field moisture capacity) and (2) the extent of the period during which excess water is present in the plant-root zone. It is recognized that permeability, level of groundwater, and seepage are factors affecting moisture status. However, because these are not easily observed or measured in the field, they cannot generally be used as criteria of moisture status. It is further recognized that soil profile morphology, for example mottling, normally, but not always, reflects soil moisture status. Although soil morphology may be a valuable field indication of moisture status, it should not be the overriding criterion. Soil drainage classes cannot be based solely on the presence or absence of mottling. Topographic position and vegetation as well as soil morphology are useful field criteria for assessing soil moisture status.

WELL DRAINED - The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year.

MODERATELY WELL DRAINED - The soil moisture content is in excess of field capacity for a small but significant period of the year.

POORLY DRAINED - The soil moisture content is in excess of field capacity in all horizons for a large part of the year.

VEGETATION DESCRIPTION

Leaf Phenology
Select the value which best describes the leaf phenology of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

EVERGREEN - Greater than 75% of the total woody cover is never without green foliage.

COLD DECIDUOUS - Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.

MIXED: EVERGREEN & COLD DECIDUOUS - Evergreen and deciduous species generally contribute 25-75% of the total woody cover. Evergreen and cold-deciduous species admixed.

PERENNIAL - Herbaceous vegetation composed of more than 50% perennial species.

ANNUAL - Herbaceous vegetation composed of more than 50% annual species.

Leaf Type
Select the value which best describes the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

BROAD-LEAVED - Woody vegetation primarily broad-leaved (generally contributes greater than 50 percent of the total woody cover).

NEEDLE-LEAVED - Woody vegetation primarily needle-leaved (generally contributes greater than 50 percent cover).

GRAMINOID - Herbaceous vegetation composed of more than 50 percent graminoid/stipe leaf species.

FORB (BROAD-LEAF-HERBACEOUS) - Herbaceous vegetation composed of more than 50% broad-leaf forb species.

PTERIDOPHYTE - Herbaceous vegetation composed of more than 50 percent species with frond or frond-like leaves. (Ferns)

Physiognomic Class

Choose one:

Forest: Trees with their crowns overlapping (generally forming 60-100% cover).

Woodland: Open stands of trees with crowns not usually touching (generally forming 25-60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover.

Shrubland: Shrubs generally greater than 2.5 feet tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover.

Dwarf-Shrubland: Low-growing shrubs usually under 2.5 feet tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 25% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover.

Herbaceous: Herbs (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover.

Nonvascular: Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and herb cover.

Sparse Vegetation: Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25% and greater than 0%).

Strata, Height Class, Cover Class, Diagnostic Species
Visually divide the community into vegetation layers (strata). Indicate the average height class of the stratum in the first column, using the Height Scale on the form. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale on the form. Height and Cover classes are also listed below.

Trees are defined as single-stemmed woody plants, generally 15 feet in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 15 feet in height at maturity and under optimal growing conditions.

Every plot does not have every strata. Strata (or vegetation layers) are only noted when they exist. A grassland with one lonely shrub does not have a shrub layer, it has only a herbaceous layer. However, on the species list (the last section of this form) you will give the one shrub a S1 or S2 of S3, as appropriate, for that species. In this way, every species is tagged to a lifeform, even though it may not be abundant enough to be called a "layer".

List the **dominant** species in each stratum.

Animal Use Evidence
Comment on any evidence of wildlife (i.e., tracks, scat, gopher or prairie dog mounds, etc.). Notes on domestic animals should be made in the field below.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting. This field can be used to describe site history such as fire events (date since last fire or evidence of severity) as well as other disturbance or reproduction factors

Other Comments
This is a place for miscellaneous comments, including a “memory jogger” to help you remember doing this plot. Memory joggers include: the thunderstorm that swept through; the fact that someone shared homemade cookies; that unusual plant you found on the way to the plot; the joke of the moment; or anything else that will help you recall doing this plot when you look at the plot form weeks or months later.

Species/Strata/Percent Cover Table
The main use of the strata information is to categorize the plots by life-form, so we can subset the data into forest and woodland, shrublands, and herbaceous plots for analysis. This is why it is imperative that things be called the same throughout the data set.

Starting with the uppermost stratum, list all the species present and their cover class using the scale provided below. If a species is in the tree layer (single-stemmed woody plants, generally 15 feet in height or greater at maturity), list whether it is T1 (emergent tree), T2 (tree canopy), or T3 (tree sub-canopy). If a species is in the shrub layer, note if S1 (tall shrub), or S2 (short shrub), or S3 (dwarf shrub). If in the ground layer, note if H (herbaceous), N (nonvascular). Some species will be in more than one layer. For example, in a Douglas-fir stand, you might have one or two especially tall specimens, which would be in the T1 (emergent tree) layer. Then the majority of the mature trees would be in T2 (tree canopy). The saplings that are coming up in the understory would be in the T3.

One other point: every plot does not have every strata. Strata (or vegetation Layers) are only noted for when they exist. A grassland with one lonely shrub does not have a shrub layer, it has only a Herbaceous layer. However, on the species list, you will give the one shrub a S1 or S2 of S3, as appropriate, for that species. In this way, every species is tagged to a lifeform, even though it may not be abundant enough to be called a "layer".

Seedlings are defined as trees less than “breast height” of DBH fame, so less than 4.5 feet tall. Seedlings between knee height and breast height will be labeled as being in the short shrub layer (S2), and those below knee height will be labeled as being in the dwarf shrub layer (S3).

<u>Cover Scale for Species Percent Cover</u>

Code	Range of Class
01	>0-1%
05	1-5%
10	5-15%
20	16-25%
30	26-35%
40	36-45%
50	46-55%
60	56-65%
70	66-75%
80	76-85%
90	86-95%
98	96-99%
100	100%

Protocol for field photos

*Before taking pictures, make sure the resolution on the camera is set to **M1**, you can do this by pressing the menu button when in shooting mode, scrolling down to resolution, and selecting M1. Make sure the compression is on the middle setting.

1. After the plot has been established, take a photo from the 1st or last line. Place the survey pole and board on the corner with the permanent marker, and take the picture in the direction of the permanent corner. Make sure to get the entire pole in the picture. The board should be labeled with the plot #, the date, and a P with a circle around it:

03A001 6/13/03 P

*It's best if you write really thick with the marker, so that it can be read on the picture. In high light, turn the board at an angle away from the sun so it doesn't reflect as much into the camera.

2. Next take a photo of the plot. Pick an area of the plot you feel is representative, put the survey pole and board in it and take a picture. The board should be labeled with the plot #, the date, and VEG, like this:

03A001 6/13/03 VEG

3. The rest of the photos will be fuels photos, taken straight down the Brown's transects. If possible, have the survey pole and board approx. 10-15 feet from the center. They should be labeled with the plot #, the line #, and the azimuth of the line, like this:

03A001 Line 1- 340^0

*After taking any pictures, flip the switch to review mode and review the pictures you have just taken. Use the zoom to make sure that the labels on the boards are legible and make sure the picture is focus. If not, delete the image, and keep trying until you can read the board in the picture and the picture is in focus (the camera focuses when the button is pushed halfway down).

Comments:

- Make sure that the camera is set to take pictures, not videos, by making sure the mode is set all the way to the right under the little camera diagram.
- Try not to have people or other gear in the pictures (especially fuels), unless it is unavoidable.
- When entering photo #'s into the GPS, label them with the camera letter (ex: B100-0071, etc) the photo #'s are found on the upper right corner of the camera when the picture is displayed.

2003 Plot Collection Data Form

IDENTIFIERS/LOCATORS (Fill out every plot)

Plot Code 03 __ __ __ __ Surveyors: Vegetation _____ Fuels _____

Date ____/____/2003 Polygon/BPU Code_____ Quad Name _____ Aerial photo # _____

State WY Park Name GRTE Park Site Name (Optional)

_____

Provisional Community Name_____

GPS rover file _____ Field UTM X___ ___ ___ ___ ___ ___ m E Field UTM Y___ ___ ___ ___ ___ ___ ___ m N

Zone: 12 Datum: NAD 27 PDOP _____ (PDOP 6 if not changed)

Vegetation Plot **OR** Observation Point **Circle One** Plot length _____ (m) Plot width _____ (m) Plot Azimuth _____

Plot Permanent **Y/N** _____ Plot Pictures _____

Comments about plot representativeness, plot layout, and permanent tag location (Optional)

ENVIRONMENTAL DESCRIPTION (Fill out only if GPS data dictionary is not working)

Elevation (ft)_____ Slope (%) _____ Aspect (degrees)_____

Topographic Position **Circle One**

Interfluve Shoulder Backslope Footslope Toeslope Step in slope Valley floor Terrace Channel

Describe Topographic Position (Optional)

Cowardin System
___ Upland
___ Riverine
___ Palustrine
___ Lacustrine

Non-Tidal – only if not upland
___Permanently Flooded
___Semi-permanently Flooded
___Seasonally/Temporarily Flooded
___Saturated
___Seasonally Flooded/Saturated
___Intermittently Flooded

Unvegetated and Non-Vascular Surface: *(use the cover scale on next page)(Must approximately equal 100%)*

___ Bedrock
___ Litter, duff
___ Wood (>1 cm)
___ Bare soil
___ Large rocks (cobbles, boulders > 10 cm)
___ Small rocks (gravel, 0.2-10cm)
___ Sand (0.1-2 mm)
___ Other:_____
___ Moss
___ Lichen
___ Fungi

Soil Texture (Pick one)
___ sand ___ loamy sand ___ sandy loam ___ sandy clay loam
___ sandy clay ___ silt loam ___ silty clay loam ___ silty clay
___ loam ___ clay loam ___ clay

Soil Drainage (Pick one)
___ Well drained
___ Moderately well drained
___ Poorly drained

USGS-NPS Vegetation Mapping Program
Grand Teton National Park

Plot Code 03 __ __ __ __ Surveyors: Vegetation _____ Fuels _____

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class	Cover Scale for Strata & Unvegetated Surface		Height Scale for Strata	
Pick one	Pick one	Pick one	01	<1%	01	<1ft.
			05	1-5%	02	1-3ft.
___Evergreen	___Broad-leaved	___Forest	10	6-15%	04	3-5ft.
___Deciduous	___Needle-leaved	___Woodland	20	16-25%	10	5-15ft.
___Mixed (evergreen & deciduous)	___Graminoid	___Shrubland	30	26-35%	25	15-30ft.
___Perennial herbs	___Forb	___Dwarf Shrubland	40	36-45%	40	30-50ft.
___Annual herbs	___Pteridophyte	___Herbaceous	50	46-55%	65	50-80ft.
		___Nonvascular	60	56-65%	90	80-100ft.
		___Sparsely Vegetated	70	66-75%	100	>100 ft.
			80	76-85%		
			90	86-95%		
			98	96-99%		
			100	>99%		

Strata	Height Class	Cover Class	Dominant species
T1 Emergent	_____	_____	_____
T2 Canopy	_____	_____	_____
T3 Sub-canopy	_____	_____	_____
S1 Tall shrub	_____	_____	_____
S2 Short shrub	_____	_____	_____
S3 Dwarf shrub	_____	_____	_____
H Herbaceous	_____	_____	_____
N Non-vascular	_____	_____	_____

see above table for height and cover scales

Description of Vegetation and Surrounding Area (Optional)

Wildlife Use Evidence

Natural & Anthropogenic Disturbance Comments (i.e., fire, insects, disease, weeds, avalanche, campsite, archeological, cattle etc…)

Other Comments (Miscellaneous, Plot "Memory Jogger,"etc...)

Plot Code 03 __ __ __ __ Surveyors: Vegetation _____ Fuels _____

Species/percent cover: Starting with the uppermost stratum, list all species with % cover for each species in the stratum. Put an asterisk (*) next to any species that appear to be diagnostics for the community in the classification.
Also list species outside the plot at the end of the table or designate with a 0 in Cover Class column....
LIST SPECIES BY TREES, SHRUBS, GRAMINOIDS, then ***FORBS***…….list ***Lichens, Mosses, Fungi*** here too.

Lifeform codes:	T1	T2	T3	S1	S2	S3	H	N
	Emergent	Canopy	Sub-canopy	Tall shrub	Short shrub	Dwarf shrub	Herbaceous	Non-vascular

Cover Class Codes:	01	05	10	20	30	40	50	60	70	80	90	98	100
	<1%	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	86-95	96-99	>99

Life Form Code	Cover Class	Species	Check if collected	Check if pressed

2003 Fuels Data Collection Protocols

Anderson's Surface Fuel Models

For each plot, surveyors will assign a fuel model (1-13) from Anderson's (1982) field guide. Anderson's guide classifies fuels into four groups: grass, shrub, timber, and slash. The differences between the four groups are related to fuel loadings and fuel size class distributions.

When choosing a fuel model, consider the fuel stratum most likely to carry fire:

- grass (models 1-3),
- shrub (models 4-7),
- timber litter (models 8-10),
- slash (models 11-13)

Read through the fuel model descriptions carefully and refer to the photographs – keep in mind the photos represent only a few possible field situations. The species depicted in the photos may be different than those present in your plot. It may be difficult at first, but when assigning a fuel model, try to visualize the vegetation in the photos and in your plot merely as different layers of fuels and choose the best fit among the 13 fuel models.

Next, make a determination as to how well the fuel model chosen matches the fuel loading present in the plot (higher than the chosen fuel model, about the same, or lower). In the comments section, note how the fuel loading in the plot differs from the chosen fuel model description/photo (e.g. is the fuel bed depth higher/lower, dead fuel loading higher/lower, etc). To get a feel for the different fuel loadings, compare the photos of different fuel models with the fuel loading values given at the top of each page (tons/acre).

Burgan and Rothermel Fuel Inventory

Herbaceous fuel layer

For all plots with herbaceous fuels, surveyors will assign a type and class using Burgan and Rothermel's (1984) photos as a guide.

Graminoids:

Type (1-4) – Classify the dominant graminoid fuels (up to three species) into one of four types according to general morphology (SEE PHOTOS).

1 = Fine, e.g. elk sedge, Idaho fescue (*Carex geyerii*, *Festuca idahoensis*)
2 = Medium, e.g. bluebunch wheatgrass, western wheatgrass *(Pseudoroegneria spicata, Pascopyrum smithii)*
3 = Coarse, e.g. beaked sedge (*Carex utriculata*)
4 = Very Coarse, e.g. Canada wildrye (*Elymus cinereus*)

Density Class (1-6) – For each type, further divide graminoids into one of six density classes (SEE PHOTOS). Locate a square foot area containing the grass in question and compare to reference photos, rather than averaging the grass canopy cover over the whole plot.

Avg. Height – Estimate the average height of the grass layer in feet and tenths of a foot.

Current Percent Green – Estimate the current amount of the grass fuel layer that is currently green (live) to the nearest 5%.

Total Percent Cover – Estimate overall grass fuel layer for entire plot area using the cover class code system that coincides with the vegetation inventory.

Shrub fuel layer

Assign a type and class for the shrub fuels in the plot in a similar fashion as the herbaceous fuels classification.

If there are small trees (under 4.5' feet) that would not be captured on the canopy fuel load data sheet, treat these as shrubs (e.g. seedlings, krummholz) and assign a shrub type of 6. Only record species, height, and percent cover for the seedlings and krummholz..

Species- record the three most dominant shrub species in each plot.

Type (1-6) – Classify shrub fuels into one of six types according to general morphology (SEE PHOTOS).
1 = Fine stems, thin leaves, e.g. huckleberry (*Vaccinium spp.*)
2 = Medium stems, thin leaves, e.g. currant, rabbitbrush (*Ribes spp., Chrysothamnus nauseosus)*
3 = Medium stems, thick leaves, e.g. ceanothus, honeysuckle (*Ceanothus spp., Lonicera spp.)*
4 = Densely packed thin stems and leaves, e.g. bitterbrush, sagebrush (*Purshia tridentata, Artemisia tridentata*)
5 = Thick stems, thick leaves, e.g. cherry, buffaloberry *(Prunus spp., Shepherdia canadensis)*
6 = Conifer seedlings, krummholz

Density Class (1-6) – For each type, further divide into one of six density classes (SEE PHOTOS). Look at the density of a square foot of shrubs to evaluate density, instead of averaging the density over the whole plot.

Avg. Height – Estimate the average height of the shrub layer in feet and tenths of a foot.

Avg. % Dead – Estimate the percentage (to the nearest 5%) of the rooted, standing shrub layer that is dead – record the average percent of dead material within each living shrub, not number of individuals that are completely dead.

Total % Cover – Estimate the percent cover of each of the three major shrub types found within the plot.

Forbs:

Estimate average height in feet, tenths of a foot and overall canopy cover for the three most dominant species. Use the cover class codes from the vegetation inventory methodologies for the canopy cover estimate.

Forest Litter Fuels

For plots where tree leaf and or needle litter is present on the ground, estimate the percentages of medium needle litter [e.g. lodgepole pine *(Pinus contorta)*, limber pine *(Pinus flexilis)*, whitebark pine *(Pinus albicaulis)*], short needle litter [e.g. Douglas-fir (*Pseudotsuga menziesii)*, blue spruce *(Picea pungens)*, engelmann spruce *(Picea Engelmannii)*, subalpine fir *(Abies lasiocarpa)*], and deciduous leaf litter (e.g. aspen (*Populus tremuloides*), cottonwood (*Populus angustifolia*)]. All percentages must add up to 100%.

Photo Series Guide Data

To estimate the dead and down fuel loading, surveyors will assign a photo from the photo series guides that best represents the general composition of the plot and 1000-hr fuel loading. Choose one photo that best represents each size class of fuels. As with the fuel model photo guide, keep in mind that the photos represent only a few possible field situations. The species depicted in the photos may be different than those present in your plot; focus attention on the dead and down fuels in the plot, choose the photo that best depicts the fuels present.

If you are unable to determine a suitable match between the photo series and the fuels on your plot, please enter "SEE PLOT PHOTOS" in the comments section.

Record the book name(s) and the page(s) that correlate to each size class for each plot. Please list the book abbreviation as it is listed below.

Abbreviations

-PNW-I Mixed-Conifer with Mortality, Western Juniper, Sagebrush & Grassland Types in the Interior Pacific Northwest
-PNW-III Lodgepole Pine, Quaking Aspen, and Gambel Oak Types in the Rocky Mountains
-PNW-IV Pinyon-Juniper, Chaparral, and Sagebrush Types in the SW U.S.
-PMS 821 Lodgepole Pine and Engelmann Spruce-Subalpine Fir Cover Types (small book)

Fuels Photos

From the plot center, take a photo of each of the four Brown's transects. In each photo, a height pole and a placard indicating the plot number and transect line number will be visible. For unforested areas, take pictures in the same direction that lines would have been run as in forested areas.

Brown's Transects

Surveyors will sample intercepts of **dead** and **downed** fuels in order to calculate loading from species specific gravities resulting in a weight usually reported as tons/acre. Fuel loading information will be used by fire management personnel in the management of natural fuels, prediction of wildfire behavior and as inputs for fire prediction models. Examples of dead and downed fuels include twigs, stems, branches, and bolewood from trees and shrubs. Examples that do not qualify as dead and downed fuels include dead branches that are attached to boles of trees, cones, bark flakes, rooted stumps, needles, leaves, grass, and forbs. A particle is considered down when it has fallen to the ground or is severed from its original source of growth (Brown 1974). Dead and downed fuels are classified into three groups based on the diameter of the fuels. Ten-hour fuels consist of dead branchwood between 0.6 cm and 2.5 cm (0.25" – 1.0") in diameter. Dead branchwood between 2.5 cm and 7.6 cm (1" – 3") in diameter constitute the one hundred-hour fuels. Dead branchwood larger than 7.6 cm (> 3") in diameter make up the thousand-hour fuels.

At each plot, four 50' long planar intercept transects will be established radially from a center point within the macroplot. The first 15' of each transect will be a buffer. Thus, the total length of each transect will be 65' (15' buffer, 50' sample plane). The azimuth for the first line will be randomly selected (rounded to the nearest 10) with the remaining three azimuths located 90, 180, and 270 degrees from the first azimuth. For example, if the first random azimuth is 20 degrees, the other three azimuths would be 110, 200, and 290 degrees respectively (adding 90 to each subsequent azimuth).

Transect intercepts of 1-hour and 10- hour fuels will be tallied for the last six feet (59'-65') of the 50' Brown's transect. 100-hours will be tallied for the last twelve feet (53'-65'), and 1000-hr fuels will be tallied along the entire transect (15'-65'). In addition, all 1000-hour fuels that intercept the transect will be identified to species and assigned a decay class (1-5). Decay classes 1-3 are considered sound, 4-5 rotten (See table). In the case that a 1000-hr fuel cannot be identified to species, record *conifer* or *hardwood* as the default.

	Decay Class				
Log Feature	**1**	**2**	**3**	**4**	**5**
Bark	intact	intact	sloughing and/or absent	detached or absent	detached or absent
Needles	present	absent	absent	absent	absent
Branches	fine twigs present	large twigs present, branch system entire	larger branches present	larger branches present, but greatly reduced	detached or easily removed from bole
Structural Integrity	sound	sound	mostly sound, may be punky	mostly rot, center of large logs sound	rot throughout, may have small sound sections
Shape	round	round	round	round to oval	oval to collapsed

Litter and Duff Depths

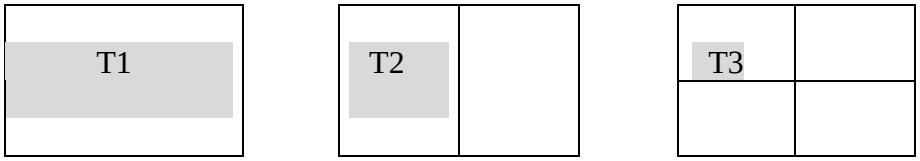
Along each Brown's transect, 3 litter and duff measurements (depth) will be taken. Depths will be taken at 15 , 40, and 65 feet on each transect for a total of 12 depths per plot.

Using a trowel, expose a profile of the forest floor and measure the depth of the litter and duff layers in millimeters. Litter refers to the freshly cast material that makes up the top layer of the forest floor. The duff layer lies between the litter layer and mineral soil and consists of the fermentation (F) and humus (H) layers.

Canopy Fuel Loading

Information on stand structure and canopy characteristics is necessary to model the potential for crown fire behavior. This information is of great importance in making fire management decisions.

Tree density and Structure:
The size of the tree plot will be systematically selected based on existing areas within the vegetation plot (T1-T3). The plot size will be decided in the field by the technicians based on the minimum tree requirement (20 trees), while still capturing the variability in density and size class within the plot. Once a plot size has been selected, all trees must be measured (do not stop at 20 trees) within the designated area (T1-T3). Be sure to record the tree plot size on the data sheet.



For each **tree** (greater than 4.5' in height) within a plot, surveyors will record the following information:

- Species, (record entire scientific name or four letter code consisting of the first two letters of genus and first two letters of the specific epithet (e.g., PICO)).
- DBH, diameter (in inches) at breast height (4.5 feet), Tree diameter is a measure of the circumference of a tree. The measurement is taken using a "diameter tape" also called a dbh tape, specifically designed to measure tree diameter in inches. Tree diameter is to be taken at breast height (dbh), which is defined as the average stem diameter at a point 4.5 feet above ground as measured from the uphill side of the stem. Place the sharp pin at the end of the dbh tape in the tree stem at breast height, keeping the tape level, wrap it around the rest of the stem until the black line on the opposite end overlaps a number. Be sure to read the number representing the diameter of the tree at breast height in inches. Tree oddities such as split stems, leaning trees, trees on slopes should be measured as indicated on the tree datasheet.
- Tree height (in feet, measured with a clinometer; only representative trees need be measured, other trees can then be estimated). The clinometer is a tool used to measure tree height. It works on the principle of measuring tangents of angles to the top and base of the tree, multiplied by horizontal distance to derive the height of each measured section of the stem. Simply begin by selecting a flat spot 66 feet (depending on scale) from the base of the tree to be measured. Closing one eye, place the black line visible inside the clinometer across the base of the tree, open the other eye and read the number of topographic units found on the left side. This is the tree base number, subtract the tree base number from the next reading to treetop. Next, sight the black line across the top of the tree, again read the number of topograghic units. Subtract the number of units measured for the tree base from the number of degrees measured to the top of the tree. This will give you tree height in feet. If there is no flat spot from which to measure the tree, slope correction is necessary.
- Crown ratio (ocular estimate of the ratio of crown length to total tree height).
- Crown base height (in feet, height of the lowest live branch which when burning would cause vertical movement of the fire into the crown).
- Ladder height (in feet, the distance between the height of the lowest ladder fuel (live or dead branch, moss etc…) which when burning would cause vertical movement of the fire into the crown),
- Status (live or dead) Is the tree live or dead? A tree is considered living until no green branches remain of the tree.
- Tree structural stage
  - ◊ **1:** Dominant (trees with crowns extending above the general level of the crown cover, receiving full light from above and partly from the side; larger than the average trees in stand)
  - ◊ **2:** Codominant (trees with crowns forming the general level of the crown cover, receiving full light from above, but comparatively little from the sides)
  - ◊ **3:** Intermediate (trees shorter than those in preceding classes with crowns below or extending into crown cover formed by dominant and codominant classes, receiving little direct light from above)
  - ◊ **4:** Suppressed (trees with crowns below the general level of crown cover, receiving no direct light from above
  - ◊ **5:** Open growth (trees receiving full sunlight from above and all sides, trees widely spaced and/or isolated)

Comments- This section is intended to include notes on any site-specific characteristics not represented in the data already collected. It can include things such as insect or wildlife damage, disease, windthrow, etc.

Seedlings – The size of the seedling plot will be determined by the same standards as defined above for trees. For each species, record average height (feet) and a total count.

Densiometer- Densiometers are a tool used to estimate canopy cover. For each plot, four readings will be taken at plot center in the four cardinal directions. Refer to the densiometer instructions on the box for methodologies and calculations.

References

Anderson, H.E. 1982. Aids to determining fuel models for estimating fire behavior. USDA Forest Service, General Technical Report INT-GTR-122.

Brown, J.K. 1974. Handbook for inventorying downed woody material. Gen. Tech. Rep. INT-16. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 24 p.

Burgan, R.E. and R.C. Rothermel. 1984. BEHAVE: Fire behavior prediction and fuel modeling system – FUEL subsystem. USDA Forest Service, General Technical Report INT-GTR-167.

2003 Fuels Data Collection Data Forms

Plot Code 03 __ __ __ __	Date _____	Surveyor(s): Fuels _____

ANDERSON'S SURFACE FUEL MODELS

Fuel # (**1-13**)	Fuel Loading (**L, N, H** than in guide)	Primary Carrier of Fire (**life form, species**)	Comments- How does this area differ from the description in Anderson's

BURGAN AND ROTHERMEL FUEL INVENTORY

Herbaceous (Graminoids) Fuels ----------

Species (top three species)	Type (**1-4**)	Class (Density) (**1-6**)	Avg. Ht. (ft)	Current % Green	Total % Cover

Shrub (including trees < 4.5' tall) Fuels ---------- ***Type 6 = conifer seedlings

Species (top three species)	Type (1-6)	Class (Density) (**1-6**)	Avg. Ht. (ft)	% Dead	Total % Cover

Herbaceous (Forbs) Fuels ----------

Species (top three species)	Avg. Height. (ft.)	Overall Canopy Cover (%)

Forest Litter Fuels – forested areas only	
Percent Medium Needle Litter (PICO, PIAL, PIFL)	
Percent Short Needle Litter (PSME, ABL A, PIEN, PIPU)	
Percent Hardwood Litter	
Total percent cover	

FUELS PHOTOS – To be taken from the plot center end of each Brown's transect or general direction if unforested

	Azimuth (degrees)	Photo Number	Comments (optional)
Line 1			
Line 2			
Line 3			
Line 4			

PHOTO SERIES GUIDE DATA

Size Class	Book Name(s)	Page # ('s)	Comments
Photo best representing General composition			
Photo for >3" diameter (1000 hr)			
*Nonforested sites (sage and grass)			

BROWN'S TRANSECTS -Small Dead and Down Woody Fuel Loading (forested areas only)(*counts)

Line	Azimuth	*1-hr	*10-hr	*100-hr
1				
2				
3				
4				

Fuel Size	Sampling Plane	Section of Line
1-hr	6'	59'-65'
10-hr	6'	59'-65'
100-hr	12'	53'-65'
1000-hr	50'	15'-65'

1000-hr Dead and Down Fuel Loading

Line 1	Line 2	Line 3	Line 4
Diameter - Species – Decay Class (**1-5**)	Diameter – Species - Decay Class (**1-5**)	Diameter – Species - Decay Class (**1-5**)	Diameter – Species - Decay Class (**1-5**)

Decay Class	1	2	3	4	5
Bark	Intact	Intact	Sloughing and/or absent	Detached or absent	Detached or absent
Needles	Present	Absent	Absent	Absent	Absent
Branches	Fine twigs present	Large twigs present, branch system entire	Larger branches present	Larger branches present but greatly reduced	Detached or easily removed from bole
Structural Integrity	Sound	Sound	Mostly sound, may be punky	Mostly rot, center of large logs sound	Rot throughout, may have small sound sections
Shape	Round	Round	Round	Round to oval	Oval to collapsed

Litter and Duff Depths

Sample #	Litter Type (**Deciduous, Conifer, Moss, Grass** (detached), **Combo** (specify), **Mineral Soil**)	Litter Depth (mm)	Litter Compactness (**Loose, Medium,Compact**)	Duff Depth (mm)
Line 1-15				
1-40				
1-65				
Line 2-15				
2-40				
2-65				
Line 3-15				
3-40				
3-65				
Line 4-15				
4-40				
4-65				

Plot Code 03 __ __ __ __	Date _____	Surveyor(s): Fuels _____

Canopy Fuel Loading – trees greater than or equal to 4.5 feet in height

Plot Size: X

Tree Species	DBH (in.)	Height (ft.)	Crown Ratio (%)	Crown Base Height (ft.)	Ladder Height (ft.)	Status (Live or Dead)	*Structural Stage	Comments (i.e. tree damage, insects, disease…)

**Tree Structure Stages: Dominant (D), Co-Dominant (CD), Intermediate (I), Suppressed (S), or Open Growth (O)*

Seedlings – trees less than 4.5 feet in height

Plot Size: X		**Count**	
Species	Average Ht. (ft.)	Live	Dead

Overall Canopy Cover (Densiometer)

Point	Count-Sky / Count-Canopy (circle one)
1	
2	
3	
4	

Plot Code 03 __ __ __ __	Date ________________	Surveyor(s): Fuels ________________

Canopy Fuel Loading – trees greater than or equal to 4.5 feet in height

Tree Species	DBH (in.)	Height (ft.)	Crown Ratio (%)	Crown Base Height (ft.)	Ladder Height (ft.)	Status (Live or Dead)	*Structural Stage	Comments (i.e. tree damage, insects, disease…)

**Tree Structure Stages: Dominant (D), Co-Dominant (CD), Intermediate (I), Suppressed (S), or Open Growth (O)*

2004 Accuracy Assessment Protocols

PROTOCOLS FOR ACCURACY ASSESSMENT
AT
GRAND TETON NATIONAL PARK

A Basic Guide for Field Work

Prepared for the 2004 Field Season, USGS/NPS Vegetation Mapping Program

Before you leave

Check that you have all the materials needed to complete your field work. Your GPS, Camera, and Gear Tub should all have the same letter (A, B, or C).

- GPS Unit and Antenna (battery charged, previous files downloaded)
- Camera and spare battery (battery charged, previous photos downloaded)
- Radio (battery charged)
- Survey pole (orange/white/orange/white)
- Gear tub
- Maps
- AA points list with UTMs
- Botany books
- Lunch and Water
- Rain Gear
- Truck keys

***Along the* way**

Look around. Digital data layers are great, but they do ***not*** replace human perception. Make notes about the vegetation on the aerial photos, and start thinking about who are the most common species and their % cover.

Establishing a point

The general steps should be followed in more or less the following order:

- GPS
- Person One: Location data, environmental data, fuels, disturbance comments, other comments, and photos
- Person Two: Species list, strata table, representativeness, and description of vegetation
- Two people together (at least at the beginning of the season): Species cover, Rationale for classification, community names, map codes.

GPS

1. Set up the survey pole at the point the UTMs indicate.
2. Face the antenna south at the top of the survey pole.
3. Collect at least 180 beeps. See GPS instructions if necessary.
4. Most of the time, the GPS will collect beeps with the PDOP set at 6.0. If it won't collect beeps, then change the PDOP to a higher number, increasing as little as possible and still get the beeps. If the GPS needs the PDOP changed in order to get some beeps, see below, MAKE SURE YOU SET IT BACK TO 6 WHEN DONE WITH THE POINT.
    a. SYS button (you may have to scroll though using the SYS button to get to the Select window)
    b. Select "Configurations", then ENTER button
    c. Select "GPS", then ENTER
    d. If you can't read the PDOP, then push OPTIONS button, then ENTER button. You should now be able to read the PDOP.
    e. Use the left arrow key to move cursor over to the left until PDOP reads 20.
    f. When you finish gathering Beeps….
        - SYS button
        - Use right arrow to move the PDOP back to 6.0.

- CLOSE button
- CLOSE button
- Screen should be back to where it says “Configurations”

While the GPS beeps, wander around doing reconnaissance, fill out the forms, and take photos.

Taking photographs

You will have to wait for the GPS unit to collect 180 points before taking photos.

- Before taking pictures, make sure the resolution on the camera is set to **M1**; you can do this by pressing the menu button when in shooting mode, scrolling down to resolution, and selecting M1. Make sure the compression is on the middle setting.
- Make sure that the camera is set to take pictures, not videos, by making sure the mode is set all the way to the right under the little camera diagram.
- **Vegetation Photo**: Write the field point code and date on the white board, and stand the white board and survey pole at the AA point. Take a picture of the vegetation and survey pole from whichever direction is best, based on the lighting and the goal of documenting the vegetation of the site.

04-K-001 6/13/03

- **Fuels Photos**: White board should have the following info:

Field point code
Line number
Azimuth

04-K-001 Line 1- 340^0

Photos are taken down two lines from the AA point. Line 1 and 2 will be 180 degrees apart. The photographer will choose the azimuth for the first line based on which two lines will best characterize the fuels on the site. The survey pole and white board will be set up on the line 30 feet from the AA point.

Two photographs of each line will be taken, first one pointing up enough to “capture” the tree canopy, and second, one pointing down enough to “capture” the downed woody material and fine fuels. Make sure the entire survey pole is visible. For the tree canopy, have the pole at the bottom of the picture, and for the downed material, have the pole at the top of the picture.

Avoid having people in the picture.

Look at the pictures in the camera to check if the photo board is legible. Glare is often a problem. The easiest fix is to have the white board at an angle to the camera.

Photos will be taken in the following order: 1) View of the accuracy assessment point from the outside looking in; 2-5) Views down the fuels lines (Line 1, tree canopy; Line 1, ground; Line 2 tree canopy; Line 2, ground).

PAGE ONE OF FIELD FORM

If you ever leave a blank field, write N/A or a null (zero with a line through it (∅))

Field Point Code
For the 2004 field season, the codes will be in the format "04-M-001". The "04" refers to 2004. The letter refers to crew "K", "M", "J", "R", or "X". The crew's letter designation is based on the crew leader for the day (Klara, Mark, Jenny, Rob, or "other"). The crew leader designation will be in the above order, so if both Mark and Jenny are on a crew doing a point, the point will be named after Mark, and the code will be 04-M-001. If the field crew is Steve and Megan, then the crew will be labeled X, and the code will be 04-X-001. The last three digits refer to the field point number.

Surveyors
Last names of surveyors, with principal surveyor listed first. The principal surveyor is the one who composes the species list.

Quad Name
Use the map of quads to determine which one you are in.

Aerial Photo
This is the map that Cory and Dan provided.

Park Site Name
Provisional name assigned by field worker that describes where the data were collected. It should represent an identifiable feature on a topographic map.

Dominant Community Name
Using the Key to Plant Associations and the Vegetation Description, assign the name of the dominant community which most closely resembles this type. If you aren't confident with your name, you may list up to two alternative names under "Alternate Community Name." It is possible that *none* of the names may be a good fit; you may have found a new type. *If you have a new type, name it based on the two or three most dominant species in the plot, listing taller strata first, and let Klara know about it ASAP.* The Field Coordinator will review the 'dominant community name' in light of the data you collect and her knowledge of the park vegetation and of the classification. You may use 4-6 letter codes to write the community name on the form.

Map Code
Using the Description of Map Codes, assign a map code to the dominant vegetation represented by the AA point. One or more Map Code is suggested on the Vegetation Key – determine which Map Code best describes the vegetation by using the Brief Description of Map Codes. First determine the Map Category – Forest, Regeneration Forest, Shrubland, Dwarf Shrubland, Sparse Veg or Non-Vegetated/Cultural you are in. Review ALL the Map Codes in the Map Category (above) to determine which one fits. If you aren't confident with your name, you may list up to two alternative names under "**Alternate Map Code.**" The alternatives may be in different Map Categories (i.e. you are on the valley floor with mostly graminoids under foot and a scattered lodgepole overstory – if the overstory is >10% cover it is FLP -Lodgepole Forest with a sparse overstory – however, it is also very nearly HGL-Herbaceous Grassland Low-Mid Elev with some scattered Lodgepole) – record the Map Code and Alternative and feel free to briefly state why. What you put here may or may not agree with the code suggested by the Vegetation Key to be associated with the Dominant Community name – those codes are guidance, not guaranteed.

Adjacent Community and Adjacent Map Code
Document, by association and map code, any other vegetation within 50 meters of the AA point. Describe if the other vegetation is in a different polygon, an inclusion or a finger of a nearby polygon.

GPS Rover File
Record the number of the file from the GPS unit.

Field UTM X
Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Field UTM Y

Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

PDOP
Record this off the GPS unit. The default is 6. If you have trouble getting beeps, see above. IF IT IS NECESSARY TO ADJUST THE PDOP, ***REMEMBER TO CHANGE THE PDOP BACK TO SIX*** WHEN YOU FINISH AT AN AA POINT.

Elevation
Elevation of the plot. Estimate your elevation with the topo map. The reading you get from a topo map (provided you are **certain** where you are) is more accurate than the average reading from the GPS unit.

Slope
Measure the slope in percent using a clinometer. Take readings upslope and downslope, and then average the two values.

Aspect
Measure the aspect using a compass (be sure compass is set to correct for the magnetic declination).

Topographic Position
Choose one:

INTERFLUVE (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two fluves (drainageways) that sheds water to the drainageways.

SHOULDER (shoulder slope, upper slope, convex creep slope). Geomorphic component that forms the uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.

BACKSLOPE. Subset of midslopes that are steep, linear, and may include cliff segments (fall faces).

FOOTSLOPE (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between backslope, and toeslope.

TOESLOPE (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, commonly gentle and linear and characterized by alluvial deposition.

TERRACE Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

CHANNEL (narrow valley bottom, gully arroyo). Bed of single or braided watercourse commonly barren of vegetation and formed of modern alluvium.

VALLEY FLOOR. Nearly level to gently sloping, bottom surface of a valley.

Describe Topographic Position (Optional)
Give more details here, such as "This is the toeslope of a moraine."

Anderson's Surface Fuel Models

For each **forest** plot, surveyors will assign a fuel model from Anderson's (1982) field guide. Anderson's guide classifies fuels into four groups: grass, shrub, timber, and slash. The differences between the four groups are related to fuel loadings and fuel size class distributions.

The models we will deal with for AA points include:
2: open forests
8: closed canopy stands of short-needle conifers or hardwoods, little undergrowth, little downed woody material
10: forest stands with abundant downed woody material
11-13: represent the downed woody material created by avalanches or windthrow only

Read through the fuel model descriptions carefully and refer to the photographs – keep in mind the photos represent only a few possible field situations. The species depicted in the photos may be different than those present in your plot. It may be difficult at first, but when assigning a fuel model, try to visualize the vegetation in the photos and in your plot merely as different layers of fuels and choose the best fit among the 13 fuel models.

Next, make a determination as to how well the fuel model chosen matches the fuel loading present in the plot (higher than the chosen fuel model, about the same, or lower). In the comments section, note how the fuel loading in the plot differs from the chosen fuel model description/photo (e.g. is the fuel bed depth higher/lower, dead fuel loading higher/lower, etc). To get a feel for the different fuel loadings, compare the photos of different fuel models with the fuel loading values given at the top of each page (tons/acre).

Fuels Photos
See "Taking photographs", page 2.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source.

Other Comments
This is a place for miscellaneous comments, including a "memory jogger" to help you remember doing this plot. Memory joggers include: the thunderstorm that swept through; the fact that someone shared homemade cookies; that unusual plant you found on the way to the plot; the joke of the moment; or anything else that will help you recall doing this plot when you look at the plot form weeks or months later.

PAGE TWO OF FIELD FORM

Table of Strata, Height Class, Cover Class, Dominant Species
Visually divide the community into vegetation layers (strata). Indicate the *average* height class of the stratum in the first column, using the Height Scale on the form. Enter the average percent cover class *of the whole stratum* in the second column, using the Cover Scale on the form.

Trees are defined as single-stemmed woody plants, generally 15 feet in height or greater at maturity and under optimal growing conditions.
Shrubs are defined as multiple-stemmed woody plants generally less than 15 feet in height at maturity and under optimal growing conditions.

A community does **not** have every stratum. Strata (or vegetation layers) are noted only when they exist. A grassland with one lonely shrub does not have a shrub layer, it has only a herbaceous layer.

List the **dominant** species in each stratum. You may list up to 3 species. Use scientific names, or if it is an unknown, use the same name as you used on the species list.

Point Representativeness
Does this plot represent the full variability of the polygon? Distinguish the point's ability to represent the stand or polygon you are sampling. Are the common species uniform across the area, or patchy?

Description of Vegetation and Surrounding Area
This is your chance to describe the vegetation in prose rather than a species list. The more detail you put here, the better the vegetation descriptions will be in the final report. Describe the strata, and species. Also describe other vegetation within 50 meters.

Rationale for Classification
Record the logical procedure you used to determine the vegetation association based on indicator species, major species, structure, etc. For example, for a POTR/SYOR/CARU community, you might write: POTR dominant, Rosa sp. has 15% cover, CARU the only species with over 10% cover." Also write the page number and choice number from the key.

Example: p1, 1b, 4b, 5a; p9, 1a, p11, 1b, 2a; p12, 1a, 2b, 3a

PAGE THREE OF FIELD FORM

Species/Strata/Percent Cover Table
Starting with the uppermost stratum, list the dominant, common, and indicator species and their cover class using the scale on the data sheet. You should not record the species with 1% or less cover until you are so proficient that you can write them down after a recon walk. There isn't time this year to stop to examine every little forb. Use scientific names, and write the name out; do not abbreviate or use codes.

If a species is in the tree layer (single-stemmed woody plants, generally 15 feet in height or greater at maturity), list whether it is T1 (emergent tree), T2 (tree canopy), or T3 (tree sub-canopy). Also estimate DBH, Tree Height, Canopy Base Height, and Crown Ratio for each tree species in each strata.

DBH= Diameter at Breast Height (4.5 feet). Use the same codes as for cover class. Estimate the average by number of trees rather than by canopy. So if you have one 25 inch Douglas-fir and 15 10-13 inch Douglas-fir, then the average DBH is code 12 (range of 10-15 inches).

Tree Height – Use clinometers and tapes to calibrate your eye.

Canopy Base Height – How high from the ground is the live and/or dead canopy? Use the height class codes.

Crown Ratio – Estimate what percentage of the tree has canopy on it. Use the cover class codes.

If a species is in the shrub layer, note if S1 (tall shrub), or S2 (short shrub), or S3 (dwarf shrub). Shrubs may be listed on the forested sheet if there is room for them.

If a species is in the ground layer, note H (herbaceous), and list the graminoids BEFORE the forbs.

Some species will be in more than one layer. For example, in a Douglas-fir stand, you might have one or two especially tall specimens, which would be in the T1 (emergent tree) layer. Then the majority of the mature trees would be in T2 (tree canopy). The saplings that are coming up in the understory would be in the T3, and the seedling would be in the S2 (short shrub) or S3 (dwarf shrub).

Seedlings are defined as trees less than "breast height" of DBH fame, so less than 4.5 feet tall. Seedlings between knee height and breast height will be labeled as being in the short shrub layer (S2), and those below knee height will be labeled as being in the dwarf shrub layer (S3).

Unknown plants
If you can't identify a plant to species, record the species on your form as "Carex unknown sp. 1," "Brassicaceae yellow fls #2", "Aster Fred", or as a last resort "unknown species #1," etc. The more information you record about the unknowns, the easier it is to keep track of them. Record associated cover class and other data for the unknown as you would for any other species.
Collect a specimen. Take a sample of the species with as much of the plant as possible, (<u>including roots and intact sexual parts</u>). Place the sample in a baggie, and label the baggie with the plot code and the name you gave it on the data form.

When you get back to the office, if you need the species identified right away because it appears to be dominant or diagnostic (you're seeing it all over the place or you're seeing much more in this particular vegetation type than in others), get it identified by Klara or Rob, or key it before going to the field again.

If you don't need the plant keyed right away, press it. On a white 4" x 2" label mark the pressed specimen with the plot code, the name of the collector, the date, and the name you gave it on the data form. When pressing plants, remember to spread them out as much as possible. *Put only one species in each newspaper!!!!* Label the paper on the OUTSIDE, so the information can be read without opening the paper to the specimen.

Information to put on the newspaper:

- Field name
- Point number
- Date
- % Cover

Leave room for the CORRECTED SPECIES NAME. Do NOT write "Poa sp. 04-X001". Instead, the correct way is:

Poa sp.
04-X-001

Give all your specimens, bagged and pressed, to the Field Coordinator for keying. You can, of course, key some of these out yourself if you want to, but don't let plant keying get in the way of your primary responsibility: *field data collection*. No one expects you to identify every plant; that's why keying is considered part of the Field Coordinator's routine responsibilities. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular plot. If the species has a high cover value (>1%) it is more of a priority to identify.

EQUIPMENT LIST:

2 first aid kits
1 whiteboard
1 hammer
1 DBH tape
1 can OFF
1 roll tape
1 compass
1 clinometer
2 whiteboard markers
pencils, sharpies, extra lead
collection bags
1 50m tape
1 Anderson's
2004 protocols
1 quad index
1 willow key
stakes
whiteboard cleaner & eraser

Also need (but not necessarily in bin):

tatums
GPS
camera
radio
survey pole
vegetation key
vegetation descriptions
aerial & topo maps
data sheets

2004 Accuracy Assessment Data Form

IDENTIFIERS/LOCATORS (Fill out every point)

Field Point Code 04 __ __ __ __ Database Point Code_____ Surveyors:_____

Date ____/____/2004 Quad Name _____ Aerial photo # _____ Plot Pictures Taken (Y/N)_____

State WY Park Name GRTE Park Site Name _____

Dominant Association 1)_____

Alternate Association Name 2)_____

Alternate Association Name 3)_____

Map Code 1)_____ 2)_____ 3)_____

Adjacent Association within 50m 1)_____

Adjacent Association within 50m 2)_____

Adjacent Map Codes within 50m 1)_____ 2)_____

GPS rover file _____ Field UTM X___ ___ ___ ___ ___ ___ m E Field UTM Y___ ___ ___ ___ ___ ___ ___ m N

Zone: 12 Datum: NAD 27 PDOP _____ (PDOP 6 if not changed)

ENVIRONMENTAL DESCRIPTION (Fill out only if GPS data dictionary is not working)

Elevation (ft)_____ Slope (%) _____ Aspect (degrees)_____

Topo Position **Circle One** – Interfluve Shoulder Backslope Footslope Toeslope Step in slope Valley floor Terrace Channel

Describe Topographic Position

ANDERSON'S SURFACE FUEL MODELS

Fuel # (**1-13**)	Fuel Loading (**L, N, H** than in gu	Primary Carrier of Fire (**life form, species**)	Comments- How does this area differ from the description in Anderson's

FUELS PHOTOS

	Azimuth (degrees)	Comments (optional)
Line 1		
Line 2		

Natural & Anthropogenic Disturbance Comments (i.e., fire, insects, disease, dead standing trees, ungulate browsing, weeds, avalanche, campsite, archeological, cattle etc…)

Other Comments (Miscellaneous, Plot "Memory Jogger,"etc...)

Field Point Code 04 __ __ __ __ Database Point Codes _____ Surveyors:_____

VEGETATION DESCRIPTION

Cover Scale for Strata & Unvegetated Surface						Height Scale for Strata			
Tr	<1%	20	16-25%	70	66-75%	01	<1ft.	40	30-50 ft.
01	1-2%	30	26-35%	80	76-85%	02	1-1.9 ft.	65	50-80 ft.
03	3-4%	40	36-45%	90	86-95%	04	2-5 ft.	90	80-100 ft.
07	5-9%	50	46-55%	98	96-99%	10	5-15 ft.	100	>100 ft.
12	10-15%	60	56-65%	100	>99%	25	15-30 ft.		

Strata	Height Class	Cover Class	Dominant species
T1 Emergent	_____	_____	_____
T2 Canopy	_____	_____	_____
T3 Sub-canopy	_____	_____	_____
S1 Tall shrub	_____	_____	_____
S2 Short shrub	_____	_____	_____
S3 Dwarf shrub	_____	_____	_____
H Herbaceous	_____	_____	_____
N Non-vascular	_____	_____	_____

Comments about point representativeness

Description of Vegetation within 50m of AA point and Surrounding Area

Rationale for Classification (s)

Field Point Code 04 __ __ __ __ Data Point Code _____ Surveyors: _____

LIST SPECIES BY TREES, SHRUBS, GRAMINOIDS, then ***FORBS***…….list ***Lichens, Mosses, Fungi*** here too.

Lifeform codes:	T1	T2	T3	S1	S2	S3	H	N
	Emergent	Canopy	Sub-canopy	Tall shrub	Short shrub	Dwarf shrub	Herbaceous	Non-vascular

Life Form Code	Cover Class	Species	Check if collected	Check if pressed

Life Form Code	**Cover Class**	**Species**	**Check if collected**	**Check if pressed**

Cover	Tr	01	03	07	12	20	30	40	50	60	70	80	90	98	100
Class Codes:	<1%	1-2	3-4	5-9	10-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	86-95	96-99	>99

APPENDIX C: Dichotomous Key to the Plant Associations of GRTE

KEY TO VEGETATION ASSOCIATIONS
AND
CROSSWALK FROM ASSOCIATION TO MAP CODE
FOR
GRAND TETON NATIONAL PARK

1. Avalanche chute communities with at least 50% cover of shrubs and/or regenerating trees. 2
1. Not as above.....4

2. *Populus tremuloides* with 40% or more cover.....*Populus tremuloides* / *Amelanchier alnifolia* Avalanche Chute Shrubland Map Code: RAP, SDS, RAM
2. Not as above 3

3. *Acer glabrum* with 20% or more cover .....*Acer glabrum* Avalanche Chute Map Code: SDS
3. Not as above. If conifer species are dominant, try the coniferous key (page 2).....Unclassified Type

4. Tree species, regardless of height, with 10% or more cover.....Forests and Woodlands
4. Not as above 5

5. Shrub species with 10% or more cover, or the dominant lifeform in depauperate stands.....Shrublands
5. Not as above.....6

6. At least one graminoid species with 10% or more cover.....Graminoid Dominated Herbaceous Vegetation
6. Not as above 7

7. Perennial forb species dominant .....Forb Dominated Herbaceous Vegetation
7. Not as above.....Unclassified Type

FORESTS AND WOODLANDS

Tree species with more than 10% cover.

1. Conifers, either as mature trees, or as seedlings and saplings, form a distinct stratum. Hardwoods are less than 25% of the total tree canopy. .....Coniferous Forests and Woodlands

1. Conifers a minor component of tree canopy, or co-dominant with hardwoods.....2

2. *Populus tremuloides*, either as mature trees, or as seedlings and saplings, forms a distinct stratum. Conifers may be co-dominant. .....Aspen Forests
2. *Populus tremuloides* a minor component of the tree canopy.....3

3. *Populus angustifolia* or *Populus balsamifera*, alone or in combination, form a distinct strata either as mature trees, or as seedlings and saplings. *Picea pungens* may present, and may be up to 75% of the total tree cover. .....Cottonwood Forests and Woodlands
3. *Populus angustifolia* or *Populus balsamifera* a minor component of the tree canopy .....Unclassified Forests

Coniferous Forests and Woodlands

Conifers, either as mature trees, or as seedlings and saplings, form a distinct stratum. Hardwoods are less than 25% of the total tree canopy

1. *Picea engelmannii* 90% of the tree layer. *Abies lasiocarpa* may be present in very small amounts (less than 10% of tree layer) ..... Engelmann Spruce Forests

1. *Picea engelmannii* not the dominant tree species 2

    2. *Pseudotsuga menziesii* dominant in mature stands (twice as much as any other species) ..... Douglas-fir Forests

    2. *Pseudotsuga menziesii* not dominant 3

3. *Pinus albicaulis* dominant or present in the tree layer, regardless of stature ..... Whitebark Pine Forests and Woodlands

3. *Pinus albicaulis* absent 4

    4. Mature (T2 and T3 layers) *Abies lasiocarpa* 10% or more cover, OR *Abies lasiocarpa* krummholz 10% or more cover . Other species may be present ..... Subalpine Fir Forests

    4. *Abies lasiocarpa* less than 10% cover 5

5. *Picea pungens* dominant, *Populus* species, if present, less than 25% of the tree canopy ..... Blue Spruce Forests

5. *Picea pungens* not dominant 6

    6. *Pinus flexilis* a successfully reproducing dominant in mature stands, or co-dominant with *Pseudotsuga menziesii* ..... *Pinus flexilis* / *Pseudoroegneria spicata* Woodland
    Map Code: FLM, FMC, RMC

    6. *Pinus flexilis* not dominant 7

7. *Pinus contorta* dominant ..... Lodgepole Forests

7. *Pinus contorta* not dominant ..... Unclassified Forests

Engelmann Spruce Forests

Picea engelmannii 90% of the tree layer.
Map Code: FSF, RMC

1. *Equisetum arvense* with 10% or more cover ..... *Picea engelmannii* / *Equisetum arvense*
1. *Equisetum arvense* with less than 10% cover 2
    2. *Galium triflorum, Actaea rubra,* or *Senecio triangularis* with 10% or more cover, either individually or collectively ..... *Picea engelmannii* / *Galium triflorum*
    2. *Galium triflorum, Actaea rubra,* or *Senecio triangularis* with less than 10% cover, either individually or collectively ..... Try keying as a Subalpine Fir – Engelmann Spruce Forest

Douglas-Fir Forests

Pseudotsuga menziesii dominant in mature stands.
Map Code: FDF, FMC, RMC

1. *Acer glabrum* 5% or more cover ..... *Pseudotsuga menziesii* / *Acer glabrum*

1. *Acer glabrum* less than 5% cover 2

    2. *Vaccinium membranaceum* 5% or more cover ..... *Pseudotsuga menziesii* / *Vaccinium membranaceum*

    2. *Vaccinium membranaceum* less than 5% cover 3

3. *Symphoricarpos albus* 5% or more cover ..... *Pseudotsuga menziesii* / *Symphoricarpos albus*

3. *Symphoricarpos albus* less than 5% cover 4

    4. *Thalictrum occidentale* 5% or more cover ..... *Pseudotsuga menziesii* / *Thalictrum occidentale*

    4. *Thalictrum occidentale* less than 5% cover 5

5. *Osmorhiza berteroi* 5% or more cover ..... *Pseudotsuga menziesii / Osmorhiza berteroi*

5. *Osmorhiza berteroi* less than 5% cover 6

6. *Spiraea betulifolia* 5% or more cover ..... *Pseudotsuga menziesii / Spiraea betulifolia*

6. *Spiraea betulifolia* less than 5% cover 7

7. *Calamagrostis rubescens* 5% or more cover ..... *Pseudotsuga menziesii / Calamagrostis rubescens*

7. *Calamagrostis rubescens* less than 5% cover 8

8. *Amelanchier alnifolia* 10% or more cover ..... *Pseudotsuga menziesii / Amelanchier alnifolia*

8. *Amelanchier alnifolia* less than 10% cover 9

9. *Carex geyeri* 5% or more cover ..... *Pseudotsuga menziesii / Carex geyeri*

9. *Carex geyeri* less than 5% cover 10

10. *Symphoricarpos oreophilus* 5% or more cover ..... *Pseudotsuga menziesii / Symphoricarpos oreophilus*

10. *Symphoricarpos oreophilus* less than 5% cover ..... Unclassified Forest

Subalpine Fir Forests

Mature (T2 and T3 layers) *Abies lasiocarpa* 10% or more cover. Other species may be present.

1. *Pseudotsuga menziesii* and *Pinus contorta*, alone or in combination, having equal or greater cover with the combined total cover of *Abies lasiocarpa* and *Picea engelmannii* ..... *Abies lasiocarpa – Pseudotsuga menziesii – Pinus contorta* Forest
Map Codes: FMC, RMC

1. Not as above 2

2. *Populus tremuloides* or *Pinus albicaulis*, co-dominant 3

2. Not as above ..... Subalpine Fir – Engelmann Spruce Forests

3. *Populus tremuloides* co-dominant with *Abies lasiocarpa* 4

3. *Populus tremuloides* not co-dominant 5

4. *Calamagrostis rubescens* dominant in the understory ..... *Populus tremuloides - Abies lasiocarpa / Carex geyeri - Calamagrostis rubescens* Forest
Map Codes: FEP, FSF

4. *Calamagrostis rubescens* present in trace amounts or lacking ..... Unclassified *Abies lasiocarpa – Populus tremuloides* Forest

5. *Pinus albicaulis* present, or co-dominant with the *Abies lasiocarpa* ..... Key under Whitebark Pine Forests

5. *Abies lasiocarpa* the only tree species present ..... Subalpine Fir – Engelmann Spruce Forests (See below)

Subalpine Fir – Engelmann Spruce Forests

Map Code: FSF, RMC unless noted otherwise
Engelmann Spruce is in the name, but it is not necessarily *always* present.

1. *Abies lasiocarpa* krummholz dominating the shrub layer. *Pinus albicaulis* and/or *Picea engelmannii* may be present. (Krummholz is shrub-like stature and growth resulting from harsh treeline conditions. It does not include sapling-sized or pole-sized specimens) ..... *Abies lasiocarpa*
Krummholz Shrubland
Map Code: KRM, FSF

1. *Abies lasiocarpa* krummholz present in trace amounts or lacking 2

2. *Calamagrostis canadensis* or *C. scopulorum* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii /*

Calamagrostis canadensis
2. *Calamagrostis canadensis* or *C. scopulorum* with less than 5% cover 3
3. *Menziesia ferruginea* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea*
3. *Menziesia ferruginea* with less than 5% cover 4
4. *Streptopus amplexifolius* or *Senecio triangularis* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Streptopus amplexifolius*
4. *Streptopus amplexifolius* or *Senecio triangularis* with less than 5% cover 5
5. *Actaea rubra* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Actaea rubra*
5. *Actaea rubra* with less than 5% cover 6
6. *Acer glabrum* or *Sorbus scopulina*, alone or in combination, with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Acer glabrum*
6. Not as above 7
7. *Vaccinium membranaceum* with 5% or more cover 8
8. *Xerophyllum tenax* with 1% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax*
8. *Xerophyllum tenax* not present ..... *Abies lasiocarpa – Picea engelmannii / Vaccinium membranaceum*
7. *Vaccinium membranaceum* with less than 5% cover 9
9. *Vaccinium scoparium* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium*
9. *Vaccinium scoparium* with less than 5% cover 10
10. *Arnica latifolia* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Arnica latifolia*
10. *Arnica latifolia* with less than 5% cover 11
11. *Symphoricarpos albus* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Symphoricarpos albus*
11. *Symphoricarpos albus* with less than 5% cover 12
12. *Thalictrum occidentale* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Thalictrum occidentale*
12. *Thalictrum occidentale* with less than 5% cover 13
13. *Luzula glabrata* var. *hitchcockii* with 1% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Luzula glabrata* var. *hitchcockii*
13. *Luzula glabrata* var. *hitchcockii* with less than 1% cover 14
14. *Calamagrostis rubescens* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Calamagrostis rubescens*
14. *Calamagrostis rubescens* with less than 5% cover 15
15. *Carex geyeri* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Carex geyeri*
15. *Carex geyeri* with less than 5% cover 16
16. *Ribes lacustre* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Ribes lacustre*
16. *Ribes lacustre* with less than 5% cover 17
17. *Ribes montigenum* or other *Ribes* spp with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Ribes* Spp.
17. *Ribes montigenum* or other *Ribes* spp with less than 5% cover 18
18. *Arnica cordifolia* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Arnica cordifolia*
18. *Arnica cordifolia* with less than 5% cover 19
19. *Shepherdia canadensis* with 5% or more cover ..... *Abies lasiocarpa – Picea engelmannii / Shepherdia canadensis*
19. *Shepherdia canadensis* with less than 5% cover ..... Unclassified Forest

Blue Spruce Forests

Picea pungens dominant
Map Code: FBS, RMC, FRM

1. *Populus angustifolia* 25-75% of the tree layer ..... *Populus angustifolia* Forests and Woodlands
1. *Populus angustifolia* less than 25% of the tree layer 3

    2. *Actaea rubra* with at least 10% cover ..... *Picea pungens / Actaea rubra*
    2. Not as above 4

3. *Alnus incana* with at least 3% cover ..... *Picea pungens / Alnus incana*
3. Not as above 4

    4. *Equisetum arvense* or *E. hyemale* with 3% cover. Usually *E. arvense* has at least 10% cover ..... *Picea pungens / Equisetum arvense*
    4. Not as above 5

5. Juniperus communis with at least 10% cover, usually more than 25% ..... *Picea pungens / Juniperus communis*
5. Not as above 6

    6. *Shepherdia canadensis* with at least 10% cover ..... *Picea pungens / Shepherdia canadensis*

    6. Not as above. If *Populus* species are co-dominant, try the Cottonwood Key ..... Unclassified Type

Whitebark Pine Forests and Woodlands

Pinus albicaulis dominant or present in the tree layer, regardless of stature

1. *Pinus albicaulis* dominant. Abies lasiocarpa with less than 10% cover 2
    2. *Vaccinium scoparium* with 10% or more cover ..... *Pinus albicaulis / Vaccinium scoparium* Forest
    Map Code: FWB, FMC
    2. Not as above ..... Unclassified Type
1. *Pinus albicaulis* present, but NOT dominant. *Abies lasiocarpa* present, usually co-dominant with *Pinus albicaulis*. If krummholz, see *Abies lasiocarpa* Krummholz 3
    3. *Vaccinium scoparium* with 10% or more cover ..... *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Woodland
    Map Code: FWB, FMC, FSF
    3. *Vaccinium scoparium* less than 10% cover ..... *Pinus albicaulis – Abies lasiocarpa* Woodland
    Map Code: FWB, FMC

Lodgepole Forests

Pinus contorta dominant.
Map Code: FLP, RLP, unless noted otherwise

1. *Calamagrostis canadensis* with 5% or more cover ..... *Pinus contorta / Calamagrostis canadensis*
1. *Calamagrostis canadensis* with less than 5% cover 2

    2. *Dasiphora floribunda* with 5% or more cover ..... *Pinus contorta / Dasiphora floribunda*
    2. *Dasiphora floribunda* with less than 5% cover 3

3. *Hierochloe hirta* with 5% or more cover ..... *Pinus contorta / Hierochloe hirta*
    Map Code: RLP, FLP
3. *Hierochloe hirta* with less than 5% cover 4

    4. *Shepherdia canadensis* with 5% or more cover ..... *Pinus contorta / Shepherdia canadensis*
    4. *Shepherdia canadensis* with less than 5% cover 5

5. *Ceanothus velutinus* with 5% or more cover ..... *Pinus contorta / Ceanothus velutinus*
5. *Ceanothus velutinus* with less than 5% cover 6

6. *Vaccinium membranaceum* with 5% or more cover. ..... *Pinus contorta / Vaccinium membranaceum*
6. *Vaccinium membranaceum* with less than 5% cover 7

7. *Vaccinium scoparium* with 5% or more cover ..... *Pinus contorta / Vaccinium scoparium*
7. *Vaccinium scoparium* with less than 5% cover 8
8. *Spiraea betulifolia* with 5% or more cover ..... *Pinus contorta / Spiraea betulifolia*
8. *Spiraea betulifolia* with less than 5% cover 9
9. *Calamagrostis rubescens* with 5% or more cover ..... *Pinus contorta / Calamagrostis rubescens*
Map Code: RLP, FLP
9. *Calamagrostis rubescens* with less than 5% cover 10
10. *Carex geyeri* with 5% or more cover ..... *Pinus contorta / Carex geyeri*
Map Code: RLP, FLP
10. *Carex geyeri* with less than 5% cover 11
11. *Carex rossii* with 5% or more cover or the dominant species in depauperate undergrowth ..... *Pinus contorta / Carex rossii*
11. *Carex rossii* not dominant ..... Unclassified Forest

Aspen Forests

Populus tremuloides, either as mature trees, or as seedlings and saplings, forms a distinct stratum

1. *Pinus contorta* at least 10% cover 2
2. *Symphoricarpos oreophilus* at least 10% cover ..... *Populus tremuloides – Pinus contorta / Symphoricarpos oreophilus*
Map Code: FEP, RMC
2. *Symphoricarpos oreophilus* less than 10% cover 3

3. *Calamagrostis rubescens* at least 10% cover ..... *Populus tremuloides – Pinus contorta / Carex geyeri – Calamagrostis rubescens*
Map Code: FEP, RMC
3. *Calamagrostis rubescens* less than 10% cover ..... Unclassified Forest
1. *Pinus contorta* less than 10% cover 4
4. *Pseudotsuga menziesii* at least 10% cover 5
5. *Amelanchier alnifolia, Prunus virginiana,* or *Salix scouleriana*, alone or in combination, at least 10% cover ..... *Populus tremuloides – Pseudotsuga menziesii / Amelanchier alnifolia*
Map Code: FEP, RMC
5. *Amelanchier alnifolia, Prunus virginiana,* or *Salix scouleriana*, alone or in combination, less than 10% cover ..... Unclassified Forest
4. *Pseudotsuga menziesii* less than 10% cover 6

6. *Abies lasiocarpa* at least 10% cover 7
7. Tall Forbs (*Agastache urticifolia, Eucephalus engelmannii, Delphinium × occidentale, Heracleum maximum, Mertensia ciliata, Senecio serra*, *Osmorhiza occidentalis,* or *Valeriana occidentalis*) alone or in combination, at least 10% cover ..... *Populus tremuloides – Abies lasiocarpa /* Tall Forbs
Map Code: FEP, RMC
7. Tall Forbs less than 10% cover ..... Unclassified Forest
6. *Abies lasiocarpa* less than 10% cover 8
8. Some other coniferous trees at least 10% cover ..... Unclassified Forest
8. Not as above 9

9. *Amelanchier alnifolia, Prunus virginiana,* or *Salix scouleriana,* alone or in combination, at least 10% canopy cover.....Aspen Forests with Tall Shrub Undergrowth (See below)
9. Not as above.....10
10. *Symphoricarpos oreophilus, Paxistima myrsinites*, and *Rosa* spp., alone or in combination, at least 10% cover; OR *Ceanothus velutinus*, *Symphoricarpos albus* or *Shepherdia canadensis* at least 10% cover.....Aspen Forests with Short Shrub Undergrowth (See below)
10. A shrub layer lacking, or shrubs present only in small amounts.....Aspen Forests with Herb Undergrowth (See below)

Aspen Forests with Tall Shrub Undergrowth

Amelanchier alnifolia, Prunus virginiana, or *Salix scouleriana,* alone or in combination, form at least 10% canopy cover.
Map Code: FAP, RAP

1. *Salix scouleriana* at least 10% cover.....*Populus tremuloides / Salix scouleriana*
1. *Salix scouleriana* less than 10% cover.....2

2. *Pteridium aquilinum* at least 5% cover, usually more than 20% cover.....*Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum*
2. *Pteridium aquilinum* less than 5% cover.....3

3. *Symphoricarpos oreophilus, Symphoricarpos albus, Paxistima myrsinites*, and *Rosa* spp., alone or in combination, at least 10% cover.....4
3. *Symphoricarpos oreophilus, Symphoricarpos albus, Paxistima myrsinites*, and *Rosa* spp, alone or in combination, less than 10% cover.....7

4. *Calamagrostis rubescens* at least 10% cover, often more than 20% cover.....*Populus tremuloides / Amelanchier alnifolia – Symphoricarpos oreophilus / Calamagrostis rubescens*
4. *Calamagrostis rubescens* less than 10% cover.....5
5. *Thalictrum fendleri*, *Osmorhiza berteroi,* or *Geranium viscosissimum*, alone or in combination, at least 10% cover.....*Populus tremuloides / Amelanchier alnifolia – Symphoricarpos oreophilus /Thalictrum fendleri*
5. The above species less than 10% cover.....6

6. *Bromus carinatus, Elymus glaucus,* or *Elymus trachycaulus,* alone or in combination, at least 10% cover.....*Populus tremuloides / Amelanchier alnifolia – Symphoricarpos oreophilus / Bromus carinatus*
6. The above species less than 10% cover.....Unclassified Forest

7. *Carex geyeri* at least 10% cover.....*Populus tremuloides / Amelanchier alnifolia – Carex geyeri*
7. Not as above.....Unclassified Forest

Aspen Forests with Short Shrub Undergrowth

Symphoricarpos oreophilus, Paxistima myrsinites, and *Rosa* spp., alone or in combination, at least 10% cover; OR *Ceanothus velutinus*, *Symphoricarpos albus* or *Shepherdia canadensis* at least 10% cover.
Map Code: FAP, RAP

1. *Symphoricarpos albus* at least 10% cover.....*Populus tremuloides / Symphoricarpos albus*
1. *Symphoricarpos albus* less than 10% cover.....2

2. *Shepherdia canadensis* at least 10% cover.....*Populus tremuloides / Shepherdia canadensis*
2. *Shepherdia canadensis* less than 10% cover.....3

3. *Ceanothus velutinus* at least 10% cover.....*Populus tremuloides* / *Ceanothus velutinus*
3. *Ceanothus velutinus* less than 10% cover.....4

4. *Symphoricarpos oreophilus, Paxistima myrsinites*, and *Rosa* spp., alone or in combination, at least 10% cover.....5
4. Not as above .....Unclassified Type

5. Tall Forbs (*Agastache urticifolia, Eucephalus engelmannii, Delphinium × occidentale, Heracleum maximum, Mertensia ciliata, Osmorhiza occidentalis, Senecio serra*, or *Valeriana occidentalis*) alone or in combination, at least 10% over .....*Populus tremuloides* / *Symphoricarpos oreophilus* / Tall Forbs
5. Tall Forbs less than 10% cover.....6

6. *Calamagrostis rubescens* at least 10% cover.....*Populus tremuloides* / *Symphoricarpos oreophilus* /*Calamagrostis rubescens*
6. *Calamagrostis rubescens* less than 10% cover.....7

7. *Thalictrum fendleri*, *Osmorhiza berteroi,* or *Geranium viscosissimum*, alone or in combination, at least 10% cover.....*Populus tremuloides* / *Symphoricarpos oreophilus* / *Thalictrum fendleri*
7. Above species less than 10% cover.....Unclassified Forest

Aspen Forests with Herb Undergrowth
A shrub layer lacking, or shrubs present only in small amounts.
Map Code: FAP, RAP

1. Tall Forbs (*Agastache urticifolia, Eucephalus engelmannii, Delphinium × occidentale, Heracleum maximum, Mertensia ciliata, Osmorhiza occidentalis, Senecio serra*, or *Valeriana occidentalis*) alone or in combination, at least 10% over .....*Populus tremuloides* / Tall Forbs
1. Tall Forbs less than 10% cover.....2

2. *Calamagrostis rubescens* at least 10% cover.....*Populus tremuloides* /*Calamagrostis rubescens*
2. *Calamagrostis rubescens* less than 10% cover.....3

3. *Thalictrum fendleri*, *Osmorhiza berteroi,* or *Geranium viscosissimum*, alone or in combination, at least 10% cover .....*Populus tremuloides* / *Thalictrum fendleri*
3. The above species less than 10% cover.....Unclassified Forest

4. *Phleum pretense* at least 20% cover.....*Populus tremuloides* / *Phleum pratense*
4. *Phleum pretense* less than 20% cover.....5

5. *Poa pratensis* at least 20% cover.....*Populus tremuloides* /*Poa pratensis*
5. *Poa pratensis* less than 20% cover.....Unclassified Forest

Cottonwood Forests and Woodlands

Populus angustifolia or *Populus balsamifera*, alone or in combination, form a distinct strata either as mature trees, or as seedlings and saplings.

1. *Populus angustifolia* more abundant/common than *Populus balsamifera* .....Narrowleaf Cottonwood Forests and Woodlands

1. *Populus balsamifera* more abundant/common than *Populus angustifolia*. .....Balsam Poplar Forests

Narrowleaf Cottonwood Forests and Woodlands

Map Code: FCW unless noted otherwise

1. *Picea pungens* 25-75% of the tree canopy (if *P. pungens* is over 75% of the tree canopy, try the blue spruce key) 2
1. *Picea pungens* less than 25% of the tree canopy, or lacking 4

2. *Shepherdia canadensis* at least 5% cover ..... *Populus angustifolia – Picea pungens / Shepherdia canadensis* Forest
Map Code: FRM
2. Not as above 3

3. *Poa pratensis* at least 10% cover, and usually dominating the herbaceous layer ..... *Populus angustifolia - Picea pungens / Poa pratensis* Forest
3. Not as above ..... Unclassified *Populus angustifolia – Picea pungens* Forest
Map Code: FRM

4. *Shepherdia canadensis* or *Juniperus communis,* alone or in combination, at least 3% cover, more often over 5% ..... *Populus angustifolia / Shepherdia canadensis* Forest
4. Not as above 5

5. *Symphoricarpos oreophilus* at least 5% cover ..... *Populus angustifolia / Symphoricarpos (albus, occidentalis, oreophilus)* Forest
5. Not as above 6

6. *Artemisia tridentata ssp. vaseyana* or *Eriogonum umbellatum* at least 10% cover. *Purshia tridentata* may be co-dominant or lacking. ..... *Populus angustifolia / Artemisia tridentata ssp. vaseyana – (Purshia tridentata) / Eriogonum umbellatum* Woodland
6. *Artemisia tridentata ssp. vaseyana* and *Eriogonum umbellatum* less than 10% cover 7

7. *Poa pratensis* at least 10% cover ..... *Populus angustifolia / Poa pratensis*
7. *Poa pratensis* less than 10% cover ..... Unclassified Forest or Woodland

Balsam Poplar Forests
Map Code: FCW, FRM

1. *Cornus sericea* at least 10%cover ..... *Populus balsamifera / Cornus sericea*
1. *Cornus sericea* less than 10% cover 2
2. *Prunus virginiana* at least 5% cover ..... *Populus balsamifera / Prunus virginiana*
2. *Prunus virginiana* less than 5% cover 3
3. *Symphoricarpos albus* or *S. oreophilus,* alone or in combination, at least 10% cover ..... *Populus balsamifera / Symphoricarpos spp.*
3. *Symphoricarpos albus* or *S. oreophilus,* alone or in combination, less than 10% cover 4
4. Shrub species, alone or in combination, less than 15% cover ..... *Populus balsamifera* / Mixed Herbs
4. Not as above ..... Unclassified Forest

SHRUBLANDS

1. *Prunus virginiana* and/or *Amelanchier alnifolia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... Chokecherry Shrublands
1. *Prunus virginiana* and/or *Amelanchier alnifolia* present in trace amounts or lacking 2

2. Species in the genus *Artemisia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers. ..... Sagebrush Shrublands
2. Species in the genus *Artemisia* present in trace amounts or lacking..... 3
3. *Chrysothamnus viscidiflorus* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Chrysothamnus viscidiflorus*
Map Code: SSD, SSW
3. *Chrysothamnus viscidiflorus* present in trace amounts or lacking..... 4
4. *Symphoricarpos oreophilus* or other species in the genus *Symphoricarpos* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers..... *Symphoricarpos oreophilus*
Map Code: SSD, SSW, SMR
4. *Symphoricarpos oreophilus* or other species in the genus *Symphoricarpos* present in trace amounts or lacking..... 5
5. *Ceanothus velutinus* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Ceanothus velutinus*
Map Code: SCV
5. *Ceanothus velutinus* present in trace amounts or lacking 6
6. *Cornus sericea* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Cornus sericea*
Map Code: SWL, SAI, SMR
6. *Cornus sericea* present in trace amounts or lacking..... 7
7. *Dasiphora floribunda* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... Shrubby Cinquefoil Shrublands (see below)
7. *Dasiphora floribunda* present in trace amounts or lacking..... 8
8. *Spiraea splendens* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Spiraea splendens*
Map Code: DSA, SMR
8. *Spiraea splendens* present in trace amounts or lacking..... 9
9. *Betula nana* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Betula nana* /
Mesic Forbs - Mesic Graminoids
Map Code: SWL
9. *Betula nana* present in trace amounts or lacking..... 10
10. *Rhamnus alnifolia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Rhamnus alnifolia*
Map Code: SWL, SAI
10. *Rhamnus alnifolia* present in trace amounts or lacking 11
11. *Alnus incana* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... Alder Shrublands (see below)
11. *Alnus incana* present in trace amounts or lacking..... 12
12. *Vaccinium membranaceum* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Vaccinium membranaceum*
Map Code: SDS, SMR
12. *Vaccinium membranaceum* present in trace amounts or lacking 13
13. *Vaccinium scoparium* or *V. caespitosum* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers..... *Vaccinium scoparium*
Map Code: DSA
13. *Vaccinium scoparium* or *V. caespitosum* present in trace amounts or lacking 14
14. *Spirea betulifolia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Spirea betulifolia*
Map Code: SMR
14. *Spirea betulifolia* present in trace amounts or lacking..... 15
15. *Dryas octopetala* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers ..... *Dryas octopetala* – *Carex* spp.
Map Code: DSA, HWM, HSA
15. *Dryas octopetala* present in trace amounts or lacking 16

16. *Salix* species dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers.....Willow Shrublands (See below)
16. *Salix* species present in trace amounts or lacking.....Undefined Shrubland

Chokecherry Shrublands

Prunus virginiana and/or *Amelanchier alnifolia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers.
Map Code: SMR

1. The herbaceous layer dominated by *Carex geyeri*, which has at least 20% cover. .....*Prunus virginiana / Carex geyeri*

1. *Carex geyeri* present in trace amounts or lacking. The herbaceous layer dominated by some other species.....*Prunus virginiana* Shrubland

Sagebrush Shrublands

Species in the genus *Artemisia* dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers.

1. *Artemisia arbuscula* dominating the shrub layer.....Low Sagebrush Shrublands
1. *Artemisia arbuscula* less than 1% cover or lacking. Other *Artemisia* species dominant 2
    2. *Artemisia tridentata* ssp. *vaseyana* dominant or co-dominant with another shrub species; other *Artemisia* species lacking or present in trace amounts.....*Artemisia tridentata* ssp. *vaseyana* Shrublands (see below)
    2. *Artemisia tridentata* ssp. *vaseyana* present in trace amounts or lacking. Other *Artemisia* species or sub-species dominant 3
        3. *Artemisia tridentata* ssp. *spiciformis* the dominant shrub.....*Artemisia tridentata* ssp. *spiciformis* Map Code: SSD, SMR
        3. *Artemisia tridentata* ssp. *spiciformis* present in trace amounts or lacking. Other *Artemisia* species or sub-species dominant 4
            4. *Artemisia tripartita* the dominant shrub.....5
                5. *Hesperostipa comata* the principal grass.....*Artemisia tripartita /Hesperostipa comata* Map Code: SSD, SSW
                5. *Hesperostipa comata* present in trace amounts or lacking.....Unclassified Shrubland
            4. *Artemisia tripartita* present in trace amounts or lacking. Other *Artemisia* species or sub-species dominant 6
                6. *Artemisia cana* the dominant shrub.....7
                7. *Poa pratensis* the principal grass.....*Artemisia cana / Poa pratensis* Map Code: SSW, SSD
                7. *Poa pratensis* present in trace amounts or lacking.....Unclassified Shrubland
                6. *Artemisia cana* present in trace amounts or lacking.....Unclassified Shrubland

Low Sagebrush Shrublands
Map Code: DSE

1. *Festuca idahoensis* the most abundant grass, with at least 1% cover, but usually 5% or more.....*Artemisia arbuscula /Festuca idahoensis* Shrub Herbaceous Vegetation
1. Not as above.....2

    2. *Pseudoroegneria spicata* the dominant grass, or *Eriogonum umbellatum* the dominant understory species, with more than 10% cover in most stands. .....*Artemisia arbuscula /Pseudoroegneria spicata* Shrub Herbaceous Vegetation
    2. Not as above.....Unclassified Shrubland

***Artemisia tridentata* ssp. *vaseyana* Shrublands**

1. *Artemisia tridentata* ssp. *vaseyana* dominant, with no other shrubs co-dominant (Co-dominant means providing at least 5% of the shrub layer.).....2
    2. *Pseudoroegneria spicata* the dominant grass, *Festuca idahoensis* present in trace amounts or lacking.....*Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* Map Code: SSD, SSW
    2. *Pseudoroegneria spicata* present in trace amounts or lacking. 3
        3. *Festuca idahoensis* the dominant grass.....*Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Map Code: SSD, SSW
        3. *Festuca idahoensis* present in trace amounts or lacking. 4
            4. *Hesperostipa comata* the dominant grass .....*Artemisia tridentata* ssp. *vaseyana* / *Hesperostipa comata* Map Code: SSD, SSW
            4. *Hesperostipa comata* present in trace amounts or lacking.....5
                5. *Bromus carinatus* the dominant grass.....*Artemisia tridentata* ssp. *vaseyana* / *Bromus carinatus* Map Code: SSD, SSW
                5. *Bromus carinatus* present in trace amounts or lacking 6
                6. *Carex geyeri* the dominant graminoid .....*Artemisia tridentata* ssp. *vaseyana* / *Carex geyeri* Map Code: SSD, SSW
                6. *Carex geyeri* present in trace amounts or lacking.....7
                7. *Poa pratensis* the dominant grass.....*Artemisia tridentata* ssp. *vaseyana* / *Poa pratensis* Map Code: SSD, SSW
                7. *Poa pratensis* not the dominant grass.....8
                8. *Bromus inermis* the dominant grass .....*Artemisia tridentata* ssp. *vaseyana* / *Bromus inermis* Map Code: SSD, SSW
                8. *Bromus inermis* not the dominant grass .....Unclassified Shrubland

1. *Artemisia tridentata* ssp. *vaseyana* co-dominant, with other shrubs providing at least 5% of the shrub layer 7
    9. *Purshia tridentata* co-dominant, providing at least 5% of the shrub layer, but occasionally the dominant shrub 8
        10. *Festuca idahoensis* with 5% or more cover. *Balsamorhiza sagittata* with less than 10% cover.....*Artemisia tridentata* ssp. *vaseyana* – *Purshia tridentata* / *Festuca idahoensis* Map Code: SES, SSD, SSW
        10. *Festuca idahoensis* present in trace amounts or lacking 11
            11. *Balsamorhiza sagittata* with more than 10% cover .....*Artemisia tridentata* ssp. *vaseyana* – *Purshia tridentata* / *Balsamorhiza sagittata* Map Code: SES, SSD, SSW
            11. Not as above.....12
                12. *Bromus inermis* or *Poa pratensis* , alone or in combination, the dominant understory species .....*Artemisia tridentata* ssp. *vaseyana* – *Purshia tridentata* / *Bromus inermis- Poa pratensis* Map Code: SES, SSD, SSW
                12. Not as above.....Unclassified Shrubland

9. *Purshia tridentata* present in trace amounts or lacking. *Symphoricarpos oreophilus* co-dominant, providing at least 5% of the shrub layer 13
13. *Pseudoroegneria spicata* the dominant grass. ..... *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Pseudoroegneria spicata* Map Code: SSD, SSW, SMR
13. *Pseudoroegneria spicata* present in trace amounts or lacking. 14
14. *Festuca idahoensis* the dominant grass. ..... *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Festuca idahoensis* Map Code: SSD, SSW, SMR
14. *Festuca idahoensis* present in trace amounts or lacking. 14
15. *Hesperostipa comata* the dominant grass ..... *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Hesperostipa comata* Map Code: SSD, SSW, SMR
15. *Hesperostipa comata* present in trace amounts or lacking 16
16. *Bromus carinatus* the dominant grass ..... *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Bromus carinatus* Map Code: SSD, SSW, SMR
16. *Bromus carinatus* present in trace amounts or lacking 17
17. *Carex geyeri* the dominant graminoid ..... *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Carex geyeri* Map Code: SMR, SSD, SSW
17. *Carex geyeri* present in trace amounts or lacking. ..... Unclassified Shrubland

Shrubby Cinquefoil Shrublands

Dasiphora floribunda dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers.
Map Code: SSW

1. *Deschampsia caespitosa* present, with as little as 1% cover. *Poa pratensis* may be dominant or abundant. ..... *Dasiphora floribunda / Deschampsia caespitosa*

1. *Deschampsia caespitosa* absent, *Carex* species provide at least 10% cover. *Poa pratensis* may be dominant or abundant ..... *Dasiphora floribunda / Carex* spp.

Alder Shrublands

Alnus incana dominant or co-dominant in the shrub layer. Usually over 10% cover, but occasionally less in depauperate shrub layers.
Map Code: SAI, SWL

1. *Equisetum arvense* at least 25% cover. ..... *Alnus incana / Equisetum arvense*
1. *Equisetum arvense* less than 25% cover. 2
2. *Glyceria striata* at least 25% cover. ..... *Alnus incana / Glyceria striata*
2. *Glyceria striata* less than 25% cover 3
3. Mesic forbs dominant in the herbaceous layer, or present in an herb layer that includes less than 20% graminoids. Mesic forbs include, but are not limited to, the following: Tall *Mertensia* spp., *Heracleum maximum*, *Aconitum columbianum*, and *Maianthemum stellatum*. *Poa pratensis* is often present with high cover ..... *Alnus incana* / Mesic Forbs
3. Mesic forbs not dominant. Mesic graminoids present in open undergrowth that doesn't include many forbs. Mesic graminoids include, but are not limited to, the following: *Agrostis stolonifera*, *Glyceria* spp., *Poa palustris*, or various *Carex* spp. *Poa pratensis* is often present with high cover. ..... *Alnus incana* / Mesic Graminoids

Willow Shrublands

Willows (*Salix* sp.) dominate the overstory

1. Willows greater than knee height; plants of montane and upper montane environments 2
1. Willows less than knee height; plants of alpine environments ..... GROUP H

    2. *Salix geyeriana* dominating overstory with cover usually exceeding 25%, *Salix wolfii* rarely co-dominant ..... GROUP A
    2. *Salix geyeriana* not dominating overstory 3

3. *Salix lemmonii* dominating overstory with cover usually exceeding 25%, *Salix wolfii* rarely co-dominant ..... GROUP B
3. *Salix lemmonii* not dominating overstory 4

    4. *Salix boothii* dominating overstory with cover usually exceeding 25%, *Salix drummondiana* may be present in equal or slightly greater amounts, but *Salix boothii* creates the taller willow canopy ..... GROUP C
    4. *Salix boothii* not dominating overstory 5

5. *Salix lutea* dominating overstory with cover usually exceeding 25% ..... GROUP D
5. *Salix lutea* not dominating overstory 6

    6. *Salix eastwoodiae* dominating overstory with cover usually exceeding 25% ..... *Salix eastwoodiae* Map Code: SWL
    6. *Salix eastwoodiae* not dominating overstory 7

7. *Salix planifolia* dominating overstory or co-dominating with *Betula nana*; *Salix boothii* may be present in slightly smaller quantities than *S. planifolia* in the tall shrub stratum ..... GROUP E
7. *Salix planifolia* not dominating overstory 8

    8. *Salix drummondiana* dominating overstory with cover usually exceeding 20% ..... GROUP F
    8. *Salix drummondiana* not dominating overstory 9

9. *Salix wolfii* dominating overstory with cover usually exceeding 25%, *Salix geyeriana* or *Salix lemmonii* rarely co-dominant ..... GROUP G
9. *Salix wolfii* not dominating overstory ..... Undescribed Shrubland

GROUP A. Key to *Salix geyeriana*-Dominated Shrublands

Map Code: SWL

1. *Carex utriculata* present with at least 25% cover ..... *Salix geyeriana* / *Carex utriculata*
1. Not as above 2

    2. *Calamagrostis canadensis* present with at least 25% cover ..... *Salix geyeriana* / *Calamagrostis canadensis*
    2. Not as above 3

3. *Carex praticola* present with at least 25% cover ..... *Salix geyeriana* / *Carex praticola*
3. Not as above 4

    4. Understory dominated by other graminoids, with *Poa pratensis, Deschampsia caespitosa, Carex microptera*, and *Carex praticola* typically present in varying amounts 5
    4. Not as above ..... Undescribed *Salix geyeriana* Shrubland

5. *Salix geyeriana* exclusively dominates the overstory ..... *Salix geyeriana* / Mesic Graminoids

5. *Salix geyeriana* is co-dominant with *Salix wolfii*; both species have at least 25% canopy cover ..... *Salix geyeriana – Salix wolfii* / Mesic Graminoids

GROUP B. Key to *Salix lemmonii*-Dominated Shrublands
Map Code: SWL

1. *Carex pellita* present with at least 25% cover ..... *Salix lemmonii* / *Carex pellita*
1. Not as above 2

2. Understory dominated by other graminoids, with *Bromus* species, *Carex* species, and *Poa pratensis* typically present in varying amounts 3
2. Not as above 4

3. *Salix lemmonii* exclusively dominates the overstory ..... *Salix lemmonii* / Mesic Graminoids
3. *Salix lemmonii* is co-dominant with *Salix wolfii*; both species have at least 25% canopy cover ..... *Salix geyeriana – Salix wolfii* / Mesic Graminoids

4. Understory dominated by forbs, with *Fragaria virginiana, Geum macrophyllum,* and *Urtica dioica* typically present in varying amounts ..... *Salix lemmonii* / Mesic Tall Forbs
4. Not as above ..... Undescribed *Salix lemmonii* Shrubland

GROUP C. Key to *Salix boothii*-Dominated Shrublands
Map Code: SWL

1. *Carex utriculata* present with at least 25% cover ..... *Salix boothii* / *Carex utriculata*
1. Not as above 2

2. Understory dominated by other graminoids, with *Carex microptera, Carex praegracilis, Carex praticola, Deschampsia caespitosa, Poa palustris,* and/or *Poa pratensis* typically present in varying amounts ..... *Salix boothii* / Mesic Graminoids
2. Not as above 3

3. Understory dominated by forbs, with *Symphyotrichum foliaceum, Aconitum columbianum, Fragaria virginiana, Geranium viscosissimum,* and/or *Rudbeckia occidentalis* typically present in varying amounts ..... *Salix boothii* / Mesic Forbs
3. Not as above ..... Undescribed *Salix boothii* Shrubland

GROUP D. Key to *Salix lutea*-Dominated Shrublands
Map Code: SWL

1. Understory dominated by graminoids, with *Carex utriculata, Poa palustris,* and/or *Poa pratensis* typically present in varying amounts ..... *Salix lutea* / Mesic Graminoids
1. Not as above ..... Undescribed *Salix lutea* Shrublands

GROUP E. Key to *Salix planifolia*-Dominated Shrublands
Map Code: SWL

1. *Carex utriculata* present with at least 25% cover ..... *Salix planifolia* / *Carex utriculata*
1. Not as above 2

2. Understory dominated by forbs, with *Maianthemum stellatum, Fragaria virginiana, Ligusticum filicinum, Symphyotrichum ascendens,* and/or *Thalictrum* sp. typically present in varying amounts .....*Salix planifolia* / Mesic Forbs
2. Not as above .....Undescribed *Salix planifolia* Shrublands

GROUP F. Key to *Salix drummondiana*-Dominated Shrublands
Map Codes: SWL

1. *Carex utriculata* present with at least 25% cover..... *Salix drummondiana /Carex utriculata*
1. Not as above 2

2. Understory dominated by graminoids, with *Carex* sp*, Calamagrostis canadensis,* and/or *Poa pratensis* typically present in varying amounts .....*Salix drummondiana* / Mesic Graminoids
2. Not as above 3

3. Understory dominated by forbs, with some combination of *Angelica arguta, Delphinium* x *occidentale, Eucephalus engelmannii, Ligusticum filicinum, Maianthemum stellatum, Rudbeckia occidentalis, Thalictrum occidentale,* and/or *Valeriana occidentalis* typically present in varying amounts .....*Salix drummondiana* / Mesic Forbs
3. Not as above .....Undescribed *Salix drummondiana* Shrublands

GROUP G. Key to *Salix wolfii*-Dominated Shrublands
Map Code: SWL

1. *Carex aquatilis* present with at least 10% cover and more common than *Carex utriculata*.....*Salix wolfii / Carex aquatilis*
1. Not as above 2

2. *Carex utriculata* present with at least 20% cover.....*Salix wolfii / Carex utriculata*
2. Not as above 3

3. *Carex pellita* dominates the herbaceous layer.....*Salix wolfii / Carex pellita*
3. Not as above 4

4. *Calamagrostis canadensis* dominates the herbaceous layer .....*Salix wolfii / Calamagrostis canadensis*
4. Not as above 5

5. *Carex praegracilis* present with at least 25% cover.....*Salix wolfii / Carex praegracilis*
5. Not as above 6

6. *Deschampsia caespitosa* dominates the herbaceous layer .....*Salix wolfii / Deschampsia caespitosa*
6. Not as above 7

7. *Salix wolfii* is co-dominant with either *Salix lemmonii* or *Salix geyeriana*; both species have at least 25% canopy cover; understory dominated by other graminoids, with *Carex* species (including *C. microptera, C. praticola,* and/or *C. nebrascensis*), *Poa pratensis, Bromus vulgaris,* and/or *Deschampsia caespitosa* typically present in varying amounts..... *Salix geyeriana – Salix wolfii* / Mesic Graminoids
7. Not as above 8

8. Understory dominated by forbs, with some combination of *Fragaria virginiana, F. vesca, Mertensia ciliata, Arnica longifolia, Erigeron peregrinus, Lupinus argenteus, Saxifraga odontoloma, Valeriana acutiloba,* and/or *Senecio triangularis* typically present in varying amounts .....*Salix wolfii* / Mesic Forbs

8. Not as above .....Undescribed *Salix wolfii* Shrubland

GROUP H. Key to Alpine Willow Shrublands

Salix arctica, S. petrophila, or *S. glauca,* alone or in any combination, dominate the canopy, usually with at least 20% cover
Map Code: DSA

1. *Salix glauca* the dominating shrub; if *S. arctica* and/or *S. petrophila* present, they form only a minor canopy component 2
1. *Salix glauca* present in small quantities or lacking 3

2. *Deschampsia caespitosa* at least 10% cover ..... *Salix glauca / Deschampsia caespitosa*
Additional Map Code: HWM
2. Not as above ..... *Salix glauca*

3. *Salix arctica* or *S. petrophila* the dominating shrub; if *S. glauca* present, it forms only a minor canopy component 4
3. Not as above ..... Unclassified Alpine Willow Shrubland

4. *Salix petrophila* at least 10% cover, and *Carex paysonis* at least 10% cover. ..... *Carex paysonis - Sibbaldia procumbens*
Herbaceous Vegetation
Map Code: DSA, HWM, HSA
4. Not as above 5

5. *Caltha leptosepala* one of the dominant forbs ..... *Salix arctica - Salix petrophila / Caltha leptosepala*
Additional Map Code: HWM
5. Not as above 6

6. *Polygonum bistortoides* usually present within the herbaceous layer; *Caltha leptosepala* absent ..... *Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides*
6. Not as above ..... Undescribed *Salix arctica* Type

GRAMINOID DOMINATED HERBACEOUS VEGETATION

At least one graminoid species has more than 10% canopy cover.

1. Grasses dominant ..... Grass dominated Herbaceous Vegetation
1. Not as above 2

2. Members of Cyperaceae (Sedge family) dominant ..... Sedge Family dominated Herbaceous Vegetation
2. Not as above 3

3. Rushes dominant ..... Rush dominated Herbaceous Vegetation
3. Not as above ..... Unclassified Herbaceous Vegetation

Grass Dominated Herbaceous Vegetation

1. *Pseudoroegneria spicata* one of the dominant grasses, usually with at least 5% cover 2
2. *Balsamorhiza sagittata* present. *Poa secunda* may be absent in GRTE stands, even though it is in the name for this type ..... *Pseudoroegneria spicata – Balsamorhiza sagittata – Poa secunda*
Map Code: HFX, HGL
2. Not as above 3
3. *Poa secunda* present. *Balsamorhiza sagittata* absent ..... *Pseudoroegneria spicata – Poa secunda*
Map Code: HGL

3. Not as above 4
4. Neither *Balsamorhiza sagittata* nor *Poa secunda* present.....*Pseudoroegneria spicata*
Map Code: HFX, HGL
4. Not as above .....Unclassified Herbaceous Vegetation
1. *Pseudoroegneria spicata* not dominant.....5
5. *Poa secunda* the dominant grass, usually with over 25% cover 6
6. *Balsamorhiza sagittata* co-dominant, usually with over 10% cover. (*Balsamorhiza serrata* is not present, but the type is named after it, based on a National Vegetation Classification name) .....(*Balsamorhiza serrata*) – *Poa secunda*
Map Codes: HFX, HGL
6. Not as above. .....Unclassified Herbaceous Vegetation
5. Not as above 7
7. *Hesperostipa comata* the dominant grass, usually with over 5% cover.....*Hesperostipa comata*
Map Code: HFX, HGL
7. Not as above.....8
8. *Festuca idahoensis* with at least 10% cover 9
9. *Danthonia intermedia* co-dominant or dominant, with at least 10% cover .....*Festuca idahoensis – Danthonia intermedia*
Map Code: HGL, HFX
9. Not as above 10
10. *Geranium viscosissimum* with at least 3% cover.....*Festuca idahoensis – Geranium viscosissimum*
Map Code: HGL, HFX
10. Not as above 11
11. *Helianthella uniflora* with at least 10% cover.....*Festuca idahoensis – Helianthella uniflora*
Map Codes: HFX, HGL
11. Not as above. .....Unclassified Type
8. *Festuca idahoensis* with less than 10% cover 12
12. *Danthonia spicata* dominant, with at least 10% cover.....*Danthonia spicata*
Map Codes: HGL, HFX
12. Not as above 13
13. *Phleum pratense, Poa pratensis, Bromus inermis, Poa compressa*, or other non-native grasses, either alone or in combination, dominant (If other native species have high cover, try re-keying, focusing on just the natives).....*Phleum pratense – Poa pratensis – Bromus inermis*
Map Codes: HGL, HFX, HFD
13. Not as above 14
14. *Calamagrostis rubescens* dominant, with at least 10% cover.....*Calamagrostis rubescens*
Map Codes: HGL, HFX, HFD
14. Not as above 15
15. *Calamagrostis canadensis* dominant, with at least 10% cover.....*Calamagrostis canadensis*
Map Codes: HGS, HWM
15. Not as above 16
16. *Poa palustris* dominant, with at least 20% cover .....*Poa palustris*
Map Codes: HGS, HFD
16. Not as above 17
17. *Leucopoa kingii* the dominant graminoid, although the forb *Phlox pulvinata* may have more cover (this type keys here and in the Forblands key) .....*Leucopoa kingii / Phlox pulvinata*
Map Codes: HDA, HSA, VCT
17. Not as above 18
18. *Deschampsia caespitosa* dominant **or** co-dominant, with at least 25% cover.....19
18. Not as above. .....Unclassified Grass Dominated Herbaceous Vegetation
19. *Deschampsia caespitosa* dominant, with at least 25% cover; occasionally *Carex aquatilis* or *Carex utriculata* will have slightly less cover and appear to co-dominate .....*Deschampsia caespitosa*
Map Codes: HGS, HWM, HSA
19. *Deschampsia caespitosa* co-dominates with *Carex microptera*; both with at least 25% cover .....*Deschampsia caespitosa – Carex microptera*
Map Codes: HGS, HWM, HSA

Sedge Family Dominated Herbaceous Vegetation

1. *Carex hoodii* the dominant graminoid, with over 10% cover. Forbs may be more abundant that *Carex hoodii* ..... *Carex hoodii*
Map Code: HFX, HFD, HGL, HSA

1. Not as above 2

2. *Carex geyeri* at least 10% cover ..... *Carex geyeri*
Map Code: HGL, HSA, HFX

2. Not as above 3

3. *Carex rossii* is the dominant graminoid, usually with at least 10% cover, but may have less on depauperate sites ..... *Carex rossii*
Map Code: HGL, HFX

3. Not as above 4

4. *Carex nardina* at least 10% cover, often as much as 30% cover ..... *Carex nardina* Scree
Map Code: HSA, HDA

4. Not as above 5

5. *Carex illota* at least 10% cover. Other graminoids may also have 10% cover ..... *Carex illota*
Map Code: HDA

5. Not as above 6

6. *Carex aquatilis* dominant, with at least 25% cover; *Carex utriculata* (if present) in small quantities only ..... *Carex aquatilis*
Map Code: HGS

6. Not as above 7

7. *Carex utriculata* dominant, usually with over 25% cover; rarely *C. utriculata* with low cover and co-dominant with other graminoids ..... *Carex utriculata*
Map Code: HGS

7. Not as above 8

8. *Carex nebrascensis* dominant, usually with over 25% cover; rarely *C. nebrascensis* with low cover and co-dominant with other graminoids ..... *Carex nebrascensis*
Map Code: HGS

8. Not as above 9

9. *Carex vesicaria* dominant, usually with over 25% cover; rarely *C. vesicaria* with low cover and co-dominant with other graminoids ..... *Carex vesicaria*
Map Code: HGS

9. Not as above 10

10. *Carex buxbaumii* dominant, usually with over 25% cover; rarely *C. buxbaumii* with low cover and co-dominant with other graminoids ..... *Carex buxbaumii*
Map Code: HGS

10. Not as above 11

11. *Carex pellita* dominant, with at least 25% cover ..... *Carex pellita*
Map Code: HGS

11. Not as above 12

12. *Carex microptera* dominant or co-dominant with graminoid species not previously mentioned; usually with over 20% cover 13

12. Not as above 14

13. *Carex microptera* co-dominant with *Deschampsia caespitosa* ..... *Deschampsia caespitosa – Carex microptera*
Map Code: HGS, HWM, HSA

13. *Carex microptera* exclusively dominant, or co-dominant with graminoid not previously mentioned ..... *Carex microptera*
Map Code: HGS, HWM, HSA

14. *Carex paysonis* dominant or co-dominant, with at least 10% cover. Alpine dwarf willows may have over 10% cover ..... *Carex paysonis - Sibbaldia procumbens* Herbaceous Vegetation
Map Code: DSA, HWM, HSA

14. Not as above 15

15. *Eleocharis acicularis* dominant or co-dominant, with at least 25% cover.....*Eleocharis acicularis*
Map Code: HGS, HA

15. Not as above 16

16. *Eleocharis palustris* dominant, with at least 25% cover .....*Eleocharis palustris*
Map Code: HGS, HA

16. Not as above .....Unclassified Sedge Family Dominated Type

Rush Dominated Herbaceous Vegetation

1. *Juncus drummondii* dominant, usually with over 20% cover .....*Juncus drummondii - Antennaria lanata*
Map Code: HSA, HWM, HDA

1. Not as above.....2

2. *Juncus parryi* dominant or co-dominant with Carex spp. Usually with over 20% cover, but occasionally only 10%. If any single forb species is far more abundant than *J. parryi*, try the forb key .....*Juncus parryi / Sibbaldia procumbens*
Map Code: HSA, HWM, HDA

2. Not as above 3

3. *Juncus balticus* dominant, usually over 20% cover.....*Juncus balticus*
Map Code: HGS

3. Another species of *Juncus* dominant.....Unclassified Rush-dominated Type

FORB DOMINATED HERBACEOUS VEGETATION

1. *Nuphar lutea ssp. polysepala* dominant, with at least 20% cover .....*Nuphar lutea* ssp. *polysepala*
Map Code: HA

1. Not as above.....2

2. *Menyanthes trifoliata* dominant, with at least 20% cover.....*Menyanthes trifoliata*
Map Code: HA

2. Not as above 3

3. *Heracleum maximum* one of the dominant species, usually with at least 20% cover. *Rudbeckia occidentalis* may be present in varying amounts .....*Heracleum maximum – Rudbeckia occidentalis*
Map Code: HFD

3. Not as above.....4

4. *Pteridium aquilinum* dominant, usually with over 50% cover.....*Pteridium aquilinum*
Map Code: HBR

4. Not as above 5

5. *Arnica mollis*, *Senecio triangularis,* or *Mimulus guttatus,* alone or in combination, dominant, usually with over 25% cover.....*Senecio triangularis – Mimulus guttatus*
Map Code: HFD, HSA

5. Not as above.....6

6. *Mertensia ciliata* dominant, usually with over 25% cover. .....*Mertensia ciliata*
Map Code: HSA, HFD

6. Not as above 7

7. *Arnica longifolia* dominant, usually with over 25% cover. *Juncus parryi* may have up to 10% cover. If *Juncus parryi* has greater cover than *Arnica*, try the Rush Key.....*Arnica longifolia*
Map Code: HSA

7. Not as above.....8

8. *Ligusticum filicinum* one of the top three co-dominant species, usually with over 20% cover, however it may be as little as 5% in depauperate stands. *Delphinium × occidentale* may be lacking or co-dominant, or anything in-between .....*Ligusticum filicinum – Delphinium × occidentale*
Map Code: HFD, HSA

8. Not as above 9

9. *Eucephalus engelmannii* dominant, usually with at least 20% cover.....*Eucephalus engelmannii*

Map Code: HFD, HSA

9. Not as above.....10

10. *Symphyotrichum ascendens* one of the top three co-dominant species, usually with at least 10% cover.....*Symphyotrichum ascendens*
Map Code: HSA, HFX, HFD

10. Not as above.....11

11. *Erigeron peregrinus* dominant, usually with at least 10% cover.....*Erigeron peregrinus*
Map Code: HSA

11. Not as above.....12

12. *Helianthella uniflora* dominant, or one of the top three co-dominant species, usually with at least 10% cover.....*Helianthella uniflora*
Map Code: HFX

12. Not as above.....13

13. *Geranium viscosissimum* dominant, or one of the top three co-dominant species, usually with over 10% cover.....*Geranium viscosissimum*
Map Code: HFX

13. Not as above.....14

14. *Apocynum androsaemifolium* dominant, usually with over 25% cover, however it may be as little as 5% in depauperate stands.....*Apocynum androsaemifolium*
Map Code: HFX, HSA

14. Not as above.....15

15. *Caltha leptosepala* dominant, with at least 25% cover.....*Caltha leptosepala*
Map Code: HWM, HGS

15. Not as above.....16

16. *Phlox pulvinata*, or *Leucopoa kingii*, alone or in combination, dominant, with at least 20% cover.....*Leucopoa kingii* / *Phlox pulvinata*
Map Code: HDA, HSA, VCT

16. Not as above.....17

17. *Phlox multiflora* dominant, or one of the top three co-dominant species, usually with at least 10% cover.....*Phlox multiflora* Alpine Cushion
Map Code: HSA, HDA, VCT

17. Not as above.....18

18. *Ivesia gordonii* present, often dominant or co-dominant, with 1-30% cover. *Eriogonum caespitosum* may be present or absent.....*Ivesia gordonii – Eriogonum caespitosum*
Map Code: HSA, VCT, HDA

18. Not as above.....19

19. *Pteryxia hendersonii* dominant, with at least 10% cover.....*Pteryxia hendersonii* Alpine
Map Code: HSA, VCT

19. Not as above.....Unclassified Forb Dominated Herbaceous Vegetation

APPENDIX D: Vegetation Association Descriptions for GRTE

NatureServe. 2005. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of August 2005.

U.S. NATIONAL VEGETATION CLASSIFICATION

Grand Teton National Park

Global and Local Descriptions

September 30, 2005

By
NatureServe
1101 Wilson Blvd., 15th floor
Arlington, VA 22209

And

Grand Teton National Park
Drawer 170
Moose, WY 83012

This subset of the U.S. National Classification covers vegetation associations and alliances attributed to the Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Gwen Kittel, Vegetation Ecologist, Gwen_Kittel@natureserve.org, Kelly McCloskey, Park Ecologist, kelly_McCloskey@nps.gov, and Klara Varga, Park Botanist, Klara_Varga@nps.gov.

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

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IV. DWARF-SHRUBLAND **D-417**

IV.B.2.N.a. Cespitose cold-deciduous dwarf-shrubland **D-417**

A.1114 *Vaccinium* (*caespitosum, myrtillus, scoparium*) Dwarf-shrubland Alliance **D-417**
[CEGL001140] *Vaccinium* (*caespitosum, scoparium*) Dwarf-shrubland D-417

IV.B.2.N.b. Creeping or matted cold-deciduous dwarf-shrubland **D-419**

A.1117 *Salix arctica* Dwarf-shrubland Alliance **D-419**
[CEGL001431] *Salix arctica* - (*Salix petrophila, Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland D-420

IV.B.2.N.d. Saturated cold-deciduous dwarf-shrubland **D-423**

A.1124 *Salix arctica* Saturated Dwarf-shrubland Alliance **D-423**
[CEGL001429] *Salix arctica* - *Salix petrophila* / *Caltha leptosepala* Dwarf-shrubland D-424

V. HERBACEOUS VEGETATION **D-427**

V.A.5.N.c. Medium-tall sod temperate or subpolar grassland **D-427**

A.2637 *Calamagrostis rubescens* Herbaceous Alliance **D-427**
[CEGL005862] *Calamagrostis rubescens* Herbaceous Vegetation D-427

V.A.5.N.d. Medium-tall bunch temperate or subpolar grassland **D-429**

A.1251 *Festuca idahoensis* Herbaceous Alliance **D-429**
[CEGL001612] *Festuca idahoensis* - *Danthonia intermedia* Herbaceous Vegetation D-430
[CEGL001618] *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation D-432
[PARK SPECIAL GRTE-001] *Festuca idahoensis* / *Helianthella uniflora* Herbaceous Vegetation D-435

A.3562 *Poa pratensis* Semi-natural Herbaceous Alliance **D-436**
[CEGL005874] *Phleum pratense* - *Poa pratensis* - *Bromus inermis* Semi-natural Herbaceous Vegetation D-437

A.1265 *Pseudoroegneria spicata* Herbaceous Alliance **440**
[CEGL001662] *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation D-442
[CEGL001677] *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation D-444
[CEGL001660] *Pseudoroegneria spicata* Herbaceous Vegetation D-446

No Alliance Assigned-Park Special Medium-Tall bunch temperate or subpolar grassland **D-450**
[PARK SPECIAL GRTE-008] *Hesperostipa comata* Herbaceous Vegetation D-450

V.A.5.N.e. Short sod temperate or subpolar grassland **D-452**

A.2639 *Carex geyeri* Herbaceous Alliance **D-452**
[CEGL005864] *Carex geyeri* Herbaceous Vegetation D-452

No Alliance Assigned—Park Special Short sod temperate or subpolar grassland **D-455**
[PARK SPECIAL GRTE-021] *Carex hoodii* Herbaceous Vegetation D-455
[PARK SPECIAL GRTE-027] *Carex rossii* Herbaceous Vegetation D-456

A.2640 *Carex paysonis* Herbaceous Alliance **D-458**
[CEGL005865] *Carex paysonis* - *Sibbaldia procumbens* Herbaceous Vegetation D-458

V.A.5.N.f. Short bunch temperate or subpolar grassland **D-460**

A.1291 *Poa secunda* Herbaceous Alliance **D-460**
[CEGL001782] (*Balsamorhiza serrata*) - *Poa secunda* Herbaceous Vegetation D-462

No Alliance Assigned—Park Special Short Bunch temperate or subpolar grassland **D-464**
[PARK SPECIAL GRTE-025] *Danthonia spicata* Herbaceous Vegetation D-464

V.A.5.N.g. Short alpine or subalpine sod grassland **D-466**

A.1299 *Carex nardina* Herbaceous Alliance **D-466**
[CEGL001812] *Carex nardina* Scree Herbaceous Vegetation D-466

V.A.5.N.h. Short alpine or subalpine dry bunch grassland **D-468**

A.1324 *Juncus drummondii* Herbaceous Alliance **D-468**
[CEGL001904] *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation D-469
A.1325 *Juncus parryi* Herbaceous Alliance **D-472**
[CEGL005871] *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation D-472
A.1323 *Leucopoa kingii* Herbaceous Alliance **D-475**
[CEGL001913] *Leucopoa kingii - Phlox pulvinata* Herbaceous Vegetation D-476
V.A.5.N.k. Seasonally flooded temperate or subpolar grassland **D-478**
A.1400 *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance **D-478**
[CEGL001559] *Calamagrostis canadensis* Western Herbaceous Vegetation D-480
A.1424 *Carex* (*lachenalii, capillaris, illota*) Seasonally Flooded Herbaceous Alliance **D-483**
[CEGL001876] *Carex illota* Herbaceous Vegetation D-484
A.1403 *Carex* (*rostrata, utriculata*) Seasonally Flooded Herbaceous Alliance **D-487**
[CEGL001562] *Carex utriculata* Herbaceous Vegetation D-488
A.1404 *Carex aquatilis* Seasonally Flooded Herbaceous Alliance **D-492**
[CEGL001802] *Carex aquatilis* Herbaceous Vegetation D-493
A.1413 *Carex buxbaumii* Seasonally Flooded Herbaceous Alliance **D-497**
[CEGL001806] *Carex buxbaumii* Herbaceous Vegetation D-497
A.1411 *Carex microptera* Seasonally Flooded Herbaceous Alliance **D-500**
[CEGL001792] *Carex microptera* Herbaceous Vegetation D-500
A.1417 *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance **D-501**
[CEGL001813] *Carex nebrascensis* Herbaceous Vegetation D-504
A.1414 *Carex pellita* Seasonally Flooded Herbaceous Alliance **D-507**
[CEGL001809] *Carex pellita* Herbaceous Vegetation D-508
A.2501 *Carex vesicaria* Seasonally Flooded Herbaceous Alliance **D-510**
[CEGL002661] *Carex vesicaria* Herbaceous Vegetation D-511
A.1408 *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance **D-513**
[CEGL001883] *Deschampsia caespitosa - Carex microptera* Herbaceous Vegetation D-514
[CEGL001599] *Deschampsia caespitosa* Herbaceous Vegetation D-516
A.1421 *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance **D-520**
[CEGL001832] *Eleocharis acicularis* Herbaceous Vegetation D-520
A.1422 *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance **D-522**
[CEGL001833] *Eleocharis palustris* Herbaceous Vegetation D-524
A.1374 *Juncus balticus* Seasonally Flooded Herbaceous Alliance **D-527**
[CEGL001838] *Juncus balticus* Herbaceous Vegetation D-529
A.1409 *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance **D-532**
[CEGL001659] *Poa palustris* Herbaceous Vegetation D-533
V.A.7.N.e. Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer **D-535**
A.1566 *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance **D-535**
[CEGL001409] *Artemisia arbuscula* ssp. *arbuscula / Festuca idahoensis* Shrub Herbaceous Vegetation D-536
[CEGL001412] *Artemisia arbuscula* ssp. *arbuscula / Pseudoroegneria spicata* Shrub Herbaceous Vegetation D-539
A.2555 *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance **D-542**
[CEGL002993] *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Vegetation [Provisional] D-543
A.1528 *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance **D-545**
[CEGL001539] *Artemisia tripartita* ssp. *tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation D-546
A.1526 *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance **D-547**
[CEGL001532] *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation D-550
[CEGL001533] *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation D-552
A.1524 *Chrysothamnus viscidiflorus* Shrub Herbaceous Alliance **D-555**
[CEGL002530] *Chrysothamnus viscidiflorus* Shrub Herbaceous Vegetation [Provisional] D-556
V.A.8.N.c. Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer **D-558**

A.1577 *Dryas octopetala* Dwarf-shrub Herbaceous Alliance **D-558**
[CEGL001893] *Dryas octopetala* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation D-559

V.B.2.N.a. Tall temperate or subpolar perennial forb vegetation **D-560**

A.1604 *Ligusticum filicinum* Herbaceous Alliance **D-560**
[CEGL001941] *Ligusticum filicinum* - *Delphinium* X *occidentale* Herbaceous Vegetation D-561

A.1606 *Mertensia ciliata* Herbaceous Alliance **D-564**
[CEGL001944] *Mertensia ciliata* Herbaceous Vegetation D-564

No Alliance Assigned—NVC Tall temperate or subpolar perennial forb vegetation **D-566**
[CEGL002536] *Geranium viscosissimum* Herbaceous Vegetation [Provisional] D-566

No Alliance Assigned—Park Special Tall temperate or subpolar perennial forb Vegetation **D-568**
[PARK SPECIAL GRTE-005] *Arnica longifolia* Herbaceous Vegetation D-568
[PARK SPECIAL GRTE-003] *Helianthella uniflora* Herbaceous Vegetation D-570
[PARK SPECIAL GRTE-039] *Apocynum androsaemifolium* Herbaceous Vegetation D-572
[PARK SPECIAL GRTE-017] *Erigeron peregrinus* Herbaceous Vegetation D-573
[PARK SPECIAL GRTE-079] *Eucephalus engelmannii* Herbaceous Vegetation D-575
[PARK SPECIAL GRTE-004] *Symphyotrichum ascendens* Herbaceous Vegetation D-576

V.B.2.N.b. Low temperate or subpolar perennial forb vegetation **D-578**

A.1627 *Ivesia gordonii* Herbaceous Alliance **D-578**
[CEGL001903] *Ivesia gordonii* - *Eriogonum caespitosum* Herbaceous Vegetation D-578

No Alliance Assigned—Park Special Low temperate or subpolar perennial forb vegetation **D-580**
[PARK SPECIAL GRTE-030] *Phlox multiflora* Alpine Cushion Herbaceous Vegetation D-581
[PARK SPECIAL GRTE-029] *Pteryxia hendersonii* Alpine Herbaceous Vegetation D-582

V.B.2.N.d. Temporarily flooded temperate perennial forb vegetation **D-584**

A.1661 *Heracleum maximum* Temporarily Flooded Herbaceous Alliance **D-584**
[CEGL001940] *Heracleum maximum* - *Rudbeckia occidentalis* Herbaceous Vegetation D-584

V.B.2.N.e. Semipermanently flooded temperate perennial forb vegetation **D-586**

A.1680 *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance **D-586**
[CEGL001988] *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation D-587

V.B.2.N.f. Saturated temperate perennial forb vegetation **D-589**

A.1698 *Caltha leptosepala* Saturated Herbaceous Alliance **D-589**
[CEGL001954] *Caltha leptosepala* Herbaceous Vegetation D-590

No Alliance Assigned—NVC Saturated temperate perennial forb vegetation **D-593**
[CEGL003410] *Menyanthes trifoliata* Herbaceous Vegetation [Provisional] D-593
[CEGL002544] *Pteridium aquilinum* Herbaceous Vegetation [Provisional] D-595

BIBLIOGRAPHY **D-597**

I. Forest

I.A.8.N.b. Rounded-crowned temperate or subpolar needle-leaved evergreen forest

A.132 *Pinus albicaulis* Forest Alliance

Whitebark Pine Forest Alliance

ALLIANCE CONCEPT

Summary: This subalpine forest alliance occurs locally in the mountains of the interior northwestern U.S. and adjacent southwestern Canada from the central and northern Rocky Mountains to the Sierra Nevada, Klamath Mountains and Cascade Range. Elevations range from 2000-3200 m depending on latitude and geography. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, land- and rockslides, and cirque headwalls and basins. Sites may be nearly level to steep sloping, on all aspects. Subalpine stands typically occur where disturbance such as avalanche or fire has temporarily reduced more shade-tolerant tree species, whereas at treeline are found in mesic, protected pockets away from the extremely harsh environmental conditions. Substrates are generally lithic, well-drained, coarse-textured soils such as shallow, gravelly sands or loams derived from colluvium, glacial till and residuum. These forests are characterized by a coniferous tree canopy, 10-20 m tall, that is dominated or codominated by *Pinus albicaulis*. Other tree associates, if present, vary by geography and elevation zones. Species include *Picea engelmannii* and *Abies lasiocarpa* in more mesic stands, *Pinus contorta* and *Pseudotsuga menziesii* in the lower subalpine, *Tsuga mertensiana* in the Cascades, and *Pinus flexilis* in southern stands. A sparse shrub layer may be present consisting of juvenile trees and other woody species such as *Juniperus communis, Ribes montigenum, Shepherdia canadensis, Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The herbaceous layer is typically sparse, but ranges from nearly absent to a moderately dense cover of graminoids with scattered forbs. Characteristic species include *Achillea millefolium, Antennaria microphylla, Arnica* spp., *Carex geyeri, Carex rossii, Festuca idahoensis, Poa nervosa, Potentilla diversifolia*, and *Solidago multiradiata*. Diagnostic of this alliance is a dense tree canopy dominated by *Pinus albicaulis*.

Environment: Forests included in this subalpine alliance occur locally in the Rocky Mountains in Wyoming, Montana, and Idaho west to the Cascade Range in Oregon. Elevations range from 2000-3200 m depending on latitude and geography. Climate is mostly semiarid, temperate continental with maritime influences in the Cascades and western Rocky Mountains. Winter temperatures range from very cold in the Rocky Mountains to moderately cold in the Cascades. Mean annual precipitation ranges from 60-180 cm occurring mostly in the winter. Snowpack is often deep, especially in the western ranges and may linger into summer. Some sites have little snow accumulation because of high winds and sublimation. Summers are cool and typically dry from July to September. Stands typically occur below the subalpine forest where disturbance such as avalanche or fire has temporarily reduced more shade-tolerant tree species, or in protected areas at treeline. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, land- and rock slides, and cirque headwalls and basins. Sites may be nearly level to steep sloping, on all aspects. Some stands occur at treeline in mesic, protected pockets away from the extremely harsh environmental conditions. Substrates are generally lithic, well-drained, coarse-textured soils such as shallow, gravelly sands or loams derived from colluvium, glacial till and residuum from a variety of volcanic, igneous, sedimentary and metamorphic rocks. Parent materials include basalt, gneiss, granite, andesite, sandstone, and limestone. Soils may be calcareous and alkaline, but are more typically non-calcareous and acidic. Calcareous soils are more common in more mesic northern stands.

Adjacent vegetation at higher elevations is typically alpine and subalpine meadows. At lower elevations, there are subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii, Pinus contorta, Tsuga mertensiana*, or *Pseudotsuga menziesii*.

Vegetation: Stands included in this subalpine forest alliance occur locally in the mountains of the interior northwestern U.S. and adjacent southwestern Canada from the central and northern Rocky Mountains to the Sierra Nevada, Klamath Mountains and Cascade Range. These forests have a coniferous tree canopy, 10-20 m tall, that is dominated or codominated by the evergreen needle-leaved tree *Pinus albicaulis*. In some cases *Pinus albicaulis* is the only canopy tree species present. Other associated tree species vary by geography and elevation zones throughout the alliance's range. In the lower subalpine, *Pinus contorta* and *Pseudotsuga menziesii* are present to codominant. In mesic stands in Canada and elsewhere *Picea engelmannii* and *Abies lasiocarpa* are present to codominant. *Tsuga mertensiana* may be found in mesic stands in the Cascades. Near the southern range extent, *Pinus flexilis* is often present. The undergrowth is typically sparse because sites are often dry. There may be a sparse shrub layer consisting of juvenile trees and other woody species such as *Juniperus communis, Ribes montigenum, Shepherdia canadensis, Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The herbaceous layer is typically sparse and ranges from nearly absent to moderately dense cover of graminoids with scattered forbs. Characteristic species include *Achillea millefolium, Antennaria microphylla, Arnica* spp., *Carex geyeri, Carex rossii, Festuca idahoensis, Lupinus sierrae-blancae (= Lupinus laetus), Poa nervosa, Potentilla diversifolia*, and *Solidago multiradiata*.

Dynamics: *Pinus albicaulis* is a slow-growing, long-lived conifer that is common at higher elevations in the upper subalpine zone. It typically occurs in a mosaic of tree islands and meadows where it often colonizes sites and creates habitat for less hardy tree species. In lower subalpine forests, it is a seral species, establishing after a large disturbance such as stand-replacing fire or avalanche, or it is restricted to dry, rocky ridges where it competes well with shade-tolerant tree species. Without disturbance it will be overtopped in

100-120 years by faster growing, shade-tolerant species such as *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, and *Tsuga mertensiana*. Although crown fires and hot ground fires kill *Pinus albicaulis*, it tolerates low-intensity ground fires that will kill the shade-tolerant understory. Fire intervals range from 30-300 years.

Birds and small mammals often eat and cache the large, wingless pine seeds and are responsible for the dispersal of this species. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept and burned-over sites. This results in the regeneration of pines in clumps from forgotten caches (Burns and Honkala 1990a, Eyre 1980, Schmidt and McDonald 1990, Steel et al. 1983).

Pests include the mountain pine beetle, *Dendroctonus ponderosae*, which has killed many mature trees in the past, during epidemics where populations of the beetles build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steel et al. 1983). The exotic pathogen, white pine blister rust, *Cronartium ribicola*, is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host, *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steel et al. 1983).

Similar Alliances:
- *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus albicaulis* Woodland Alliance (A.531)
- *Pinus contorta* Forest Alliance (A.118)

Similar Alliance Comments: Two of the similar alliances have the same diagnostic species as this alliance. One of the associations in this alliance is closely related to an association in the ~*Pinus contorta* Forest Alliance (A.118)$$.

ALLIANCE DISTRIBUTION

Range: These subalpine forests occur intermittently throughout the northern and central Rocky Mountains and in the Cascade Range. Stands are reported from Idaho, Montana, Oregon, and Wyoming, and likely occur in California, Washington, and the Canadian Provinces of British Columbia and Alberta.
Nations: CA?, US
Subnations: AB?, BC?, CA?, ID, MT, OR, WY
TNC Ecoregions: 8:C, 9:C, 11:C
USFS Ecoregions: M242C:CC, M331A:CC, M331D:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC
Federal Lands: NPS (Grand Teton, Yellowstone); USFS (Caribou-Targhee, Fremont, Shoshone)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Achuff 1989, Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff and Dudynsky 1984b, Achuff et al. 1993, Arno and Weaver 1990, Barrows et al. 1977, Burns and Honkala 1990a, Chappell et al. 1997, Cole 1982, Cooper 1975, Cooper et al. 1987, Cooper et al. 1995, Daubenmire and Daubenmire 1968, Eyre 1980, Hall 1973, Holland 1986b, Hopkins 1979a, Johnson and Clausnitzer 1992, Johnston 1987, Loope 1969, Pfister et al. 1977, Reed 1969, Sawyer and Keeler-Wolf 1995, Schmidt and McDonald 1990, Steele and Geier-Hayes 1987, Steele et al. 1981, Steele et al. 1983, Terwilliger et al. 1979a, Weaver and Dale 1974, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b

[CEGL000131] *Pinus albicaulis / Vaccinium scoparium* Forest

Translated Name: **Whitebark Pine / Grouseberry Forest**
Common Name: **Whitebark Pine / Grouseberry**
Ecological System(s):
- Northern Rocky Mountain Subalpine Dry Parkland (CES306.807)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Steele et al. (1983)

ELEMENT CONCEPT

Global Summary: This is on of the highest subalpine forests below timberline on protected sites and on exposed ridges or south-facing slopes at lower elevations. Slopes are 8-50% gradients on south-, southeast-, and west-facing aspects. Soils are dry, cold gravelly loams to silts, generally acidic to very acidic on the surface. It occurs from 2591 to 3200 m (8500-10,500 feet) in elevation. These are generally open forests with sparse understory cover. *Pinus albicaulis* is the dominant tree. *Pinus flexilis* can be codominant or not present. Other tree species that may be present, but never codominant, include *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus contorta*, depending on the elevation of the stand. The understory is sparse, generally only obtaining at most 50% cover. *Vaccinium scoparium* is the most abundant and commonly present shrub with 10-50% cover. Other shrubs present include *Ribes montigenum* and *Juniperus communis*. Few and scattered herbaceous species are common in very low amounts and include *Arnica latifolia*, *Poa*

nervosa, Carex geyeri, and *Carex rossii*. This association is differentiated from similar associations by the dominance of *Pinus albicaulis* to the exclusion of other conifers.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on plateaus or slopes with gradients ranging from 8% to 75% on all aspects. The elevations for these stands range from 8360 feet to 10,200 feet. The soils are well-drained loams, silt loams, or sandy loams. The unvegetated ground cover is comprised primarily of litter and duff (70% to 80% cover), wood (5% to 20% cover), rocks greater than 10cm (1% to 10% cover), gravel (1% to 5% cover), and bare soil (1% to 5% cover). Traces of lichens, mosses, and fungi may be present. The vegetation adjacent to the sampled stand is often either a continuation of the *Pinus albicaulis/Vaccinium scoparium* forest type or is *Abies lasiocarpa* dominated.

Global Environment: This is one of the highest subalpine forests below timberline on protected sites and on exposed ridges or south-facing slopes at lower elevations. Slopes are 25-40% gradients on south-, southeast-, and west-facing aspects. Soils are dry, cold gravelly loams to silts, generally acidic to very acidic on the surface. It occurs from 2591 to 3200 m (8500-10,500 feet) in elevation.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane whitebark pine community occurring on subxeric sites. The dominant tree canopy species is *Pinus albicaulis* (averaging 30% cover). *Abies lasiocarpa* is in two thirds of the stands, but averages only 3% cover. Incidental species include *Picea engelmannii* and *Pinus contorta.* The subcanopy may include *Pinus albicaulis, Abies lasiocarpa* or *Picea engelmannii*. Seedlings of one or all three species are found most stands. Other seedlings that may occur include *Pinus contorta*. *Vaccinium scoparium* dominates the understory, and averages 24% cover. Herbaceous species with over 30% constancy include *Arnica latifolia* (average 5% cover), *Carex geyeri* (average 10% cover), *Juncus parryi cordifolia* (average 3% cover), and *Eucephalus engelmannii* (average 1% cover).

Global Vegetation: These are generally open forests with sparse understory cover. *Pinus albicaulis* is the predominant tree. *Pinus flexilis* can be codominant. Other tree species that may be present include *Abies lasiocarpa, Picea engelmannii*, and *Pinus contorta*, depending on the elevation of the stand. The understory is sparse, generally only obtaining at most 50% cover. *Vaccinium scoparium* is the most abundant and commonly present shrub with 10-50% cover. Other shrubs present include *Ribes montigenum* and *Juniperus communis*. Few and scattered herbaceous species are common in very low amounts and include *Arnica latifolia, Poa nervosa, Carex geyeri*, and *Carex rossii*. Pine duff litter, bare ground and rock outcrops make up the bulk of the ground cover.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	.	.

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Woodland (CEGL000752)

- *Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Xerophyllum tenax* Woodland (CEGL005838)

Global Related Concepts:
- *Pinus albicaulis - Pinus flexilis / Potentilla diversifolia* Habitat Type (Reed 1969) =
- *Pinus albicaulis - Vaccinium scoparium* Habitat Type (Reed 1976) =
- *Pinus albicaulis / Vaccinium scoparium* Habitat Type (Steele et al. 1983) =
- *Pinus albicaulis / Vaccinium scoparium* Habitat Type (Cooper 1975) =
- *Pinus albicaulis / Vaccinium scoparium* Plant Association (Johnston 1987) =
- *Pinus albicaulis/Vaccinium scoparium* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description well.
Grand Teton National Park Other Comments: Given the presence of *Abies lasiocarpa* seedlings and saplings in the understory of most plots, this association may become dominated by *Abies lasiocarpa* sometime in the future.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Stands were sampled in Death Canyon, on or near the eastern slopes of the Grand Teton, near the Survey Peak Saddle, in Cascade Canyon, in Paintbrush Canyon, and in Jedediah Smith Wilderness west of Jackass Pass.

Global Range: This open subalpine forest occurs in Idaho, Montana, Oregon, and Wyoming. It is suspected to also occur in Alberta and British Columbia, Canada.
Nations: CA?, US
States/Provinces: AB?, BC?, ID:S4?, MT:S3, OR:S3, WY:S3
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C037, GT-03C038, GT-03C084, GT-0202092
Accuracy Assessment Points: 04J178, 04J252, 04J253, 04J256, 04K037, 04K090, 04K091, 04R145, 04R146, 04R179, 04R254, 04R287, 04R296, 04X331
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-KV-027

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones 1999	.	.	.	.	X	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Reed 1969	.	X	X	X	.	.	.	.	.
Reed 1976	.	X	X	X	.	.	.	.	.
Steele et al. 1983*	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

A.118 *Pinus contorta* Forest Alliance

Lodgepole Pine Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the upper montane and subalpine zone of most major mountain ranges of the western U.S., as well as forested dunes of the Oregon and northern California coast. *Pinus contorta* occupies the broadest array of habitats of any coniferous species in the western United States. Forests included in this alliance are characterized by a closed to moderately open tree canopy that is dominated by the conifer *Pinus contorta*. Stands may be even-aged or multi-aged depending on geographic location, edaphic characteristics, and how the stands were established following wildfire. Shrub and herbaceous layers may be present or absent depending on tree canopy. Other tree species, such as *Abies grandis, Abies lasiocarpa, Picea engelmannii, Tsuga heterophylla, Tsuga mertensiana*, or *Pseudotsuga menziesii*, may be present to abundant as seedlings and saplings. Associated shrub and herbaceous species vary across the range of this alliance. In the coastal dunes stands important species include *Gaultheria shallon, Vaccinium ovatum, Rhododendron macrophyllum*, and *Morella californica (= Myrica californica).* Herbaceous cover is very sparse. Common subalpine and montane shrub species include *Arctostaphylos uva-ursi, Arctostaphylos patula, Arctostaphylos nevadensis, Ceanothus velutinus, Linnaea borealis, Mahonia repens, Purshia tridentata, Spiraea betulifolia, Spiraea douglasii, Shepherdia canadensis, Vaccinium caespitosum, Vaccinium scoparium, Vaccinium membranaceum, Symphoricarpos albus*, and *Ribes* spp. The cover of the herbaceous stratum can be dominated by either graminoids or perennial forbs and tends to vary inversely with shrub cover. Important graminoids include *Carex pensylvanica, Carex geyeri, Carex rossii, Calamagrostis rubescens, Danthonia californica, Elymus glaucus*, or *Achnatherum occidentale (= Stipa occidentalis).* Important forbs are *Arnica cordifolia, Chimaphila umbellata, Orthilia secunda, Osmorhiza berteroi (= Osmorhiza chilensis), Pedicularis racemosa, Xerophyllum tenax*, and *Thalictrum* spp. Diagnostic of this upland forest alliance is the dominance of *Pinus contorta* in the tree canopy without significant regeneration of *Abies lasiocarpa* or similar shade-tolerant species.

Environment: *Pinus contorta* occupies the broadest array of habitats of any coniferous species in the western United States, and forests dominated by this species occur in widely varying ecological settings. The ~*Pinus contorta* Forest Alliance (A.118)$$ includes upland plant associations found in the montane and subalpine zone of most major mountain ranges of the western U.S., as well as a few scattered associations on forested dunes of the Oregon and northern California coast. Where this alliance occurs in the montane and subalpine zones of the Rocky Mountains and Sierra Nevada-Cascades, elevations range from just over 900 m in the east Cascades to well over 3100 m in the Uintas in Utah and the southern Colorado Rockies. Temperature regimes are extreme throughout this region and frequent growing season frosts occur. Annual precipitation in these montane and subalpine habitats ranges from less than 40 cm to over 150 cm, usually with the majority falling as snow. Late-melting snowpacks provide the majority of growing season moisture, particularly in the Cascades and Sierra Nevada.

The dominance of *Pinus contorta* in associations in this alliance is related to fire history and topo-edaphic conditions (Pfister et al. 1977, Hoffman and Alexander 1980, Steele et al. 1981, Mauk and Henderson 1984). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. Over time, many of these stands can succeed to dominance by other more shade-tolerant conifer species. Most forests in this alliance are early to mid-successional forests which developed following fires.

Some *Pinus contorta* forest associations occur, and will persist, on sites that are too extreme for other conifers to establish. These include excessively well-drained pumice deposits (Volland 1976), glacial till and alluvium on valley floors where there is cold air accumulation (Steele et al. 1981), warm and droughty shallow soils over fractured quartzite bedrock (Mauk and Henderson 1984), well-drained to xeric stabilized sand dunes (Jenny et al. 1969, Kumler 1969), and shallow moisture-deficient soils with a significant component of volcanic ash (Cooper et al. 1987). Some *Pinus contorta* forests can be persistent for hundreds of years, a result of a lack of seed source or the competitive exclusion of other conifer species (Moir 1969a, Pfister et al. 1977, Despain 1983, Hoffman and Alexander 1983, Cooper et al. 1987), or the frost tolerance of *Pinus contorta* seedlings and mature trees, which allows the development of monotypic stands in frost-prone areas (Steele et al. 1981, Burns and Honkala 1990a). Soils supporting these forests are typically well-drained, gravelly, and have textures ranging from silty to sands and gravels. They are acidic and rarely are formed from calcareous parent materials.

Vegetation: The ~*Pinus contorta* Forest Alliance (A.118)$$ is composed of upper montane to subalpine coniferous forest associations. It is found throughout the northern ranges and plateaus of the West and in coastal environments from northern California and Oregon. The alliance is characterized by the dominance of *Pinus contorta var. latifolia* or *Pinus contorta var. murrayana* in the overstory. *Pinus contorta var. contorta* is the dominant taxon in the coastal forested dune associations. The canopy can be closed to moderately open depending upon geographic location, edaphic characteristics, and disturbance (fire) history. *Pinus contorta* is almost always the only mature tree in stands of this alliance, but other conifers are occasionally present. In some stands, species such as *Abies grandis, Abies lasiocarpa, Picea engelmannii, Tsuga heterophylla, Tsuga mertensiana*, or *Pseudotsuga menziesii* may be present to abundant as seedlings and saplings. Associated shrub and herbaceous species vary somewhat across the range of this alliance.

In the coastal forested dune associations, shrub layers vary from very open or low, to extremely dense and tall, and evergreen shrubs predominate. Important species include *Gaultheria shallon, Vaccinium ovatum, Rhododendron macrophyllum*, and *Morella*

californica (= Myrica californica). The herbaceous layer is usually sparse, but may include coastal strand or forest species, depending upon canopy closure. Few graminoids occur in these dune stands.

In the east Cascades, northern Utah, and Rocky Mountains, *Pinus contorta* forests occupy large areas in the upper montane to lower subalpine elevation zones. Stand structure can vary from dense 'dog-hair' stands established following wildfire, to a more multi-aged structure with widely spaced large older trees and a subcanopy of younger *Pinus contorta*. The dominance of *Pinus contorta* may be maintained in some of these stands by recurring ground fires that kill seedlings and saplings of other shade-tolerant conifers but allow reproduction of *Pinus contorta* (Pfister et al. 1977, Chappell et al. 1997). The shrub stratum may be conspicuous to absent depending upon canopy closure and soil moisture, but where shrubs are present common species include *Arctostaphylos uva-ursi, Arctostaphylos patula, Arctostaphylos nevadensis, Ceanothus velutinus, Linnaea borealis, Mahonia repens, Purshia tridentata, Spiraea betulifolia, Spiraea douglasii, Shepherdia canadensis, Vaccinium caespitosum, Vaccinium scoparium, Vaccinium membranaceum, Symphoricarpos albus*, and *Ribes* spp. The cover of the herbaceous stratum tends to vary inversely with shrub cover. Where there is a significant herbaceous layer, it can be dominated by either graminoids or perennial forbs. Important graminoids include *Carex pensylvanica, Carex geyeri, Carex rossii, Calamagrostis rubescens, Danthonia californica, Elymus glaucus*, or *Achnatherum occidentale (= Stipa occidentalis)*. Important forbs *Arnica cordifolia, Chimaphila umbellata, Orthilia secunda, Osmorhiza berteroi (= Osmorhiza chilensis), Pedicularis racemosa, Xerophyllum tenax*, and *Thalictrum* spp.

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones. Chappell et al. (1997) report that where these forests are found on pumice, *Pinus contorta* dominance is maintained by periodic disturbance from both fires and insect infestations. Without fires and insects, stands will become dense forests, and quite barren. Unlike most *Pinus contorta* forests, most of these stands are not seral to another tree species (Chappell et al. 1997). Fire is infrequent in coastal stands, but shifting sand substrates and wind-borne salt spray act to discourage competition and provide suitable conditions for perpetuation of *Pinus contorta* (Jenny et al. 1969, Kumler 1969, Chappell et al. 1997).

Similar Alliances:

- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Pinus albicaulis* Forest Alliance (A.132)
- *Pinus contorta - Populus tremuloides* Forest Alliance (A.424)
- *Pinus contorta* Woodland Alliance (A.512)

Similar Alliance Comments: The ~*Pinus contorta* Forest Alliance (A.118)$$ is distinguished from the similar *Pinus contorta* alliances by having a closed canopy with *Pinus contorta* being the dominant species. The ~*Abies lasiocarpa* Forest Alliance (A.168)$$ is similar in that *Pinus contorta* can be codominant or even dominant in some stands, but *Abies lasiocarpa* is the dominant in the regeneration layer, and *Pinus contorta* is not regenerating.

ALLIANCE DISTRIBUTION

Range: These forests occur from southern British Columbia south through the Rocky Mountains to Colorado and Alberta and British Columbia, Canada, and through the Cascades and Sierra Nevada to southern California. Coastal associations are found on stable, forested dunes in Oregon and California. The alliance has not been reported from Nevada, New Mexico, or Arizona. The species occurs in mountains of northern Baja California, Mexico, but it is unclear if forest stands occur there.

Nations: CA, MX, US

Subnations: AB, BC, CA, CO, ID, MT, MXBC?, NV, OR, UT, WA, WY, YT

TNC Ecoregions: 2:C, 4:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 20:C, 26:C, 68:P

USFS Ecoregions: 242A:CC, 263A:CC, 331D:CC, 341D:CC, M242A:CC, M242B:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M262:C, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Crater Lake?, Glacier, Grand Teton, Kings Canyon?, Rockefeller, Rocky Mountain, Sequoia?, Yellowstone, Yosemite); PC (Banff, Jasper, Waterton Lakes); USFS (Bighorn, Bridger-Teton, Caribou-Targhee, Colville NF, Inyo, Medicine Bow, Okanogan, Shoshone, Siuslaw, Wallowa-Whitman, Wenatchee, Winema)

ALLIANCE SOURCES

Author(s): M.S. Reid/D. Sarr

References: Alexander 1981, Alexander 1986, Arno et al. 1985, Atzet and McCrimmon 1990, Barrows et al. 1977, Burns and Honkala 1990a, Chappell 1994, Chappell et al. 1997, Cooper et al. 1987, Dealy 1971, Despain 1973b, Douglas 1971, Eyre 1980, Franklin 1966, Franklin and Dyrness 1973, Green and Klinka 1994, Hall 1973, Harrington 1978, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Holland 1986b, Horton 1971, Jenny et al. 1969, Johnson 1981a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987,

Kartesz 1999, Klish 1977, Komarkova et al. 1988b, Kovalchik 1987, Krajina 1969, Kumler 1969, Marr et al. 1973b, Marsh et al. 1987, Martin and Frenkel 1978, Mauk and Henderson 1984, Moir 1969a, Oswald 1966, Pfister 1972, Pfister et al. 1977, Rolston 1961, Sawyer and Keeler-Wolf 1995, Scow and Culwell 1986, Steele et al. 1981, Steele et al. 1983, Steen and Dix 1974, Terwilliger et al. 1979a, Tisdale and McLean 1957, Ueckert 1968, Volland 1976, Wasser and Hess 1982, Whipple 1975, Wiedemann 1977, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b

[CEGL000139] *Pinus contorta / Calamagrostis rubescens* Forest

Translated Name: **Lodgepole Pine / Pinegrass Forest**
Common Name: **Lodgepole Pine / Pinegrass Forest**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, dry sites. It typically occurs on gentle to moderately steep, lower slopes, benches and valley bottoms where soils are better developed. Soils are gravelly, sandy or silt loams. Ground cover is dominated by litter with low cover of rock and bare ground. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy varies from open to nearly closed (30-90% cover) and often is solely dominated by *Pinus contorta*. However, in some stands *Abies lasiocarpa, Picea engelmannii, Pinus albicaulis*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Scattered dwarf- and short shrubs are often present, but they seldom form a distinct layer. Common dwarf- and short shrubs may include *Arctostaphylos uva-ursi, Amelanchier alnifolia, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Spiraea betulifolia, Symphoricarpos oreophilus, Lonicera utahensis*, and *Vaccinium scoparium*. The moderately dense (30-50% cover) herbaceous layer is dominated by the perennial graminoids *Calamagrostis rubescens* and *Carex geyeri*. Diagnostic of this association is the dominance of *Pinus contorta* in the tree canopy with *Calamagrostis rubescens* dominating the graminoid layer. Also, the cover of *Calamagrostis rubescens* is greater than *Vaccinium scoparium*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stands defining this association occur mainly on terraces or slopes with gradients ranging from 2 to 56%. The majority of the slopes have north- to west-facing aspects; a few slopes face east to southeast. The elevations for these stands range from 6200 to 8122 feet. Where data are available the loam or clay based soils tend to be moderately well- to well-drained. The unvegetated and nonvascular ground cover is comprised primarily of litter and duff (40 to 80% cover), basal vegetation (10 to 40% cover), wood (3 to 30% cover), bare soil (trace to 20%), and mosses (trace to 10%). Small quantities of rocks greater than 10cm, gravel, lichens, and fungi may occur in some stands. Common disturbance to many of these stands include fire and/or ungulate use, many with dead and downed wood. The surrounding vegetation for most of the stands are other *Pinus contorta* vegetation types with occasional intermixed grasslands. *Ceanothus velutinus* shrublands occur adjacent to some of the regenerating stands. Other noted adjacent communities include *Alnus incana*/Mesic graminoids shrubland and mixed conifer forests.

Global Environment: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. It is more common east of the Continental Divide. Elevations range between 1050 and 2477 m (3440-8122 feet) depending on longitude and aspect. It typically occurs on cool, dry sites on lower slopes, benches and valley bottoms where soils are better developed. Topography is rolling with gentle to moderately steep slopes. Soils are gravelly, sandy, silt loams, or clay-based, derived from a variety of parent materials, excepting alkaline, calcareous, sedimentary substrates (Cooper 1975). Ground cover is dominated by litter with low cover of rock and bare ground.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane mixed coniferous forest that occurs on mesic and subxeric sites. *Pinus contorta* (up to 80% cover) is the dominant tree canopy or subcanopy species. Incidental species include *Abies lasiocarpa, Pseudotsuga menziesii, Populus tremuloides, Picea engelmannii*, and *Pinus flexilis.* All of the aforementioned species may be found in the subcanopy and as seedlings. Twelve of the sampled stands do not have a tree canopy stratum. In ten of these stands *P. contorta* contributes up to 70% canopy cover as a subcanopy species and in the final two stands *P. contorta* contributes 12 and 20% cover to the dwarf shrub stratum. Seedlings of all the aforementioned tree species may occur. The shrub layer for some stands may be diverse, but no species occurs in even half the stands or with more than 7% cover. *Calamagrostis rubescens* (7 to 70% cover) is the only herbaceous species to occur in every stand. Other high constancy species include *Carex geyeri, Lupinus argenteus, Arnica cordifolia*, and *Geranium viscosissimum*.

Global Vegetation: This upper montane and subalpine conifer association is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy varies from open to nearly closed (30-90% cover) and is often solely dominated by

Pinus contorta. However, in some stands scattered *Abies lasiocarpa, Picea engelmannii, Pinus albicaulis, Pseudotsuga menziesii, Populus tremuloides*, or *Pinus flexilis* trees may be present, especially in the subcanopy. Some stands have only a tall-shrub canopy of trees, with no mature canopy cover, as the site was burned 10-15 years prior. Scattered dwarf- and short shrubs are often present, but they seldom form a distinct layer and except for *Arctostaphylos uva-ursi* have low cover. Common dwarf- and short shrubs may include *Amelanchier alnifolia, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Spiraea betulifolia, Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The moderately dense (30-50% cover) herbaceous layer is dominated by the perennial graminoids *Calamagrostis rubescens* and *Carex geyeri*. The herbaceous layer is densest in openings between trees. Other common herbaceous species include *Arnica cordifolia, Carex rossii, Chamerion angustifolium, Lupinus argenteus, Festuca idahoensis, Orthilia secunda, Geranium viscosissimum*, and *Packera streptanthifolia*.

Global Dynamics: The dominance of *Pinus contorta* in stands in this association is related to fire history and topo-edaphic conditions (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983, Mauk and Henderson 1984, Cooper et al. 1987). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. Over time, many of these stands can succeed to dominance by other, more shade-tolerant conifer species. Most forests in this association are early- to mid-successional forests which developed following fires and are considered seral to *~Abies lasiocarpa / Calamagrostis rubescens* Forest (CEGL000301)$$ or *~Pseudotsuga menziesii / Calamagrostis rubescens* Forest (CEGL000429)$$ (Oswald 1966, Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983), while other stands have a canopy that is dominated by more persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Abies lasiocarpa, Picea engelmannii, Pinus flexilis*, or *Pseudotsuga menziesii*.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree subcanopy	Needle-leaved tree	X	.	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	X
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	X
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Crepis tectorum	-	P	exotic
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens* Forest (CEGL000301)
- *Pinus contorta / Spiraea betulifolia* Forest (CEGL000164)
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)

Global Related Concepts:

- *Pinus contorta / Calamagrostis rubescens* Association (Johnson and Clausnitzer 1992) =

- *Pinus contorta / Calamagrostis rubescens* Community (Oswald 1966) =
- *Pinus contorta / Calamagrostis rubescens* Community Type (Pfister et al. 1977) =
- *Pinus contorta / Calamagrostis rubescens* Community Type (Steele et al. 1983) =
- *Pinus contorta/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Cooper 1975) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association fits the Steele et al. (1983) *Pinus contorta/Calamagrostis rubescens* community type (c.t.) description extremely well.

Global Classification Comments: Most forests in this association are early- to mid-successional forests which developed following fires and are considered seral to ~*Abies lasiocarpa / Calamagrostis rubescens* Forest (CEGL000301)$$ or ~*Pseudotsuga menziesii / Calamagrostis rubescens* Forest (CEGL000429)$$ (Oswald 1966, Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983), while other stands have a canopy that is dominated by more persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus flexilis*, or *Pseudotsuga menziesii*.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides – Pinus contorta / Calamagrostis rubescens* association, but is differentiated by the absence of *Populus tremuloides* as a co-dominant species

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur over a large geographic range within the park.

Global Range: This association occurs in the upper montane and subalpine zone of the central and northern Rocky Mountains.
Nations: US
States/Provinces: ID:S4, MT:S5, OR, WA?, WY:S4?
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7, ECO8, ECO9 added (MSR 3-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rockefeller, Yellowstone); USFS (Bridger-Teton, Wallowa-Whitman)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B008, GT-03B109, GT-0202083, GT-03B086, GT-03A015
Accuracy Assessment Points: 04J041, 04J058, 04J101, 04J104, 04J105, 04J108, 04J169, 04J231, 04K014, 04K020, 04K027, 04K028, 04K030, 04K071, 04M001, 04M004, 04M008, 04R123, 04R132, 04R137, 04R186, 04R236, 04R308, 04R327, 04S010, 04X011, 04X012, 04X014, 04X061, 04X401, 04X402, 04X405, 04X415, 04X421, 04X429, 04X445, 04X461, 04X805
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407026, BT-9407039, BT-9407057, BT-9407077, BT-9507011, BT-9408023, BT-9408201, BT-9409022, BT-9407084, BT-9408200, BT-9408204

Grand Teton National Park Description Author(s): M. Fain, K. Varga, and K. McCloskey
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Horton 1971	.	X	.	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	.	.	X	.	.	.	.	.
Oswald 1966	.	X	X	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.

Steele et al. 1981	.	.	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Tisdale and McLean 1957	.	X	.	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000141] *Pinus contorta / Carex geyeri* Forest

Translated Name: **Lodgepole Pine / Geyer's Sedge Forest**
Common Name: **Lodgepole Pine / Geyer's Sedge**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Hess and Wasser (1982)

ELEMENT CONCEPT

Global Summary: This is a vast cold and dry forest of the Yellowstone Plateau, common on the granitic substrates of central Idaho and in the lodgepole pine belt of Colorado. This forest association occurs on near-flat to rolling terrain (slopes range from 5-25%) on generally deeper soil than other *Pinus contorta* types. Elevation range is from 2130 to 2800 m (6993-9200 feet). It occupies vast rhyolitic flows in Yellowstone National Park. In general this type occupies the cool, dry aspects of relatively gentle terrain. Soils are well-drained silt loams, sandy clay loams or sandy loams, are moderately permeable and moderately deep. The ground cover is primarily litter and duff; exposed rock is generally less than 10%. This is a dry to submesic, high-elevation forest distinguished by dominance of *Pinus contorta* in the tree layer and by *Carex geyeri* in the herbaceous layer. *Pinus contorta* is the sole dominate tree and is successfully reproducing. If other conifers such as *Abies lasiocarpa* or *Pinus albicaulis* are present, they have less than 10% cover. Shrub cover is sparse throughout its range. The herbaceous layer is dominated by *Carex geyeri*. Other graminoids that may be present include *Danthonia intermedia*, *Calamagrostis rubescens*, *Elymus glaucus*, *Achnatherum nelsonii*, and *Poa wheeleri*. Forb cover is generally low (1-3%). This forest association is distinguished from similar types by the dominance of *Pinus contorta* (at least 10% cover, has a higher cover than that of other conifers if present, and is successfully reproducing).

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on the valley floor and on shallow to moderate slopes with the majority having south- or west-facing aspects. It occurs at elevations ranging from 6700 to 7400 feet. Where data are available the soils are well-drained silt loams, sandy clay loams, or sandy loams. Unvegetated ground cover is comprised primarily of litter and duff (40% to 80%), gravel (5% to 30%), and wood (10% to 20%) with traces of moss, lichen, and bedrock. One stand has 10% bare soil and another stand has 30% moss and 10% lichen. Adjacent to most plots are *Pinus contorta* forests with varying understories. Other adjacent communities mentioned include *Artemisia arbuscula* and *Artemisia tridentata* ssp. *vaseyana* shrublands. Almost half the stands have been disturbed by fire and many have large amounts of dead and down woody debris.

Global Environment: This forest association occurs on near-flat to rolling terrain (slopes range from 5-49%) on generally deeper soils than other *Pinus contorta* types. Elevation range is from 2130 to 2800 m (6993-9200 feet). It occupies vast rhyolitic flows in Yellowstone National Park. In generally this type occupies the cool, dry aspects of relatively gentle terrain. Soils are well-drained, silt loams, sandy clay loams or sandy loams, are moderately permeable and moderately deep. The ground cover is primarily litter and duff; exposed rock is generally less than 10%.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community occurring on subxeric to mesic sites. The tree canopy is dominated by *Pinus contorta* (7 to 60% cover) in either the tree canopy, subcanopy, or as regeneration. *Abies lasiocarpa* occurs in more than half the stands with trace to 10% cover. Seedlings of *P. contorta*, *A. lasiocarpa*, *Pinus flexilis*, *Picea engelmannii*, *Populus tremuloides*, and *Pseudotsuga menziesii* may occur in either the short or dwarf shrub strata. No shrubs occur in a high percentage of the stands, but the most constant are *Mahonia repens*, *Spiraea betulifolia*, and *Lonicera utahensis*. The herbaceous layer can be very diverse with total cover ranging from 7 to 80%. *Carex geyeri* (7 to 80% cover) is the dominant graminoid. *Calamagrostis rubescens* is the next most constant graminoid, growing mostly in the shadier areas of the stands. The most constant forbs are *Lupinus argenteus*, *Campanula rotundifolia*, and *Eriogonum umbellatum*.

Global Vegetation: This is a dry to submesic, high-elevation forest distinguished by dominance of *Pinus contorta* in the tree layer and by *Carex geyeri* in the herbaceous layer. *Pinus contorta* is the sole dominate tree (30-60% cover) and is successfully reproducing. If other conifers such as *Abies lasiocarpa*, *Pinus albicaulis*, *Pseudotsuga menziesii*, or *Populus tremuloides* are present, they have less than 10% cover. This forest type has moderate species diversity and a closed tree canopy, generally higher canopy coverage in the overstory than in the herbaceous growth, but this ratio can be variable. In the northern distribution in Idaho and western Wyoming, the herbaceous understory is better developed with higher abundance of *Carex geyeri* and greater forb diversity. Shrub cover is sparse throughout its range. In Colorado, shrub cover is low and includes *Juniperus communis*, *Arctostaphylos uva-ursi*, *Rosa woodsii*,

Mahonia repens (= Berberis repens), *Physocarpus monogynus*, and *Ribes cereum*. In Idaho and Wyoming, shrub species also include *Amelanchier alnifolia* and *Spiraea betulifolia*. The herbaceous layer is dominated by *Carex geyeri*. Other graminoids that may be present include *Danthonia intermedia*, *Calamagrostis rubescens*, *Elymus glaucus*, *Achnatherum nelsonii*, and *Poa wheeleri*. Forb cover is generally low (1-3%) and can include *Campanula rotundifolia*, *Viola* sp., *Arnica cordifolia*, and *Lupinus* spp. This forest association is distinguished from similar types by the dominance of *Pinus contorta* (at least 10% cover, has a higher cover than that of other conifers if present, and is successfully reproducing).

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Campanula rotundifolia	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Hordeum jubatum	-	P	exotic
Phleum pratense	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304)--This can have *Pinus contorta* as a codominant. The abundance of *Abies lasiocarpa* and/or *Picea engelmannii* (with at least 10% cover) separates this from the *Pinus contorta* type.
- *Pinus contorta / Festuca idahoensis* Woodland (CEGL000149)

Global Related Concepts:

- *Pinus albicaulis / Carex geyeri* Habitat Type, *Pinus contorta* Phase (Cooper 1975) =
- *Pinus contorta - (Abies lasiocarpa) / Carex geyeri* Plant Association (Johnson and Clausnitzer 1992) =
- *Pinus contorta / Carex geyeri* Community Type (Steele et al. 1983) =
- *Pinus contorta / Carex geyeri* Habitat Type (Wasser and Hess 1982) =
- *Pinus contorta / Carex geyeri* Habitat Type (Hess and Wasser 1982) =
- *Pinus contorta / Carex geyeri* Plant Association (Johnston 1987) =
- *Pinus contorta/Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description fairly well. The only major departure between their description and Grand Teton National Park stands is the occurrence of forbs. Steele et al. intimate that few forbs are present in the understory; Grand Teton National Park stands have numerous forbs in the understory, although most occur in only trace amounts.

Global Classification Comments: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur throughout a wide range of the park.

Global Range: This Rocky Mountain forest type is know from central and eastern Idaho, western Wyoming, to central Colorado. Stands of very closely related types occur in Montana. One stand has been identified in the Blue Mountains of Oregon.
Nations: US
States/Provinces: CO:S4, ID:S4, MT?, OR?, WY:S3S4
TNC Ecoregions: 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05).ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331H:CC, M331I:CC, M332A:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain, Yellowstone); USFS (Medicine Bow)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202063, GT-03B123, GT-03B122, GT-03B016
Accuracy Assessment Points: 04J090, 04J092, 04J097, 04J103, 04J227, 04J228, 04J232, 04K063, 04K064, 04K065, 04K066, 04K067, 04M022, 04R025, 04R026, 04R027, 04R091, 04R130, 04R228, 04R229, 04R230, 04R235, 04R240, 04R242, 04R303, 04X052, 04X060, 04X073, 04X424, 04X428, 04X449, 04X452, 04X453, 04X469, 04X510, 04X518, 04X600, 04X601
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1981	.	X	.	X	.	.	.	.	.
Alexander 1986	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cooper 1975	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
Hess and Alexander 1986	.	X	.	X	.	.	.	.	.
Hess and Wasser 1982*	.	X	X	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	.	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Komarkova et al. 1988b	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Moir 1969a	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Steen and Dix 1974	.	X	.	X	.	.	.	.	.
Wasser and Hess 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL000144] *Pinus contorta / Carex rossii* Forest

Translated Name: **Lodgepole Pine / Ross' Sedge Forest**
Common Name: **Lodgepole Pine / Ross' Sedge**
Ecological System(s):

- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is found mainly between 2155 and 2956 m (7070-9700 feet) elevation in Teton National Park, Yellowstone National Park, the Wind River Mountains, and the Medicine Bow Mountains of northwestern and southeastern Wyoming, and in the north-central Uintah Mountains of northern Utah. This forest occupies gentle slopes on cold sites that are very well-drained. Soils are primarily derived from quartzite parent materials and are gravelly sandy loams to gravelly loams. The overstory canopy is almost exclusively *Pinus contorta* (30-64%). Small amounts of *Picea engelmannii, Abies lasiocarpa*, and *Pinus albicaulis* may be present. Shrubs may be completely absent or present in trace amounts and include species such as *Arctostaphylos uva-ursi, Vaccinium caespitosum, Vaccinium scoparium*, and *Mahonia repens*. The herbaceous understory is very depauperate, with *Lupinus argenteus, Solidago multiradiata, Sedum lanceolatum, Orthilia secunda (= Pyrola secunda)*, and *Pyrola chlorantha (= Pyrola virens)* present. *Poa nervosa, Carex geyeri*, and *Carex rossii* are also common. *Carex rossii* is the only species to have the highest cover (1-10%) in all stands (100% constancy) and can obtain dominance because all other herbaceous species are sparse. This association is differentiated from similar associations by the clear dominance of *Pinus contorta* in the overstory canopy.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The one sampled stand for this association occurs on a toeslope at 2155 m (7070 feet). The well-drained sandy loam soil is covered primarily by litter and duff. Wood, mosses, and lichens are well-represented in the ground cover with scarce amounts of gravel and rocks greater than 10 cm. Adjacent vegetation is a continuation of open *Pinus contorta* forest.

Global Environment: This association is found mainly between 2155 and 2956 m (7070-9700 feet) elevation in Teton National Park, Yellowstone National Park, the Wind River Mountains, and the Medicine Bow Mountains of northwestern and southeastern Wyoming, in the north-central Uintah Mountains of northern Utah, and in the Rocky Mountains of Colorado. This forest occupies gentle slopes on cold sites that are very well-drained. Soils are primarily derived from quartzite parent materials and are gravelly sandy loams to gravelly loams. There is little surface rock and bare soil as the litter and duff layer often covers as much as 60% of the ground surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forest. *Pinus contorta* (30% cover) is the only tree canopy species. Seedlings of *Pinus contorta, Pinus albicaulis*, and *Abies lasiocarpa* are found in the stand. *Pinus contorta* seedlings contribute 20% cover to the short-shrub stratum. No other shrubs occur in more than trace amounts. The only herbaceous species to occur in more than trace amounts are *Carex rossii* (10% cover) and *Carex geyeri* (3% cover).

Global Vegetation: The overstory canopy is almost exclusively *Pinus contorta* (30-64%). Small amounts of *Picea engelmannii, Abies lasiocarpa*, and *Pinus albicaulis* may be present. Shrubs may be completely absent or present in trace amounts and include species such as *Arctostaphylos uva-ursi, Vaccinium caespitosum, Vaccinium scoparium, Acer glabrum, Juniperus communis var. montana*, and *Mahonia repens*. The herbaceous understory are very depauperate, with *Lupinus argenteus, Solidago multiradiata, Sedum lanceolatum, Orthilia secunda (= Pyrola secunda)*, and *Pyrola chlorantha (= Pyrola virens)* present. *Poa nervosa, Carex geyeri*, and *Carex rossii* are also common. *Carex rossii* is the only species to have the highest cover (1-40%) in all stands (100% constancy) and can obtain dominance because all other herbaceous species are sparse. This association is differentiated from similar associations by the clear dominance of *Pinus contorta* in the overstory canopy.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree subcanopy	Needle-leaved tree	X	.	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Carex rossii	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Carex rossii	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa / Carex rossii* Forest (CEGL000305)
- *Pinus contorta / Festuca idahoensis* Woodland (CEGL000149)

Global Related Concepts:
- *Pinus contorta / Carex rossii* Community Type (Steele et al. 1983) =
- *Pinus contorta / Carex rossii* Habitat Type (Mauk and Henderson 1984) =
- *Pinus contorta / Carex rossii* Habitat Type (Alexander 1986) =
- *Pinus contorta / Carex rossii* Plant Association (Johnston 1987) =
- *Pinus contorta/Carex rossii* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description extremely well.
Global Classification Comments: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This stand occurs in the John D. Rockefeller, Jr. Memorial Parkway near the Yellowstone Boundary Line Trail and is known to occur more extensively on the Targhee National Forest and in Yellowstone National Park.
Global Range: This Rocky Mountain forest association is well-documented from northern Utah, southern Idaho, western and southeastern Wyoming, and northern Colorado. It may also occur in Montana.
Nations: US
States/Provinces: CO, ID, MT?, UT:S4?, WY:S5
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331I:CC
Federal Lands: NPS (Grand Teton?, Rockefeller, Rocky Mountain, Yellowstone); USFS (Caribou-Targhee, Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B099
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1986	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.

Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000145] *Pinus contorta / Ceanothus velutinus* Forest

Translated Name: **Lodgepole Pine / Tobacco-brush Forest**
Common Name: **Lodgepole Pine / Tobacco-brush**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a dry, well-drained forest occurring on all aspects; slopes range from 2 to 15% on flat, concave, or convex slopes, benches, plateaus or lower slopes of buttes and escarpments. It appears to be a post-fire forest type. All stands sampled are recent regeneration from known fires. Elevation range is 1463 to 2085 m (4800-6841 feet). Soils are sandy loam to loamy coarse sand, that can be derived from pumice and lava colluvium, or granitics. This forest type is represented by stands of pole or immature *Pinus contorta* with 10-40% cover. Few other trees may be present, such as *Pinus ponderosa* in Oregon. The shrub layer can be limited but is usually clearly defined with a dominance of *Ceanothus velutinus* with trace to 70% cover. Other shrub species that may be present include *Amelanchier alnifolia* and *Spiraea betulifolia* in Wyoming, or *Arctostaphylos patula, Arctostaphylos nevadensis*, or *Purshia tridentata* in Oregon. Herbaceous layer species include *Carex geyeri, Carex rossii*, and *Calamagrostis rubescens*. *Elymus elymoides (= Sitanion hystrix), Chamerion angustifolium (= Epilobium angustifolum), Chimaphila umbellata*, and *Fragaria virginiana* may also be present in trace amounts.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor, interfluves, or a variety of slopes above the valley floor at elevations of 6700 to 7000 feet. The slopes have gradients of 32% or less with variable aspects. Soil data is available for one stand; the well-drained sandy loam soils are covered primarily by litter and duff; rocks greater than 10 cm, gravel, and wood are well represented. All stands except for one were noted as disturbed by fire within approximately the last 20 years.

Global Environment: This is a dry, well-drained forest occurring on all aspects; slopes range from 2 to 15% on flat, concave, or convex slopes, benches, plateaus or lower slopes of buttes and escarpments. It appears to be a post-fire forest type. All stands sampled are recent regeneration from known fires. Elevation range is 1463 to 2085 m (4800-6841 feet). Soils are sandy loam to loamy coarse sand, that can be derived from pumice and lava colluvium, or granitics.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community. *Pinus contorta* (12 to 50% cover) is the dominant tree species present and occurs almost exclusively as regeneration less than 30 feet tall. Seedlings of *P. contorta, Picea engelmannii, Abies lasiocarpa*, and *Populus tremuloides* may be found. *Ceanothus velutinus* (7 to 70% cover) is the dominant shrub, occurring in the tall or short shrub stratum. Other common shrubs include *Amelanchier alnifolia*, typically growing in the more open spaces and *Spiraea betulifolia* found growing mostly in association with *C. velutinus.* The only herbaceous species that occur in more than half the stands are *Carex geyeri* (trace to 30% cover) and *Calamagrostis rubescens* (trace to 20% cover).

Global Vegetation: This forest type is represented by stands of pole or immature *Pinus contorta* with 10-40% cover. Few other trees may be present, such as *Pinus ponderosa* in Oregon. The shrub layer may be limited but is usually clearly defined with a dominance of *Ceanothus velutinus* with trace to 70% cover. Other shrub species that may be present include *Amelanchier alnifolia* and *Spiraea betulifolia* in Wyoming, or *Arctostaphylos patula, Arctostaphylos nevadensis*, or *Purshia tridentata* in Oregon. Herbaceous layer species include *Hesperostipa comata (= Stipa comata), Carex geyeri, Carex rossii, Calamagrostis rubescens, Elymus elymoides (= Sitanion hystrix), Chamerion angustifolium (= Epilobium angustifolium), Chimaphila umbellata*, and *Fragaria virginiana*.
Global Dynamics: **This is a post-fire, early-seral forest association.**
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Carduus nutans	-	P	exotic
Cynoglossum officinale	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Pinus contorta/Ceanothus velutinus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B
- Lodgepole Pine / Snowbush - Manzanita Plant Community (Volland 1976) =

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Two stands that define this association occur on toeslopes and footslopes just west of Jackson Lake, and the remainder of the stands occur in the Taggart Lake area.

Global Range: This association is known from central Oregon, north-central Montana, and western Wyoming.
Nations: US
States/Provinces: MT:S3, OR:S3S4, WY
TNC Ecoregions: 4:C, 9:C, 26:C
TNC Ecoregion Comments: ECO4 and ECO26 added (GK 1-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331D:CC, M242C:CC, M261G:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A010
Accuracy Assessment Points: 04S018, 04K003, 04K005, 04K007, 04M009, 04M010, 04M012, 04R012, 04R013, 04R014, 04R015, 04R092, 04S036
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.

MTNHP 2002b	.	X	.	.	.	.	.	.	.
Scow and Culwell 1986	.	X	.	X	.	.	.	.	.
Volland 1976	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000163] *Pinus contorta / Shepherdia canadensis* Forest

Translated Name: **Lodgepole Pine / Russet Buffaloberry Forest**
Common Name: **Lodgepole Pine / Russet Buffaloberry**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is an abundant forest type in the lodgepole pine belt of southeastern Idaho, northwestern and southeastern Wyoming and north-central Colorado. It also occurs in northeastern Washington but is less common there. It occurs on cool to warm, dry sites, mostly on well-drained gentle toeslopes and benches, on slopes of 4-10% (32%). Elevation ranges from 2105 to 2960 m (6900-9700 feet) in the Rocky Mountains and from 790 to 1620 m (2600-5320 feet) in southeastern Washington. Soils are shallow to moderately deep, skeletal sandy to silty loams derived from sandstone, conglomerate or outwash materials. The vegetation is characterized by nearly pure stands of *Pinus contorta*. Stands in northeastern Wyoming and northeastern Washington are often mixed with other, later-seral conifers such as *Abies lasiocarpa, Pseudotsuga menziesii*, and *Larix occidentalis*, but the stands are still strongly dominated by *Pinus contorta*. *Populus tremuloides* can be present on more mesic sites. The low-shrub layer is dominated by *Shepherdia canadensis* with 30-60% cover. Other shrub species present may include *Spiraea betulifolia, Amelanchier alnifolia, Mahonia repens, Lonicera utahensis, Vaccinium scoparium, Juniperus communis*, and *Linnaea borealis*. Tall shrubs when present are never abundant enough to form a tall-shrub layer. The herbaceous layer is generally depauperate, ranging from scattered individuals to as much as 10% cover each, and includes graminoids *Carex geyeri, Calamagrostis rubescens*, exotic grasses *Phleum pratense* and *Poa pratensis*, and forbs *Eurybia conspicua, Osmorhiza berteroi, Orthilia secunda, Geranium viscosissimum, Thalictrum occidentale, Arnica cordifolia, Fragaria virginiana*, and *Galium boreale*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on shallow to moderate slopes with varying aspects near the valley floor or on interfluves. The elevations for these stands range from 6800 to 7500 feet. The soils, where data are available, differ for each stand: one has sandy clay, one has moderately well-drained silty clay, one has well-drained silty clay, and two are loam. The ground cover is comprised mostly of litter and duff (40 to 80% cover), wood (3 to 20% cover), and mosses (3 to 10% cover). There are traces of lichens, gravel, bare soil, and fungi present. Surrounding vegetation includes similar stands to this association with *Picea engelmannii, Abies lasiocarpa, Pseudotsuga menziesii*, and *Populus tremuloides* intermixing in low densities.

Global Environment: This is an abundant forest type in the lodgepole pine belt of southeastern Idaho, northwestern and southeastern Wyoming and north-central Colorado. It also occurs in northeastern Washington but is less common there. It occurs on cool to warm dry sites, mostly on well-drained gentle toeslopes and benches, on slopes of 4-10% (32%). Elevation ranges from 2110 to 2850 m (6900-9700 feet) in the Rocky Mountains and from 790 to 1620 m (2600-5320 feet) in southeastern Washington. Soils are shallow to moderately deep, skeletal sandy to silty loams derived from sandstone, conglomerate, or outwash materials.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane mixed coniferous forest that occurs on mesic sites. The dominant tree canopy species is *Pinus contorta* (12 to 60% cover). Incidental species may include *Abies lasiocarpa, Pseudotsuga menziesii, Populus tremuloides*, and *Picea engelmannii* occurring in both the tree canopy and subcanopy. Seedlings of aforementioned species may be present. *Shepherdia canadensis* (7 to 60% cover) is the dominant shrub and occurs in either the tall, short, or dwarf shrub stratum. Other high constancy shrubs include *Spiraea betulifolia, Mahonia repens*, and *Lonicera utahensis*. The herbaceous layer is diverse with forbs much more abundant than graminoids. The only graminoid present in every stand is *Calamagrostis rubescens* (1 to 30% cover). *Carex geyeri* occurs in the majority of stands with 1 to 20% cover. High constancy forbs include *Geranium viscosissimum, Eurybia conspicua*, and *Lupinus argenteus.*

Global Vegetation: This association is dominated by nearly pure stands of *Pinus contorta*. Stands in northeastern Wyoming and northeastern Washington are often mixed with other, later-seral conifers such as *Abies lasiocarpa, Pseudotsuga menziesii*, and *Larix occidentalis*. *Populus tremuloides* can be present on more mesic sites. The low-shrub layer is dominated by *Shepherdia canadensis* with 30-60% cover. Other shrub species present may include *Spiraea betulifolia, Amelanchier alnifolia, Mahonia repens, Lonicera utahensis, Vaccinium scoparium, Juniperus communis*, and *Linnaea borealis*. Tall shrubs when present are never abundant enough to form a tall-shrub layer. The herbaceous layer is generally depauperate, from scattered individuals to as much as 10% cover each, and

includes graminoids *Carex geyeri*, *Calamagrostis rubescens*, *Phleum pratense*, and *Poa pratensis*; and forbs *Eurybia conspicua*, *Osmorhiza berteroi*, *Orthilia secunda*, *Geranium viscosissimum*, *Thalictrum occidentale*, *Arnica cordifolia*, *Fragaria virginiana*, and *Galium boreale*.

Global Dynamics: Most stands of this association are even-aged, post-fire stands. In southeastern Wyoming and north-central Colorado, *Pinus contorta* is reproducing successfully, and few other conifer species are present, indicating a stable, climax, fire-responsive forest. In northwestern Wyoming and northeastern Washington, the reproductive presence of other conifers indicates that in cooler, more moist climates, with lower fire frequencies, this is a long-lived seral stage to other forested associations.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	.	X	.
Shepherdia canadensis	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Eurybia conspicua	Herb (field)	Forb	X	.	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Mahonia repens	Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	.	X	.
Shepherdia canadensis	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Crepis tectorum	-	P	exotic
Taraxacum laevigatum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Pinus contorta / Arnica cordifolia* Forest (CEGL000135)

Global Related Concepts:

- *Pinus contorta / Shepherdia canadensis* Community Type (Williams et al. 1990b) =
- *Pinus contorta / Shepherdia canadensis* Community Type (Steele et al. 1983) =
- *Pinus contorta / Shepherdia canadensis* Habitat Type (Alexander 1986) =
- *Pinus contorta / Shepherdia canadensis* Habitat Type (Wasser and Hess 1982) =
- *Pinus contorta / Shepherdia canadensis* Habitat Type (Hess and Wasser 1982) =
- *Pinus contorta / Shepherdia canadensis* Habitat Type (Alexander et al. 1986) =
- *Pinus contorta / Shepherdia canadensis* Plant Association (Johnston 1987) =
- *Pinus contorta/Shepherdia canadensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description fairly well. Steele describes a sparse forb layer, whereas this association has many species with 3% cover or more.

Global Classification Comments: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur east of Emma Matilda Lake near Two Ocean Road, near Arizona Creek, south of Triangle X Ranch, near or in Eynon Draw, near Lozier Hill and on Signal Mountain.

Global Range: This association occurs in north-central Colorado, southeastern and northwestern Wyoming, southeastern Idaho, and northwestern Washington. It may also occur in Montana.
Nations: US
States/Provinces: CO:S3S4, ID, MT?, WA:S3?, WY:S3S4
TNC Ecoregions: 7:C, 9:C, 20:C
TNC Ecoregion Comments: ECO7 added (GK 1-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331F:CC, M331H:CC, M331I:CC, M331J:CC, M333A:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A103, GT-03A110, GT-0202071, GT-0201056, GT-0201014
Accuracy Assessment Points: 04J214, 04J236, 04J239, 04K075, 04R198, 04R326
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9902033, BT-9407012

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1981	.	X	.	X	.	.	.	.	.
Alexander 1986	.	X	X	X	.	.	.	.	.
Alexander et al. 1986	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
Hess and Alexander 1986	.	X	.	X	.	.	.	.	.
Hess and Wasser 1982	.	X	X	X	.	.	.	.	.
Hoffman and Alexander 1980	.	X	.	X	.	.	.	.	.
Hoffman and Alexander 1983	.	X	.	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Klish 1977	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Moir 1969a	.	X	.	X	.	.	.	.	.
Oswald 1966	.	X	.	X	.	.	.	.	.
Rolston 1961	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Steen and Dix 1974	.	X	.	X	.	.	.	.	.
Wasser and Hess 1982	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Whipple 1975	.	X	.	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.

[CEGL000164] *Pinus contorta / Spiraea betulifolia* Forest

Translated Name: **Lodgepole Pine / Shinyleaf Meadowsweet Forest**
Common Name: **Lodgepole Pine / Shinyleaf Meadowsweet**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, across Idaho and western Montana into Canada. Elevations range from 1070 to 2500 m (3500-8200 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various. Tree litter is often 4-6 cm deep and dominates ground cover. Vegetation is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Spiraea betulifolia* prominent in the understory. *Picea engelmannii, Pseudotsuga menziesii*, or *Populus tremuloides* may be present in the subcanopy. Sites are generally too cool for *Pinus ponderosa*. *Spiraea betulifolia* is a major component in the short-shrub layer with *Mahonia repens* or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum, Amelanchier alnifolia, Lonicera utahensis, Prunus virginiana, Shepherdia canadensis, Sorbus scopulina, Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is dominated by graminoids *Calamagrostis rubescens, Carex geyeri, Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on shallow slopes with gradients ranging from 3-7% and aspects of either south or north. The elevations for these stands range from 2110 to 2186 m (6922-7172 feet). The soils vary for each stand; one is silty clay loam, one is loam with a trace of gravel, and one is sandy clay with 35% gravel.

Global Environment: This subalpine forest association is known from the central and northern Rocky Mountains. Elevations range from 1070 to 2500 m (3500-8200 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various, typically comprised of colluvium or residuum derived from andesite, basalt, granites, gneiss, quartzite, schist phyllite, or limestone. Soils tend to be coarser textured, gravelly loam, sandy loam, or sandy clay. Tree litter, often 4-6 cm deep, dominates the ground cover.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest occurring on mesic and subxeric sites. The dominant tree canopy species is *Pinus contorta* (30-50% cover). *Pseudotsuga menziesii* (1-20% cover) occurs in every stand, *Picea engelmannii* occurs in one stand, and *Abies lasiocarpa* occurs in another stand. *Abies lasiocarpa* seedlings occur in every stand, contributing 3-10% cover to the dwarf-shrub stratum. Seedlings of *Picea engelmannii, Pseudotsuga menziesii, Pinus contorta, Pinus flexilis*, and *Populus tremuloides* may occur. The dominant shrub is *Spiraea betulifolia* (10-30% cover). Other common or high-constancy shrubs include *Shepherdia canadensis, Symphoricarpos albus, Ribes viscosissimum, Paxistima myrsinites*, and *Mahonia repens*. The only herbaceous species that occur in every stand are *Hieracium albiflorum* (1-10% cover) and *Osmorhiza berteroi* (1% cover). Species that occur in two of three stands include *Elymus glaucus* (1-3% cover), *Arnica cordifolia* (1-3% cover), *Chamerion angustifolium* (1-3% cover), *Chimaphila umbellata* (1-3% cover), *Geranium viscosissimum* (1-3% cover), *Campanula rotundifolia* (1% cover), and *Fragaria virginiana* (1% cover).

Global Vegetation: This forest association is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Spiraea betulifolia* prominent in the understory. *Picea engelmannii, Abies lasiocarpa, Pseudotsuga menziesii*, or *Populus tremuloides* may be present in the subcanopy. Sites are generally too cool for *Pinus ponderosa*. *Spiraea betulifolia* is a major component in the short-shrub layer with *Mahonia repens* or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum, Amelanchier alnifolia, Lonicera utahensis, Prunus virginiana, Ribes viscosissimum, Shepherdia canadensis, Sorbus scopulina, Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is dominated by graminoids *Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs. The most common forb species are *Arnica cordifolia, Astragalus miser, Balsamorhiza sagittata, Fragaria virginiana, Goodyera oblongifolia, Hieracium albiflorum, Maianthemum racemosum, Osmorhiza berteroi (= Osmorhiza chilensis), Orthilia secunda (= Pyrola secunda), Chamerion angustifolium, Chimaphila umbellata, Geranium viscosissimum, Campanula rotundifolia, Fragaria virginiana*, and *Thalictrum occidentale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Ribes viscosissimum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.

Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Spiraea betulifolia	Herb (field)	Dwarf-shrub	X	X	.
Hieracium albiflorum	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	X
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Trifolium hybridum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa / Spiraea betulifolia* Forest (CEGL000335)
- *Pinus contorta / Calamagrostis rubescens* Forest (CEGL000139)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii / Spiraea betulifolia* Forest (CEGL000457)

Global Related Concepts:
- *Abies lasiocarpa / Spiraea betulifolia* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa / Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pinus contorta / Spiraea betulifolia* Community Type (Steele et al. 1983) =
- *Pinus contorta/Spiraea betulifolia* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type, *Calamagrostis rubescens* Phase (Steele et al. 1981) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type, *Spiraea betulifolia* Phase (Steele et al. 1981) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description extremely well.
Global Classification Comments: This association includes *Pinus contorta*-dominated stands within the *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type of Cooper et al. (1987), Pfister et al. (1977), Steele et al. (1981, 1983), but not the *Pinus ponderosa* Phase of Steele et al. (1981). This association also includes lodgepole-dominated stands of the *Abies lasiocarpa / Spiraea betulifolia* Habitat Type (Steele et al. 1981, 1983). *Pinus contorta* is not a seral component of the *Pseudotsuga menziesii / Spiraea betulifolia* or *Abies lasiocarpa / Spiraea betulifolia* plant associations described in Johnson and Simon (1987) for northeastern Oregon.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs to the east and west of Emma Matilda Lake and east of Apres Vous Peak.
Global Range: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, across Idaho and western Montana into Canada.
Nations: CA, US
States/Provinces: AB, ID, MT?, WY:S3
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7 & ECO8 added (MSR 4-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331J:CC, M332A:C?, M332B:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton, Yellowstone); PC (Waterton Lakes)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201093, GT-0201099, GT-0202006
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnson and Simon 1987	.	.	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	.	.	.	.	.	.
Steele et al. 1981	.	X	X	.	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000169] *Pinus contorta / Vaccinium membranaceum* Rocky Mountain Forest

Translated Name: **Lodgepole Pine / Square-twig Blueberry Rocky Mountain Forest**
Common Name: **Lodgepole Pine / Square-twig Blueberry**
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Steele et al. (1983)

ELEMENT CONCEPT

Global Summary: This type is known from Yellowstone and Grand Teton national parks in northwestern Wyoming, southwestern Idaho south to Utah. It occurs on moist slopes and benches having northerly to easterly aspects, between 2055 and 2440 m (6730-8000 feet) in elevation. Soils are loam-based and are well- to moderately well-drained. In Oregon it occurs on moist sites above 1525 m (5000 feet) and below 1830 m (6000 feet), on slopes <15%. In Oregon and Montana, stands are considered seral to ~*Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342)$$. The overstory canopy is dominated by *Pinus contorta*. Other conifers that may be present as incidental individuals are *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. In Montana, stands dominated by *Pinus contorta*, but with *Abies lasiocarpa* in the subcanopy, are classified as ~*Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342)$$ but would be included here floristically. The undergrowth is usually dominated by *Vaccinium membranaceum*, with *Lonicera utahensis*. Other shrubs occasionally present include *Shepherdia canadensis* and *Spiraea betulifolia*. *Vaccinium scoparium* can be well-represented. Herbaceous species include *Calamagrostis rubescens, Carex geyeri*, and *Arnica cordifolia*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on interfluves, step-in-slopes, and slopes. The majority of the shallow to steep slopes face north. The elevations for these stands range from 2057 to 2345 m (6749-7694 feet). The loam-based soils are well- to moderately well-drained. The unvegetated ground cover is comprised of litter and duff (60-90% cover), wood (5-40% cover), and traces of bare soil, lichen, and mosses. Surrounding vegetation for most of these stands includes *Pinus contorta* forests with varying understories.
Global Environment: This type is known from Yellowstone and Grand Teton national parks in northwestern Wyoming, southwestern Idaho south to Utah. It occurs on moist slopes and benches having northerly to easterly aspects, between 2057 and 2438 m (6729-8000 feet) in elevation. Soils are loam-based and are well- to moderately well-drained. In Oregon it occurs on moist sites from 1372 to 1981 m (4500-6500 feet), on undulating topography, on low slopes (2-20%). Soils are pumice ash (in Oregon), fine sandy loams, well- to moderately well-drained.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest that occurs on mesic to subxeric sites. The dominant tree canopy species is *Pinus contorta* (3-60% cover). One stand does not have a mature tree canopy. In this stand, *Pinus contorta* is dominant with 40% cover in the subcanopy. Incidental tree canopy species include *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. Tree subcanopy species may include *Pinus contorta*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus flexilis*, *Pseudotsuga menziesii*, and *Pinus albicaulis*. Seedlings that may be present are *Pinus contorta*, *Abies lasiocarpa*, *Picea engelmannii*, *Pinus flexilis*, and *Populus tremuloides*. The shrub layer is dominated by *Vaccinium membranaceum* (10-50% cover) in the majority of the stands. Species that are dominant or codominant with *Vaccinium membranaceum* include *Lonicera utahensis* (13 of 15 stands, 1-10% cover), *Vaccinium scoparium* (12 stands, 1-40% cover), *Shepherdia canadensis* (11 stands, 1-20% cover), and *Spiraea betulifolia* (11 stands, 1-20% cover). The herbaceous layer is dominated by *Calamagrostis rubescens* (13 stands, 1-20% cover). Other high-constancy species include *Carex geyeri* (8 stands, 1-20% cover) and *Arnica cordifolia* (10 stands, 1-20% cover).
Global Vegetation: The overstory canopy is dominated by *Pinus contorta*. Other conifers that may be present as incidental individuals are *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. In Montana, stands dominated by *Pinus contorta*, but with *Abies lasiocarpa* in the subcanopy, are classified as *~Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342)$$ but would be included here floristically. The undergrowth is usually dominated by *Vaccinium membranaceum*, with *Lonicera utahensis*. Other shrubs occasionally present include *Shepherdia canadensis* and *Spiraea betulifolia*. *Vaccinium scoparium* can be well-represented. Herbaceous species include *Calamagrostis rubescens*, *Carex geyeri*, and *Arnica cordifolia*.
Global Dynamics: Stands are often considered seral to *~Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342)$$.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Pinus contorta* var. *latifolia / Vaccinium membranaceum / Cladina* spp. Woodland (CEGL002325)

Global Related Concepts:
- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Steele et al. 1983) B
- *Pinus contorta - (Abies lasiocarpa) / Vaccinium membranaceum / Calamagrostis rubescens* Plant Association (Johnson and Clausnitzer 1992) =
- *Pinus contorta - (Abies lasiocarpa) / Vaccinium membranaceum* Plant Association (Johnson and Clausnitzer 1992) =

- *Pinus contorta* - *Vaccinium membranaceum* Plant Community (Hall 1973) =
- *Pinus contorta / Vaccinium globulare* Habitat Type (Steele et al. 1983) =
- *Pinus contorta/Vaccinium globulare* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type, *Vaccinium globulare* Phase (Pfister et al. 1977) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Pinus contorta / Vaccinium globulare (= Vaccinium membranaceum*) Habitat Type very well.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs throughout Grand Teton National Park; one sampled stand is located on the western slope of Mount Reid, two occur south of Harem Hill, one occurs east of Two Ocean Lake, three occur south of Spalding Bay, and one occurs west of Phelps Lake. In the Caribou-Targhee National Forest one stand is located northwest of Lake of the Woods. In the Bridger-Teton National Forest one stand occurs east of Teton Science School and five occur on the western slope of Shadow Mountain.
Global Range: This association is known from Idaho, Montana, Oregon and Wyoming.
Nations: US
States/Provinces: ID, MT, OR:S3, WY:S2S3
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7 added (mjr 7-05). ECO8 added (GK 1-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Yellowstone); USFS (Bridger-Teton, Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Seven of the fifteen stands describing this association do not occur within the park boundaries.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A004, GT-03A025, GT-03B019, GT-03B052, GT-03B058, GT-03B116, GT-0202050, GT-0202053
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407061, BT-9407005, BT-9407007, BT-9407012, BT-9407010, BT-9407014, CT-95-JW-027

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	.	.	.	.	.	.
Steele et al. 1983*	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL000172] *Pinus contorta / Vaccinium scoparium* Forest

Translated Name: **Lodgepole Pine / Grouseberry Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This widespread forest association is found in the upper montane and subalpine zones of the Rocky Mountains from central Colorado to Montana, east to the Black Hills and west to the mountains of Utah, Oregon and Washington. Elevation is variable depending on latitude and ranges from 3250 m (10,660 feet) in Colorado to 1555 m (5100 feet) in central Oregon. Stands occur on relatively cold, dry sites. Topography ranges from gentle to steep (10-100%) middle to upper slopes and ridgetops. Aspects are variable. Substrates are typically poorly developed, well-drained, gravelly, loamy sand or sandy loam soils that are too shallow or rocky for more mesic communities. Parent materials are variable. Ground cover is variable, with some stands having high cover of gravel and rock, and other stands having high cover of litter and duff. Vegetation is characterized by a *Pinus contorta*-dominated tree canopy with understory dominated by a patchy to continuous dwarf-shrub layer of *Vaccinium scoparium*. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa, Picea engelmannii, Pinus albicaulis* (northern stands), *Pinus flexilis, Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs, but not enough to form a tall- or short-shrub layer. The open to moderately dense dwarf-shrub layer is dominated by *Vaccinium scoparium* (indicator species) usually with 15-70% cover. Low cover of other dwarf-shrubs may be present such as scattered *Paxistima myrsinites, Rosa* spp., *Vaccinium caespitosum*, or *Juniperus communis*. The herbaceous layer if present is usually sparse but may be moderately dense and is typically dominated or codominated by perennial graminoids such as *Carex geyeri, Carex rossii (=Carex brevipes), Festuca brachyphylla, Poa nemoralis ssp. interior (= Poa interior), Poa nervosa*, or *Trisetum spicatum*. Forbs are generally sparse and may include *Antennaria* spp., *Arnica cordifolia, Chamerion angustifolium, Lupinus argenteus, Senecio* spp., and *Solidago* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The stands defining this association occur on the valley floor, interfluves, or shallow slopes. The slopes have gradients from 1-23% and generally face southwest through northwest. The elevations for the sampled stands range from 2073 to 2310 m (6801-7580 feet). The soils are typically loam-based, except in one stand that has moderately well-drained sandy clay soil. Unvegetated and nonvascular ground cover consists primarily of litter and duff (40-80% cover), basal vegetation (10-40% cover), wood (10-20% cover), and rocks greater than 10 cm (0-10% cover). Traces of gravel, bare soil, and mosses may be present. One stand has 20% cover of mosses. Two of these stands have been disturbed by recent fires. Adjacent vegetation for some of the plots includes a continuation of the association.

Global Environment: This widespread forest association is found in the upper montane and subalpine zones of the Rocky Mountains from central Colorado to Montana, east to the Black Hills and west to the mountains of Utah, Oregon and Washington. Elevations range from 2745 to 3150 m (9000-10,660 feet) in Colorado and 2590 to 3050 m (8500-10,000 feet) in the Uinta Mountains down to 1770 to 2135 m (5800-7000 feet) in Montana and 1555 to 1950 m (5100-6400 feet) in central Oregon. Stands occur on relatively cold, dry sites. Topography ranges from gentle to steep (10-100%), middle to upper slopes and ridgetops. Aspects are variable. Substrates are typically poorly developed, well-drained, gravelly, loamy sand or sandy loam soils that are too shallow or rocky for more mesic communities. Parent materials are variable and include noncalcareous sedimentary, metamorphic or igneous rock, including argillite, quartzite, gneiss and schist, basalt, andecite, granite, quartz monzonite, rhyolite, and volcanic ash. Ground cover is variable. Cover of gravel and rock is often high (>50% cover), but other stands have high cover of litter and duff (40-80%). Mosses and lichens are common on some sites.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest that occurs on mesic to subxeric sites. The dominant tree canopy species is *Pinus contorta* (10-40% cover). *Pinus contorta* is absent from three stands in the mature tree canopy; *Abies lasiocarpa* (3 of 10 stands, 1% and 10% cover) and *Picea engelmannii* (1 stand, 1% cover) codominate in one of the stands in which *Pinus contorta* is absent. In the other two stands the mature tree canopy is absent; *Pinus contorta* is dominant with 30% cover in the subcanopy in one stand and 10% cover in the dwarf-shrub stratum in the other stand. *Picea pungens* and *Pinus flexilis* may occur as incidental species. *Pinus flexilis, Pinus contorta, Picea pungens*, and *Pseudotsuga menziesii* may occur in the subcanopy. Seedlings of *Abies lasiocarpa, Pinus contorta, Pinus flexilis, Pseudotsuga menziesii*, and *Populus tremuloides* may be present. *Vaccinium scoparium* (10-30% cover) is the dominant shrub species and is present in the dwarf-shrub stratum. High-constancy shrubs include *Shepherdia canadensis* (6 stands, 1-30% cover) in the short-shrub stratum, *Lonicera utahensis* (7 stands, 1-10% cover) in the short- and dwarf-shrub strata, and *Spiraea betulifolia* (7 stands, 1-10% cover) in the dwarf-shrub stratum. High-constancy herbaceous species include *Calamagrostis rubescens* (8 stands, 3-50% cover), *Carex geyeri* (6 stands, 1-30% cover), *Chamerion angustifolium* (8 stands, 1-10% cover), *Arnica cordifolia* (6 stands, 1-10% cover), and *Geranium viscosissimum* (6 stands, 1-3% cover).

Global Vegetation: This forest association is characterized by a *Pinus contorta*-dominated tree canopy with understory dominated by a patchy to continuous dwarf-shrub layer of *Vaccinium scoparium*. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa, Picea engelmannii, Pinus albicaulis* (northern stands), *Pinus flexilis, Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs, but not enough to form a tall- or short-shrub layer. The open to moderately dense dwarf-shrub layer is dominated by *Vaccinium scoparium* (indicator species) usually with 15-70% cover. Other dwarf-shrubs may be present and include low cover of *Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites,*

Rosa spp., *Vaccinium caespitosum*, or *Juniperus communis*. The herbaceous layer if present is usually sparse but may be moderately dense and is typically dominated or codominated by perennial graminoids such as *Carex geyeri, Carex rossii (=Carex brevipes), Festuca brachyphylla, Poa nemoralis ssp. interior (= Poa interior), Poa nervosa*, or *Trisetum spicatum*. Forbs are generally sparse and may include *Antennaria* spp., *Arnica cordifolia, Chamerion angustifolium, Lupinus argenteus, Packera neomexicana (= Senecio neomexicanus), Solidago multiradiata*, and several others.

Global Dynamics: The dominance of *Pinus contorta* in stands of this association is related to fire history and topo-edaphic conditions (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983, Cooper et al. 1987). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. Over time, many of these stands can succeed to dominance by other, more shade-tolerant conifer species; however, others stands, restricted by dry, shallow rocky soils on more extreme sites, will remain dominated by *Pinus contorta* (Hoffmann and Alexander 1976, Alexander et al. 1986, Hess and Alexander 1986, Komarkova et al. 1988b).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	X
Juniperus communis	Short shrub/sapling	Needle-leaved shrub	.	.	X
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X

Higher Taxon	Note
Rosa spp.	constant broad-leaved deciduous short shrubs

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005914)
- *Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens* Forest (CEGL000174)
- *Pinus contorta / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005924)

Global Related Concepts:

- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1987) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1980) B
- *Pinus contorta - Vaccinium scoparium* Plant Community (Hall 1973) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Steele et al. 1981) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Wasser and Hess 1982) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Pfister et al. 1977) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Steele et al. 1983) =

- *Pinus contorta / Vaccinium scoparium* Community Type (Hess 1981) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Cooper et al. 1987) =
- *Pinus contorta / Vaccinium scoparium* Community Type (Hess and Alexander 1986) =
- *Pinus contorta / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1976) =
- *Pinus contorta / Vaccinium scoparium* Habitat Type (Komarkova et al. 1988b) =
- *Pinus contorta / Vaccinium scoparium* Habitat Type (Alexander et al. 1986) =
- *Pinus contorta / Vaccinium scoparium* Plant Association (Johnston 1987) =
- *Pinus contorta / Vaccinium scoparium* Plant Association (Baker 1984a) =
- *Pinus contorta/Vaccinium scoparium* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B
- Lodgepole Pine / Grouse Huckleberry Plant Community (Volland 1976) =
- Lodgepole Pine / Grouse Whortleberry Plant Community (Horton 1971) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description fairly well. Steele et al. intimate that, other than *Vaccinium scoparium*, the shrub layer is usually sparse and well-scattered. The Grand Teton National Park association has a well-developed shrub layer.
Grand Teton National Park Other Comments:
Global Classification Comments: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

Many stands in this association are considered early- to mid-successional, which developed following fires and are considered seral to *~Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium* Forest (CEGL000344)$$, less often *~Picea engelmannii / Vaccinium scoparium* Forest (CEGL000381)$$, and in extreme cold sites with *~Pseudotsuga menziesii / Vaccinium* spp. Forest (CEGL000464)$$ (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983, Mauk and Henderson 1984, Cooper et al. 1987,), while other stands have a canopy that is dominated by persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Abies lasiocarpa, Picea engelmannii, Picea glauca*, or *Pseudotsuga menziesii*.

Compare this association to *~Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens* Forest (CEGL000174)$$. Regional analysis suggests that they are synonymous.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Six of the sampled stands occur within Grand Teton National Park boundaries. One occurs in the Lizard Creek drainage, one occurs on Timbered Island, and one occurs northeast of Cygnet Pond; three of the Grand Teton National Park stands occur in the John D. Rockefeller, Jr. Memorial Parkway, one near Glade Creek and two south of the Snake River Campground. Four sampled stands occur in Bridger-Teton National Forest, one near Spread Creek, two on the western slopes of Shadow Mountain, and one northeast of Teton Science School.
Global Range: This association is common in the Rocky Mountains and mountains in the northwestern U.S. and is reported from Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, and possibly California.
Nations: US
States/Provinces: CA?, CO:S4, ID:S5, MT:S5, OR:S3, UT:S4S5, WA:S4, WY:S5
TNC Ecoregions: 4:C, 5:C, 7:C, 8:C, 9:C, 10:C, 20:C, 68:C
TNC Ecoregion Comments: ECO4, ECO5, ECO7, ECO8, ECO68 added (mjr 7-05).
USFS Ecoregions: M242C:CC, M261D:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rockefeller, Rocky Mountain); USFS (Bighorn, Bridger-Teton, Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Four of the ten sampled stands occur outside of Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201054, GT-0201004, GT-03B108, GT-0202064, GT-0201007, GT-0202084
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407008, BT-9902042, BT-9407063, BT-9407009

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander et al. 1986	.	X	X	X	X	.	.	.	.
Baker 1984a	.	.	X	.	X	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cooper 1975	.	.	.	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Harrington 1978	.	X	.	X	.	.	.	.	.
Hess 1981	.	X	X	X	.	.	.	.	.
Hess and Alexander 1986	.	X	X	X	.	.	.	.	.
Hoffman and Alexander 1976	.	X	X	X	.	.	.	.	.
Hoffman and Alexander 1980	.	.	X	X	.	.	.	.	.
Hoffman and Alexander 1987	.	.	X	X	.	.	.	.	.
Horton 1971	.	X	X	X	.	.	.	.	.
Johnson 1981a	.	X	.	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones 1999	.	.	.	.	X	.	.	.	.
Jones and Fertig 1999d	.	.	.	.	X	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Komarkova et al. 1988b	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Marr et al. 1973b	.	X	.	X	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Oswald 1966	.	X	.	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Rolston 1961	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Steen and Dix 1974	.	X	.	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Ueckert 1968	.	X	.	X	.	.	.	.	.
Volland 1976	.	X	X	X	.	.	.	.	.
Wasser and Hess 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-062] *Pinus contorta / Dasiphora floribunda* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The one sampled stand for this association occurs on the valley floor at an elevation of 6702 feet. The moderately well-drained clay loam soils are primarily covered by litter and duff. Wood and mosses are well represented, gravel and bare soil are common, and lichen is present in trace quantities. Adjacent vegetation is a continuation of *Pinus contorta* forests with an increase of *Dasiphora floribunda* or *Artemisia tridentata* in the understory, finally transitioning into a *D. floribunda* or *A. tridentata* shrubland without *P. contorta.*

Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Pinus contorta* (50% cover) is the only species in the tree canopy layer. Seedlings of *Populus angustifolia* are present in scarce amounts. *Dasiphora floribunda* (30% cover) is abundant in the short shrub stratum. The herbaceous layer is diverse, although few species occur in more than trace amounts. *Poa pratensis* (40% cover) is dominant and the only graminoid to occur with more than 1% cover. Forbs with 3% to 10% cover include *Fragaria virginiana, Symphyotrichum ascendens, Taraxacum officinale,* and *Achillea millefolium.*

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Pinus contorta*
SHORT SHRUB	*Dasiphora floribunda*
GRAMINOID	*Poa pratensis*
FORB	*Fragaria virginiana, Symphyotrichum ascendens*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Pinus contorta, Dasiphora floribunda, Poa pratensis, Achillea millefolium, Fragaria virginiana, Symphyotrichum ascendens, Taraxacum officinale

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Poa pratensis, Cirsium arvense, Taraxacum laevigatum, Taraxacum officinale, Trifolium repens*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This stand occurs in the Snake River floodplain east of The Potholes.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-03B106
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one sampled stand defines this association.

Classification Confidence: **Identifier:** New-GRTE-062

Local Author: Mark Fain
Date: 19 April 2004
Local Editor: Klara Varga
Date: 3 May 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-061] *Pinus contorta / Hierochloe hirta* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stand sampled for this association occurs on a shallow, west-facing slope at an elevation of 8065 feet. Unvegetated and nonvascular ground cover is composed of litter and duff (60% cover), basal vegetation (30% cover), bare soil (3% cover), wood (3% cover) and trace amounts of moss.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community occurring on mesic sites. There is no mature tree canopy for this stand. *Pinus contorta* (10% cover) is the only species to occur in the subcanopy and *Abies lasiocarpa* occurs in trace amounts as a seedling. The understory is not well developed. In the short shrub stratum, *Vaccinium scoparium* (3% cover) is the only common shrub species. The only graminoid present is *Hierochloe hirta* (30% cover). Common forbs with 3% cover each include *Achillea millefolium* and *Chamerion angustifolium*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Pinus contorta*
GRAMINOID	*Hierochloe hirta*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Pinus contorta, Vaccinium scoparium, Hierochloe hirta, Achillea millefolium, Chamerion angustifolium

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This stand occurs on the west slope of Shadow Mountain in Bridger-Teton National Forest.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9408203

GRAND TETON NATIONAL PARK Inventory Notes: The one stand defining this association does not occur in GTNP.

Classification Confidence: **Identifier:** New-GRTE-061
Local Author: Mark Fain
Date: 19 April 2004
Local Editor: Klara Varga
Date: 4 May 2004

Global Author:

REFERENCES: None

I.A.8.N.c. Conical-crowned temperate or subpolar needle-leaved evergreen forest

A.165 *Picea pungens* Forest Alliance

Blue Spruce Forest Alliance

ALLIANCE CONCEPT

Summary: This forest alliance occurs at middle elevations (1800-3300 m) of the central and southern Rocky Mountains, usually in moist, concave topographic positions. Soils are variable, but usually young and derived from glacial or alluvially deposited materials. Stands often occupy sites that are protected from extreme sun and wind, within *Pinus ponderosa* or *Pseudotsuga menziesii* montane forests. North aspects are most common. Forests included in this alliance are characterized by the dominance of *Picea pungens* in the forest canopy. Other conifers are usually present in these stands, and may include *Pseudotsuga menziesii, Abies lasiocarpa, Abies concolor, Picea engelmannii, Pinus ponderosa, Pinus contorta*, and *Pinus strobiformis*. *Populus tremuloides* is the only widespread hardwood associate. The shrub layer is usually of only moderate cover and dominated by ericaceous or cold-deciduous species, with the latter group increasing with soil moisture or proximity to watercourses. Common species include *Quercus gambelii, Amelanchier alnifolia, Acer glabrum, Arctostaphylos uva-ursi, Juniperus communis, Mahonia repens*, and *Rubus parviflorus*. Due to favorable soil moisture, the herbaceous layer is usually a diverse mixture of forbs and graminoids, including *Carex siccata (= Carex foenea), Festuca arizonica, Arnica cordifolia, Packera cardamine (= Senecio cardamine), Fragaria virginiana, Linnaea borealis, Pseudoroegneria spicata, Erigeron eximius*, and *Achillea millefolium*. Diagnostic of this alliance is the dominance of *Picea pungens* in the moderately closed to closed tree canopy on sites that are not flooded during the growing season.

Environment: These forests occur at middle elevations (1800-3300 m) of the central and southern Rocky Mountains, usually in moist, concave topographic positions. Precipitation averages 46-60 cm annually, with the majority falling as growing-season rainfall. The temperature regime is continental and winters are moderately severe. Soils are variable, but usually young and derived from glacial or alluvially deposited materials. The pH is neutral to slightly alkaline. Youngblood and Mauk (1985) suggest a preference by these forests for non-igneous parent materials. These communities often occupy sites that are protected from extreme sun and wind, within *Pinus ponderosa* or *Pseudotsuga menziesii* montane forests. These forests are typically most common on north-facing slopes, which can be gentle to steep. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or woody riparian communities where this vegetation grades into streamside wetlands.

Vegetation: These forests are characterized by the dominance of *Picea pungens* in the forest canopy and usually represent a mesic phase of the mixed conifer forests of the southern Rocky Mountains and Colorado Plateau. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Pseudotsuga menziesii, Abies lasiocarpa, Abies concolor, Picea engelmannii, Pinus ponderosa, Pinus contorta*, and *Pinus strobiformis*. *Populus tremuloides* is the only widespread hardwood associate. The shrub layer is usually of only moderate cover and dominated by ericaceous or cold-deciduous species, with the latter group increasing with soil moisture or proximity to watercourses. Common species include *Quercus gambelii, Amelanchier alnifolia, Acer glabrum, Arctostaphylos uva-ursi, Juniperus communis, Mahonia repens*, and *Rubus parviflorus*. Due to favorable soil moisture, the herbaceous layer is usually a diverse mixture of forbs and graminoids, including *Carex siccata (= Carex foenea), Festuca arizonica, Arnica cordifolia, Packera cardamine (= Senecio cardamine), Fragaria virginiana, Linnaea borealis, Pseudoroegneria spicata, Erigeron eximius*, and *Achillea millefolium*.

Dynamics: *Picea pungens* is a slow-growing, long-lived tree which regenerates from seed (Burns and Honkala 1990a). Seedlings are shallow rooted and require perennially moist soils for establishment and optimal growth. *Picea pungens* is intermediate in shade tolerance, being somewhat more tolerant than *Pinus ponderosa* or *Pseudotsuga menziesii*, and less tolerant than *Abies lasiocarpa* or *Picea engelmannii*. It forms late seral stands in the subhumid regions of the southern Rocky Mountains. It is common for these forests to be heavily disturbed by grazing or fire.

Similar Alliances:

- *Picea pungens - Populus tremuloides* Forest Alliance (A.423)
- *Picea pungens* Temporarily Flooded Woodland Alliance (A.567)
- *Picea pungens* Woodland Alliance (A.557)

Similar Alliance Comments: The ~*Picea pungens* Forest Alliance (A.165)$$ is distinguished from the similar alliances by the relatively closed tree canopy (>60% cover), and by occurring on upland rather than wetland sites.

ALLIANCE DISTRIBUTION

Range: These forests have been reported from the central and southern Rocky Mountains and higher elevations of the Colorado Plateau in Arizona, Colorado, New Mexico, and Utah. One association possible occurs in Oregon.

Nations: US

Subnations: AZ, CO, NM, OR?, UT, WY

TNC Ecoregions: 9:C, 10:C, 11:C, 20:C, 21:P

USFS Ecoregions: 331J:CC, 341:C, M313A:CC, M313B:C?, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M341:C

Federal Lands: NPS (Curecanti, Florissant Fossil Beds, Grand Teton); USFS (Apache-Sitgreaves?, Cibola?, Gila?, Lincoln?)

ALLIANCE SOURCES

Author(s): D. Sarr

References: Alexander 1981, Alexander et al. 1984a, Alexander et al. 1984b, Baker 1986, Baker 1989b, Burns and Honkala 1990a, DeVelice 1983, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Fitzhugh et al. 1987, Graybosch and Buchanan 1983, Hess 1981, Hess and Alexander 1986, Johnston 1984, Johnston 1987, Kerr and Henderson 1979, Kittel and Lederer 1993, Larson and

Moir 1987, Mauk and Henderson 1984, Moir and Ludwig 1979, Pfister 1972, Roberts et al. 1992, Szaro 1989, USFS 1983b, Wasser and Hess 1982, Youngblood and Mauk 1985

[CEGL000392] *Picea pungens / Juniperus communis* Forest

Translated Name: **Blue Spruce / Common Juniper Forest**
Common Name: **Blue Spruce / Common Juniper**
Ecological System(s):
- Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: These forests occur at middle elevations of 1800 to 3300 m (5900-10,826 feet) in the central and southern Rocky Mountains, usually in moist, concave topographic positions. These communities often occupy sites that are protected from extreme sun and wind, within *Pinus ponderosa* or *Pseudotsuga menziesii* montane forests. These forests are typically most common on north-facing slopes, which can be gentle to steep. These forests are characterized by the dominance of *Picea pungens* in the forest canopy and usually represent a mesic phase of the mixed conifer forests of the southern Rocky Mountains and Colorado Plateau. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Pseudotsuga menziesii, Abies lasiocarpa*, and *Pinus ponderosa*. *Populus tremuloides* is the only widespread hardwood associate. The shrub layer is usually of only moderate cover and dominated by ericaceous or cold-deciduous species, with the latter group increasing with soil moisture or proximity to watercourses. Common species include *Arctostaphylos uva-ursi, Juniperus communis, Mahonia repens*, and *Rubus parviflorus*. Due to favorable soil moisture, the herbaceous layer is usually a diverse mixture of forbs and graminoids, including *Packera cardamine (= Senecio cardamine), Fragaria virginiana, Linnaea borealis, Pseudoroegneria spicata, Erigeron eximius, Thalictrum fendleri, Maianthemum stellatum*, and *Achillea millefolium*. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or woody riparian communities where this vegetation grades into streamside wetlands.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stands defining this association occur in the Snake River Channel or on the valley floor at elevations between 6500 and 6830 feet. In two plots where data are available, the well-drained silty loam and the moderately well-drained silty clay loam soils are covered by litter and duff (60 and 80% cover), wood (20 and 30% cover), moss (5% cover), bare soil (1 to 10% cover), and traces of lichen, fungi, and gravel. One stand has adjacent vegetation of *Artemisia tridentata* shrubland on all sides. Ungulate use is evident in most plots.

Global Environment: These forests occur at middle elevations of 1800 to 3300 m (5900-10,826 feet) in the central and southern Rocky Mountains, usually in moist, concave topographic positions. Precipitation averages 46-60 cm annually, with the majority falling as growing season rainfall. The temperature regime is continental and winters are moderately severe. Soils are variable. In Wyoming they are reported as silty loams and silty clay loams and are usually young and derived from glacial or alluvially deposited materials. The pH is neutral to slightly alkaline. Youngblood and Mauk (1985) suggest a preference by these forests for non-igneous parent materials. These communities often occupy sites that are protected from extreme sun and wind, within *Pinus ponderosa* or *Pseudotsuga menziesii* montane forests. These forests are typically most common on north-facing slopes, which can be gentle to steep. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or woody riparian communities where this vegetation grades into streamside wetlands. One stand in northwestern Wyoming is surrounded by *Artemisia tridentata* on all sides.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Picea pungens* (12 to 60% cover) is the dominant tree canopy species. *P. pungens* occurs in the subcanopy of five of seven stands (trace to 20% cover). Seedlings of *P. pungens, Abies lasiocarpa, Pinus flexilis*, and/or *Populus tremuloides* may occur in trace amounts. The dominant shrub is *Juniperus communis* (3 to 40% cover), occurring in the short or dwarf shrub strata. Other high constancy species include *Shepherdia canadensis* (1 to 10% cover, all plots) and *Mahonia repens* (trace to 3% cover, 5 plots). Graminoids occurring in more than half the stands are *Poa pratensis* (1 to 12% cover) and *Phleum pretense* (trace to 1% cover). The forbs occurring in three of seven stands include *Galium boreale* (3 to 10% cover), *Achillea millefolium* (1 to 3% cover), *Fragaria virginiana* (trace to 3% cover), and *Carduus nutans* (trace to 1% cover).

Global Vegetation: These forests are characterized by the dominance of *Picea pungens* in the forest canopy and usually represent a mesic phase of the mixed conifer forests of the southern Rocky Mountains and Colorado Plateau. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Pseudotsuga menziesii, Abies lasiocarpa*, and *Pinus ponderosa*. *Populus tremuloides, Populus angustifolia*, or *Populus balsamifera* are common hardwood associates. The shrub layer is usually of only moderate cover and dominated by ericaceous or cold-deciduous species, with

the latter group increasing with soil moisture or proximity to watercourses. Common species include *Quercus gambelii, Amelanchier alnifolia, Acer glabrum, Arctostaphylos uva-ursi, Juniperus communis, Mahonia repens, Lonicera involucrata, Shepherdia canadensis*, and *Rubus parviflorus*. Due to favorable soil moisture, the herbaceous layer is usually a diverse mixture of forbs and graminoids, including *Carex siccata (= Carex foenea), Festuca arizonica, Arnica cordifolia, Packera cardamine (= Senecio cardamine), Fragaria virginiana, Linnaea borealis, Maianthemum stellatum, Pseudoroegneria spicata, Erigeron eximius*, and *Achillea millefolium*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea pungens	Tree canopy	Needle-leaved tree	X	X	.
Juniperus communis	Short shrub/sapling	Needle-leaved shrub	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Lonicera involucrata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Carduus nutans	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea pungens	Tree canopy	Needle-leaved tree	X	X	.
Juniperus communis	Shrub/sapling (tall & short)	Needle-leaved tree	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic
Cirsium vulgare	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:

- *Picea pungens / Arctostaphylos uva-ursi* Forest (CEGL000385)--*Juniperus communis* is present in most stands but has less than 5% cover, while *Arctostaphylos uva-ursi* averages >20%.
- *Picea pungens / Mahonia repens* Forest (CEGL000395)--*Arctostaphylos uva-ursi* and *Juniperus communis* are generally not present in this type.
- *Pseudotsuga menziesii / Juniperus communis* Forest (CEGL000439)

Global Related Concepts:

- *Picea pungens / Berberis repens* Community Type (Kerr and Henderson 1979) B
- *Picea pungens / Juniperus communis* Habitat Type (Youngblood and Mauk 1985) =
- *Picea pungens/Juniperus communis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This association is closely aligned with ~*Picea pungens / Arctostaphylos uva-ursi* Forest (CEGL000385)$$ and ~*Picea pungens / Mahonia repens* Forest (CEGL000395)$$. The presence and abundance of *Arctostaphylos uva-ursi* keys to the former, while a lack of *Juniperus communis* and presence of *Mahonia repens* keys to the later. Moir and Ludwig (1979) describe a similar *Picea pungens - Pseudotsuga menziesii* Habitat Type, *Juniperus communis* Phase that has a mature canopy codominated by the two conifer tree species.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Three sampled stands occur in the Spread Creek area, three occur in the Snake River Channel, and one occurs near the Moose post office.

Global Range: This association is known from the Colorado Plateau and southern Rocky Mountains in Wyoming, Utah, Colorado, and may occur in Arizona.
Nations: US
States/Provinces: AZ?, CO, UT:S4S5, WY
TNC Ecoregions: 9:C, 11:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M341:C
Federal Lands: NPS (Florissant Fossil Beds, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C039, GT-03C062
Accuracy Assessment Points: 04K079, 04K078, 04R200, 04R077, 04X055
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kerr and Henderson 1979	.	X	X	X	.	.	.	.	.
Moir and Ludwig 1979	.	X	.	.	.	.	.	.	.
Roberts et al. 1992	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.

[PARK SPECIAL GRTE-076] *Picea pungens / Shepherdia canadensis* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor or in channels on the valley floor at elevations of 6500 to 6800 feet. The limited ground cover data suggest that bare sandy ground with litter and duff, small rocks, and/or mosses is common. Disturbances associated with most stands include ungulate browsing and a moderate amount of weedy species. Adjacent vegetation to three stands includes the *Populus angustifolia-Picea pungens/Shepherdia canadensis* association.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane forested community that occurs on mesic sites. *Picea pungens* dominates both the canopy and subcanopy with up to 30% cover. *Populus angustifolia* occurs in half of the stands with no more than 1% cover. The shrub layer is diverse and fairly well developed in most stands. *Shepherdia canadensis* (1 to 12% cover) and *Juniperus communis* (trace to 7% cover) occur in each stand; *J. communis* is co-dominant with *S. canadensis* in half the stands. *Dasiphora floribunda* occurs in half the stands with trace to 3% cover. The herbaceous layer may be diverse, but is rather sparse in most stands. *Poa pratensis* occurs in all stands with 1 to 20% cover and *Phleum pratense* is the only other species to occur in more than half the stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Picea pungens*
SUBCANOPY	*Picea pungens*
SHORT SHRUB	*Shepherdia canadensis, Juniperus communis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Picea pungens, Populus angustifolia, Dasiphora floribunda, Juniperus communis, Shepherdia canadensis, Phleum pratense, Poa pratensis

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Phleum pratense, Poa compressa, Poa pratensis, Carduus nutans, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: Although four sampled stands contain *Populus angustifolia*, this association differs from the *Populus angustifolia-Picea pungens/Shepherdia canadensis* association because *Populus angustifolia* does not reach co-dominance with *Picea pungens*. This association is also similar to the *Picea pungens/Juniperus communis* association, but they are differentiated because *J. communis* does not reach 10% canopy cover in any of the sampled stands.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near the Moose Post Office, adjacent to Buffalo Fork Channel, in the Snake River Channel, and in the Spread Creek Channel.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:

Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04K079, 04R041, 04R074, 04R099, 04R200, 04X055
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-076
Local Author: Mark Fain
Date: 05 November 2004
Local Editor: Klara Varga
Date: 13 December 2004

Global Author:

REFERENCES: None

A.157 *Pseudotsuga menziesii* Forest Alliance

Douglas-fir Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance includes evergreen forests dominated by *Pseudotsuga menziesii* occurring from Vancouver Island south through the Cascades and Coastal Ranges of northern California, through the Great Basin and Rocky Mountains, to extreme western Texas and northern Mexico. In the Pacific ranges the dominant species is *Pseudotsuga menziesii var. menziesii*, while *Pseudotsuga menziesii var. glauca* is the dominant in forests of the Rocky Mountains, south to Mexico. Currently this alliance includes 49 associations, occurring in 12 states or provinces. Associated species vary with geographic location but can include in the canopy/subcanopy *Arbutus menziesii, Acer circinatum, Acer glabrum, Acer grandidentatum, Amelanchier alnifolia, Quercus arizonica, Quercus gambelii, Quercus hypoleucoides*, and *Quercus rugosa*. Typical shrubs and herbs include *Arctostaphylos patula, Arctostaphylos uva-ursi, Arnica cordifolia, Bromus ciliatus, Calamagrostis rubescens, Carex geyeri, Festuca arizonica, Festuca occidentalis, Gaultheria shallon, Holodiscus discolor, Jamesia americana, Juniperus communis, Juniperus osteosperma, Linnaea borealis, Mahonia aquifolium (= Mahonia piperiana), Mahonia repens, Muhlenbergia montana, Muhlenbergia virescens, Osmorhiza berteroi, Paxistima myrsinites, Physocarpus malvaceus, Purshia tridentata, Spiraea betulifolia, Symphoricarpos albus, Symphoricarpos occidentalis, Symphoricarpos oreophilus, Thalictrum occidentale, Vaccinium caespitosum, Vaccinium membranaceum*, and *Viola adunca*. In western Texas, this alliance is restricted to upper canyons and slopes at high elevations of 1830 to 2440 m (6000-8000 feet) in the mountains of the Trans-Pecos, where important associates include *Pinus ponderosa var. scopulorum, Pinus strobiformis* (Guadalupe Mountains), and *Cupressus arizonica* (Chisos Mountains).
Environment: Forest associations within this alliance occur in two major distributions. The first is along the northwest Pacific slope in low-elevation valleys of western Oregon and Washington, in scattered dry sites of the Olympics and western Cascades, and along the eastern slope of the Oregon and Washington Cascades. The second is in the Rocky Mountains, extending from the Okanogan Highlands and Blue Mountains of eastern Washington and Oregon south and east into the mountains of the Great Basin and into the Rocky Mountains from Montana south into northern Mexico.

The Pacific Northwest region has mild winter temperatures, cool to hot summers, and receives 75-250 cm of annual precipitation in a Mediterranean pattern of winter rain followed by summer drought. The majority of the precipitation falls as rain, but snowfall can be abundant at montane elevations. These forests occur along low- to moderate-elevation (0-1300 m) mountain slopes and valley margins, with an increasing affinity for moist topographic positions away from the coast and southward. They occupy sites where soil drought is induced by site features (shallow soils, sunny aspect) or local rainshadow effects that lessen precipitation. Generally these forests are in drier sites or zones than *Pseudotsuga menziesii - Abies grandis* forests but more moist sites or zones than *Pinus ponderosa - Pseudotsuga menziesii* woodlands. Contiguous vegetation is often *Quercus* spp. woodlands and savannas, chaparral, or annual grasslands at the xeric margin, and closed *Sequoia sempervirens*, or *Tsuga heterophylla* forests at the mesic margin.

In the Rocky Mountains, *Pseudotsuga menziesii* forests occur under a comparatively drier and more continental climate regime, and at higher elevations than in the Pacific Northwest. Elevations range from less than 1000 m in the northern Rocky Mountains to nearly

2900 m in the southern Rockies and plateaus of the southwestern U.S. Lower elevation stands typically occupy protected northern exposures or mesic ravines and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops. Annual precipitation ranges from 50-100 cm with moderate snowfall and a greater proportion falling during the growing season. Monsoonal summer rains contribute a significant proportion of the annual precipitation in Arizona, New Mexico, and Colorado. Adjacent vegetation is typically dominated by *Pinus ponderosa* or *Pinus flexilis* on drier, warmer sites; *Picea* spp. on more moist sites; *Abies concolor* or *Abies lasiocarpa* at higher, cooler sites. Montane grasslands and meadows may also occur in patches within these forests, or on adjacent dry slopes.

Soils are highly variable across the range of this alliance and derived from diverse parent materials. *Pseudotsuga menziesii* forests are reported by most studies (Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984, Lillybridge et al. 1995) to show no particular affinities to geologic substrates. Rock types can include marine sediments in northern California and Oregon, glacial deposits in the Puget Sound, extrusive volcanics in the Cascades and Columbia Basin, and sedimentary rocks in the central and southern Rockies and the Colorado Plateau. The soils are typically slightly acidic (pH 5.0-6.0), well-drained, and well-aerated. They can be derived from moderately deep colluvium or shallow jointed bedrock, and are usually gravelly or rocky.
Vegetation: This alliance includes evergreen forests dominated by *Pseudotsuga menziesii* occurring in mountain ranges of the western U.S., as well as northern Mexico, and western Texas. In the Pacific ranges the dominant species is *Pseudotsuga menziesii var. menziesii*, while *Pseudotsuga menziesii var. glauca* is the dominant in forests of the Rocky Mountains, south to Mexico.

On the eastside of the Cascades and east into the northern and southern Rocky Mountains, these forests are dominated by *Pseudotsuga menziesii* in the canopy and almost always in the tree regeneration layer. *Pinus ponderosa* is an important seral species occurring in many associations, either as older seral remnants or codominating in the canopy. Other trees that can be present to abundant (typically seral) include *Larix occidentalis* in the northern Rockies, *Populus tremuloides*, (in the southern Rockies and south into New Mexico and Arizona), *Pinus strobiformis* (in New Mexico and Arizona), and *Pinus contorta* (throughout much of the alliance's range). Species of *Abies* and *Picea* do not commonly occur in this alliance, but are present in some stands.

Understories in *Pseudotsuga menziesii* forests are varied; many associations have well-developed shrub layers, varying in height from <2 m (typically), up to 5 m. Dominant species in some associations in the northern Rockies include *Acer glabrum, Linnaea borealis, Paxistima myrsinites, Physocarpus malvaceus, Symphoricarpos albus, Symphoricarpos oreophilus, Spiraea betulifolia, Vaccinium caespitosum*, and *Vaccinium membranaceum*. Further south other shrubs become the dominant or diagnostic species, such as *Acer grandidentatum, Amelanchier alnifolia, Arctostaphylos patula, Jamesia americana, Physocarpus monogynus, Quercus arizonica, Quercus gambelii, Quercus rugosa, Quercus X pauciloba*, and *Quercus hypoleucoides*. *Arctostaphylos uva-ursi* and *Mahonia repens* are present to important throughout the range.

The herbaceous layer can be sparse, or if the shrub layer is not abundant, can be relatively species-rich, usually graminoid-dominated. Important or dominant species include the graminoids *Bromus ciliatus, Calamagrostis rubescens, Carex geyeri, Carex rossii, Festuca arizonica, Festuca occidentalis, Bromus ciliatus, Luzula parviflora, Muhlenbergia montana*, and *Muhlenbergia virescens*; and the forbs *Arnica cordifolia, Osmorhiza berteroi, Thalictrum occidentale, Viola adunca*, and species of many other genera, including *Lathyrus, Penstemon, Erigeron, Lupinus, Fragaria, Vicia, Arenaria, Galium*, and others.

In the low elevation forests of western Washington and Oregon (west of the Cascade crest) the canopy is semi-open to closed. *Pseudotsuga menziesii* dominates with little or no *Tsuga heterophylla* or *Thuja plicata*. *Abies grandis* is codominant on some sites, and *Pinus contorta* can also codominate. *Salix scouleriana* and *Arbutus menziesii* are common but subordinate. There is a well-developed understory of deciduous or evergreen shrubs, or graminoids. *Holodiscus discolor, Symphoricarpos albus*, or *Rosa gymnocarpa* are typical dominant species and diagnostic. Other shrubs that may be important include *Gaultheria shallon, Rhododendron macrophyllum, Vaccinium ovatum, Mahonia aquifolium (= Mahonia piperiana), Mahonia nervosa, Corylus cornuta, Symphoricarpos mollis*. In the herbaceus layer *Festuca occidentalis*, and *Melica subulata* are diagnostic species which are often dominant or codominant. *Bromus vulgaris, Festuca subuliflora*, and *Elymus glaucus* are also very common.
Dynamics: Successional relationships in this alliance are complex. *Pseudotsuga menziesii* is less shade-tolerant than many northern or montane trees such as *Tsuga heterophylla, Abies concolor, Picea engelmannii*, or *Thuja plicata*, and seedlings compete poorly in deep shade. At drier locales, seedlings may be favored by moderate shading, such as by a canopy of *Pinus ponderosa*, which helps to minimize drought stress. In some locations, much of these forests have been logged or burned during European settlement, and present-day stands are second-growth forests dating from fire, logging, or other stand replacing disturbances (Mauk and Henderson 1984, Chappell et al. 1997). *Pseudotsuga menziesii* forests were probably subject to a moderate severity fire regime in pre-settlement times, with fire-return intervals of 30-100 years. Many of the important tree species in these forests are fire-adapted (*Populus tremuloides, Pinus ponderosa, Pinus contorta, Larix occidentalis*) (Pfister et al. 1977), and fire-induced reproduction of *Pinus ponderosa* can result in its continued codominance in *Pseudotsuga menziesii* forests (Steele et al. 1981). Seeds of the shrub *Ceanothus velutinus* can remain dormant in forest stands for 200 years (Steele et al. 1981) and germinate abundantly after fire, competitively suppressing conifer seedlings. Some stands may have higher tree-stem density than historically, due largely to fire

suppression. Fire suppression has also lead to the succession of *Pinus ponderosa* woodlands or *Quercus* spp. woodlands to *Pseudotsuga menziesii* forests.

Similar Alliances:

- *Abies grandis* Forest Alliance (A.153)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Picea engelmannii* Forest Alliance (A.164)
- *Pinus ponderosa - Pseudotsuga menziesii* Forest Alliance (A.134)
- *Pinus ponderosa - Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Populus tremuloides - Pseudotsuga menziesii* Forest Alliance (A.426)
- *Pseudotsuga menziesii - Acer macrophyllum* Forest Alliance (A.427)
- *Pseudotsuga menziesii - Arbutus menziesii* Forest Alliance (A.159)
- *Pseudotsuga menziesii - Lithocarpus densiflorus* Forest Alliance (A.106)
- *Pseudotsuga menziesii - Quercus garryana* Woodland Alliance (A.688)
- *Pseudotsuga menziesii - Tsuga heterophylla* Forest Alliance (A.107)
- *Pseudotsuga menziesii* Giant Forest Alliance (A.108)
- *Pseudotsuga menziesii* Temporarily Flooded Woodland Alliance (A.568)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus gambelii* Shrubland Alliance (A.920)

Similar Alliance Comments: Vegetation in the ~*Pseudotsuga menziesii* Forest Alliance (A.157)$$ is distinguished from similar alliances by the closed forest (>60% cover) canopy, occurrence on non-wetland sites, and the dominance (sometimes in the regeneration layer) of *Pseudotsuga menziesii* in non-giant (<50 m in height), forests.

ALLIANCE DISTRIBUTION

Range: This montane and coastal alliance includes evergreen forests dominated by *Pseudotsuga menziesii* occurring from Vancouver Island south through the Cascades and Coast ranges of northern California, through the Rocky Mountains of Montana, Colorado, and Alberta, the Nevada-Utah mountains, the Arizona-New Mexico mountains, to extreme western Texas and northern Mexico.

Nations: CA, MX, US

Subnations: AB, AZ, BC, CA, CO, ID, MT, MXCH, MXSO, NM, OR, TX, UT, WA, WY

TNC Ecoregions: 2:C, 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 15:C, 18:C, 19:C, 20:C, 21:C, 22:C, 24:P, 26:C, 67:P, 68:C, 144:C

USFS Ecoregions: 242A:CC, 263A:CC, 313A:CC, 313B:CC, 313C:CC, 313D:CC, 313E:CC, 315A:??, 321A:CC, 331A:CC, 331D:CC, 331J:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342E:CC, M242A:CC, M242B:CC, M242C:CC, M261A:CC, M261E:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC, M341C:CC

Federal Lands: DOD (White Sands Missile Range); NPS (Capitol Reef, Colorado, Curecanti, Dinosaur, Florissant Fossil Beds, Glacier, Grand Teton, Natural Bridges, Olympic NP, Point Reyes, Rockefeller, Rocky Mountain, Sunset Crater, Walnut Canyon, Yosemite, Zion); PC (Waterton Lakes); USFS (Bighorn, Bridger-Teton, Caribou-Targhee, Colville NF, Gifford Pinchot, Gunnison, Lincoln?, Medicine Bow, Mount Hood, Routt, Shasta-Trinity, Shoshone, White River NF)

ALLIANCE SOURCES

Author(s): M.S. Reid, D. Sarr

References: Agee and Kertis 1987, Agee and Wasem 1987, Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1984b, Alexander et al. 1987, Allard 1990, Atzet and Wheeler 1984, Atzet et al. 1996, Bachrach 1951, Bader 1932, Bassett et al. 1987, Blackhawk Coal Company 1981, Bourgeron et al. 1995, Boyce 1977, Brayshaw 1965, Bunin 1975c, Burns and Honkala 1990a, Chappell 1994, Chappell et al. 1997, Clausnitzer and Zamora 1987, Cole 1982, Collins et al. 1984, Cooper et al. 1987, Daubenmire 1952, Daubenmire and Daubenmire 1968, DeVelice and Lesica 1993, DeVelice et al. 1986, Del Moral and Long 1977, Diamond 1993, Douglas 1971, Dyrness et al. 1974a, Eyre 1980, Fischer and Clayton 1983, Fitzhugh et al. 1987, Fonda and Bernardi 1976, Franklin and Dyrness 1973, Franklin et al. 1988, Freeman and Dick-Peddie 1970, Giese 1975, Graybosch and Buchanan 1983, Green and Klinka 1994, Hall 1973, Hansen et al. 2004c, Hemstrom et al. 1987, Henderson et al. 1989, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Holland 1986b, Horton 1971, Johnson 1985a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Johnston and Hendzel 1985, Keammerer 1974b, Kittel et al. 1999a, Komarkova et al. 1988b, Krajina 1969, Lillybridge et al. 1995, Mauk and Henderson 1984, McLean 1970, Moir and Ludwig 1979, Muldavin 1994, Muldavin et al. 1996, Murphy 1982, Ogilvie 1962, Olson and Gerhart 1982, Oswald 1966, Peet 1981, Pfister et al. 1977, Reed 1976, Roberts 1980, Roberts et al. 1992, Sawyer and Keeler-Wolf 1995, Shepherd 1975, Spies et al. 1990, Steele and Geier-Hayes 1995, Steele et al. 1981, Steele et al. 1983, Stuever and Hayden 1997a, Stuever and Hayden 1997b, Tiedemann and Terwilliger 1978, Tisdale and McLean 1957, Topik 1989, Topik et al. 1986, Topik et al. 1988, Vories 1974, WANHP unpubl. data, Williams and Lillybridge 1983, Williams et al. 1995, Youngblood and Mauk 1985, Zamora 1983

[CEGL000418] *Pseudotsuga menziesii / Acer glabrum* Forest

Translated Name: **Douglas-fir / Rocky Mountain Maple Forest**
Common Name: **Douglas-fir / Rocky Mountain Maple**
Ecological System(s):
- Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. The vegetation is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover). Mature seral tree species such as *Pinus contorta, Pinus flexilis, Pinus ponderosa, Larix occidentalis, Populus angustifolia*, or *Populus tremuloides* may be present to codominant. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia, Cornus sericea, Quercus gambelii, Prunus virginiana, Sorbus scopulina, Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Rosa* spp., *Ribes cereum, Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes of any aspect with gradients between 37% and 70%. The elevations of the stands range from 2118 to 2290 m (6948-7511 feet). The parent material of the soils is colluvium derived from limestone and loess. Soils are well-drained clay loams to sandy loams. The unvegetated ground surface consists of up to 70% litter and duff, 30% wood, 10% gravel and 10% cobble. One plot has 30% ground cover of mosses and liverworts. Of the stands located in Grand Teton National Park, one is surrounded by similar vegetation with a lower density of *Acer glabrum* and the other has surrounding vegetation dominated by *Prunus virginiana*.
Global Environment: This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. Parent materials include loess, basalt, diorite, dolomite, limestone, granite, quartz monzonite or sandstone. Ground surface has high cover of litter 3-7 cm deep, sometimes with significant cover of rock, and low cover of bare soil.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest that occurs on subxeric sites. *Pseudotsuga menziesii* is the dominant tree canopy species. *Pseudotsuga menziesii* that make up the overstory canopy contribute 40% cover. *Pseudotsuga menziesii* seedlings and saplings make up 1% canopy cover for each stand. The shrub layer is dominated by *Acer glabrum*, contributing 10-40% canopy cover. *Amelanchier alnifolia* codominates in some plots with 3-40% canopy cover. Other common shrubs include *Paxistima myrsinites* (1-20% canopy cover) and *Lonicera utahensis* (1-10% canopy cover). The herbaceous layer is very diverse, but no species dominates throughout the association. In one plot *Carex geyeri* comprises 40% of the canopy cover, and in a different plot *Eurybia conspicua* comprises 30% of the canopy cover.
Global Vegetation: This minor Rocky Mountain conifer association is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover). Mature seral tree species like *Pinus contorta, Pinus flexilis, Pinus ponderosa, Larix occidentalis, Populus angustifolia*, or *Populus tremuloides* may be present to codominant. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia, Cornus sericea, Quercus gambelii, Prunus virginiana, Sorbus scopulina, Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Rosa* spp., *Ribes cereum, Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant. Species may include *Moehringia macrophylla (= Arenaria macrophylla), Arnica cordifolia, Calamagrostis rubescens, Carex geyeri, Cystopteris fragilis, Elymus glaucus, Eurybia conspicua, Fragaria vesca, Galium triflorum, Mitella stauropetala, Osmorhiza berteroi (=*

Osmorhiza chilensis), Penstemon wilcoxii, Poa nervosa, Maianthemum racemosum ssp. amplexicaule, Thalictrum fendleri, or *Thalictrum occidentale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Lonicera utahensis	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Tall shrub/sapling	Broad-leaved evergreen shrub	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	X
Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous tree	X	X	X
Arnica cordifolia	Herb (field)	Forb	.	X	.
Maianthemum racemosum	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Thalictrum fendleri	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies concolor - Pseudotsuga menziesii / Acer glabrum* Forest (CEGL000240)
- *Abies lasiocarpa - Picea engelmannii / Acer glabrum* Forest (CEGL000294)
- *Picea engelmannii / Acer glabrum* Forest (CEGL000354)
- *Populus tremuloides / Acer glabrum* Forest (CEGL000563)

Global Related Concepts:

- *Pseudotsuga menziesii / Acer glabrum / Physocarpus malvaceus* plant association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii / Acer glabrum* Habitat Type (Mauk and Henderson 1984) B
- *Pseudotsuga menziesii / Acer glabrum* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii / Acer glabrum* Habitat Type (Henderson et al. 1976) =
- *Pseudotsuga menziesii / Acer glabrum* Habitat Type, *Pachistima myrsinites* Phase (Steele et al. 1983) B
- *Pseudotsuga menziesii / Acer glabrum* plant association (Johnston 1987) =
- *Pseudotsuga menziesii/Acer glabrum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description well.

Global Classification Comments: All phases of the *Pseudotsuga menziesii / Acer glabrum* Habitat Type are included in the concept of this association (Steele et al. 1981, 1983, Mauk and Henderson 1984).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Inside Grand Teton National Park this association occurs south of Elk Ridge and west of Phelps Lake. In Bridger-Teton National Forest this association occurs on the west side of Shadow Mountain.

Global Range: This forest association occurs in the montane zone in the southern, central and northern Rocky Mountains from northern Colorado, through Utah, Wyoming, and Idaho, extending into Oregon and Alberta, and possibly Montana.

Nations: CA, US
States/Provinces: AB, CO:S1, ID:S3, MT?, OR:S2, UT:S4?, WY:S3?
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 19:C, 20:C
TNC Ecoregion Comments: ECO19 & 341B added for CARE (mjr 3-05). ECO7, ECO8, ECO9 added (MSR 4-04).
USFS Ecoregions: 341B:CC, 342B:CC, 342E:CC, M331A:CC, M331D:CC, M331H:CP, M331I:CC, M332A:CC, M332B:CP, M332C:CP, M332D:CP, M332E:CP, M332F:CC, M332G:CC, M333:P
Federal Lands: NPS (Capitol Reef, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Bridger-Teton, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B055, GT-03C065
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407037

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Henderson et al. 1976	.	X	X	.	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000420] *Pseudotsuga menziesii / Amelanchier alnifolia* Forest

Translated Name: **Douglas-fir / Saskatoon Serviceberry Forest**
Common Name: **Douglas-fir / Serviceberry Forest**
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): P. Lesica and S.V. Cooper

ELEMENT CONCEPT

Global Summary: This association was originally described from 5 stands in the Bear's Paw Mountains of Montana with *Pinus ponderosa* dominant (38%) but *Pseudotsuga menziesii* consistently present with only 5% cover (i.e., potential natural vegetation rather than existing). The one stand sampled in Grand Teton National Park has no ponderosa pine but is dominated by *Pseudotsuga menziesii* (20%). See Classification Comments.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The one stand sampled for this association occurs on a southwest-facing slope with a gradient of 74%. The elevation for this stand is 2251 m (7384 feet). The well-drained loam soil is covered by litter and duff (70% cover), gravel (20% cover), rocks greater than 10 cm (10% cover), bare soil (5% cover), and a trace of wood. Adjacent vegetation includes ~*Pinus contorta / Vaccinium scoparium* Forest (CEGL000172)$$ downslope.
Global Environment: This community occurs on moderate to sleep, northeastern to northwestern slopes at 4000-5000 feet (Roberts 1980). Mean annual precipitation is about 40-50 cm (Soil Conservation Service 1981b). Soils are gravelly loams and sandy loams with a slightly acidic reaction. Mean duff depth is 7 cm. Parent material is primarily granitic (Roberts 1980).

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane Douglas-fir forest that occurs on subxeric sites. *Pseudotsuga menziesii* (20% cover) is the dominant tree canopy species. *Pinus albicaulis* or *Pinus flexilis* is present with up to 3% cover. The field crew was unable to determine which of the two species is present due to a lack of cones. The shrub layer is dominated by *Amelanchier alnifolia* (30% cover). *Prunus virginiana* and *Ceanothus velutinus* are both present with 3% cover each. The only abundant graminoid is *Carex geyeri* (40% cover). Forbs are diverse, but most are present in only trace amounts. The most common forbs include *Eucephalus engelmannii* (10% cover), *Helianthella uniflora* (3% cover), and *Symphyotrichum ascendens* (3% cover).

Global Vegetation: In Montana, *Pseudotsuga menziesii* is the indicated climax dominant; however, it is not abundant in most stands (mean canopy cover of 5%). *Pinus ponderosa* is the canopy dominant (38%). Dominant understory shrubs include *Amelanchier alnifolia* (15%), *Prunus virginiana* (15%), *Spiraea betulifolia* (15%), and *Symphoricarpos occidentalis* (10%). Graminoids are rare; *Pseudoroegneria spicata* (1%) and *Agrostis scabra* (1%) are the only constant species. Common forbs include *Eurybia conspicua (= Aster conspicuus)* (5%), *Fragaria virginiana* (2%), and *Maianthemum racemosum* (3%) (Roberts 1980). In Wyoming, *Pseudotsuga menziesii* forms an open canopy with 20% cover, *Amelanchier alnifolia* has 30% cover, and *Carex geyeri* forms a lush undergrowth with 40% cover.

Global Dynamics: Mean fire interval in the moist *Pseudotsuga menziesii* habitat types was about 40 years. Long fire-free intervals resulted in high fuel loads and eventually a stand-replacing fire. Less severe fires resulted in more park-like stands (Fischer and Clayton 1983). Fire suppression is undoubtedly increasing the proportion of stands with high stocking of *Pseudotsuga menziesii* and high fuel loads and decreasing the proportion of more park-like stands dominated by pine.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Symphyotrichum ascendens	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2Q (6-Jul-2005). Need to review the classification of this type. This is a unique, highly restricted association that has been described as occurring only within the central core of the Bear's Paw Mountains (wholly within the Rocky Boys Indian Reservation), a range of central Montana set within the sea of surrounding Great Plains; it is further restricted as a topographic climax to steep slopes with northerly aspects and elevations ranging from 1220 to 15425 m (4000-5000 feet). These sites represent a unique combination of climate and floristics within a geographically circumscribed area. It is possible that seral stages of other climax associations may pass through a seral stage that compositionally overlaps with ~*Pseudotsuga menziesii / Amelanchier alnifolia* Forest (CEGL000420)$$, but their site parameters would differ. Potential threats to this type include logging, firewood cutting, wildfire and ungulate browsing (*Amelanchier alnifolia* is a highly preferred browse species). Fire on these slopes is followed by bunchgrass- and then tall shrub-dominated structural/seral stages, with more than 80 years post-fire required for attaining the current forest structure.

RELATED CONCEPTS

Global Similar Associations:

- *Pinus ponderosa / Amelanchier alnifolia* Woodland (CEGL000840)--also occurs in the Bear's Paw Mountains (Roberts 1980) and has similar understory vegetation, but occurs on sites that are too dry to support *Pseudotsuga menziesii*.
- *Pinus ponderosa / Prunus virginiana* Forest (CEGL000192)--has similar understory vegetation, but occurs on sites that are too dry to support *Pseudotsuga menziesii*. More widespread than ~*Pinus ponderosa / Amelanchier alnifolia* Forest (CEGL000420)$$ (Pfister et al. 1977).
- *Pseudotsuga menziesii / Symphoricarpos albus* Forest (CEGL000459)--The *Symphoricarpos albus* phase of the common *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type of Pfister et al. (1977) has a similar overstory, but *Mahonia repens*

and *Arctostaphylos uva-ursi* are common in that type but are rare in the Bear's Paw Mountains (Roberts 1980). Furthermore, that type has *Symphoricarpos albus* rather than *Symphoricarpos occidentalis*.
- *Pseudotsuga menziesii / Symphoricarpos occidentalis* Forest (CEGL000461)--(of the Bear's Paw and Little Rocky Mountains) occurs on drier sites and has a more grassland-like ground layer (Roberts 1980).

Global Related Concepts:
- *Pseudotsuga menziesii / Amelanchier alnifolia* Habitat Type (Roberts 1980) =
- *Pseudotsuga menziesii/Amelanchier alnifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: Roberts' (1980) 5 stands are dominated by *Pinus ponderosa* (average cover 38%), with a constant presence of *Pseudotsuga menziesii*, but average cover is 5%. The Grand Teton plot has no ponderosa pine. To better fit with the NatureServe concept of plant associations as existing vegetation, I suggest we place the Roberts type in ~*Pinus ponderosa / Amelanchier alnifolia* Woodland (CEGL000840)$$, but that leaves just one plot holding the *Pseudotsuga menziesii / Amelanchier alnifolia* type.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This stand is located in the John D. Rockefeller, Jr. Memorial Parkway southeast of Grassy Lake Reservoir.
Global Range: This association is known from just north of Grand Teton National Park and from the Bear's Paw Mountains of the Montana Isolated Mountain Ranges Subsection of the Northwestern Glaciated Plains Section (Roberts 1980). It occurs in the central portion of the range where conditions are sufficiently moist to support the *Pseudotsuga menziesii* Series.
Nations: US
States/Provinces: CO, MT:S2, WY
TNC Ecoregions: 9:C, 26:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331D:CC, M331D:CC, M331E:CC
Federal Lands: NPS (Dinosaur, Grand Teton?, Rockefeller)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The one stand defining this association does not occur in Grand Teton National Park. The field crew was unable to determine which *Pinus* species was present due to the lack of cones. *Pinus albicaulis* was written in the data sheets, but the crew thought that the trees might actually be *Pinus flexilis*.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B103
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): P. Lesica and S.V. Cooper, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Fischer and Clayton 1983	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	.	.	X	.	.	.	.	.
Roberts 1980	.	X	X	X	X	.	.	.	.
Soil Conservation Service 1981b	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000430] *Pseudotsuga menziesii / Carex geyeri* Forest

Translated Name: **Douglas-fir / Geyer's Sedge Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association has been found in the montane zone of the Rocky Mountains of Colorado, Idaho, Montana, Oregon and Washington. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Site slope and aspect vary greatly. Slopes where this association is found in Colorado are reported to be steep to very steep (45-80%). Parent materials include granitics, conglomerates, sandstones, basalts, and shales. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep. Vegetation is characterized by the dominance of *Pseudotsuga menziesii*, with a relatively closed canopy, as well as stands that are more open or have a mixed conifer tree canopy. *Pseudotsuga* is self-regenerating in this association. Several other conifers may be present to codominant, including *Pinus ponderosa* or *Juniperus scopulorum* in southern Rocky Mountain stands, and *Abies lasiocarpa, Pinus albicaulis, Pinus contorta*, or *Populus tremuloides* in stands farther north. These species are typically present only in early-seral stands of this association. There is no shrub layer, although several shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved cold-deciduous *Amelanchier alnifolia, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Purshia tridentata, Spiraea betulifolia, Vaccinium membranaceum, Vaccinium scoparium*, and *Symphoricarpos occidentalis* or *Symphoricarpos oreophilus*. The herbaceous layer is dominated by the perennial sedge *Carex geyeri* (averaging 35% cover). No other herbaceous species are well-represented, but many different forbs can occur in low amounts.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on west- or south-facing slopes of varying gradients (3 to 55%). The elevations for these stands range from 6981 to 7853 feet. Soil data are available for two stands; the soils are well-drained sandy loams. Unvegetated and nonvascular ground cover varies between the two stands. Both stands are comprised primarily of litter and duff (50 and 80% cover), wood (10 and 20% cover), and bare soil (5% cover). One stand has ground cover including 10% gravel, 5% bedrock, 5% mosses, and traces of lichen and rocks greater than 10cm. One stand that was previously burned has approximately 25% bare soil and large amounts of downed woody debris. Adjacent vegetation includes mixed coniferous forests and/or *Abies lasiocarpa* forests.

Global Environment: This association has been found throughout much of the Rocky Mountains. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Elevations range from 1860-2315 m (6100-7600 feet) in southern Montana, 2315-2800 m (7600-9200 feet) in central Colorado, and from 1125-2650 m (3700-8700 feet) in Idaho. Site slope and aspect vary greatly. Slopes where this association is found in Colorado are reported to be steep to very steep (26-80%), with other stands occurring on gentle slopes. Parent materials include granitics, conglomerates, sandstones, basalts, and shales. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep with 20-50% cover.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a mixed coniferous forest occurring on subxeric sites. Tree canopy or subcanopy species occurring in all stands include *Pseudotsuga menziesii* (7 to 30% cover) and *Abies lasiocarpa* (3 to 10% cover). *Pinus contorta* (1 to 10% cover) occurs in three of four stands. *Pinus contorta, Picea engelmannii, Pseudotsuga menziesii*, or *Abies lasiocarpa* seedlings may be present. While no shrub species contributes more than 3% canopy cover, there are eight species that occur in at least half the stands; these are *Lonicera utahensis, Amelanchier alnifolia, Spiraea betulifolia, Symphoricarpos oreophilus, Vaccinium membranaceum, Paxistima myrsinites, Vaccinium scoparium*, and *Mahonia repens.* The dominant herbaceous species is *Carex geyeri* (7 to 50% cover). No other graminoid occurs in more than one stand. *Antennaria racemosa* (1 and 10% cover) is the only forb to occur in more than one stand.

Global Vegetation: This association includes stands dominated by the evergreen needle-leaved tree *Pseudotsuga menziesii*, with a relatively closed canopy, as well as stands that are more open or have a mixed conifer tree canopy. *Pseudotsuga* is self-regenerating in the association. Several other conifers may be present to codominant, including *Pinus ponderosa* or *Juniperus scopulorum* in southern Rocky Mountain stands, and *Abies lasiocarpa, Pinus albicaulis, Pinus contorta*, or *Populus tremuloides* in stands farther north. *Pinus contorta* or *Populus tremuloides* are typically present only in early-seral stands of this association (Steele et al. 1981). In some Idaho stands, the canopy is reported to be more open, with larger, more widely spaced trees in late-seral stands. There is no distinct shrub layer, although several shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved cold-deciduous *Amelanchier alnifolia, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Purshia tridentata, Spiraea betulifolia, Vaccinium membranaceum, Vaccinium scoparium*, and *Symphoricarpos occidentalis* or *Symphoricarpos oreophilus*. The herbaceous layer is dominated by the perennial sedge *Carex geyeri* (averaging 35% cover). No other herbaceous species are well-represented, but many different forbs can occur in low amounts, including *Arnica cordifolia, Antennaria racemosa, Achillea millefolium var. occidentalis (= Achillea lanulosa), Fragaria* spp., *Osmorhiza* spp., and *Astragalus* spp. Other graminoids can include various species of *Poa, Elymus glaucus*, and *Carex siccata (= Carex foenea).*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Antennaria racemosa	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Phleum pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304)
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)

Global Related Concepts:

- *Abies lasiocarpa / Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Steele et al. 1981) B
- *Abies lasiocarpa / Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa / Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Steele et al. 1983) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Williams and Smith 1990) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Topik et al. 1988) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Hess 1981) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Komarkova et al. 1988a) B
- *Pseudotsuga menziesii / Carex geyeri* Habitat Type (Hess and Alexander 1986) B
- *Pseudotsuga menziesii / Carex geyeri* Plant Association (Johnston 1987) B
- *Pseudotsuga menziesii/Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

Grand Teton National Park Other Comments:

Global Classification Comments: Some stands had an open tree canopy (40% cover) that could be classified as a woodland, but were included in this forest association until review of this association is completed rangewide. Stands included in this association from Colorado may be different from stands in the northwestern United States and northern Rocky Mountains and need to be re-analyzed.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs east of Spalding Bay, one occurs on Steamboat Mountain, one occurs north of Warm Springs, and one occurs north of Leeks Marina.

Global Range: This association has been found in the montane zone of the Rocky Mountains of Colorado, Idaho, Montana, Oregon and Washington.
Nations: US
States/Provinces: CO:S3, ID:S4?, MT:S4, OR:S3, WA:S1, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO7, ECO8, ECO9 added (MSR 4-04).
USFS Ecoregions: 342C:CC, M331A:CC, M331D:CC, M331H:C?, M331I:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Curecanti, Glacier, Grand Teton, Rocky Mountain?); USFS (Arapaho-Roosevelt, Gunnison, Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C100, GT-03B037
Accuracy Assessment Points: 04J129, 04J213
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Boyce 1977	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Clausnitzer and Zamora 1987	.	X	.	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Giese 1975	.	X	.	X	.	.	.	.	.
Hess 1981	.	X	X	X	.	.	.	.	.
Hess and Alexander 1986	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Komarkova et al. 1988a	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	.	.	.	.	.	.
Topik et al. 1988	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Smith 1990	.	X	X	X	.	.	.	.	.

[PARK SPECIAL GRTE-006] *Pseudotsuga menziesii / Thalictrum occidentale* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The two stands sampled for this association occur on slopes of 7% and 60% with southeast-facing aspects. The elevations for these stands are 8110 feet and 8480 feet. The Katpa soils in one stand are derived from colluvium from loess and limestone and the other stand has loam soils with 20% gravel. *Abies lasiocarpa* broken off by windthrow at about fifteen feet is fairly common in one stand.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane mixed coniferous forest occurring on mesic sites. *Pseudotsuga menziesii* is the dominant tree canopy species (20% and 40% cover). *Abies lasiocarpa* (10% and 20% cover) and *Picea engelmannii* (1 stand, 3% cover) also occur in the tree canopy. The subcanopy may include *P. engelmannii* (1 stand, 10% cover). Seedlings of *A. lasiocarpa* occur in one stand. The shrub layer is not well developed. The only shrub that occurs in both stands is *Paxistima myrsinites* (1% cover). Well represented or common shrubs include *Sorbus scopulina* (1 stand, 10% cover) and *Lonicera utahensis* (1 stand, 3% cover). The herbaceous layer is diverse with forbs dominating over graminoids. *Calamagrostis rubescens* (1% and 10% cover) and *Bromus* spp. (1% and 3% cover) are the only graminoids to occur in both stands. Forbs that occur in both stands include *Eucephalus engelmannii* (10% and 20% cover), *Thalictrum occidentale* (1% and 20% cover), *Arnica cordifolia* (10% cover), *Geranium viscosissimum* (1% and 10% cover), *Chamerion angustifolium* (1% and 3% cover), *Osmorhiza berteroi* (1% and 3% cover), *Helianthella uniflora* (1% cover), and *Orthilia secunda* (1% cover).

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Pseudotsuga menziesii*
FORB	*Eucephalus engelmannii, Thalictrum occidentale, Arnica cordifolia*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Abies lasiocarpa, Pseudotsuga menziesii, Paxistima myrsinites, Bromus spp., *Calamagrostis rubescens, Arnica cordifolia, Chamerion angustifolium, Eucephalus engelmannii, Helianthella uniflora, Geranium viscosissimum, Orthilia secunda, Osmorhiza berteroi, Thalictrum occidentale*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The stand that lies within the park boundary occurs on Rendezvous Mountain and the stand that is in Jedediah Smith Wilderness occurs near Darby Creek.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202057
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-048

GRAND TETON NATIONAL PARK Inventory Notes: One of the two stands describing this association in not within the park boundaries.

Classification Confidence: **Identifier:** New-GRTE-006
Local Author: Mark Fain
Date: 06 April 2004
Local Editor: Klara Varga
Date: 20 April 2004

Global Author:

REFERENCES: None

[CEGL000445] *Pseudotsuga menziesii / Osmorhiza berteroi* Forest

Translated Name: **Douglas-fir / Mountain Sweet-cicely Forest**
Common Name: **Douglas-fir / Mountain Sweet-cicley**
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Steele et al. (1981)

ELEMENT CONCEPT

Global Summary: This association is known from northern Utah; southern, eastern, and central Idaho; and western Wyoming. It occurs between 1650 and 2377 m (5400-7800 feet) in elevation, on moderate to steep lower to middle slopes on northern, northeasterly and eastern aspects, generally in protected locations. Soils are often gravelly silty clay loams to sandy loams, often from sedimentary colluvial parent materials. Usually *Pseudotsuga menziesii* is the only conifer present; however, *Populus tremuloides, Acer grandidentatum*, and sometimes *Pinus contorta, Pinus flexilis* or *Abies lasiocarpa* may be present and even abundant. The undergrowth is diverse, with shrubs influenced by adjacent montane shrub communities, with species spilling into this type, but not abundant enough to form a distinct layer. Shrub species present include *Prunus virginiana, Symphoricarpos oreophilus, Shepherdia canadensis, Mahonia repens*, and *Amelanchier alnifolia*. *Osmorhiza berteroi* and sometimes *Osmorhiza depauperata* dominates the forb layer. Other herbaceous species include *Maianthemum racemosum (= Smilacina racemosa), Viola nuttallii, Helianthella uniflora, Calamagrostis rubescens*, and *Elymus glaucus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The two stands defining this association occur on shallow to moderate slopes (9% and 23%) facing east. The elevations for these stands are 2146 and 2261 m (7040 and 7419 feet). Unvegetated and nonvascular ground cover consists primarily of litter and duff (70% and 80% cover), wood (10% and 20% cover), and basal vegetation (3% and 10% cover). Traces of mosses, bare soil, and gravel may occur. There are no data for soil or adjacent vegetation available.
Global Environment: This association is known from northern Utah; southern, eastern, and central Idaho; and western Wyoming. It occurs between 1650 and 2377 m (5400-7800 feet) in elevation, on moderate to steep lower to middle slopes on northern,

northeasterly and eastern aspects, generally in protected locations. Soils are often gravelly silty clay loams to sandy loams, often from sedimentary colluvial parent materials, but occasionally on limestone, schist-gneiss, or calcareous substrates.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane Douglas-fir forest that occurs on subxeric sites. *Pseudotsuga menziesii* (40% cover) is the dominant tree canopy species with *Populus tremuloides* (1% and 3% cover) also present in both stands. *Pseudotsuga menziesii* occurs in the subcanopy of one stand. Seedlings of *Populus tremuloides* and *Pinus flexilis* are present in one stand. The shrub layer is not well-developed, but *Symphoricarpos oreophilus* (1% and 3% cover), *Amelanchier alnifolia* (1% cover), and *Shepherdia canadensis* (1% cover) occur in both stands. The herbaceous layer is also poorly developed. *Osmorhiza berteroi* (3% and 10% cover) is the dominant species. Other high-constancy species include *Helianthella uniflora* (1% and 3% cover), *Calamagrostis rubescens* (1% and 3% cover), and *Elymus glaucus* (1% and 3% cover).
Global Vegetation: Usually *Pseudotsuga menziesii* is the only conifer present. *Populus tremuloides*, *Acer grandidentatum*, and sometimes *Pinus contorta*, *Pinus flexilis* or *Abies lasiocarpa* may be present and even abundant. The undergrowth is diverse; the shrub layer is generally influenced by adjacent montane shrub communities, with species spilling into this type but not really a part of the community. Shrub species present include *Prunus virginiana*, *Symphoricarpos oreophilus*, *Shepherdia canadensis*, *Mahonia repens*, and *Amelanchier alnifolia*. *Osmorhiza berteroi* and sometimes *Osmorhiza depauperata* dominate the forb layer. Other herbaceous species include *Maianthemum racemosum (= Smilacina racemosa)*, *Viola nuttallii*, *Helianthella uniflora*, *Calamagrostis rubescens*, and *Elymus glaucus*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	.	X	.
Amelanchier alnifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	.	X	.
Amelanchier alnifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Pseudotsuga menziesii / Osmorhiza chilensis* Habitat Type (Mauk and Henderson 1984) =
- *Pseudotsuga menziesii / Osmorhiza chilensis* Habitat Type (Steele et al. 1981) =
- *Pseudotsuga menziesii / Osmorhiza chilensis* Habitat Type (Steele et al. 1983) =
- *Pseudotsuga menziesii/Osmorhiza chilensis* (Bourgeron and Engelking 1994) = DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This description fits the Steele et al. (1983) *Pseudotsuga menziesii / Osmorhiza chilensis* description extremely well, although there is no mention that this habitat type occurs in Wyoming.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Both stands defining this association occur in Bridger-Teton National Forest. One stand occurs southeast of Davis Hill and one stand occurs southeast of Teton Science School.
Global Range: This association is known from northern Utah, southern, central and eastern Idaho, and western Wyoming.
Nations: US
States/Provinces: ID:S3, UT:S4S5, WY:S2S3
TNC Ecoregions: 6:C, 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (GK 1-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: This association is defined by two stands that do not occur in Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507046, BT-9902108

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Steele et al. 1981*	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL000457] *Pseudotsuga menziesii / Spiraea betulifolia* Forest

Translated Name: **Douglas-fir / Shinyleaf Meadowsweet Forest**
Common Name: **Douglas-fir / Shinyleaf Spiraea Forest**
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This montane to lower subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, to eastern Oregon, Idaho and western Montana, and extending into Canada. Elevations range from 1010to 2470 m (3300-8100 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various. Soils tend to be coarser-textured, gravelly loam or sandy loam. Tree litter, often 4-6 cm deep, dominates the ground cover. Vegetation is characterized by an overstory tree canopy dominated by *Pseudotsuga menziesii* with *Spiraea betulifolia* prominent in the understory. *Pinus ponderosa* may be codominant in the overstory tree canopy, and *Pinus contorta* or *Populus tremuloides* may be present in the subcanopy. *Spiraea betulifolia* is a major component in the short-shrub layer with *Amelanchier alnifolia, Mahonia repens*, or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum, Lonicera utahensis, Prunus virginiana, Salix scouleriana, Shepherdia canadensis, Sorbus scopulina, Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The

sparse to moderately dense herbaceous layer may be dominated by graminoids *Calamagrostis rubescens, Carex geyeri, Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on slopes of any aspect varying from 15-63%. The elevations of these stands range from 2138 to 2357 m (7014-7732 feet). The well-drained soils can be either loam, silt loam, or clay loam. Unvegetated and nonvascular ground cover primarily consists of litter and duff (50-80%) and wood (5-50%) with smaller amounts of gravel, cobble, or bare soil. One plot is unique due to its 60% basal vegetation ground cover. This association is generally surrounded by similar forest types.

Global Environment: This montane to lower subalpine forest association is known from the central and northern Rocky Mountains. Elevations range from 1000 to 2500 m (3300-8100 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various, typically comprised of colluvium or residuum derived from andesite, basalt, granites, gneiss, quartzite, schist phyllite, or limestone. Soils tend to be coarser-textured, gravelly loam or sandy loam. Tree litter, often 4-6 cm deep, dominates ground cover.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a mixed coniferous forest that occurs on subxeric to mesic sites. *Pseudotsuga menziesii* is the dominant tree canopy species contributing 10-80% cover. The short-shrub layer is dominated by *Spiraea betulifolia*, which contributes 3-30% canopy cover in all but one plot where it contributes 3% canopy cover to the dwarf-shrub layer. Other common or high-constancy shrub species include *Symphoricarpos oreophilus, Mahonia repens, Paxistima myrsinites*, and *Amelanchier alnifolia*. The herbaceous layer is very diverse with no species consistently dominating. *Calamagrostis rubescens* is the most common graminoid, contributing 1-30% canopy cover in six of the nine stands. The most common forb is *Arnica cordifolia*, which contributes 1-20% canopy cover in six of the nine stands. Other common forbs include *Eurybia conspicua* and *Fragaria vesca*.

Global Vegetation: This forest association is characterized by an overstory tree canopy dominated by *Pseudotsuga menziesii* with *Spiraea betulifolia* prominent in the understory. *Pinus ponderosa* may be codominant in the overstory tree canopy, and *Pinus contorta* or *Populus tremuloides* may be present in the subcanopy. *Spiraea betulifolia* is a major component in the short-shrub layer with *Amelanchier alnifolia, Mahonia repens*, or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum, Lonicera utahensis, Prunus virginiana, Salix scouleriana, Shepherdia canadensis, Sorbus scopulina, Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is typically dominated by graminoids *Calamagrostis rubescens, Carex geyeri, Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs. The most common species are *Arnica cordifolia, Astragalus miser, Balsamorhiza sagittata, Eurybia conspicua, Fragaria virginiana, Fragaria vesca, Goodyera oblongifolia, Maianthemum racemosum, Osmorhiza berteroi (= Osmorhiza chilensis), Orthilia secunda (= Pyrola secunda)*, and *Thalictrum occidentale*.

Global Dynamics: Occurrences are typically mid-seral stands initiated by fire. The understory composition and the common presence of burned stumps and charcoal reflect the disturbance history of this type.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Chenopodium album	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Pinus contorta / Spiraea betulifolia* Forest (CEGL000164)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)--distinguished by having a less abundant shrub component, but otherwise is very similar.
- *Pseudotsuga menziesii / Symphoricarpos albus* Forest (CEGL000459)

Global Related Concepts:
- *Abies lasiocarpa / Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Youngblood and Mueggler 1981) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii / Spiraea betulifolia* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii / Spiraea betulifolia* Plant Association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii/Spiraea betulifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description extremely well.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association is spread throughout the park. There are four stands on the western slope of Shadow Mountain, two south of Elk Ranch Reservoir, two on the northeast slope of Owl Peak, and one on the southwest slope of Albright Peak.
Global Range: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, to eastern Oregon, Idaho and western Montana, and extending into Canada.
Nations: CA, US
States/Provinces: AB, ID:S3S4, MT:S4, OR:S4, WY:S2S3
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7, ECO8, ECO9 added and ECO6 changed from ? to C (MSR 4-04).
USFS Ecoregions: 342C:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Bighorn, Bridger-Teton, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B032, GT-03B015, GT-0202069, GT-03B059, GT-03B057
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407110, BT-9507008, BT-9407109, BT-9407020

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Horton 1971	.	X	.	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.

Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Oswald 1966	.	X	.	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000459] *Pseudotsuga menziesii / Symphoricarpos albus* Forest

Translated Name: **Douglas-fir / Common Snowberry Forest**
Common Name: **Douglas-fir / Snowberry Forest**
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This widespread forest association occurs in the central and northern Rocky Mountains from the mid montane zone down to upper foothill zone on cool aspects. Sites are warm and relatively dry to moist, gentle to steep, mid to lower slopes, benches, and terraces. Stands are found on southerly or easterly aspects throughout much of its range, but may occur on any aspect. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silt derived from alluvium, glacial till and outwash. Ground surface has high cover of litter, sometimes significant cover of rock, and low cover of bare soil. The vegetation is characterized by a moderately dense to dense (40-90% cover) evergreen needle-leaved tree canopy, dominated or codominated by *Pseudotsuga menziesii* with the short shrub *Symphoricarpos albus* dominating or codominating the understory. Mature *Pinus ponderosa* often codominates the tree canopy, but does not regenerate. Other mature seral tree species present to codominant may include *Pinus contorta, Pinus flexilis, Larix occidentalis, Juniperus* spp., or *Populus tremuloides*. Understory trees are almost exclusively *Pseudotsuga menziesii*. The short-shrub layer is dominated or codominated by the rhizomatous *Symphoricarpos albus* and other short shrubs such as *Juniperus communis, Mahonia repens, Paxistima myrsinites, Ribes cereum, Rosa* spp., *Spiraea betulifolia*, and *Symphoricarpos oreophilus*. Scattered tall shrubs such as *Amelanchier alnifolia, Prunus virginiana*, or *Sorbus scopulina* may form an open tall-shrub layer. A low cover to moderately dense herbaceous layer is present and is composed of diverse forbs with the graminoids *Calamagrostis rubescens, Carex geyeri, Festuca idahoensis* or *Pseudoroegneria spicata* present to codominant.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The one stand sampled for this association occurs on a shallow west-facing slope. The elevation for this stand is 2018 m (6621 feet). The soil is a well-drained silty clay. Litter and duff (70% cover), wood (30% cover), and traces of moss compose the ground cover for this stand.
Global Environment: This widespread forest association occurs in the central and northern Rocky Mountains from the mid montane zone down to upper foothill zone on cool aspects. Elevations range 820-2260 m (2700-7400 feet) in the central and northern Rocky Mountains and down to 680-1700 m (2230-5575 feet) in eastern Oregon and Washington. Sites are warm and relatively dry to moist, gentle to steep, mid to lower slopes, benches, and terraces. Stands are found on southerly or easterly aspects throughout much of its range, but may occur on any aspect. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silty clay derived from alluvium, glacial till and outwash. Parent materials include loess, various calcareous and noncalcareous sedimentary rock, andesite, argillite, basalt, gneiss, granite, limestone, quartzite, quartz monzonite, rhyolite, sandstone or schist,. Ground surface has high cover of litter 4-8 cm deep, sometimes significant cover of rock, and low cover of bare soil.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs on subxeric sites. *Pseudotsuga menziesii* (60% cover) is the dominant tree canopy species. *Populus tremuloides* (10% cover) and *Abies lasiocarpa* (1% cover) are also present within the tree canopy. Seedlings of *Pseudotsuga menziesii* and *Populus tremuloides* are present. The shrub layer is very diverse with three codominant species: *Spiraea splendens* (40% cover), *Shepherdia canadensis* (30% cover), and *Symphoricarpos albus* (20% cover). All occur in the short-shrub stratum. The only herbaceous species occurring in more than trace quantities are *Calamagrostis rubescens* (30% cover) and *Arnica cordifolia* (10% cover).
Global Vegetation: This Rocky Mountain conifer association is characterized by a moderately dense to dense (40-90% cover). evergreen needle-leaved tree canopy dominated or codominated by *Pseudotsuga menziesii* with the short shrub *Symphoricarpos albus* dominating or codominating the understory. Mature *Pinus ponderosa* often codominates tree canopy, but does not regenerate. Other mature seral tree species present to codominant may include *Pinus contorta, Pinus flexilis, Larix occidentalis, Juniperus scopulorum,*

Juniperus occidentalis (eastern Oregon and Washington), or *Populus tremuloides*. Understory trees are almost exclusively *Pseudotsuga menziesii*. The short-shrub layer is open (patchy) to moderately dense (25-50% cover) and is dominated or codominated by the rhizomatous *Symphoricarpos albus* and other short shrubs such as *Juniperus communis, Mahonia repens, Paxistima myrsinites, Ribes cereum, Rosa* spp., *Spiraea betulifolia, Spiraea splendens, Shepherdia canadensis*, and *Symphoricarpos oreophilus*. Scattered tall shrubs such as *Amelanchier alnifolia, Prunus virginiana*, or *Sorbus scopulina* may form an open tall-shrub layer, but it does not dominate the undergrowth. A low cover to moderately dense herbaceous layer is present and is composed of diverse forbs with the graminoids *Calamagrostis rubescens, Carex geyeri, Festuca idahoensis* or *Pseudoroegneria spicata* present to codominant. Forb species may include *Achillea millefolium, Moehringia macrophylla (= Arenaria macrophylla), Arnica cordifolia, Balsamorhiza sagittata, Fragaria* spp., *Hieracium* spp., *Osmorhiza berteroi (= Osmorhiza chilensis), Penstemon wilcoxii, Poa nervosa, Maianthemum racemosum ssp. amplexicaule*, and *Thalictrum occidentale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Spiraea splendens	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	.	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	X
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

Higher Taxon / Species Name	Note: GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus* Forest (CEGL000337)
- *Pinus contorta / Symphoricarpos albus* Forest (CEGL000166)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia - Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii / Amelanchier alnifolia* Forest (CEGL000420)
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii / Spiraea betulifolia* Forest (CEGL000457)
- *Pseudotsuga menziesii / Symphoricarpos albus / Hieracium cynoglossoides* Forest (CEGL000458)

Global Related Concepts:

- *Abies lasiocarpa / Symphoricarpos albus* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii - Pinus ponderosa / Symphoricarpos albus* Association (Brayshaw 1965) =
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Ogilvie 1962) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Daubenmire and Daubenmire 1968) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Zamora 1983) B
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Johnson and Simon 1987) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Topik et al. 1988) B
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Cooper et al. 1987) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Ogilvie 1962) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Plant Association (Williams et al. 1990b) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Plant Association (Williams and Lillybridge 1983) =

- *Pseudotsuga menziesii / Symphoricarpos albus* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Plant Association (Johnson and Clausnitzer 1992) =
- *Pseudotsuga menziesii / Symphoricarpos albus* Plant Association (Williams and Lillybridge 1985) =
- *Pseudotsuga menziesii/Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- Douglas fir/snowberry (McLean and Holland 1958) =
- ponderosa pine-Douglas-fir-snowberry-oceanspray community (Hall 1973) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description fairly well. The only difference is that Steele et al. describe *Spiraea betulifolia* as a common shrub, which does not occur in the sampled Grand Teton National Park stand.
Global Classification Comments: All phases of *Pseudotsuga menziesii / Symphoricarpos albus* Habitat Type (Pfister et al. 1977, Steele et al. 1981) are included in the concept of this association.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs east of Moose Junction on Blacktail Butte.
Global Range: This widespread montane forest association occurs in the central and northern Rocky Mountains from southeastern Idaho and northwestern Wyoming, Montana, Idaho and eastern Oregon and Washington, extending into southern Alberta and British Columbia.
Nations: CA, US
States/Provinces: AB, BC, ID:S4, MT:S5, OR:S2, WA:S4, WY:S2
TNC Ecoregions: 4:C, 6:?, 7:C, 8:C, 9:C, 68:C
TNC Ecoregion Comments: ECO4:C, ECO7:C, ECO8:C, ECO9:C, ECO68:C added (MSR 4-04).
USFS Ecoregions: M242C:CC, M331A:CC, M331D:CC, M332A:CC, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand was sampled for this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B002
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Brayshaw 1965	.	.	X	.	.	.	.	.	.
Cooper 1975	.	X	.	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	.	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
McLean and Holland 1958	.	.	X	.	.	.	.	.	.
Ogilvie 1962	.	.	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.

Topik et al. 1988	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Williams and Lillybridge 1985	.	X	X	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.
Zamora 1983	.	X	X	X	.	.	.	.	.

[CEGL000462] *Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest

Translated Name: **Douglas-fir / Mountain Snowberry Forest**
Common Name: **Douglas-fir / Mountain Snowberry**
Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): K.A. Schulz

ELEMENT CONCEPT

Global Summary: This widespread forest association occurs in foothills, mountains and plateaus from southwestern Montana to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington. Elevation ranges from 700-2900 m (2310-9500 feet). This broadly defined forest association occurs as both a non-obligate riparian community and as an upland community. In more arid regions stands occur along drainages along narrow riparian areas in ravines, canyons, and up steep draws. It continues upland on steep north-facing slopes in narrow canyons where dense shade and steepness preclude any significant shrub or herbaceous understory. Elsewhere at more northern latitudes, it occurs near lower treeline on warm, dry southern aspects with moderate to very steep mid- and upper slopes and ridges. Soils are variable and range from deep silt loam to shallow, rocky substrates. Most stands have abundant litter on the ground, and some have high rock cover. The vegetation is characterized by a relatively sparse to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with scattered large *Pinus ponderosa, Pinus flexilis, Populus tremuloides, Juniperus scopulorum*, or *Juniperus occidentalis*, especially on drier sites. *Abies concolor* is typically not present. *Symphoricarpos oreophilus* dominates the sparse to moderately dense short-shrub layer. Shrub associates vary depending on range and habitat and may include *Acer glabrum, Amelanchier* spp., *Artemisia tridentata ssp. vaseyana, Cercocarpus montanus, Holodiscus dumosus, Juniperus communis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Quercus gambelii, Ribes cereum, Ribes inerme, Rosa woodsii*, or *Shepherdia canadensis*. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes with gradients ranging from 28-55% and aspects from southeast to northwest. The elevations of these stands range from 2156 to 2315 m (7074-7594 feet). The soils are derived from alluvium and/or colluvium from igneous rocks and loess. The unvegetated ground cover primarily consists of litter and duff (60-80%), wood (10-20%), and basal vegetation (10-20%).
Global Environment: This widespread forest association occurs in foothills, mountains and plateaus from southwestern Montana to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington. Elevation ranges from 700-2900 m (2310-9500 feet). This broadly defined forest association occurs as both a non-obligate riparian community and as an upland community. In more arid regions stands occur along drainages along narrow riparian areas in ravines, canyons, and up steep draws. It continues upland on steep north-facing slopes in narrow canyons where dense shade and steepness preclude any significant shrub or herbaceous understory. Elsewhere at more northern latitudes, it occurs near lower treeline on warm, dry southern aspects on moderate to very steep mid- and upper slopes and ridges. Soils are variable and range from deep silt loam to shallow, rocky substrates. Parent materials are also variable and may include colluvium or residuum derived from calcareous shale, sandstone, granite, limestone, rhyolite and basalt. Most stands have abundant litter on the ground, and some have high rock cover.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane coniferous forest that occurs on subxeric sites. *Pseudotsuga menziesii* dominates the tree canopy layer with 20-30% cover. *Pinus flexilis* saplings and poles can have up to 25% cover. The shrub layer is diverse with *Amelanchier alnifolia* (1-10% canopy cover) dominating the tall-shrub stratum, *Symphoricarpos oreophilus* (3-10% canopy cover) dominating the short-shrub stratum, and *Mahonia repens* (1-30% canopy cover) dominating the dwarf-shrub stratum. Other common shrubs include *Juniperus communis, Prunus virginiana, Shepherdia canadensis*, and *Paxistima myrsinites*. There are no dominant graminoids in the herbaceous layer in either cover or constancy. The most common forbs, each occurring in three of the four plots, are *Helianthella uniflora, Geranium viscosissimum*, and *Balsamorhiza sagittata*.
Global Vegetation: This forest association is characterized by a relatively sparse to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with scattered large *Pinus ponderosa, Pinus flexilis, Populus tremuloides, Juniperus scopulorum*,

or *Juniperus occidentalis*, especially on drier sites. *Abies concolor* is typically not present. *Symphoricarpos oreophilus* is present and usually dominates the sparse to moderately dense short-shrub layer. Shrub associates vary depending on location and habitat and may include *Acer glabrum, Amelanchier* spp., *Artemisia tridentata ssp. vaseyana, Cercocarpus montanus, Holodiscus dumosus, Juniperus communis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Quercus gambelii, Ribes cereum, Ribes inerme, Rosa woodsii,* or *Shepherdia canadensis*. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs. Associated graminoids may include *Bromus* spp., *Carex geyeri, Carex rossii, Festuca idahoensis, Leucopoa kingii, Koeleria macrantha*, and *Poa fendleriana*. Common forbs include *Achillea millefolium, Arnica cordifolia, Artemisia frigida, Thalictrum fendleri*, and *Vicia americana*.

Global Dynamics: This association occurs over a wide range of environmental conditions. Where precipitation and temperature are adequate, it occurs as an upland association. Where it occurs as a riparian forest, it is limited to very narrow canyon bottoms where narrow canyons with steep slopes create pockets of cool, moist air by funneling cold air downwards, thus providing a microsite for *Pseudotsuga menziesii* (Kittel et al. 1999). Often the coarse colluvial substrates provide deep moisture for trees and shrubs but little moisture for herbaceous layer.

Both diagnostic species are tolerant of ground fire. *Pseudotsuga menziesii* develops thick fire-resistant bark with age, and *Symphoricarpos oreophilus* resprouts after burning (Fischer and Bradley 1987, Wright et al. 1979). Ground fires occur at less than 30-year intervals in the Rocky Mountains (Pfister et al. 1977). Fire-return interval can be much less frequent in cool, dry stands in Utah were ground fire is limited by lack of continuous fine fuels or moist forest areas that rarely burn (about every 140 years) (Arno 1980,Youngblood and Mauk, 1985). In many cases, past fire suppression has allowed dense stands to form which provide a continuous fuel ladder to the crown of overstory trees and have increased the potential for severe, stand-destroying wildfires.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Juniperus communis	Short shrub/sapling	Needle-leaved shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies concolor / Symphoricarpos oreophilus* Forest (CEGL000263)
- *Pinus ponderosa / Symphoricarpos oreophilus* Forest (CEGL000205)
- *Populus tremuloides - Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest (CEGL000546)

Global Related Concepts:

- *Pseudotsuga menziesii - Symphoricarpos oreophilus* Habitat Type (Reed 1976) B
- *Pseudotsuga menziesii / Berberis repens* Habitat Type, *Symphoricarpos oreophilus* Phase (Mauk and Henderson 1984) I
- *Pseudotsuga menziesii / Symphoricarpos oreophilus / Carex geyeri* Habitat Type (Hess and Wasser 1982) F
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Association (Williams et al. 1990b) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Association (Williams and Lillybridge 1983) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Association (Johnson and Clausnitzer 1992) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Community Type (Johnson and Simon 1987) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest Association (Kittel et al. 1994) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest Association (Kittel et al. 1999a) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Mauk and Henderson 1984) =

- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Steele et al. 1981) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Youngblood and Mauk 1985) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Pfister et al. 1977) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Hess and Wasser 1982) F
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Steele et al. 1983) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Habitat Type (Komarkova et al. 1988b) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Plant Association (Lillybridge et al. 1995) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Plant Association (Williams and Lillybridge 1985) =
- *Pseudotsuga menziesii/Symphoricarpos oreophilus* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii* Sparse Habitat Type (Muldavin et al. 1996) I
- Douglas Fir-Pine Series (Diamond 1993) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association is similar to Steele et al.'s (1983) description. The main difference is the large amount of shrub species other than *Symphoricarpos oreophilus*. *Artemisia tridentata* and *Ribes cereum* are common in the Steele et al. (1983) description. In the Grand Teton National Park stands, *Ribes cereum* is completely absent and *Artemisia tridentata ssp. spiciformis* occurs in only one plot.
Global Classification Comments: This is a broadly defined *Pseudotsuga menziesii* association which includes a variety of stands from different environments that are tied together by a common widespread species, *Symphoricarpos oreophilus*.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association has not been documented inside the park boundaries. Three stands occur near the park border on the western slope of Shadow Mountain in the Bridger-Teton National Forest and one stand occurs north of Boone Creek Ridge in Jedediah Smith Wilderness. Small stands of this association were observed on the west side of Jackson Lake, along Berry Creek; they were not large enough to lay out a 20x20-meter plot.
Global Range: This widespread montane forest association occurs in foothills, mountains and plateaus from southwestern Montana to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington.
Nations: US
States/Provinces: AZ?, CO:S4, ID:S3, MT:S3, NM:S4, OR:S3, TX, UT:S5, WA:S3, WY:S2S3
TNC Ecoregions: 4:C, 6:?, 8:C, 9:C, 10:C, 18:C, 19:C, 20:C, 21:C, 28:?, 68:C
TNC Ecoregion Comments: ECO4, ECO8, ECO28, ECO68 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04). ECO18 & ECO19 added (KAS 9-01).
USFS Ecoregions: 313A:CC, 315A:??, 341B:CC, M242C:CC, M313A:CC, M331A:CC, M331D:CC, M331E:CC, M331F:C?, M331G:CC, M331J:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M341B:CC, M341C:CC
Federal Lands: NPS (Capitol Reef, Curecanti, Dinosaur, Grand Teton, Natural Bridges, Zion); USFS (Bighorn, Bridger-Teton, Caribou-Targhee, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-96-KV-117, BT-9507005, BT-9407053, BT-9407034

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. J. Drake

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Arno 1980	.	.	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Diamond 1993	.	.	X	X	.	.	.	.	.
Fischer and Bradley 1987	.	.	.	X	.	.	.	.	.
Hess and Wasser 1982	.	X	X	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	.	X	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.

Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1994	.	X	X	X	.	.	.	.	.
Kittel et al. 1999a	.	X	X	X	.	.	.	.	.
Komarkova et al. 1988b	.	X	X	X	.	.	.	.	.
Lillybridge et al. 1995	.	.	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Muldavin et al. 1996	.	.	X	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Reed 1976	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Williams and Lillybridge 1985	.	X	X	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.
Wright et al. 1979	.	.	.	X	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.

[CEGL000466] *Pseudotsuga menziesii / Vaccinium membranaceum* Forest

Translated Name: **Douglas-fir / Square-twig Blueberry Forest**
Common Name: **Douglas-fir / Square-twig Blueberry**
Ecological System(s):
- Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Cooper (1975)

ELEMENT CONCEPT

Global Summary: This association occurs in the mountains of northern and eastern Idaho, western and central Montana, and western Wyoming. It occurs from 1310 to 2286 m (4300-7500 feet) in elevation on mostly north-facing slopes but can occur on any aspect; slopes are moderately steep to steep (12-82%). Soils are well-drained, generally acidic, with gravelly sandy loam to gravelly silty loam textures. These tall forests are dominated by mature *Pseudotsuga menziesii*. Other conifers often present in the subcanopy include *Pinus contorta, Abies lasiocarpa, Picea engelmannii, Abies grandis, Pinus albicaulis, Pinus ponderosa*, and *Larix occidentalis*. *Pinus contorta* is the most common co-associate. The understory is relatively open; the short- (1-3 feet tall) and dwarf-shrub layers (<1/2 foot tall) are dominated by *Vaccinium membranaceum*. Other shrubs that may be present include *Spiraea betulifolia, Lonicera utahensis, Paxistima myrsinites, Sorbus scopulina, Acer glabrum*, and *Mahonia repens*. In the northern part of the range, stands may lack *Vaccinium membranaceum* but have another indicator species, *Xerophyllum tenax*, and few other shrubs present. *Calamagrostis rubescens* is the most common graminoid in the herbaceous undergrowth.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes with gradients ranging from 12-82% and aspects facing any direction. The elevations of these stands range from 2116 to 2274 m (6942-7460 feet). The soils are well- to moderately well-drained loam, sandy loam, sandy clay loam or silty clay loam; gravel is scarce within the soil except in one stand that occurs in an avalanche chute. The unvegetated ground cover consists primarily of litter and duff (up to 80%) and wood (up to 20%). Trace amounts of gravel, cobble, moss, and lichen may be present. Most of the plots are representative of surrounding vegetation.
Global Environment: It occurs from 1310 to 2286 m (4300-7500 feet) in elevation on mostly north-facing slopes but can occur on any aspect; slopes are moderately steep to steep (12-82%). Soils are well-drained, generally acidic, with gravelly sandy loam to gravelly silty loam textures.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest that occurs on subxeric sites. *Pseudotsuga menziesii* dominates the tree canopy contributing 10-70% cover. Other species that are commonly found in the tree canopy are *Abies lasiocarpa, Picea engelmannii, Pinus contorta*, and *Pinus flexilis*. *Pinus contorta* is the most abundant species in the tree subcanopy. Seedlings of *Pseudotsuga menziesii, Abies lasiocarpa, Picea engelmannii, Pinus contorta*, and *Pinus flexilis* occur in many of the stands. The shrub layer is diverse. The dominant shrub species is *Vaccinium membranaceum*, contributing 10-60% canopy cover in the short-shrub stratum and 10-40% canopy cover in the dwarf-shrub stratum. *Paxistima myrsinites* also occurs in each stand contributing 1-3% canopy cover in the dwarf-shrub stratum. Other common or high-constancy shrubs include *Lonicera*

utahensis, Spiraea betulifolia, Sorbus scopulina, Acer glabrum, and *Mahonia repens*. *Calamagrostis rubescens* is the most common graminoid in the herbaceous layer contributing 1-30% canopy cover in five of seven stands. Other common graminoids are *Carex* spp., *Bromus vulgaris*, and *Elymus glaucus*. The forbs are dominated by *Arnica cordifolia*, contributing 3-10% canopy cover in five of seven stands. Other common forbs include *Chamerion angustifolium, Orthilia secunda*, and *Osmorhiza berteroi*.

Global Vegetation: These tall forests are dominated by mature *Pseudotsuga menziesii*. Other conifers often present in the subcanopy include *Pinus contorta, Abies lasiocarpa, Picea engelmannii, Abies grandis, Pinus albicaulis, Pinus ponderosa*, and *Larix occidentalis*. *Pinus contorta* is the most common co-associate. The understory is relatively open; the short-(1-3 feet tall) and dwarf-shrub layers (<1/2 foot tall) are dominated by *Vaccinium membranaceum*. Other shrubs that may be present include *Spiraea betulifolia, Lonicera utahensis, Paxistima myrsinites, Sorbus scopulina, Acer glabrum*, and *Mahonia repens*. In the northern part of the range, stands may lack *Vaccinium membranaceum* but have another indicator species, *Xerophyllum tenax*, and few other shrubs present. *Calamagrostis rubescens* is the most common graminoid in the herbaceous undergrowth.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note		
Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005913)
- *Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005852)

Global Related Concepts:

- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type (Pfister et al. 1977) =
- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type (Steele et al. 1983) =
- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type (Cooper et al. 1987) =
- *Pseudotsuga menziesii / Vaccinium globulare* Habitat Type (Cooper 1975) = *Pseudotsuga menziesii / Vaccinium globulare* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii/Vaccinium globulare* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association differs slightly from the Steele et al. (1983) description. The main difference occurs in the tree canopy layer. The Steele et al. (1983) description has *Pinus contorta* and *Pseudotsuga menziesii* as the only tree species present. The Grand Teton National Park association has numerous species of trees that may occur.

Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs throughout the park. Three stands occur on the eastern slopes of the Teton Range between Granite Canyon and Avalanche Canyon, three occur on the northwest slope of Shadow Mountain, and one occurs northwest of Two Ocean Lake.
Global Range: This association is known to occur in northern and eastern Idaho, western and central Montana, western Wyoming, and possibly Washington.
Nations: US
States/Provinces: ID:S2, MT:S5, WA?, WY:S1
TNC Ecoregions: 7:C, 8:C, 9:C, 68:C
TNC Ecoregion Comments: ECO7 & ECO68 added (mjr 7-05). ECO8 added (GK 1-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M332E:CC, M333A:CC, M333D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202030, GT-0201073, GT-03B010, GT-03A079, GT-03A024
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407015, BT-9902035

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975*	.	X	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Galatowitsch and Bourgeron 1985	.	X	.	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

I.A.8.N.d. Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest

A.168 *Abies lasiocarpa - Picea engelmannii* Forest Alliance

Subalpine Fir - Engelmann Spruce Forest Alliance

ALLIANCE CONCEPT

Summary: These upper montane or subalpine conifer forests occur in many of the mountainous areas of western North America, where they are often the matrix forests of the subalpine zone. They occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests, but may extend down into the montane zone where there is cold-air drainage. Parent materials and soils are variable. Typically, soils are not deep, poorly developed and rocky. Tree canopy characteristics are remarkably similar across the wide distribution of the alliance. *Abies lasiocarpa* and *Picea engelmannii* generally are codominant, usually with higher density of *Abies lasiocarpa* in the smaller size classes, and with fewer, larger *Picea engelmannii*. In some stands, *Picea engelmannii* may be absent altogether, or *Abies lasiocarpa* may only occur as seedlings and saplings. *Picea engelmannii* will often be prominent on more moist sites or in more mature stands. *Pinus contorta* and *Populus tremuloides* are important seral species. Forest understories are highly variable across the range of this alliance and can be dominated by grasses, dry sedges, mesic forbs or shrubs (typically ericaceous). Important shrubs include *Vaccinium* spp., *Menziesia ferruginea, Oplopanax horridus, Physocarpus* spp., *Linnaea borealis, Rubus parviflorus, Symphoricarpos albus, Spiraea betulifolia, Mahonia repens, Shepherdia canadensis, Acer glabrum*, and *Juniperus communis*. Herbaceous layers are highly variable. Species that are important in individual associations include *Arnica* spp., *Actaea rubra, Calamagrostis rubescens, Carex* spp., *Clematis columbiana, Clintonia uniflora, Cornus canadensis, Erigeron eximius, Coptis occidentalis, Xerophyllum tenax, Valeriana sitchensis*, and *Thalictrum occidentale*. Diagnostic

of forests in this alliance is that they are upland forests (non-flooded) with average tree canopy cover greater than 60%, and with *Abies lasiocarpa* being the predominant conifer in the tree-regeneration layer.

Environment: These upper montane or subalpine forests occur in many of the mountainous areas of western North America, where they are often the matrix forests of the subalpine zone. They occur above the warmer and drier montane forests of the West, which are typically mixed-coniferous forests. In the Olympic and Cascade ranges, they occupy areas with pronounced rainshadow effects from mountains to the west, where precipitation is more limited than in the surrounding areas. For example, Henderson et al. (1989) report annual precipitation of less than 20 cm where these forests occur in the Olympics. Average temperatures are fairly uniform across the alliance's range, with mean July and January temperatures of 12 degrees and -10 degrees Centigrade, respectively (Burns and Honkala 1990a). Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially on sites where cold air pools. Elevations range from 1300-1950 m in the Olympics and eastern Cascades, and increase with decreasing latitude (from roughly 2200 m in central Idaho to over 3500 m in Arizona and New Mexico). In some locations where there is cold-air drainage, these forests may extend down in elevation into the montane zone, where they will occupy dry stream terraces, toeslopes, or mesic sites with cooler temperature regimes such as northern aspects. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, quartzite, dolomite, rhyolite, and other sedimentary rock types. Stands can also occur on colluvium or alluvium. Soils are typically not deep, poorly developed, and can have significant amounts of rock and gravel in the profile. Subalpine soils, such as found associated with these forests, often show evidence of podzolization processes, especially in the north, and poorly decomposed organic layers are common.

Adjacent forest vegetation types include *Picea engelmannii* forests, *Pinus albicaulis* or *Abies amabilis* forests or woodlands at the upper elevation boundary, and *Pseudotsuga menziesii, Abies grandis,* or *Tsuga heterophylla* forests at lower elevations. Adjoining wet sites often support forests of *Picea engelmannii, Pinus contorta,* woody riparian plant communities dominated by species of *Salix, Alnus, Acer,* or *Populus,* or wet meadows and wetlands dominated by species of *Carex, Eleocharis, Juncus,* or *Calamagrostis*. Large seral stands dominated by *Populus tremuloides* or *Pinus contorta* are typical in patches in *Abies lasiocarpa* forests, resulting from fire or logging disturbance.

Vegetation: Despite the wide distribution of these subalpine forests, their tree canopy characteristics are remarkably similar across their range of distribution. *Abies lasiocarpa* and *Picea engelmannii* generally are codominant, usually with higher density of *Abies lasiocarpa* in the smaller size classes, and with fewer, larger *Picea engelmannii*. In some stands, *Picea engelmannii* may be absent altogether, or *Abies lasiocarpa* may only occur as seedlings and saplings. *Picea engelmannii* will often be prominent on more moist sites or in more mature stands. *Pinus contorta* is an important seral species in *Abies lasiocarpa* forests, particularly in the northern Rockies and interior Pacific Northwest, and is present to abundant in many associations in this alliance. Further south in the central and southern Rockies, *Populus tremuloides* is a major seral species, and *Pinus contorta* occurs less frequently. In the interior Pacific Northwest and northern Rockies, other important conifers at higher elevations include *Pinus albicaulis* and *Larix lyallii*, but they are not dominant. Other species occasionally present include *Abies amabilis, Abies procera, Abies grandis, Larix occidentalis*, and *Tsuga mertensiana*. In the central and southern Rocky Mountains, *Abies concolor, Pseudotsuga menziesii,* and *Populus tremuloides* are the major seral species found in these forests, although *Pinus contorta* is often important in Colorado stands.

The shrub and herbaceous layers of *Abies lasiocarpa* forest associations are highly variable. Forest understories can be dominated by grasses or dry sedges in the more open forests, or by ericaceous shrubs or moist forbs in the closed-canopy, moist sites. Shrub layers when they do occur are typically less than 1 m in height, almost always include, or are dominated by, ericaceous species, and well-developed when light reaches the forest floor. Important species in the northern Rockies and Pacific Northwest include *Vaccinium scoparium, Vaccinium caespitosum, Vaccinium membranaceum, Menziesia ferruginea, Oplopanax horridus, Physocarpus malvaceus, Linnaea borealis, Rubus parviflorus, Symphoricarpos albus*, and *Spiraea betulifolia*. South of Idaho and Montana in the Rocky Mountains, the Pacific Northwest influence decreases and stands are typically somewhat drier. Important to dominant shrubs include *Vaccinium myrtillus, Vaccinium scoparium, Vaccinium caespitosum, Mahonia repens, Shepherdia canadensis, Physocarpus monogynus, Jamesia americana, Acer glabrum, Juniperus communis*, and *Ribes* spp.

Herbaceous layers cannot be summarized across the range of distribution of the alliance. Species of many different genera can be present or dominant. Some that are important in individual associations include *Arnica cordifolia, Arnica latifolia, Actaea rubra, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Clematis columbiana, Clintonia uniflora, Cornus canadensis, Erigeron eximius, Coptis occidentalis, Xerophyllum tenax, Valeriana sitchensis*, and *Thalictrum occidentale*. Species of *Senecio, Pedicularis, Polemonium, Erigeron, Galium, Thalictrum, Lathyrus, Pseudocymopterus, Pyrola, Osmorhiza, Ligusticum* are other important taxa in these forests.

Dynamics: *Abies lasiocarpa* forests develop on sites with limited, short growing seasons and relatively deep winter snowpacks. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pseudotsuga menziesii, Pinus contorta,* or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. *Abies lasiocarpa* is among the most shade-tolerant trees in the Rocky Mountains, but seedlings compete poorly in greater than 50% full sunlight (Burns and Honkala 1990a). In coastal ranges of the Pacific Northwest, the species is considered less shade-tolerant than *Tsuga mertensiana, Tsuga heterophylla,* or *Abies amabilis*. In Oregon and Washington, many communities are bottomland, moist, upper montane forests that rarely burn. Fire is important in many of the more open sites, as well as those on steep slopes. Snow

avalanches occur frequently at upper elevations, and can result in a mosaic of varying stand ages on sites affected by this disturbance type.

Similar Alliances:

- *Abies grandis* Forest Alliance (A.153)
- *Abies lasiocarpa - Acer glabrum* Shrubland Alliance (A.1052)
- *Abies lasiocarpa - Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Picea engelmannii* Forest Alliance (A.164)
- *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)

Similar Alliance Comments: The ~*Abies lasiocarpa* Forest Alliance (A.168)$$ is distinguished from the similar *Abies lasiocarpa* alliances (1) by not including riparian forests which occur along streams or on mesic slopes, (2) by being of forest physiognomy with the tree canopy averaging >60% cover, or (3) by having *Abies lasiocarpa* as the predominant conifer in the tree-regeneration layer. The similar *Picea engelmannii, Pinus contorta* and *Pseudotsuga menziesii* alliances differ in being strongly dominated by *Picea engelmannii, Pinus contorta* or *Pseudotsuga menziesii* with little *Abies lasiocarpa* (if any) in the tree canopy or regeneration layer.

ALLIANCE DISTRIBUTION

Range: These forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, Canada, and south into all of the western states. The alliance is apparently rare in California but does occur there. It may be very extensive in western Canada, and associations from there will need to be incorporated.

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 18:C, 19:C, 20:C, 21:C, 68:C

USFS Ecoregions: 313D:CC, 331J:CC, 342B:CC, 342C:CC, 342E:CC, 342G:CC, M242A:C?, M242B:CC, M242C:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: BIA (Blackfeet); NPS (Cedar Breaks, Glacier, Grand Teton, Rockefeller, Rocky Mountain, Yellowstone); PC (Banff, Jasper, Mount Revelstoke, Waterton Lakes); USFS (Apache-Sitgreaves, Arapaho-Roosevelt, Bighorn, Bridger-Teton, Caribou-Targhee, Colville NF, Dixie, Fishlake, Gila, Gunnison, Lewis and Clark, Manti-La Sal, Medicine Bow, Mount Baker-Snoqualmie, Okanogan, Payette, Pike-San Isabel, Rio Grande, Routt, Salmon, San Juan, Shoshone, Uinta, Uncompahgre, Wasatch-Cache, Wenatchee, White River NF)

ALLIANCE SOURCES

Author(s): M.S. Reid/D. Sarr

References: Alexander 1986, Alexander et al. 1984a, Alexander et al. 1987, Amundsen 1967, Baker 1984a, Baker 1986, Bassett et al. 1987, Benedict 1977b, Boyce 1977, Brotherson 1987, Buckner 1977, Bunin 1975c, Burns and Honkala 1990a, Cole 1982, Cooper 1975, Cooper and Pfister 1981, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice 1983, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Dix and Richards 1976, Dye and Moir 1977, Eyre 1980, Fitzhugh et al. 1987, Fonda and Bliss 1969, Franklin and Dyrness 1973, Franklin et al. 1979, Franklin et al. 1988, Fritz 1981, Giese 1975, Hall 1973, Hammerson 1979, Hansen et al. 1991, Harrington 1978, Henderson 1981, Henderson et al. 1976, Henderson et al. 1977, Henderson et al. 1985, Henderson et al. 1986, Henderson et al. 1989, Henderson et al. 1992, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Horton 1971, Ives 1978, Johnson 1956a, Johnson 1956b, Johnson 1985a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1984, Johnston 1987, Johnston and Hendzel 1985, Keammerer and Stoecker 1980, Kerr and Henderson 1979, Kettler and McMullen 1996, Kittel et al. 1994, Kittel et al. 1999a, Klish 1977, Komarkova 1982, Komarkova et al. 1988b, Kovalchik 1993, Kuchler 1964, Langenheim 1962, Larson and Moir 1987, Loope 1969, Mark 1958, Marr 1959, Marr 1964a, Marr 1964b, Marr 1965, Marr 1967, Marr 1977a, Marr 1977b, Marr and Boyd 1979, Marr et al. 1973a, Marr et al. 1980, Mauk and Henderson 1984, McLean 1970, Mills 1962, Moir and Ludwig 1979, Olmsted and Taylor 1977a, Padgett et al. 1988b, Peet 1975, Peet 1981, Pfister 1972, Pfister et al. 1977, Raven 1948, Reed 1969, Reed 1976, Sawyer and Keeler-Wolf 1995, Shepherd 1975, Steele et al. 1981, Steele et al. 1983, Steen and Dix 1974, Terwilliger et al. 1979a, Thorne Ecological Institute 1973b, USFS 1983b, Wardle 1968, Wasser and Hess 1982, Whipple 1975, Wilford 1967, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Youngblood and Mauk 1985, Youngblood and Mueggler 1981

[PARK SPECIAL GRTE-059] *Abies lasiocarpa – Pseudotsuga menziesii – Pinus contorta* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on slopes varying from 19 to 63% at elevations ranging from 7000 to 8600 feet. The stands face either east-northeast or southwest. The parent material for the Rhylow soils in one stand are local alluvium and colluvium from mixed volcanic rock and loess. The other three stands have well-drained loam-based soils. The unvegetated ground surface is dominated by litter and duff (60 to 80% cover). The remaining surface is co-dominated by rocks greater than 10cm (5% cover), wood (10 to 30% cover), and bare soil (1 to 5% cover). Fungi, mosses, and lichens may be present in trace quantities. Adjacent vegetation generally includes a continuation of this association. In two stands the patchiness of the landscape is noted, formed mainly by canopy openings as a result of windthrows.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a mixed coniferous forest community that occurs in subxeric to mesic areas. *Abies lasiocarpa* is found in the tree canopy in every stand with 10 to 20% cover. Co-dominant tree canopy species may include *Pseudotsuga menziesii* (3 stands, 10 to 20% cover), *Populus tremuloides* (2 stands, 1 and 20% cover), and *Pinus contorta* (2 stands, 10% cover). *Picea engelmannii* and *Pinus flexilis* are both present in the tree sub-canopy in one stand and in the short shrub stratum as seedlings in another stand. The short and dwarf shrub strata may be present or absent. *Amelanchier alnifolia* (1 to 3% cover) is the only species present in every stand. Other common shrubs include *Lonicera utahensis* (2 stands, 3 and 10% cover), *Vaccinium membranaceum* (2 stands, 20 and 50% cover), and *Spiraea betulifolia* (2 stands, 10% cover). Graminoids may be common but do not have high constancy within the herbaceous layer. *Calamagrostis rubescens* is present in two stands with 30% cover in each. *Carex geyeri*, also present in two stands, has 3 and 10% cover. Forbs present in every stand include *Thalictrum* spp. (1 to 10% cover) and *Osmorhiza* spp. (1 to 10% cover). Other forbs occurring in two or three stands with up to 10% cover include *Hieracium* spp., *Arnica cordifolia, Eucephalus engelmannii,* and *Geranium viscosissimum*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Abies lasiocarpa, Pseudotsuga menziesii, Pinus contorta*
FORB	*Thalictrum* spp., *Osmorhiza* spp.

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Abies lasiocarpa, Pinus contorta, Pseudotsuga menziesii, Amelanchier alnifolia, Lonicera utahensis, Spiraea betulifolia, Vaccinium membranaceum, Calamagrostis rubescens, Carex geyeri, Arnica cordifolia, Eucephalus engelmannii, Geranium viscosissimum, Osmorhiza spp., *Thalictrum* spp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Poa compressa, Cirsium arvense, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs in the mouth of Paintbrush Canyon, on the east side of Phelps Lake, on the north side of Two Ocean Lake, and in the Jedediah Smith Wilderness area southeast of Dead Horse Pass.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A007, GT-03A122, GT-0202008
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-060

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-059
Local Author: Rob Massatti
Date: 30 March 2004
Local Editor: Klara Varga
Date: 1 April 2004

Global Author:

REFERENCES: None

[CEGL000294] *Abies lasiocarpa - Picea engelmannii / Acer glabrum* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Rocky Mountain Maple Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This minor forest association occurs in the upper montane and subalpine zone in the southern, central and northern Rocky Mountains. Sites are cool, relatively moist slopes or riparian areas. Stands are typically found on moderate to very steep canyon and mountain slopes, as well as on nearly flat valley bottoms and on benches with moderate to gentle slopes. Aspects are typically northerly or shaded (in canyon). Lowland aspects are variable. Substrates may be gravelly or not, typically with loam- or sandy loam-textured soil, although finer textured soils are reported. Litter dominates the ground cover often 3-8 cm deep with low cover of rock and bare ground. The vegetation is characterized by a tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* with the tall shrub *Acer glabrum* dominating the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-80% cover) and typically dominated by *Abies lasiocarpa* with lesser amounts of *Picea engelmannii*. Scattered

Pinus contorta, Abies concolor, Pseudotsuga menziesii, Picea pungens, and *Populus tremuloides* trees may be present. The tall-shrub layer is open (patchy) to moderately dense. *Acer glabrum* dominates or codominates with other tall shrubs such as *Amelanchier alnifolia* or *Sorbus scopulina*. An open to moderately dense short-shrub layer is often present with species such as *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Physocarpus malvaceus, Rosa* spp., *Rubus parviflorus, Ribes* spp., *Symphoricarpos* spp., *Vaccinium* spp. and the vine *Clematis columbiana*. The herbaceous layer is composed of diverse forbs with graminoids present to codominant. Species with high constancy include *Arnica cordifolia, Bromus* spp., *Calamagrostis rubescens, Carex geyeri, Carex rossii, Elymus glaucus, Erigeron eximius, Lathyrus lanszwertii, Osmorhiza berteroi (= Osmorhiza chilensis), Penstemon wilcoxii, Maianthemum stellatum*, and *Thalictrum* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The sampled stands for this association occur on moderate to steep south-facing slopes at elevations ranging from 2268 to 2700 m (7440-8860 feet). Two stands have Gany or Rhylow soils, which are derived from colluvium and local alluvium from limestone, mixed volcanic rock, and loess. Four of the stands are disturbed by avalanches and one by erosion. No adjacent vegetation data are available.

Global Environment: This minor forest association occurs in the upper montane and subalpine zone in the southern, central and northern Rocky Mountains. Elevations range from 2955-3050 m (9700-10,000 feet) in southern latitudes (Sandia Mountains) to 1980-3020 m (6500-9900 feet) on the Wasatch Plateau and down to 1375-1980 m (4510-6500 feet) in the northern Rocky Mountains. Sites are cool, relatively moist slopes or riparian. Stands are typically found on moderate to very steep canyon and mountain slopes, as well as on nearly flat valley bottoms and on benches with moderate to gentle slopes. Aspects are typically northerly or shaded (in canyon). Lowland aspects are variable. Substrates may be gravelly or not, typically with loam- or sandy loam-textured soil, although finer textured soils are reported. Substrates are derived from various parent materials including sandstone, granite, andesite, rhyolite, quartz monzonite or limestone. Litter dominates ground cover often 3-8 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is a high montane to subalpine forested area that occurs on mesic sites. The tree canopy and subcanopy are dominated by *Abies lasiocarpa* with 1 to 20% cover. Codominating in some stands is *Picea engelmannii* with 3 to 12% cover. Seedlings of *Abies lasiocarpa, Picea engelmannii*, and *Populus tremuloides* may occur with significant cover. Overall the shrub layer is fairly diverse. *Acer glabrum* (3-10% cover) and *Sorbus scopulina* (1-20% cover) occur in all the stands. The following species have at least 40% constancy and 1-3% cover: *Lonicera utahensis, Ribes montigenum*, and *Symphoricarpos oreophilus*. The herbaceous layer is also fairly diverse but with very little graminoid presence. Only a few forbs offer more than 1% canopy cover. The only forbs occurring in half the stands are *Thalictrum occidentale* and *Eucephalus engelmannii*. *Ligusticum filicinum* and *Helianthella uniflora* occur in 2 of the 7 stands and average 5-7% cover.

Global Vegetation: This minor Rocky Mountain conifer association is characterized by a tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* with tall shrub *Acer glabrum* dominating the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-80% cover) and is typically dominated by *Abies lasiocarpa* with lesser amounts of *Picea engelmannii*. Scattered *Pinus contorta, Abies concolor, Pseudotsuga menziesii, Picea pungens*, and *Populus tremuloides* trees may be present. The tall-shrub layer is open (patchy) to moderately dense. *Acer glabrum* dominates or codominates with other tall shrubs such as *Amelanchier alnifolia, Sorbus scopulina, Spiraea betulifolia*, or sometimes *Prunus virginiana* or *Salix scouleriana*. An open to moderately dense short-shrub layer is often present with species such as *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Physocarpus malvaceus, Rosa* spp., *Rubus parviflorus, Ribes lacustre, Symphoricarpos albus, Symphoricarpos oreophilus, Vaccinium caespitosum, Vaccinium membranaceum*, and the vine *Clematis columbiana*. Herbaceous layer is composed of diverse forbs with graminoids present to codominant. Species may include *Arnica cordifolia, Bromus carinatus, Bromus ciliatus, Calamagrostis rubescens, Carex geyeri, Carex rossii, Elymus glaucus, Erigeron eximius, Lathyrus lanszwertii, Osmorhiza berteroi (= Osmorhiza chilensis), Penstemon wilcoxii, Maianthemum stellatum, Thalictrum fendleri*, or *Thalictrum occidentale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Acer glabrum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Sorbus scopulina	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.

Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.

Higher Taxon	Note
Symphoricarpos spp.	dominant short shrubs
Thalictrum spp.	dominant forbs

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa / Erigeron eximius* Forest (CEGL000310)
- *Picea engelmannii / Acer glabrum* Forest (CEGL000354)
- *Pseudotsuga menziesii / Acer glabrum* Forest (CEGL000418)

Global Related Concepts:
- *Abies lasiocarpa / Acer glabrum* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Acer glabrum* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa / Acer glabrum* Habitat Type (Youngblood and Mauk 1985) B
- *Abies lasiocarpa / Acer glabrum* Habitat Type (Alexander et al. 1987) B
- *Abies lasiocarpa / Acer glabrum* Habitat Type (Henderson et al. 1976) B
- *Abies lasiocarpa / Acer glabrum* Habitat Type, *Pachistima myrsinites* Phase (Steele et al. 1983) B
- *Abies lasiocarpa / Acer glabrum* Plant Association (Johnston 1987) =
- *Abies lasiocarpa / Erigeron eximius* Habitat Type (Larson and Moir 1987) I
- *Abies lasiocarpa/Acer glabrum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The community is defined by either *Acer glabrum* or *Sorbus scopulina*, alone or in combination, having 10% cover under an *Abies lasiocarpa - Picea engelmannii* forest canopy.
Grand Teton National Park Other Comments:
Global Classification Comments: One plot was recently reported from Rocky Mountain National Park, otherwise it is not known from Colorado. Plots with *Acer glabrum*-dominated understories from similar associations (and habitat types) may be misclassified and need further review.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Two of the sampled stands occur in the Jedediah Smith Wilderness area, three occur in Cascade Canyon, one occurs on the south side of Survey Peak, and one occurs west of Forellen Peak.
Global Range: This upper montane and subalpine association is widespread, occurring in the southern, central and northern Rocky Mountains from the Sandia Mountains to the Wasatch Plateau and Uinta Mountains, north to Glacier National Park.
Nations: US
States/Provinces: CO, ID:S3, MT, NM:S5, UT:S5, WY:S3
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 20:C
TNC Ecoregion Comments: ECO7, ECO8, ECO9 added (MSR 3-04).
USFS Ecoregions: 331J:CC, 342B:CC, M313B:??, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331I:CC, M332A:CC, M332C:CC, M332E:CC, M332G:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); USFS (Bridger-Teton, Dixie, Fishlake, Payette, Salmon, Uinta, Wasatch-Cache)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R107, 04R110, 04R113, 04X344, 04X350
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-059, CT-95-JD-095

Grand Teton National Park Description Author(s): M. Fain, mod. K. Varga

Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander et al. 1987	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Henderson et al. 1976	.	X	X	.	.	.	.	.	.
Johnston 1987	.	X	X	.	.	.	.	.	.
Larson and Moir 1987	.	X	X	X	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.

[CEGL000295] *Abies lasiocarpa - Picea engelmannii / Actaea rubra* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Red Baneberry Forest**
Common Name: **Subalpine Fir / Baneberry Forest**
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a moist but well-drained forested association located primarily on north-facing toeslopes, lower and midslopes, near riparian areas and sideslope seepages. It is documented from Idaho, northern Utah, western Wyoming, and Montana. It may occur as a relict in Arizona, but it has not been documented there. This association is found at elevations from 1829 to 3201 m (6000-10,500 feet). Soils are deep and moist. The vegetation is dominated by *Abies lasiocarpa* and /or *Picea engelmannii*. *Pseudotsuga menziesii* and *Populus tremuloides* are often present. *Picea pungens* may also co-occur. Stands are typically shrubby (with 5-15% total cover), but no shrub species are consistently present. Common shrub species include *Amelanchier, Lonicera, Acer glabrum, Rubus parviflorus, Prunus virginiana*, and *Symphoricarpos oreophilus*. The herbaceous undergrowth is clearly dominated by lush forbs; *Actaea rubra* is almost always present and abundant, often in small clumps scattered throughout the stand. Other forbs typically present are *Arnica cordifolia, Galium triflorum, Osmorhiza berteroi, Aconitum columbianum, Equisetum arvense, Geranium richardsonii, Senecio triangularis, Streptopus amplexifolius*, and *Thalictrum fendleri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes and terraces at elevations ranging from 2073 to 2256 m (6800-7400 feet). The slopes vary from 4 to 20% and face north. Soil data are available for only one stand; the stand is situated on moderately well-drained clay. Unvegetated and nonvascular cover data are available from two stands. Litter and duff dominate the ground surface with 70% cover. Wood composes 10 to 30% of the ground cover, and mosses range from 3 to 20% cover. All of the other components are present only in trace quantities, if at all. In two stands the accumulation of downed woody material and small-scale disturbances from dead and dying mature trees were specifically noted.
Global Environment: This association is found at elevations from 1829-3201 m (6000-10,500 feet). Generally, the association is found at the higher end of this elevation range when at lower latitudes such as southern Utah (Youngblood and Mauk 1985, Padgett et al. 1989). This type is located on moist but well-drained alluvial terraces, on gentle to steep (up to 40%) lower to mid slopes. Exposures are generally northern. This association is a link to the gradual interface between riparian and upland conditions (Padgett et al. 1989). Soils are deep and moist and are mainly derived from sedimentary calcareous substrates, but sometimes from metamorphic quartziferous, and igneous andesite substrates. Surface soils are predominantly silt loam but range from loamy to clayey, and some gravel is normally present. Surface rock and bare soil are usually absent due to many sites showing the influence of fluvial deposition, and the expectantly high biomass turnover rates of the undergrowth. Litter depth averages 6.0 cm.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs in mesic areas. The tree canopy layer includes *Abies lasiocarpa* (3 to 40% cover) in every stand. Present in two out of three stands are *Pseudotsuga menziesii* (10 and 20% cover) and *Picea engelmannii* (10 and 60% cover). Height data for the tree canopy layer for one stand indicate that, on average, *Abies lasiocarpa* are 7.6 m (25 feet) tall with one 27.4-m (90-foot) outlier, and *Picea engelmannii* are stratified with a layer of 29-m (95-foot) trees and a layer of 10.7-m (35-foot) trees. All stands include *Abies lasiocarpa* seedlings (1 to 20% cover). *Picea engelmannii, Pseudotsuga menziesii*, and *Populus tremuloides* seedlings are each present in one stand in trace quantities. The shrub

layer is generally well-developed but is extremely variable. Shrubs present in two out of three stands include *Rubus* spp. (3 and 20% cover), *Lonicera* spp. (1 and 30% cover), *Acer glabrum* (1 and 3% cover), and *Ribes* spp. (1 and 3% cover). The herbaceous layer composes 20 to 70% canopy cover and is generally dominated by forbs. *Actaea rubra* (3 to 30% cover), *Galium boreale* (1 to 3% cover), and *Geranium viscosissimum* (1 to 3% cover) are found in all of the stands. Species in two out of the three stands with 1 to 30% canopy cover include *Arnica cordifolia, Galium triflorum, Osmorhiza berteroi*, and *Thalictrum occidentale*. Graminoids are present, but they are neither diverse nor abundant; no single graminoid species is found in every stand. Only in one stand is any species present in more than trace quantities (*Carex geyeri*, 20% cover).

Global Vegetation: *Abies lasiocarpa* is the indicated climax tree. *Picea engelmannii* may codominate in seral stands and, in some cases, persist to become a minor late successional species. This is especially true when conditions become excessively wet due to poor drainage, and here *Picea* has the competitive advantage. The periodic occurrence of a number of cool, moist years in succession could favor *Picea* sufficiently to maintain its stand dominance on into the late successional stage (Cooper 1975). *Pseudotsuga menziesii* and *Populus tremuloides* are minor seral species commonly present. Steele et al. (1983) and Cooper (1975) note the occurrence of *Pinus contorta*. Its absence in other studies may be due to *Pseudotsuga* being favored over *Pinus contorta* on low altitude, warm sites, or because sites noted were late seral in development and seral *Pinus contorta* had long since been eliminated.

The shrub stratum is typically sparse. Species present vary locally as extensions of adjacent communities. Such species are *Spiraea betulifolia, Lonicera utahensis, Lonicera involucrata, Symphoricarpos oreophilus, Paxistima myrsinites, Ribes montigenum, Vaccinium caespitosum*, and *Vaccinium myrtillus*. The forb layer is characteristically dense and diverse with species varying with locality. *Aconitum columbianum, Actaea rubra, Equisetum arvense, Galium triflorum, Geranium richardsonii, Osmorhiza berteroi (= Osmorhiza chilensis), Senecio triangularis, Streptopus amplexifolius*, and *Thalictrum fendleri* commonly occur.

Global Dynamics: Because of its moist conditions, this association should have a low fire frequency (Fischer and Bradley 1987). Under normal moist circumstances, a lush undergrowth of shrubs and herbs usually serves as an effective barrier to rapid fire spread. However, during unusually dry conditions such as periodic summer drought, the combination of deep duff and large amounts of dead rotten fuel can result in severe surface fire. Where dense understories exist, such fires can easily spread to the tree crowns and destroy the stand. Even if a severe surface fire does not crown, there is a good chance the overstory trees will be killed by cambium heating. A stand-destroying fire in the climax or near-climax stage results in an herb/shrub stage followed by a seedling/sapling stage, and, in the continued absence of fire, a mature stand develops.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Acer glabrum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Actaea rubra	Herb (field)	Forb	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Galium triflorum	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Lonicera spp.	dominant and characteristic short shrubs
Ribes spp.	characteristic short shrubs
Rubus spp.	dominant and characteristic short shrubs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311)--is closely related.
- *Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest (CEGL000336)
- *Picea engelmannii / Galium triflorum* Forest (CEGL002174)--is closely related.
- *Pseudotsuga menziesii / Angelica* spp. Forest (CEGL005853)

Global Related Concepts:
- *Abies lasiocarpa / Aconitum columbianum* Habitat Type (Youngblood and Mauk 1985) B
- *Abies lasiocarpa / Actaea rubra* Habitat Type (Hansen et al. 1985) B
- *Abies lasiocarpa / Actaea rubra* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Galium triflorum* Habitat Type (Pfister et al. 1977) ?
- *Abies lasiocarpa - Picea engelmannii* / *Actaea rubra* Plant Association (Johnston 1987) B
- *Abies lasiocarpa* / *Actaea rubra* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa/Actaea rubra* (Bourgeron and Engelking 1994) =
- *Picea* spp. - *Abies lasiocarpa / Galium triflorum* (Cooper 1975) B
- Conifer / *Aconitum columbianum* (Padgett et al. 1989) B
- Conifer / *Actaea rubra* (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association matches the Steele et al. (1983) *Abies lasiocarpa / Actaea rubra* Habitat Type well. Grand Teton National Park's stand with 20% *Pseudotsuga menziesii* seems unusual according to the Steele et al. (1983) description. The same Grand Teton National Park stand has 20% *Rubus parviflorus* but has no recorded signs of excessive disturbance, as Steele et al. intimate is common.

Global Classification Comments: This association may occur as a relict type in Arizona. Cooper (1975) notes that this association may be easily confused superficially with his *Abies lasiocarpa / Vaccinium globulare* or *Picea / Linnaea borealis* by noting only the dominant aspects of the vegetation and not accounting for the sometimes inconspicuous indicator species. This type seems to be closely related to ~*Picea engelmannii / Galium triflorum* Forest (CEGL000365)$$ ~*Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311)$$.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in the Pacific Creek and Pilgrim Creek drainages as well as in the Spread Creek drainage in the Bridger-Teton National Forest.
Global Range: This association extends from southern Utah northwards into Idaho, Montana, and Wyoming.
Nations: US
States/Provinces: ID:S2, MT:S2, UT:S4?, WY:S2
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO7 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331B:C?, M331D:CC, M331H:C?, M331I:C?, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:C?, M333C:CC
Federal Lands: NPS (Cedar Breaks, Grand Teton, Yellowstone); USFS (Bridger-Teton, Dixie, Manti-La Sal, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202070, GT-03A019
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9902040
Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): L.D. Engelking, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.

Cooper 1975	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Fischer and Bradley 1987	.	.	.	X	.	.	.	.	.
Hansen et al. 1985	.	X	X	.	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	.	X	X	.	.	.	.	.
Pfister et al. 1977	.	.	X	X	.	.	.	.	.
Steele et al. 1981	.	.	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985a	.	.	.	X	.	.	.	.	.
Youngblood et al. 1985b	.	.	.	X	.	.	.	.	.

[CEGL000298] *Abies lasiocarpa - Picea engelmannii / Arnica cordifolia* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Heartleaf Leopardbane Forest**
Common Name: **Subalpine Fir / Heartleaf Arnica Forest**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This cool and moist forest association is known from northern Nevada, eastern Idaho, southwestern and central Montana, and western and north-central Wyoming. This is a cool and moist forest on gentle to moderate terrain, bench-like uplands, often on north-facing slopes but can occur on any aspect. It occurs between 2105 and 2900 m (6900-9500 feet) in elevation. The overstory canopy is thick with mostly *Abies lasiocarpa* and *Picea engelmannii* in the overstory canopy. *Pinus contorta* and *Pseudotsuga menziesii* are often present. Shrub cover is low and scattered, with the exception of *Shepherdia canadensis*, which can have as much as 10% cover, and was indicated as present in a least some plots by all authors. Other shrubs that may be present include *Ribes montigenum*, *Paxistima myrsinites*, and *Rosa* spp. The herbaceous layer is not abundant; *Arnica cordifolia* is the most consistently present forb with about 10-15% cover on average. A wide variety of other herbaceous species may be present, but none with any consistency. *Arnica latifolia* can be difficult to distinguish from *Arnica cordifolia*. The leaves on flowering stems of *Arnica latifolia* are largest toward the middle and are short-petioled to sessile, whereas those of *Arnica cordifolia* are largest near the base and are distinctly petiolate. *Arnica latifolia* is restricted to relatively moist sites; *Arnica cordifolia* occurs on many dry forest sites.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stand of this association occurs on a steep south-facing draw at an elevation of 2500 m (8200 feet). The parent materials of the Katpa soils are derived from colluvium from loess and limestone. The soils are well-drained and very deep Calcic Pachic Cryoborolls.
Global Environment: This is a cool and moist forest on gentle to moderate terrain, bench-like uplands, often on north-facing slopes but can occur on any aspect. It occurs between 2100 and 3000 m (6900-9500 feet) in elevation. Soils are derived from a variety of parent materials, from granitic to limestones. One soil profile indicated a deep, dark brown, silty loam layer.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to upper montane coniferous community that occurs in mesic areas. The tree canopy is predominantly composed of *Abies lasiocarpa* (30% cover), but other species such as *Pseudotsuga menziesii* (10% cover) may be present. Shrubs are present within the short- and dwarf-shrub strata in trace quantities. A variety of graminoids and forbs are present within the herbaceous layer in trace quantities. Species contributing more than trace amounts to the herbaceous canopy include *Arnica cordifolia* (10% cover), *Carex geyeri* (3% cover), and *Thalictrum occidentale* (3% cover).
Global Vegetation: The overstory canopy is thick with mostly *Abies lasiocarpa* and *Picea engelmannii* in the overstory canopy. *Pinus contorta* and *Pseudotsuga menziesii* are often present. Shrub cover is low and scattered, with the exception of *Shepherdia*

canadensis, which can have as much as 10% cover, and was indicated as present in a least some plots by all authors. Other shrubs that may be present include *Ribes montigenum*, *Paxistima myrsinites*, and *Rosa* spp. The herbaceous layer is not abundant; *Arnica cordifolia* is the most consistently present forb with about 10-15% cover on average. A wide variety of other herbaceous species may be present, but none with any consistency.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Arnica cordifolia	Herb (field)	Forb	X	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Arnica cordifolia	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa / Clematis columbiana* var. *columbiana* Forest (CEGL000306)
- *Pinus contorta / Arnica cordifolia* Forest (CEGL000135)

Global Related Concepts:
- *Abies lasiocarpa / Arnica cordifolia* Habitat Type (Hoffman and Alexander 1976) B
- *Abies lasiocarpa / Arnica cordifolia* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Arnica cordifolia* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Arnica cordifolia* Habitat Type (Komarkova et al. 1988b) =
- *Abies lasiocarpa/Arnica cordifolia* (Bourgeron and Engelking 1994) =
- *Abies lasiocarpa* stands of the Jarbridge, Independence, and Bull Run mountains (Loope 1969) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The sampled stand of this association fits the Steele et al. (1983) *Abies lasiocarpa / Arnica cordifolia* Habitat Type well. Specifically, Steele et al. mention that *Pseudotsuga menziesii* tends to be present on limestone parent materials where *Pinus contorta* is absent and that the shrub and herbaceous layers tend to be light or sparse.

Global Classification Comments: Youngblood and Mueggler (1981) describe a *Populus tremuloides* - *Abies lasiocarpa / Arnica cordifolia* Habitat Type that is strongly codominated by the two tree species. No *Populus tremuloides* is present in the studies describing this association (CEGL0000298). *Arnica latifolia* can be difficult to distinguish from *Arnica cordifolia*. The leaves on flowering stems of *Arnica latifolia* are largest toward the middle and are short-petioled to sessile, whereas those of *Arnica cordifolia* are largest near the base and are distinctly petiolate. *Arnica latifolia* is restricted to relatively moist sites; *Arnica cordifolia* occurs on many dry forest sites.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs south of Treasure Mountain near Darby Creek in the Jedediah Smith Wilderness.

Global Range: This association is known from northern Nevada, eastern Idaho, southwestern and central Montana, and western and north-central Wyoming.

Nations: US

States/Provinces: ID:S4, MT:S5, NV, WY:S4

TNC Ecoregions: 4:C, 8:C, 9:C
TNC Ecoregion Comments: ECO4 & ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Bighorn, Caribou-Targhee, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association. This stand does not occur within Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-050

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hoffman and Alexander 1976	.	X	X	X	.	.	.	.	.
Jones and Fertig 1998a	.	.	.	.	X	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Komarkova et al. 1988b	.	X	X	X	.	.	.	.	.
Loope 1969	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Reed 1969	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	.	X	.	.	.	.	.

[CEGL000299] *Abies lasiocarpa - Picea engelmannii / Arnica latifolia* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Daffodil Leopardbane Forest**
Common Name: **Subalpine Fir / Daffodil Leopardbane**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is known from eastern Idaho, western Wyoming and northern Utah. It is dense forest canopy with low cover of shrub and herbaceous layers. It occurs on gentle to moderate terrain on all aspects, from 2255-2835 m (7400-9300 feet) elevation. Soils are from a wide range of parent materials and range from well-drained sandy clay loams to moderately well-drained silty clays. *Abies lasiocarpa* and *Picea engelmannii* codominant this forested association. *Pseudotsuga menziesii, Pinus contorta*, and *Pinus albicaulis* may be present. The shrub layer may have *Ribes montigenum* and *Paxistima myrsinites*, which can be common and occasionally dominates the undergrowth. *Arnica latifolia* dominates the forb layer that may include *Eucephalus engelmannii (= Aster engelmannii)* and *Pedicularis racemosa*. *Arnica latifolia* can be difficult to distinguish from *Arnica cordifolia*. The leaves on flowering stems of *Arnica latifolia* are largest toward the middle and are short-petioled to sessile, whereas those of *Arnica cordifolia* are largest near the base and are distinctly petiolate. *Arnica latifolia* is restricted to relatively moist sites; *Arnica cordifolia* occurs on many dry forest sites.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on north-facing slopes varying from 18 to 48% at elevations ranging from 2469 to 2743 m (8100-9000 feet). Soils range from well-drained sandy clay loams to moderately well-drained clay

loams, silty clay loams, silty clays, and silt loams. The unvegetated and nonvascular ground surface is dominated by litter and duff, which composes 50 to 90% of the ground cover. Wood (5 to 30% cover) and mosses (1 to 30% cover) codominate the remaining surface. Rocks greater than 10 cm, gravel, bare soil, fungi, and lichen may be absent or present with up to 5% ground cover. Adjacent vegetation most often includes a continuation of this forest type. Drainages and canopy openings are often present and are dominated by high concentrations of forbs. Some stands of this association abruptly breaks into forb-dominated meadows with similar compositions but with higher density and species richness.

Global Environment: It occurs on gentle to moderate terrain on all aspects, from 2255-2835 m (7400-9300 feet) elevation. Soils are from a wide range of parent materials and range from well-drained sandy clay loams, silty clay loams, silty clays, and silt loams. Ground surface is covered in litter.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an upper montane forested community that occurs in mesic areas. The codominants within the tree canopy are always *Abies lasiocarpa* (10 to 40% cover) and *Picea engelmannii* (10 to 50% cover). *Pinus albicaulis* is present in the tree canopy in three stands with 1 to 3% cover. The shrub layer may have up to 20% canopy cover and always includes *Ribes* spp. (1 to 10% cover). Present in four out of six stands are *Lonicera* spp. and *Vaccinium scoparium*, each with 1 to 3% cover. *Picea engelmannii* (3 stands, 1 to 10% cover) and *Abies lasiocarpa* (4 stands, 1 to 10% cover) are present in the shrub layer as seedlings. The herbaceous layer has 20 to 80% canopy cover and is dominated by forbs. *Arnica latifolia* (10 to 30% cover), *Aquilegia* spp. (1 to 3% cover), and *Ligusticum filicinum* (1 to 10% cover) occupy all of the stands. Other common and high-constancy species include *Eucephalus engelmannii* (3 to 20% cover), *Pedicularis bracteosa* (1 to 3% cover), *Arnica cordifolia* (1 to 30% cover), and *Osmorhiza depauperata* (3 to 10% cover). Graminoids do not compose a significant portion of the herbaceous canopy. *Elymus glaucus* (4 stands, 1 to 3% cover) is the highest constancy species.

Global Vegetation: *Abies lasiocarpa* and *Picea engelmannii* codominate this forested association. *Pseudotsuga menziesii*, *Pinus contorta*, and *Pinus albicaulis* may be present. The shrub layer may have up to 20% cover and generally always includes *Ribes* spp (*Ribes montigenum* and *Ribes lacustre*) and *Paxistima myrsinites*, which can be common and occasionally dominates the undergrowth. Other shrubs known to be present include *Lonicera* spp. and *Vaccinium scoparium*, each with 1 to 3% cover. Arnica latifolia dominates the forb layer that may include *Eucephalus engelmannii (= Aster engelmannii)* and *Pedicularis racemosa*. Other forbs encountered include *Eucephalus engelmannii*, *Pedicularis bracteosa*, *Arnica cordifolia*, and *Osmorhiza depauperata*. Graminoids do not compose a significant portion of the herbaceous canopy. Species with occasional substantive cover (>1%) include *Elymus glaucus*, *Carex geyeri*, and *Carex rossii*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Arnica latifolia	Herb (field)	Forb	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Osmorhiza depauperata	Herb (field)	Forb	.	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Aquilegia spp.	characteristic forbs
Lonicera spp.	characteristic shrubs
Ribes spp.	characteristic shrubs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Arnica latifolia	Herb (field)	Forb	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Osmorhiza depauperata	Herb (field)	Forb	.	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Abies lasiocarpa - Picea engelmannii / Arnica latifolia* Plant Association (Johnston 1987) =
- *Abies lasiocarpa / Arnica latifolia* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa/Arnica latifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Arnica latifolia* Habitat Type well, although *Paxistima* is not as common as Steele et al. intimate.
Global Classification Comments: Distinguishing *Arnica cordifolia* from *Arnica latifolia* can be confusing. Flowering plants are usually needed for positive identification. The leaves on flowering stems of *Arnica latifolia* are largest toward the middle and are short-petioled to sessile, whereas those of *Arnica cordifolia* are largest near the base and are distinctly petiolate. *Arnica latifolia* is restricted to relatively moist sites; *Arnica cordifolia* occurs on many dry forest sites.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs at the upper elevations of Granite, Death, and Leigh canyons, as well as near Moose Basin.
Global Range: This association is known from Idaho, Montana and Wyoming and may occur in Utah.
Nations: US
States/Provinces: ID:S3, MT:S3, UT?, WY:S2
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 & ECO9 added (mjr 8-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331J:CC, M332D:CC, M332E:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A036, GT-03A091, GT-03C017, GT-03C020, GT-03C030, GT-0201084
GT-03A036, GT-03A091, GT-03C017, GT-03C020, GT-03C030, GT-0201084
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Pfister 1981	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000301] *Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Pinegrass Forest**
Common Name: **Subalpine Fir / Pinegrass Forest**
Ecological System(s):

- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is known from northeastern Oregon and central and eastern Washington, Idaho, northern Utah, northwestern Wyoming to east of the Continental Divide in Montana. This forest is often on moderate to steep slopes and ranges in elevation from 1372 to 1800 m (4500-5900 feet) in Oregon and Washington, and from 1768 to 2590 m (5800-8500 feet) in the Rocky Mountains. Soils are skeletal and range from silts to loams. This association is a montane forested community in cool and dry areas in the western part of its range, and in mesic areas in the northern and eastern portion of its range. *Abies lasiocarpa* is the dominant overstory tree, often with *Picea engelmannii*. *Pinus contorta* and *Pseudotsuga menziesii* are often codominant to more abundant than *Abies*. In Washington and Oregon, *Larix occidentalis* and *Abies grandis* may also be present. The shrub layer is minor. *Paxistima myrsinites* is most often present and can have as much as 15% cover. The herbaceous layer is generally described as a mat or sward of *Calamagrostis rubescens*, with 40-50% cover. *Carex geyeri* can be present and abundant. Other forbs commonly present include *Arnica cordifolia, Thalictrum occidentale, Osmorhiza berteroi (= Osmorhiza chilensis), Orthilia secunda (= Pyrola secunda), Arnica latifolia*, and *Carex rossii*. Where *Calamagrostis rubescens* is less than 5% cover and *Carex geyeri* is 5% and greater, the stand represents *~Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304)$$.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor, interfluves, terraces, or slopes ranging from 3 to 60% at elevations ranging from 6700 to 8602 feet. The aspects of the slopes are variable. The soils are derived from various sources; alluvium from shale, limestone, and loess are the parent materials for the Sedgway soils present in one stand and local alluvium and colluvium from volcanic rock and loess comprise the parent material for the Rhylow soils in another stand. Unvegetated and non-vascular ground surface data are not available for these stands. Soil and ground cover data are not available for all stands. One stand is bordered by an *Artemisia tridentata* ssp. *spiciformis* shrubland, and the majority of the stands are surrounded by other forest communities or a continuation of this community.

Global Environment: This forest is often on moderate to steep slopes and ranges in elevation from 1372 to 1800 m (4500-5900 feet) in Oregon and Washington, and from 1768 to 2590 m (5800-8500 feet) in the Rocky Mountains. Soils are skeletal and range from silts to loams.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs in mesic areas. *Abies lasiocarpa* is present in all of the stands, composing trace to 40% cover as seedlings, subcanopy trees, or canopy trees. *Pinus contorta, Picea engelmannii,* and *Pseudotsuga menziesii* occur in at least half of the stands as either emergent trees, canopy trees, or subcanopy trees. Seedlings of all of the aforementioned species as well as *Pinus albicaulis* and *Populus tremuloides* may be present. The shrub layer is sparse and underdeveloped in most stands. Present in at least half the stands are *Lonicera utahensis* and *Vaccinium membranaceum*. The herbaceous layer is generally dominated by *Calamagrostis rubescens* (7 to 40% cover). *Carex geyeri* is the only other common graminoid (1 to 20% cover, in 80% of the stands). High constancy graminoid genera are *Poa* and *Elymus.* No forb species are common to more than one third of the sampled stands. *Arnica* spp. occur in half of the stands.

Global Vegetation: This association is a montane forested community in cool and dry areas in the western part of its range, and in mesic areas in the northern and western portion of its range. *Abies lasiocarpa* is the dominant overstory tree, often with *Picea engelmannii*. *Pinus contorta* and *Pseudotsuga menziesii* are often codominant to more abundant than *Abies*. In Washington and Oregon, *Larix occidentalis* and *Abies grandis* may also be present. The shrub layer is minor. *Paxistima myrsinites* is most often present and can have as much as 15% cover. Other shrubs may be present but in very low amounts include *Lonicera utahensis, Amelanchier alnifolia, Juniperus communis*, and *Spiraea betulifolia*. The herbaceous layer is generally described as a mat or sward of *Calamagrostis rubescens*, with 40-50% cover. *Carex geyeri* can be present and abundant. Other forbs commonly present include *Arnica cordifolia, Thalictrum occidentale, Osmorhiza berteroi (= Osmorhiza chilensis), Orthilia secunda (= Pyrola secunda), Arnica latifolia*, and *Carex rossii*. Where *Calamagrostis rubescens* is less than 5% cover and *Carex geyeri* is 5% and greater, the stand represents *~Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304)$$.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Lonicera utahensis	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.
Senecio crassulus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Arnica spp.	characteristic forbs
Elymus spp.	characteristic graminoids
Poa spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	.	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest (CEGL000304)--occupies slightly drier habitats and can have *Calamagrostis rubescens* in the herbaceous layer. In central and southern Utah (Youngblood and Mauk 1985) and in Colorado (Komarkova et al. 1988a), *Calamagrostis rubescens* drops out completely from this association.
- *Picea engelmannii / Maianthemum stellatum* Forest (CEGL000415)
- *Picea engelmannii / Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta / Calamagrostis rubescens* Forest (CEGL000139)--has no *Abies lasiocarpa* or *Picea engelmannii* in the overstory or understory.
- *Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens* Forest (CEGL000174)--has no *Abies lasiocarpa* or *Picea engelmannii* in the overstory or understory and has a dense layer of *Vaccinium scoparium*.
- *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland (CEGL000429)--has no *Abies lasiocarpa* or *Picea engelmannii* in the overstory or understory tree layers.

Global Related Concepts:

- *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type (Williams et al. 1990b) B
- *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa / Calamagrostis rubescens* Plant Association (Williams and Smith 1990) B
- *Abies lasiocarpa / Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1983) B
- *Abies lasiocarpa / Calamagrostis rubescens* Plant Association (Johnson and Simon 1987) B
- *Abies lasiocarpa/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type well. Grand Teton National Park's stands fit the *Calamagrostis rubescens* phase of this type, due to the lack of *Paxistima myrsinites* in the understory.

Global Classification Comments: While most of the stands in the literature are dominated by *Pinus contorta* (in the Rocky Mountains) or *Pseudotsuga menziesii* (in eastern Oregon and Washington), with *Abies lasiocarpa* in the understory canopy, where it is considered the "indicated climax" (Pfister et al. 1977, Steele et al. 1983, Williams and Lillybridge 1983), the concept of this association is existing stands dominated by *Abies lasiocarpa*. Stands from Teton National Park are dominated by *Abies lasiocarpa* in the overstory canopy.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the John D. Rockefeller, Jr. Memorial Parkway, south of Badger Creek and west of Green Mountain in the Jedediah Smith Wilderness Area, west and northwest of Windy Point, at Burnt Ridge, northwest of Leigh Lake at the base of Mt. Moran, south of Mud Flats, in the Lupine Meadows area, west of Sky Ranch, north of Leeks, in Death Canyon, and at the mouth of Waterfalls Canyon.

Global Range: This association is known from eastern Oregon and Washington, northern Utah, Idaho, western Montana, and northwestern Wyoming.
Nations: US
States/Provinces: ID?, MT:S3, OR:S3, UT:S4S5, WA:S4, WY:S3
TNC Ecoregions: 6:C, 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC
Federal Lands: NPS (Grand Teton, Rockefeller); USFS (Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201049, GT-0201037
Accuracy Assessment Points: 04J154, 04J042, 04J075, 04J130, 04X900, 04J165, 04J210, 04J251, 04K060, 04M006, 04S004, 04J119
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-036, CT-95-JD-066
GRAND TETON NATIONAL PARK Inventory Notes:

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Komarkova 1982	.	X	.	X	.	.	.	.	.
Komarkova et al. 1988a	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	.	.	.	.	.	.
Williams and Lillybridge 1985	.	X	.	X	.	.	.	.	.
Williams and Smith 1990	.	X	X	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.
Youngblood and Mauk 1985	.	X	.	.	.	.	.	.	.

[CEGL000304] *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Geyer's Sedge Forest**
Common Name: **Subalpine Fir / Geyer's Sedge**
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This forest occupies the lower and grades into the upper subalpine zone of the interior mountains of Oregon, Washington, Idaho, Montana, Colorado and Utah. It occurs on shallow slopes and ridgetops, on all aspects. Slopes are mostly gentle but can be steep (6-48%). Elevation range is 2011 to 3260 m (6600-10,700 feet). Soils are non-gravelly to stony loams to silts, mostly from sedimentary substrates, and igneous parent material in Utah. The ground surface is mostly litter duff with traces of lichens and moss and has little rock or bare soil. *Abies lasiocarpa* is the dominant conifer in this forested association. *Picea engelmannii* is commonly a subdominant on all but the driest sites. Other conifers may be present and include *Pinus contorta, Pinus albicaulis*, and *Pseudotsuga menziesii*, these generally not exceeding the cover of *Abies lasiocarpa* and *Picea engelmannii* combined. On higher and colder sites, *Pinus albicaulis* can be important. Shrub cover is variable, ranging from absent to 20% over. Species include *Ribes* spp., *Vaccinium* spp., *Spiraea betulifolia, Mahonia repens (= Berberis repens)*, and *Sorbus scopulina*. The herbaceous layer is dominated by sparse to abundant *Carex geyeri*. *Calamagrostis rubescens* is generally absent or poorly represented. Forbs can be sparse. Other herbaceous species include *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum), Arnica cordifolia, Arnica latifolia, Osmorhiza* spp., and *Moneses uniflora (= Pyrola uniflora)*. The dominance of *Abies lasiocarpa* in the upper canopy and as a reproducing tree, and the lack of abundance of other conifers, though present, is the differentiated character of the overstory, along with an abundance and constancy of *Carex geyeri* in the understory, characterize this association.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on shallow to moderate slopes that face any direction. The elevational range of the stands is 2332 to 2637 m (7650-8650 feet). The parent materials of the soils for two stands are recorded; local alluvium and colluvium from mixed volcanic rock and loess form the Rhylow soils for one stand, and mixed colluvium forms the Yodal soils for the other stand. Soil data from the other four stands indicate that they are loam-based; two stands have sandy loam soils that contain 20 to 30% gravel. Unvegetated and nonvascular ground surface data from one stand indicate that litter and duff dominates (80% cover) followed by wood (20% cover). Rocks greater than 10 cm, gravel, bare soil, lichens, and mosses are all present in trace quantities. Two stands show signs of fire disturbance, either by the burned boles of canopy trees or from charcoal within the soil, and two stands note ephemeral rivulets in or near them.

Global Environment: This forest occupies the lower subalpine zone on shallow slopes and ridgetops, on southerly aspects in Montana and Idaho, all aspects in Wyoming, mostly southerly aspects in Colorado and northerly aspects in southern Utah. Slopes are mostly gentle to occasionally steep (6-48%). Elevation range is 2011 to 3260 m (6600-10,700 feet), the low end corresponding to more northerly latitudes, the upper elevations occurring farther south, i.e., 2011 to 2350 m (6600-7700 feet) in southern Montana, 2377 to 2896 m (7800-9500 feet) in Idaho, 2331 to 2895 m (7650-9500 feet) in northern Wyoming, 2103 to 3260 m (6900-10,700 feet) in Colorado, 2680 to 2987 m (8800-9800 feet) in southern Utah, and 2072 to 2377 m (6850-7800 feet) in eastern Oregon and Washington. Soils are non-gravelly to stony loams to silts, mostly from sedimentary substrates, and igneous parent material in Utah. The ground surface is mostly litter duff with traces of lichens and moss and has little rock or bare soil.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an upper montane forested community that occurs in mesic areas. *Abies lasiocarpa* is present throughout all of the stands in the tree canopy or subcanopy with 20 to 70% cover. *Abies lasiocarpa* seedlings also occur in either the short-shrub or dwarf-shrub layer in four out of six stands (1 to 10% cover). Occurring within the tree canopy in three or less stands are *Pinus albicaulis* (1 to 3% cover), *Picea engelmannii* (3 to 30% cover), and *Pseudotsuga menziesii* (10% cover). *Pinus flexilis, Pinus albicaulis*, and *Picea engelmannii* are each present in one or two stands as seedlings with 3% cover or less. The shrub layer is variable but is generally dominated by *Ribes* spp. (1 to 10% cover), *Lonicera* spp. (1 to 10% cover, 5 stands), and *Sorbus scopulina* (1 to 3% cover, 5 stands). In one stand *Vaccinium* sp. occurs with 20% canopy cover. The herbaceous layer may be dominated by graminoids or forbs. *Carex geyeri* occurs in every stand with 3 to 30% canopy cover. Other common and/or high-constancy graminoids include *Calamagrostis rubescens* (1 to 10% cover, 3 stands) and *Bromus* spp. (1% cover, 4 stands). Forbs occupying every stand include *Thalictrum* spp. (1 to 20% cover), *Osmorhiza* spp. (1 to 3% cover), and *Pedicularis* spp. (1% cover). Common forbs occurring in five stands include *Eucephalus engelmannii* (1 to 10% cover) and *Arnica* spp. (1 to 20% cover).

Global Vegetation: *Abies lasiocarpa*, usually along with *Picea engelmannii* is the dominant conifer in this forested association. Other conifers may be present and include *Pinus contorta, Pinus albicaulis*, and *Pseudotsuga menziesii*, generally not exceeding the cover of *Abies lasiocarpa* and *Picea engelmannii* combined. On moist sites in Utah, *Populus tremuloides* can be a codominant tree. On drier and more exposed sites, *Picea engelmannii* drops out. On higher and colder sites, *Pinus albicaulis* can become codominant. Shrub cover is variable, ranging from absent to 20% over. Species include *Ribes* spp., *Vaccinium* ssp., *Spiraea betulifolia, Mahonia repens (= Berberis repens)*, and *Sorbus scopulina*. The herbaceous layer is dominated by sparse to abundant *Carex geyeri*. *Calamagrostis rubescens* is generally absent or poorly represented. Forbs can be sparse. Other herbaceous species include *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum), Arnica cordifolia, Arnica latifolia, Osmorhiza* spp., and *Moneses uniflora (= Pyrola uniflora)*. The dominance of *Abies lasiocarpa* in the upper canopy and as a reproducing tree, and the lack of abundance of other conifers, though present, is the differentiated character of the overstory, along with an abundance and constancy of *Carex geyeri* in the understory characterize this association.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Sorbus scopulina	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Arnica spp.	dominant and characteristic forbs
Lonicera spp.	dominant and characteristic shrubs
Osmorhiza spp.	characteristic forbs
Pedicularis spp.	characteristic forbs
Ribes spp.	dominant and characteristic shrubs
Thalictrum spp.	dominant and characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens* Forest (CEGL000301)
- *Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri* Woodland (CEGL000754)
- *Pinus contorta / Carex geyeri* Forest (CEGL000141)
- *Pseudotsuga menziesii / Carex geyeri* Forest (CEGL000430)

Global Related Concepts:

- *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Plant Association (Johnston 1987) =
- *Abies lasiocarpa - Pinus albicaulis - Carex geyeri* Plant Community (Hall 1973) B
- *Abies lasiocarpa / Berberis repens* Habitat Type, *Carex geyeri* Phase (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Carex geyeri* Habitat Type (Youngblood and Mauk 1985) B
- *Abies lasiocarpa / Carex geyeri* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Carex geyeri* Habitat Type, *Carex geyeri* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa / Carex geyeri* Plant Association (Johnson and Clausnitzer 1992) B
- *Abies lasiocarpa/Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association differs from the Steele et al. (1983) *Abies lasiocarpa / Carex geyeri* Habitat Type in two fundamental ways. Steele et al. note that *Carex geyeri* dominates the undergrowth among a sparse layer of forbs; in the Grand Teton National Park stands forbs may be dominant over *Carex geyeri*. Steele et al. also say that *Pinus contorta* is often the seral dominant. *Pinus contorta* is not present in any of the Grand Teton National Park stands.

Global Classification Comments: This association grades into the higher and colder ~*Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri* Woodland (CEGL000754)$$. Hall (1973) and Johnson and Clausnitzer (1992) types (mentioned above in related concepts) have equal dominance of *Abies lasiocarpa* and *Pinus albicaulis*. Some stands belong here, some with ~*Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri* Woodland (CEGL000754)$$.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in Garnet, Webb, and Cascade canyons, near upper Berry Creek, and near South Badger Creek and Dry Ridge in the Jedediah Smith Wilderness.

Global Range: This association is known from eastern Oregon and Washington, central and eastern Idaho, western Wyoming, central and south-central Montana, southern and northern Utah, and western Colorado.
Nations: US
States/Provinces: CO:S2S3, ID:S5, MT:S3, OR:S4, UT:S3S4, WA:S4, WY:S2S3
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 19:C, 20:C
TNC Ecoregion Comments: ECO8 added (GK 1-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331B:C?, M331D:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A047, GT-0201037, GT-0202121, GT-0202134
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-018, CT-95-JD-019

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1986	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	.	.	.	.	.	.
Hess and Alexander 1986	.	X	.	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Komarkova 1982	.	X	.	X	.	.	.	.	.
Komarkova et al. 1988b	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Wasser and Hess 1982	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.

[CEGL000319] *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Fool's Huckleberry Forest**
Common Name: **Subalpine Fir / Fool's Huckleberry**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is a moist, higher elevation forest. It occurs in northern Idaho and much of the western third of Montana, northwestern Wyoming, and stretches into northeastern Washington and Oregon. It has been documented to occur in Alberta and British Columbia as well. *Menziesia ferruginea* distribution in the northern Rockies coincides with areas having maritime influence. It occurs on gentle and steep slopes, generally on the upper third of the slope, or on gentle benches where moisture is retained throughout the summer. In the southern and lower elevational limits of its range it is limited to north-facing, sheltered pockets. Elevational range is 1190 to 2500 m (3900-8200 feet). Soils are generally acidic, often silty to loamy, with high gravel

content. *Abies lasiocarpa* and *Picea engelmannii* are the dominant overstory species. *Pinus contorta, Pseudotsuga menziesii, Pinus albicaulis, Tsuga heterophylla, Tsuga mertensiana*, and *Larix occidentalis* can be present in the over and under canopies as well. *Menziesia ferruginea* forms a dense shrub layer, usually between 1.2 and 1.8 m (4-6 feet) tall but can be shorter due to snow damage. Shorter shrubs often present include *Vaccinium scoparium* and *Vaccinium membranaceum*. *Arnica cordifolia* (or *Arnica latifolia*) and *Orthilia secunda (= Pyrola secunda)* are nearly always present in the sparse herbaceous layer. *Xerophyllum tenax* may be present but never more than 5%. This association is distinguished from other *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea* types [see Similar Associations] by the lack of certain indicator species or their cover is less than 5% (for example, *Clintonia uniflora, Streptopus amplexifolius, Luzula glabrata var. hitchcockii (= Luzula hitchcockii)*, or *Xerophyllum tenax*).

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on shallow to moderate north-facing slopes. The elevational range of the stands is 2149 to 2500 m (7050-8200 feet). Soils are generally loam-based and moderately well- to well-drained. Litter and duff (30-80% cover) usually dominate the unvegetated and nonvascular ground surface. Mosses (3 to 60% cover), rocks greater than 10 cm (1 to 20% cover), wood (5 to 20% cover), gravel (0 to 10% cover), and bare soil (0 to 10% cover) codominate the remaining surface. Seeps and drainages are common throughout the landscape on which this association is situated, supporting mesic and palustrine forb species. Adjacent vegetation often includes a continuation of this association; the shrub composition stays fairly uniform, although different ratios of species occur. The landscape pattern also includes canopy openings dominated by forbs and may include avalanche paths.

Global Environment: *Menziesia ferruginea* distribution in the northern Rockies coincides with areas having maritime influence. It occurs on gentle and steep slopes, generally on the upper third of the slope, or on gentle benches where moisture is retained throughout the summer. In the southern and lower elevational limits of its range it is limited to north-facing aspects. Elevational range is 1190 to 2500 m (3900-8200 feet). Soils are generally acidic, often silty to loamy, with high gravel content.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs in mesic areas. Only areas that have the appropriate moisture regime can support this association. The tree canopy is codominated by *Picea engelmannii* (1 to 70% cover) and *Abies lasiocarpa* (1 to 40% cover). *Pseudotsuga menziesii, Pinus contorta, Pinus albicaulis*, and *Pinus flexilis* may also be present within the canopy. The subcanopy, if present, is dominated by *Abies lasiocarpa*. Seedlings of all of the aforementioned tree species may be present; *Abies lasiocarpa* seedlings are the most frequent and dense (4 out of 9 stands, up to 3% cover). The shrub layer dominates the understory and is species-rich. *Menziesia ferruginea* is present in all of the stands as either a tall or short shrub with 10 to 60% cover. *Vaccinium membranaceum* is also present in every stand with 10 to 30% cover. These two shrub species, in addition to *Vaccinium scoparium* (7 stands, 1 to 10% cover), often form independent clumps within the stands. Other high-constancy shrub species include *Lonicera utahensis, Sorbus scopulina*, and *Ribes* spp. The herbaceous layer is often poorly developed. Graminoids are not diverse or abundant; *Carex geyeri* (7 stands, 1 to 20% cover) is the most constant and abundant graminoid. Forbs are diverse but are generally present in low quantities. The highest constancy forb is *Arnica cordifolia* (1 to 10% cover). Other common and/or high-constancy forbs include *Goodyera oblongifolia, Eucephalus engelmannii, Arnica latifolia, Thalictrum* spp., and *Osmorhiza* spp.

Global Vegetation: *Abies lasiocarpa* and *Picea engelmannii* are the dominant overstory species. *Pinus contorta, Pseudotsuga menziesii, Pinus albicaulis, Tsuga heterophylla, Tsuga mertensiana*, and *Larix occidentalis* can be present in the over and under canopies as well. *Menziesia ferruginea* forms a dense shrub layer, usually between 1.2 and 1.8 m (4-6 feet) tall but can be shorter due to snow damage. Shorter shrubs often present include *Vaccinium scoparium* and *Vaccinium membranaceum*. Other shrubs that may be present, depending on geographic location, include *Alnus viridis ssp. sinuata (= Alnus sinuata), Rhododendron albiflorum, Sorbus scopulina, Ribes* spp., and *Lonicera utahensis*. *Arnica cordifolia* or *Arnica latifolia* and *Orthilia secunda (= Pyrola secunda)* are nearly always present in the sparse herbaceous layer. *Goodyera oblongifolia* is often present. *Xerophyllum tenax* may be present but never more than 5%. This association is distinguished from other *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea* types [see Similar Associations] by the lack of certain indicator species or their cover is less than 5% (for example, *Clintonia uniflora, Streptopus amplexifolius, Luzula glabrata var. hitchcockii (= Luzula hitchcockii)*, or *Xerophyllum tenax*).

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Menziesia ferruginea	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Sorbus scopulina	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.

Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Goodyera oblongifolia	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa

Osmorhiza spp.	characteristic forbs
Ribes spp.	characteristic short shrubs
Thalictrum spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Menziesia ferruginea	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	.	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Goodyera oblongifolia	Herb (field)	Forb	.	X	.
Orthilia secunda	Herb (field)	Forb	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea - Vaccinium scoparium* Forest (CEGL005894)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Clintonia uniflora* Forest (CEGL005893)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Luzula glabrata* var. *hitchcockii* Woodland (CEGL005896)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius* Woodland (CEGL005897)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax* Forest (CEGL005895)
- *Abies lasiocarpa* var. *lasiocarpa / Vaccinium membranaceum / Brachythecium* spp. Woodland (CEGL002327)
- *Pinus albicaulis - Abies lasiocarpa / Menziesia ferruginea / Xerophyllum tenax* Woodland (CEGL005836)
- *Pinus contorta / Menziesia ferruginea* Forest (CEGL005928)

Global Related Concepts:

- *Abies lasiocarpa / Menziesia ferruginea* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Abies lasiocarpa / Menziesia ferruginea* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Menziesia ferruginea* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Menziesia ferruginea* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa / Menziesia ferruginea* Plant Association (Johnson and Simon 1987) B
- *Abies lasiocarpa/Menziesia ferruginea* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Menziesia ferruginea* Habitat Type description well.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in Death, Leigh, Paintbrush, and Cascade canyons as well as near Bradley Lake and southwest of Triangle X Ranch.
Global Range: It occurs in northern Idaho and much of the western third of Montana, northwestern Wyoming, and stretches into northeastern Washington and Oregon. It has been documented to occur in Alberta and British Columbia as well.
Nations: CA, US
States/Provinces: AB, BC, ID:S5, MT:S5, OR:S1, WA, WY:S1

TNC Ecoregions: 7:C, 8:C, 9:C, 68:C
TNC Ecoregion Comments: ECO7, ECO8, ECO68 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332A:CC, M332C:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A035, GT-03A038, GT-03A072, GT-03B036, GT-03B040, GT-03B044, GT-0201034, GT-0201040
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9902037

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000331] *Abies lasiocarpa - Picea engelmannii / Ribes (montigenum, lacustre, inerme)* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / (Western Prickly Gooseberry, Bristly Black Currant, White-stem Gooseberry) Forest**
Common Name: **Subalpine Fir / Western Prickly Gooseberry**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This forested association occurs in southern Idaho, southern Montana, western Wyoming, central and southern Utah, and through the Colorado mountains. This association is found between 2225-3415 m (7300-11,200 feet) elevation. It occurs on plateaus, benchlands, and slopes ranging from gentle to very steep but is normally on cold northwest to northeast aspects. These forest can be large continuous stands or patch stands interspersed with open meadows. These forests are heavily shaded with a very open shrub layer of just a few individuals. *Abies lasiocarpa* and *Picea engelmannii* dominate the dense tree canopy, while any of the following four *Ribes* species may be present the shrub layer: *Ribes inerme, Ribes lacustre, Ribes montigenum*, or *Ribes wolfii*. Herbaceous layer is depauperate but rich in forbs. Common forbs include *Aquilegia caerulea, Arnica cordifolia, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. A few graminoids are often present and often include *Carex rossii, Carex geyeri, Achnatherum lettermanii (= Stipa lettermanii), Bromus carinatus*, and *Festuca idahoensis*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes that range from 10 to 50% at elevations between 2423 and 2682 m (7950-8800 feet). The slopes generally face west. The parent materials for the soils are variable; one stand's Katpa soils are derived from alluvium from loess and limestone, one stand's Yodal soils are derived from alluvium from loess and shale, and a third stand's Yodal soils are derived from colluvium from loess and limestone. Mosses, lichens, and fungi are not found in any of the sampled stands.
Global Environment: This association is found between 2409-3415 m (7300-11,200 feet) elevation. It occurs on plateaus, benchlands, and slopes ranging from gentle to very steep but is normally on cold northwest to northeast aspects. The forest is often

broken by large meadows occupying the deeper soils of gentle basins along drainage systems. These meadows may be fairly dry and dominated by *Artemisia*, or fairly moist and dominated by grass, forbs, and sedges (Pfister 1972). Because of its wide distribution and broad range of altitudes, this association is found on a variety of substrate types, but soils are derived primarily from calcareous parent materials (Cooper and Pfister 1985). In Colorado, this common facultative riparian forest has a wide elevational range, 2500-3700 m. Stands occur along very steep streams where the riparian area is narrow and dominated by species of the surrounding forest. Soils are weakly developed, usually with only a structural B horizon, and generally have high rock and gravel content with pH ranging from 4.8-7.2. All of the soils have low temperatures. Textures range from loamy sands to silty clays; gravel content averages 18%, and the percentage of surface rock averages about 11% (Pfister 1972).

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an upper montane forested community that occurs in subxeric areas. *Abies lasiocarpa* is present in the tree canopy in every stand with 10 to 30% cover. Two of four stands include *Picea engelmannii* in the tree canopy, covering 10 to 20% of the ground surface. *Pinus flexilis* seedlings are recorded in the short-shrub layer in one plot; no other seedlings of any species are present in any stand. The short-shrub layer is not diverse. *Ribes montigenum* is the only species found throughout all of the stands (1 to 40% cover). Only three other shrub species are present, each occurring only in one stand and contributing only 1% cover. The herbaceous layer provides little canopy cover. No single graminoid species is found in every stand, and none comprise more than 1% cover. The highest constancy genus is *Bromus*, occurring in three of four stands. Several forb species occur in all of the stands, including *Osmorhiza berteroi* (1 to 3% cover), *Thalictrum occidentale* (1 to 3% cover), and *Viola nuttallii* (1% cover). There are no other common or high-constancy forb species.

Global Vegetation: This type is consistently dominated by *Picea engelmannii* and *Abies lasiocarpa*. Late-successional stands may have a dominant overstory of *Picea engelmannii* possibly resulting, in part, from a reproductive advantage over *Abies* through exposure of mineral soil seedbeds by heavy grazing (Roe et al. 1970). Steele et al. (1981) note that *Pinus albicaulis* codominates with *Abies lasiocarpa*, with *Picea* becoming increasingly prevalent to the south and east. Both *Abies* and *Picea* are found layering in the understory (Cooper and Pfister 1985, Youngblood and Mauk 1985). Although an important early-seral associate, *Populus tremuloides* is usually present in mature stands only as remnant stems of poor vigor. *Pinus contorta* is a minor seral species. This association is generally above the cold limits of *Pseudotsuga*, but the species does occur at lower elevations of the type.

The shrub layer is sparse, with scattered clumps of *Ribes montigenum* usually confined to near the bases of large trees. Other shrubs, which may occur in openings or on recently disturbed areas, include *Sambucus racemosa*, *Symphoricarpos oreophilus*, and *Shepherdia canadensis*. The undergrowth is characteristically depauperate. Forbs with high constancies are *Aquilegia caerulea*, *Arnica cordifolia*, *Arnica latifolia*, *Achillea millefolium*, *Astragalus miser*, *Chamerion angustifolium (= Epilobium angustifolium)*, *Ligusticum porteri*, *Lupinus argenteus*, *Mertensia arizonica*, *Thalictrum fendleri*, *Thalictrum occidentale*, *Fragaria virginiana*, *Polemonium pulcherrimum*, *Pseudocymopterus montanus*, *Orthilia secunda (= Pyrola secunda)*, *Frasera speciosa*, *Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Osmorhiza depauperata*. Graminoids are weakly represented. *Carex rossii* is the only sedge encountered with any regularity. Under disturbed conditions, or in seral stands with incomplete conifer canopies, *Lupinus argenteus*, *Lathyrus lanszwertii*, *Hymenoxys hoopesii (= Helenium hoopesii)*, *Chamerion angustifolium*, *Aquilegia caerulea*, and *Achillea millefolium* are expected to increase.

Global Dynamics: Evidence from stands burned by wildfire indicate that this type will be difficult to reforest and may persist as *Artemisia tridentata ssp. vaseyana*- and bunchgrass-dominated communities (Cooper and Pfister 1985). However, according to Youngblood and Mauk (1985), following a major stand-destroying fire, remnant *Populus tremuloides* root systems resprout, creating clones. Invasion of *Abies lasiocarpa* follows, and saplings may develop quickly under this nurse crop of *Populus tremuloides*. Invasion of *Picea* is much slower and may be restricted to areas of bare soil. Pfister (1972) suggests this progression to a pure *Abies* - *Picea* climax, without further disturbance, may require at least 1000 years.

The uneven-aged climax stand usually has abundant *Abies lasiocarpa* seedlings and saplings in addition to vegetative layering. *Picea engelmannii* is found on raised root mounds and depressions in the understory, resulting from windthrow of the shorter lived *Abies lasiocarpa* following root rot (Youngblood and Mauk 1985). *Abies lasiocarpa* is almost uniformly susceptible to decay by *Fomes annosus*, which increases the chances of windthrow. Stands of *Abies* may also become infected with yellow witches' broom rust (*Melampsorella caryophyllacearum*). Windthrow continually removes individuals or small groups of large-crowned old trees, allowing replacement of *Populus*, *Abies*, and *Picea* in the resultant openings. Devastation of old-growth *Picea engelmannii* overstories by the Engelmann spruce bark beetle (*Dendroctonus rufipennis*) creates sufficient disturbance to allow regeneration and release of all three tree species. The combination of these factors creates the characteristic all-aged structure of this type, in dynamic equilibrium with present environmental conditions and showing periodic fluctuations due to natural small-scale perturbations (Pfister 1972).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Ribes montigenum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.

Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Viola nuttallii	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa

Bromus spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Ribes inerme	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ribes lacustre	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ribes montigenum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ribes wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Aquilegia caerulea	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Abies lasiocarpa - Picea engelmannii / Ribes montigenum* Plant Association (Baker 1984a) =
- *Abies lasiocarpa - Picea engelmannii / Ribes* spp. Plant Association (Carsey et al. 2003a) =
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Cooper and Pfister 1985) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Youngblood and Mauk 1985) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Pfister 1972) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Ribes montigenum* Habitat Type (Henderson et al. 1976) B
- *Abies lasiocarpa/Ribes montigenum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the *Ribes montigenum* phase of Steele et al.'s (1983) *Abies lasiocarpa / Ribes montigenum* Habitat Type extremely well.
Global Classification Comments: In Grand Teton National Park, stands were separated into *Abies lasiocarpa - Picea engelmannii / Ribes lacustre* and *Abies lasiocarpa - Picea engelmannii / Ribes montigenum* types. While both would fit into the broader NVC concept, only one local description can be entered under one elcode.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association can be found in the Jedediah Smith Wilderness Area west of Fox Creek Pass, northwest of Green Mountain, and east of Beard Mountain.
Global Range: This association is distributed from southern Idaho into Wyoming and south throughout Utah and Colorado.
Nations: US
States/Provinces: CO:S3, ID:S5, MT:S4, UT:S5, WY:S3
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO8 & ECO20 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332D:CC, M332E:CC, M332F:CC

Federal Lands: NPS (Grand Teton); USFS (Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: None of the sampled stands of this association are located in Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-097, CT-95-JD-078, CT-95-JD-034, CT-95-JD-027

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga
Global Description Author(s): L.D. Engelking, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1984a	.	.	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Cooper and Pfister 1985	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Henderson et al. 1976	.	.	X	X	.	.	.	.	.
Henderson et al. 1977	.	X	.	X	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Langenheim 1962	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Peet 1975	.	X	.	X	.	.	.	.	.
Pfister 1972	.	X	X	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Shepherd 1975	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	.	.	.	.	.

[PARK SPECIAL GRTE-067] *Abies lasiocarpa – Picea engelmannii / Ribes lacustre* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on level terrain or north-facing toe-slopes with gradients less than 20%. The elevations for the sampled stands range from 6900 to 7900 feet. One stand is situated within an *Abies lasiocarpa – Picea engelmannii* forest on silt loam soils. Another stand is bordered by a *Salix Drummondiana* stand.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs in mesic areas. Dominant conifer species occurring either as a canopy tree, subcanopy tree, or seedling are *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus contorta*. The short shrub stratum is dominated by *Ribes lacustre* (3 to 20% cover). Other shrub species that occur in at least half the stands are *Lonicera utahensis*, *Lonicera involucrata*, and *Salix drummondiana.* The herbaceous layer is dominated by mesic graminoids, forbs, and fern allies. The most constant herbaceous species include *Bromus ciliatus*, *Elymus glaucus*, *Osmorhiza berteroi*, and *Thalictrum* sp.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Ribes lacustre*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Abies lasiocarpa, *Ribes lacustre*, *Bromus ciliatus*, *Elymus glaucus*, *Osmorhiza berteroi*, *Thalictrum* sp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A
Rare Species: *Torreyochloa pallida* var. *pauciflora*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association. Within the National Vegetation Classification, this type could be included in the [CEGL000331] *Abies lasiocarpa - Picea engelmannii / Ribes (montigenum, lacustre, inerme)* Forest type. We at the park decided to keep it separate as *Ribes lacustre* occupies much wetter environments than *Ribes montigenum*, and all plots included in the latter have only *Ribes montigenum*.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Three of the sampled stands for this association occur in Death Canyon near the Patrol Cabin and the other stand occurs north of Lupine Meadows trailhead.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-0202091
Accuracy Assessment Points: 04R336, 04J248, 04J249
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-067
Local Author: Rob Massatti
Date: 27 April 2004
Local Editor: Klara Varga
Date: 3 May 2004
Re-write: Mark Fain
Date: 26 October 2004
Re-edit: Klara Varga
Date:

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-060] *Abies lasiocarpa – Picea engelmannii / Shepherdia canadensis* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stand of this association occurs on a shallow north-facing basin floor at an elevation of 6968 feet. No other environmental data are available for this stand.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs in mesic areas. The tree canopy is composed of *Picea engelmannii* (90% cover), *Pinus contorta* (30% cover), *Abies lasiocarpa* (20% cover), and *Pseudotsuga menziesii* (10% cover). The shrub strata are well developed. *Amelanchier alnifolia* (10% cover) and *Salix scouleriana* (3% cover) compose the tall shrub stratum. The short shrub stratum consists predominantly of *Shepherdia canadensis* (40% cover) with smaller amounts of *Lonicera utahensis* (10% cover) and *Ribes* spp. (3% cover). The dwarf shrub stratum contains *Spiraea betulifolia* (10% cover), *Mahonia repens* (3% cover), *Rosa* sp. (3% cover), and *A. lasiocarpa* seedlings (3% cover). The herbaceous layer is composed of a variety of mesic forbs; graminoids within the herbaceous layer are virtually nonexistent. The well represented forbs include *Eurybia conspicua* (20% cover) and *Thalictrum* sp. (10% cover).

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Picea engelmannii, Pinus contorta, Abies lasiocarpa, Pseudotsuga menziesii*
SHORT SHRUB	*Shepherdia canadensis*
FORB	*Eurybia conspicua*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Abies lasiocarpa, Picea engelmannii, Pinus contorta, Pseudotsuga menziesii, Amelanchier alnifolia, Lonicera utahensis, Shepherdia canadensis, Spiraea betulifolia, Eurybia conspicua, Thalictrum sp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand occurs east of Emma Matilda Lake.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202137
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one stand defines this association.

Classification Confidence: **Identifier:** New-GRTE-060
Local Author: Rob Massatti
Date: 27 April 2004
Local Editor: Klara Varga
Date: 3 May 2004

Global Author:

REFERENCES: None

[CEGL000337] *Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Common Snowberry Forest**
Common Name: **Subalpine Fir / Snowberry Forest**

Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): K.A. Schulz

ELEMENT CONCEPT

Global Summary: This forest association has been found locally from mountains in eastern Idaho, western Wyoming and western Montana. Elevation ranges from 1737-2316 m (5700-7600 feet) . Stands are found on benches, lower slopes and dry alluvial terraces on rocky substrates derived from sandstone and less commonly limestone or andesite parent materials. This forest type has a moderately dense to dense canopy (>60% cover) of evergreen needle-leaved trees over 30 m tall. *Abies lasiocarpa* dominates or codominates the tree canopy, with *Pseudotsuga menziesii* or *Pinus contorta* in seral stands, and occasional *Picea engelmannii*. *Populus tremuloides* may also be present in the tree canopy. *Amelanchier alnifolia* forms a sparse, tall-shrub layer in some stands. The diagnostic understory vegetation is composed of a sparse short-shrub layer dominated by *Symphoricarpos albus* with lesser amounts of *Spiraea betulifolia* and *Mahonia repens*. The graminoid *Calamagrostis rubescens* dominates the typically sparse herbaceous layer. Other common herbaceous species include *Arnica cordifolia, Geranium viscosissimum*, and *Carex geyeri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The sampled stand of this association occurs on level terrain adjacent to a large seasonal creek at an elevation of 2020 m (6627 feet). The Tetonville soils are floodplain soils formed in alluvium. They are very gravelly sandy loams that are very deep and somewhat poorly drained.

Global Environment: This association occurs locally in the northern Rocky Mountains. Elevation ranges from 1737-2316 m (5700-7600 feet). Stands occur on benches, lower slopes, and well-drained alluvial terraces, on rocky substrates derived from sandstone and, less commonly, limestone or andesite parent material. Soils are deep and are usually covered in thick litter and duff (up to 8 cm), with little bare soil or rock at the surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane coniferous community that occurs in subxeric areas. The tree canopy is composed of *Abies lasiocarpa* (10% cover), *Pinus contorta* (10% cover), and *Populus tremuloides* (3% cover). There are a variety of shrubs present, but most occur in only trace quantities. Shrubs with 3% cover include *Symphoricarpos albus, Spiraea betulifolia, Paxistima myrsinites*, and *Mahonia repens*. The herbaceous layer is composed of a variety of graminoids and forbs that are only present in trace quantities; overall the herbaceous layer is very sparse.

Global Vegetation: This forest type has a moderately dense to dense canopy (>60% cover) of evergreen needle-leaved trees over 30 m tall. *Abies lasiocarpa* dominates or codominates the tree canopy, with *Pseudotsuga menziesii* or *Pinus contorta* in seral stands, and occasional *Picea engelmannii*. *Populus tremuloides* may also be present in the tree canopy. *Amelanchier alnifolia* forms a sparse, tall-shrub layer in some stands. The diagnostic understory vegetation is composed of a sparse short-shrub layer dominated by *Symphoricarpos albus* with lesser amounts of *Paxistima myrsinites, Spiraea betulifolia*, and *Mahonia repens*. The graminoid *Calamagrostis rubescens* dominates the typically sparse herbaceous layer. Other common herbaceous species include *Arnica cordifolia, Geranium viscosissimum*, and *Carex geyeri*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	.	X	.
Spiraea betulifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	.	X	.
Paxistima myrsinites	Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (22-Dec-1999). This association occurs locally in the northern Rocky Mountains. Stands are restricted to benches, lower slopes, and dry alluvial terraces, on rocky substrates derived from sandstone and, less commonly, limestone or andesite parent materials. Stands are naturally rare because of specific site requirements. Logging converts these forests into seral *Pinus contorta* and *Pseudotsuga menziesii* stands, and further reduces the extent of this uncommon forest type.

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii / Symphoricarpos albus* Forest (CEGL000459)

Global Related Concepts:
- *Abies lasiocarpa / Symphoricarpos albus* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa/Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Symphoricarpos albus* Habitat Type well. Notable absences within the Grand Teton National Park stand are *Pseudotsuga menziesii* and *Calamagrostis rubescens*, which Steele et al. describe as often present. Although *Amelanchier* is present within the Grand Teton National Park stand, it does not form the notable layer that Steele et al. intimate is common.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs east of Beaver Creek adjacent to Cottonwood Creek.
Global Range: This association in found locally in the mountains of eastern Idaho, western Wyoming and western Montana.
Nations: US
States/Provinces: ID:S2, MT:S3, WY:S3
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332B:CC, M332D:CC, M332E:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0203005
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Pfister 1981	.	X	.	X	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Steele et al. 1983	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000338] *Abies lasiocarpa - Picea engelmannii / Thalictrum occidentale* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Western Meadowrue Forest**
Common Name: **Subalpine Fir / Western Meadowrue**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This forested association is a minor type in northwestern Oregon, eastern Idaho, northwestern Wyoming and southwestern Montana. It occurs on gentle to steep slopes, on any aspect in the Rocky Mountains, and limited to valley bottoms and north slopes in northeastern Oregon. Elevation ranges from 1585 to 2900 m (5200-9500 feet). Soils are shallow to deep, derived from sandstone, limestone or quartzite parent materials. The understory is dominated by forbs, and the shrub layer is depauperate. *Abies lasiocarpa* and *Picea engelmannii* are the overstory dominants, together or individually. *Pinus albicaulis, Pinus contorta, Pseudotsuga menziesii*, and *Larix occidentalis* may be present. This type is distinguished from similar associations by the higher cover of *Thalictrum occidentale*. *Arnica cordifolia* may also be is present in nearly all stands but has lower abundance on average.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes varying from 4 to 70% at elevations ranging from 2057 to 2896 m (6750-9500 feet). The slopes generally face either northeast or southwest. Detailed data for the soil parent materials are available for seven stands located in the Caribou-Targhee National Forest. Soils are derived mostly from alluvium and/or colluvium from limestone and loess. Oxyaquic Cryochrept, Ketchum, Yodal, Katpa, and Koffgo soils are all present. Soil data for the other four stands indicate the presence of mainly loam-based soils containing up to 10% gravel. Unvegetated and nonvascular ground surface data from one stand show that mosses dominate with 50% cover. The remaining surface is codominated by litter and duff (30% cover) and wood (20% cover). Fungi and lichens are also present with up to 5% cover. Natural disturbances recorded in four stands include fire scars on mature trees, mistletoe infections, and two stands with insect infestations.
Global Environment: It occurs on gentle to steep slopes, on any aspect in the Rocky Mountains, and limited to valley bottoms and north slopes in northeastern Oregon. Elevation ranges from 1550 to 2896 m (5200 9500 feet). Soils are shallow to deep, derived from sandstone, limestone or quartzite parent materials.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs in subxeric to mesic areas. *Abies lasiocarpa* is present in the tree canopy in every stand with 1 to 30% cover. *Picea engelmannii* is present in eight out of eleven stands and usually codominates with 1 to 90% cover. Other species present within the tree canopy may include *Pseudotsuga menziesii* (3 stands, 10 to 20% cover), *Pinus albicaulis* (1 stand, 3% cover), and *Pinus contorta* (1 stand, 3% cover). *Abies lasiocarpa* seedlings are present in four stands in either the dwarf- or short-shrub strata, and *Picea engelmannii* seedlings are present in one stand in the short-shrub stratum. The shrub strata are quite variable but not well-developed. *Ribes* spp. compose 1 to 10% cover in ten stands. Other common species include *Vaccinium membranaceum* (2 stands, 1 and 10% cover), *Vaccinium scoparium* (2 stands, 3 and 20% cover), and *Spiraea betulifolia* (3 stands, 1 to 10% cover). Graminoids do not account for much cover within the herbaceous layer; *Carex geyeri* is the highest constancy and most common graminoid, present in seven stands with 1 to 10% canopy cover. Forbs are quite diverse and dominate the herbaceous layer. *Thalictrum occidentale* occurs in every stand with 1 to 30% cover. Present in eight or nine stands each are *Eucephalus engelmannii* (1 to 10% cover), *Arnica* spp. (1 to 20% cover), and *Osmorhiza* spp. (1 to 3% cover).
Global Vegetation: *Abies lasiocarpa* and *Picea engelmannii* are the overstory dominants, together or individually. *Pinus albicaulis, Pinus contorta, Pseudotsuga menziesii*, and *Larix occidentalis* may be present. The shrub strata are quite variable but not well-developed; common species include *Vaccinium scoparium* and *Spiraea betulifolia*. Forbs are quite diverse and dominate the herbaceous layer. *Thalictrum occidentale* occurs in every stand with 1-40% cover. Other commonly associated forbs are *Osmorhiza berteroi (= Osmorhiza chilensis), Arnica cordifolia*, and *Orthilia secunda (= Pyrola secunda)*. This type is distinguished from similar associations by the higher cover of *Thalictrum occidentale*. *Arnica cordifolia* may also be is present in nearly all stands but has lower abundance on average.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Arnica spp.	characteristic forbs
Osmorhiza spp.	characteristic forbs
Ribes spp.	dominant and characteristic short shrubs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Thalictrum occidentale	Herb (field)	Forb	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Abies lasiocarpa / Thalictrum occidentale* Community Type (Cole 1982) =
- *Abies lasiocarpa / Thalictrum occidentale* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Thalictrum* Habitat Type (Cooper 1975) B *Abies lasiocarpa/Thalictrum occidentale* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Thalictrum occidentale* Habitat Type well. Steele et al. give an elevational range of 2316 to 2713 m (7600-8900 feet) for this type; three of Grand Teton National Park's stands occur outside this range at 2062, 2254, and 2896 m (6765, 7395, and 9500 feet). *Pinus contorta* is not present as a common dominant as Steele et al. intimate is common.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs throughout the Caribou-Targhee National Forest in or near the Jedediah Smith Wilderness. Additionally, stands are located southwest of Upper Berry Cabin, south of Emma Matilda Lake, southwest of Two Ocean Lake, and in Cascade Canyon.
Global Range: This forested association is a minor type in northwestern Oregon, eastern Idaho, northwestern Wyoming and southwestern Montana.
Nations: US
States/Provinces: ID:S4, MT:S3, OR:S4, WY:S2S3
TNC Ecoregions: 6:C, 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M332E:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Seven out of the eleven sampled stands are located in the Caribou-Targhee National Forest.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C086, GT-0201018, GT-0202005, GT-0202136
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-051, CT-95-JD-067, CT-95-JD-075, CT-95-JD-077, CT-95-JD-090, CT-95-JD-099, CT-96-KV-094

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cole 1977a	.	X	.	X	.	.	.	.	.
Cole 1982	.	X	X	X	.	.	.	.	.
Cooper 1975	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL005917] *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Square-twig Blueberry / Bear-grass Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide. It is strongly associated with moderate to steep, cold, relatively dry slopes, usually having southeast- through south- to west-facing exposures. It typically occurs from midslopes upwards to slope shoulders, ridgetops and occasionally extending to high-elevation benchlands as well. Elevations range is from 1425-2025 m (4675-6643 feet) in the northern portion of its distribution and 1740-2470 m (5700-8100 feet) in its southern extent. These sites have well-drained, nutrient-poor soils derived from a variety of parent materials. The range in soil surface texture is broad, from silt to loamy sand with the gravel content averaging about 14% near surface and increasing markedly with depth. Litter dominates ground surface with low cover of bare soil and rock. The evergreen needle-leaved tree canopy is open to dense (30-80% cover) and may be stunted (2-5 m) in the highest elevation stands. The upper tree canopy is typically codominated by *Abies lasiocarpa, Picea engelmannii* trees and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii, Pinus contorta*, and *Larix occidentalis*. The short-shrub layer is typically composed of dense patches and dominated by *Vaccinium membranaceum*. Other consistent shrubs and dwarf-shrubs include *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Sorbus scopulina*, and *Spiraea betulifolia*. The herbaceous layer is dominated by *Xerophyllum tenax* and *Calamagrostis rubescens* (locally). Other relatively consistent species are *Arnica latifolia, Carex geyeri, Osmorhiza berteroi (= Osmorhiza chilensis), Orthilia secunda (= Pyrola secunda), Thalictrum occidentale*, and *Viola orbiculata*. Occasionally cover of *Vaccinium membranaceum* may be low or absent, then *Xerophyllum tenax* strongly dominates the understory.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The two sampled stands of this association occur on northeast-facing footslopes of 19 and 57%. The elevations for these stands are7296 and 7600 feet. Soil data is available for one stand; the well-drained silty clay soils are covered predominantly by litter and duff with wood, mosses, and lichens well represented and gravel, bare soil, and fungi present in trace amounts. Areas adjacent to one stand were burned in the Glade Fire of 2000. The microtopography of the hillside on which one stand is situated includes many small ridges and gullies, creating pockets of wetter areas.

Global Environment: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide in western Montana and central and northern Idaho, northwestern Wyoming, northeastern Washington and extending into the Canadian Rockies of southwestern Alberta and British Columbia. Elevation range is from 1425-2025 m (4674-6642 feet) in the northern portion of its distribution and 1740-2470 m (5700-8100 feet) in its southern extent. It is strongly associated with moderate to steep, cold and relatively dry slopes, usually having southeast- through south- to west-facing exposures, usually occurring from midslopes upwards to slope shoulders, ridgetops and occasionally extending to high-elevation benchlands as well. These sites have well-drained, nutrient-poor soils derived from a variety of parent materials, including volcanics (quartz monzonite, undifferentiated granites, rhyolite), noncalcareous sedimentaries and metamorphics (quartzite, argillite, gneiss, schist, phyllite), and glacial till. The range in soil surface texture is broad, from silty loam to sandy loam with the gravel

content averaging about 14% near the surface and increasing markedly with depth. Litter dominates ground surface with low cover of bare soil and rock.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs in mesic areas. The tree canopy is dominated by *Abies lasiocarpa* (20 and 30% cover), *Picea engelmannii* (1 and 30% cover), and *Pinus contorta* (3 and 10% cover). *P. engelmannii* and *Pinus flexilis* seedlings may be present in the short shrub stratum in trace quantities with *A. lasiocarpa* seedlings, which provide 7 and 20% cover. Also present within the short shrub stratum are *Vaccinium membranaceum* (30% cover) and *Spiraea betulifolia* (1 and 3% cover). *Vaccinium scoparium* provides 12 and 20% cover in the dwarf shrub stratum. The herbaceous layer is dominated by *Xerophyllum tenax* (3 and 30% cover). Other herbaceous species occurring in both stands include *Carex geyeri* (1 and 7% cover) and *Pedicularis racemosa* (trace amounts). A few other forbs and graminoids are present in trace quantities.

Global Vegetation: This conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with a typically dense understory dominated by *Vaccinium membranaceum* (canopy cover) and *Xerophyllum tenax*. Cover of *Vaccinium scoparium* and *Vaccinium myrtillus* is low (<5%). The evergreen needle-leaved tree canopy is open to dense (30-80% cover) and may be stunted (2-5 m) in the highest elevation stands. The upper tree canopy is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* trees and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in tree canopy are *Pseudotsuga menziesii*, *Pinus contorta*, and *Larix occidentalis*. The short-shrub layer is typically composed of dense patches and dominated by *Vaccinium membranaceum*. Other consistent shrubs and dwarf-shrubs include *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Spiraea betulifolia*. The herbaceous layer is dominated by *Xerophyllum tenax* and *Calamagrostis rubescens* (locally). Other relatively consistent species are *Arnica latifolia*, *Carex geyeri*, *Osmorhiza berteroi (= Osmorhiza chilensis)*, *Orthilia secunda (= Pyrola secunda)*, *Thalictrum occidentale*, and *Viola orbiculata*. Occasionally cover of *Vaccinium membranaceum* may be low or absent, then *Xerophyllum tenax* strongly dominates the understory.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Abies lasiocarpa	Short shrub/sapling	Needle-leaved tree	.	.	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Xerophyllum tenax	Herb (field)	Forb	X	X	.
Pedicularis racemosa	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	X	.	.
Vaccinium membranaceum	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	X
Xerophyllum tenax	Herb (field)	Forb	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Xerophyllum tenax	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (21-Apr-2004).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341)

- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005914)
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax* Woodland (CEGL005837)
- *Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005913)
- *Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005852)
- *Thuja plicata / Clintonia uniflora - Xerophyllum tenax* Forest (CEGL005930)

Global Related Concepts:
- *Abies lasiocarpa / Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Steele et al. 1981) B
- *Abies lasiocarpa / Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa / Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Steele et al. 1983) B
- *Abies lasiocarpa / Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Cooper et al. 1987) B
- *Abies lasiocarpa / Xerophyllum tenax* Plant Association (Williams et al. 1995) =

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: The sampled stand seems to be intermediate between the Steele et al. (1983) *Abies lasiocarpa / Xerophyllum tenax – Vaccinium globulare* (=*V.membranaceum*) and *Vaccinium scoparium* phases. The major distinction made between these phases is the co-dominance of either *V. membranaceum* or *V. scoparium* with *X. tenax*. All of these species occur in more or less similar quantities in the sampled stands.

Global Classification Comments: Stands of this association missing *Vaccinium membranaceum* are distinguished from the similar association, ~*Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005914)$$, by the abundance of *Xerophyllum tenax*, the lack of *Vaccinium scoparium*, and a wide diversity of forbs present.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Both sampled stands occur in the John D. Rockefeller, Jr. Memorial Parkway.

Global Range: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide.
Nations: CA, US
States/Provinces: AB, ID, MT, OR?, WA, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 68:P
TNC Ecoregion Comments:
USFS Ecoregions: M331A:CP, M331D:CC, M332A:CP, M332B:CC, M332C:CC, M332D:CP, M332E:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rockefeller); PC (Waterton Lakes)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B076
Accuracy Assessment Points: 04J088
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Cooper et al. 1987	.	X	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	.	.	.	.	.	.
Steele et al. 1981	.	X	X	.	.	.	.	.	.
Steele et al. 1983	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams et al. 1990b	.	X	.	.	.	.	.	.	.
Williams et al. 1995	.	X	X	.	.	.	.	.	.

[CEGL000341] *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Rocky Mountain Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Square-twig Blueberry Rocky Mountain Forest**
Common Name: **Subalpine Fir / Square-twig Blueberry Forest**
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a cool and moderately moist forest, known from southwestern Montana, northern and eastern Idaho, western Wyoming, and northern Utah. Rocky Mountain is in the name to distinguish it from similar types in the Cascades and on the Olympic Peninsula. This association occurs generally on north- and northeast-facing slopes, although it has been documented to occur on any aspect. Slopes are gentle to quite steep, and it can occur on flat cool benches. Elevational range is 1680 to 2685 m (5500-8800 feet). Soils are acidic, well-drained to moderately well-drained gravelly loams to gravelly clays. This forest is dominated by *Abies lasiocarpa* and *Picea engelmannii* in the overstory tree canopy. We exclude stands dominated in the overstory canopy by *Pinus contorta* or *Pseudotsuga menziesii* that may have *Abies lasiocarpa* and *Picea engelmannii* in the subcanopy. *Abies lasiocarpa* and *Picea engelmannii* combined cover occupies at least 25% of the overstory canopy in mixed conifer stands. *Abies lasiocarpa* and *Picea engelmannii* create a codominant canopy. Occasionally *Abies lasiocarpa* is present only in the subcanopy, with *Picea engelmannii* the dominant overstory conifer. Other conifers often present include *Pinus contorta* and *Pseudotsuga menziesii*. *Pinus albicaulis, Larix occidentalis*, and *Picea glauca* can occur in stands in the northern part of its range. Shrub canopy is 1-2 feet tall, dominated by discontinuous to continuous cover of *Vaccinium membranaceum*. *Vaccinium scoparium* may be present in near equal amounts. This association is differentiated from similar types by a lack of *Xerophyllum tenax* (although it may be present, it is never abundant) and clear dominance of *Abies lasiocarpa* and *Picea engelmannii* in the overstory canopy.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on level terrain and slopes varying from 1 to 43%. The majority of the stands that are on slopes face north. The elevational range of this association is 2027 to 2576 m (6650-8450 feet). Soil data from five Caribou-Targhee National Forest stands indicate that the Koffgo soils are generally derived from alluvium and/or colluvium from loess, limestone, mixed volcanic rock, and/or rhyolite. The remaining soil data indicate that, in general, well- to moderately well-drained loam-based soils are present throughout. Litter and duff dominate the unvegetated and nonvascular ground surface with 40 to 90% cover. The remaining surface is composed of wood (5 to 30% cover), rocks greater than 10 cm (0 to 40% cover), gravel (0 to 5% cover), bare soil (0 to 5% cover), lichens (0 to 5% cover), and mosses (0 to 20% cover). Two stands are located in or near avalanche paths. Adjacent vegetation usually includes a continuation of this forest type.

Global Environment: This association occurs generally on north- and northeast-facing slopes, although it has been documented to occur on any aspect. Slopes are gentle to quite steep. It can occur on flat cool benches. Elevational range is 1737 to 2680 m (5500-8800 feet). Soils are acidic, well-drained to moderately well-drained gravelly loams to gravelly clays.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs in mesic areas. *Abies lasiocarpa* has the highest constancy within the tree canopy, present in 17 out of 21 stands with covers ranging from 1 to 70%. Also present within the tree canopy are *Picea engelmannii* (11 stands, 1 to 50% cover), *Pinus contorta* (9 stands, 1 to 30% cover), *Pinus albicaulis* (5 stands, 1 to 3% cover), *Pinus flexilis* (3 stands, 1 to 10% cover), and *Pseudotsuga menziesii* (3 stands, 3 to 40% cover). All of these species, except for *Pseudotsuga menziesii*, may also occur in the tree subcanopy. *Abies lasiocarpa* forms 20% cover in the subcanopy of three stands. *Picea engelmannii* and *Abies lasiocarpa* are present as seedlings in 8 and 11 stands, respectively, with up to 20% canopy cover. All of the other aforementioned conifers are also present as seedlings in one or two stands each. In the stand in which *Pseudotsuga menziesii* seedlings are present, they form 30% cover in the dwarf-shrub stratum. The short- and/or dwarf-shrub strata are present and well-developed in most stands. *Vaccinium membranaceum* is present in every stand with 3 to 50% cover. Other common species include *Lonicera utahensis* (19 stands, 1 to 10% cover), *Vaccinium scoparium* (10 stands, 1 to 30% cover), *Sorbus scopulina* (13 stands, 1 to 10% cover), and *Paxistima myrsinites* (14 stands, 1 to 10% cover). Graminoids are in general neither common nor diverse. *Carex geyeri* occurs in 14 stands with 1 to 30% cover. Other notable species include *Calamagrostis rubescens* (9 stands, 1 to 10% cover), *Elymus trachycaulus* (3 stands, 1 to 10% cover), and *Bromus ciliatus* (2 stands, 3 and 30% cover). A number of forb species occur within the stands; in general the forbs are neither highly constant nor highly abundant. *Arnica* spp. occur in 17 stands with 1 to 20% cover. Other notable species include *Thalictrum* spp. (11 stands, 1 to 20% cover), *Eucephalus engelmannii* (8 stands, 1 to 20% cover), and *Eurybia conspicua* (2 stands, 10 and 20% cover).

Global Vegetation: This forest is dominated by *Abies lasiocarpa* and *Picea engelmannii* in the overstory tree canopy. We exclude stands dominated by *Pinus contorta* or *Pseudotsuga menziesii* that may have *Abies lasiocarpa* and *Picea engelmannii* in the subcanopy. *Abies lasiocarpa* and *Picea engelmannii* combined cover occupies at least 25% of the overstory canopy in mixed conifer stands. *Abies lasiocarpa* and *Picea engelmannii* create a codominant canopy. Occasionally *Abies lasiocarpa* is present only in the subcanopy, with *Picea engelmannii* the dominant overstory conifer. Other conifers often present include *Pinus contorta, Pseudotsuga menziesii, Pinus albicaulis, Larix occidentalis*, and *Picea glauca*. Shrub canopy is 1-2 feet tall, dominated by discontinuous to continuous cover of *Vaccinium membranaceum*. *Vaccinium scoparium* may be present in near equal amounts. Other shrubs often present include *Lonicera utahensis, Juniperus communis, Sorbus scopulina, Shepherdia canadensis, Spiraea betulifolia*, and *Paxistima myrsinites*. The herbaceous cover is depauperate, with *Calamagrostis rubescens, Carex geyeri*, and *Carex rossii* the most

common graminoids. Common forbs include *Arnica cordifolia*, *Arnica latifolia*, and *Pedicularis racemosa*. This association is differentiated from similar types by a lack of *Xerophyllum tenax* (although it may be present, it is never abundant) and clear dominance of *Abies lasiocarpa* and *Picea engelmannii* in the overstory canopy.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Arnica spp.	dominant and characteristic forbs
Thalictrum spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Sorbus scopulina	Tall shrub/sapling	Broad-leaved deciduous shrub	.	.	.
Paxistima myrsinites	Tall shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Xerophyllum tenax	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005917)--a northern Rockies type with abundant *Xerophyllum tenax*.
- *Abies lasiocarpa / Vaccinium membranaceum / Valeriana sitchensis* Forest (CEGL002612)--a Cascadian and Olympic Peninsular forest type; forb component differs from Rocky Mountain types.
- *Abies lasiocarpa / Vaccinium membranaceum* Forest (CEGL000342)--a Cascadian and Olympic Peninsula forest type; forb component differs from Rocky Mountain types.
- *Abies lasiocarpa* var. *lasiocarpa / Vaccinium membranaceum / Brachythecium* spp. Woodland (CEGL002327)--a British Columbia endemic with Picea engelmannii X glauca and other more northern species.
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax* Woodland (CEGL005837)
- *Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005913)--has abundant *Pinus contorta* in the overstory canopy and abundant *Xerophyllum tenax*.
- *Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax* Forest (CEGL005852)--has abundant *Pseudotsuga menziesii* in the overstory canopy.

Global Related Concepts:

- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Vaccinium globulare* Habitat Type (Cooper 1975) B
- *Abies lasiocarpa/Vaccinium globulare* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Vaccinium globulare (= Vaccinium membranaceum)* Habitat Type well. The stands collected under this association seem to be a mix of the Steele et al. (1983) *Vaccinium scoparium* and *Vaccinium globulare (= Vaccinium membranaceum)* phases.
Global Classification Comments: We exclude stands dominated by *Pinus contorta* or *Pseudotsuga menziesii* that may have *Abies lasiocarpa* and *Picea engelmannii* in the subcanopy. *Abies lasiocarpa* and *Picea engelmannii* combined cover occupies at least 25% of the overstory canopy in mixed conifer stands.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs throughout Grand Teton National Park and in the Caribou-Targhee and Bridger-Teton national forests.
Global Range: This association is known from eastern and northern Idaho, western Wyoming, southwestern Montana, and northern Utah. It may also occur in Washington but has not yet been documented there.
Nations: US
States/Provinces: ID:S4, MT:S5, UT:S4S5, WA?, WY:S4
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 68:C
TNC Ecoregion Comments: ECO7 & ECO68 added (mjr 7-05). ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Seven stands were sampled in the Caribou-Targhee and Bridger-Teton national forests.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A028, GT-03B025, GT-03B039, GT-03B041, GT-03B087, GT-03B105, GT-03C078, GT-0201009, GT-0201069, GT-0201070, GT-0202031, GT-0202040, GT-0202072, GT-0202135
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407059, BT-9408202, CT-95-JD-055, CT-95-JW-020, CT-95-JW-021, CT-95-JW-028, CT-95-JW-029

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Kerr and Henderson 1979	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000344] *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Grouseberry Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This widespread subalpine forest association occurs throughout the Rocky Mountains extending to the mountains in the eastern Cascades. Elevations range between 2590 and 3800 m (7760-12,500 feet) in Colorado to 1525-2590 m (5000-8500 feet) in Montana and 1005-1900 m (3300-6230 feet) in central Washington. This type is characterized by deep snowpack and brief, cool summers. Sites are relatively xeric and cold. Stands are common in the middle to upper subalpine zone. Soils are variable but are often shallow, rocky, well-drained, sandy loam (to sandy clay) soils derived from andesite, conglomerate, granite, quartzite, sandstone, shale, and various other rocks. Litter and duff and downed wood cover a significant portion of the ground surface. The vegetation is characterized by a moderately dense to dense conifer tree canopy codominated by *Picea engelmannii* and *Abies lasiocarpa*, with an understory characterized by a dwarf-shrub layer strongly dominated by *Vaccinium scoparium*. *Pinus albicaulis* or *Pinus flexilis* may be present in canopy of some stands. *Pinus contorta*, *Populus tremuloides*, and *Larix occidentalis* (northern stands) are the most common seral species, though *Pseudotsuga menziesii* may occur in lower elevation stands. In the understory, *Vaccinium myrtillus* may be present but is usually trace to less than half the cover of *Vaccinium scoparium*. Other shrubs may be present at low cover such as *Lonicera involucrata, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Spiraea betulifolia*, and *Vaccinium membranaceum*. Herbaceous species such as *Arnica* spp., *Calamagrostis rubescens, Carex geyeri, Carex rossii, Chamerion angustifolium, Erigeron peregrinus, Erythronium grandiflorum, Eucephalus engelmannii, Hieracium gracile, Lupinus argenteus, Luzula parviflora, Orthilia secunda, Poa nervosa, Pedicularis racemosa, Polemonium pulcherrimum, Orthilia secunda (= Pyrola secunda), Thalictrum occidentale*, and *Trisetum spicatum* are commonly present with low cover values.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on flat terrain and shallow slopes at elevations ranging from 2027 to 2713 m (6650-8900 feet). The aspects of the slopes are variable. The parent material of the Winegar soils in one stand is local alluvium from glacial till and loess. Soil data from the other eight stands indicate that the well- to moderately well-drained soils are generally loam-based but quite variable. Litter and duff (20 to 80% cover) and wood (10 to 30% cover) dominate the unvegetated and nonvascular ground surface. Rocks greater than 10 cm (0 to 30% cover), bare soil (1 to 10% cover), gravel (0 to 10% cover), mosses (0 to 10% cover), and lichens (0 to 5% cover) codominate the remaining surface. Anthropogenic disturbances in or near several stands include roads, trails, and cut trees. Fire scars are noted in one stand. Adjacent to most stands is a continuation of this association or *~Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Forest (CEGL005917)$$. Canopy disturbances may give way to small forb-dominated meadows. One stand is located in an avalanche path and another has ephemeral rivulets in the vicinity.

Global Environment: This widespread subalpine forest association occurs throughout the Rocky Mountains extending to the mountains in the eastern Cascades. Elevations range between 2590 and 3800 m (7760-12,500 feet) in Colorado to 1525-2590 m (5000-8500 feet) in Montana and 1005-1900 m (3300-6230 feet) in central Washington. This type is characterized by deep snowpack and brief, cool summers. Sites are relatively xeric and cold. Stands are common in the middle to upper subalpine zone. Soils are variable but are often shallow, rocky, well-drained, sandy loam (to sandy clay) soils derived from andesite, conglomerate, granite, quartzite, sandstone, shale, and various other rocks. Litter and duff and downed wood cover a significant portion of the ground surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: The association is a montane forested community that occurs in mesic areas. *Abies lasiocarpa* is present throughout all of the stands within the tree canopy or as an emergent with 3 to 30% cover. Codominants within the tree canopy may include *Picea engelmannii* (6 out of 9 stands, 1 to 30% cover) and *Pinus contorta* (6 stands, 3 to 50% cover). Other species within the tree canopy may include *Pinus albicaulis, Pinus flexilis, Pseudotsuga menziesii*, and *Populus tremuloides*. Tree species that may compose the tree subcanopy include *Abies lasiocarpa, Pinus albicaulis*, and *Picea engelmannii*. Seedlings of *Abies lasiocarpa* are present in seven stands with 3 to 10% cover. Seedlings from all of the aforementioned conifers may also be present. A dwarf-shrub stratum is present in every stand, dominated by *Vaccinium scoparium* (3 to 40% cover). Some stands also have a short-shrub stratum that may be dominated by *Lonicera utahensis* (6 stands, 1 to 3% cover), *Spiraea betulifolia* (2 stands, 1 and 20% cover), and/or *Vaccinium membranaceum* (2 stands, 3 to 10% cover). *Spiraea betulifolia* and *Vaccinium membranaceum* are also present in two or three stands each in the dwarf-shrub stratum. Graminoids may be common within the herbaceous layer but do not have high constancy; common graminoids include *Carex geyeri* (5 stands, 1 to 20% cover), *Calamagrostis rubescens* (4 stands, 1 to 40% cover), and *Eleocharis rostellata* (1 stand, 10% cover). In general forbs are not as common as graminoids and most are not highly constant. Occurring in six stands are *Arnica cordifolia* (1 to 3% cover) and *Chamerion angustifolium* (1% cover). Common forb species include *Eucephalus engelmannii* (4 stands, 1 to 20% cover), *Thalictrum occidentale* (3 stands, 1 to 10% cover), *Arnica latifolia* (2 stands, 3 and 10% cover), *Lupinus* sp. (2 stands, 1 and 10% cover), and *Sibbaldia procumbens* (1 stand, 10% cover).

Global Vegetation: This conifer forest association has a moderately dense to dense tree canopy codominated by *Picea engelmannii* and *Abies lasiocarpa*, with an understory characterized by a dwarf-shrub layer dominated by *Vaccinium scoparium*. *Pinus albicaulis* or *Pinus flexilis* may be present in the canopy of some stands. *Pinus contorta, Populus tremuloides*, and *Larix occidentalis* (northern stands) are the most common seral species, though *Pseudotsuga menziesii* may occur in lower elevation stands. In the understory, *Vaccinium myrtillus* may be present but is usually trace to less than half the cover of *Vaccinium scoparium*. Other shrubs may be present at low cover such as *Lonicera involucrata, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Spiraea betulifolia*, and *Vaccinium membranaceum*. Herbaceous species such as *Arnica cordifolia, Arnica latifolia, Calamagrostis rubescens, Carex*

geyeri, Carex rossii, Chamerion angustifolium, Erigeron peregrinus, Erythronium grandiflorum, Eucephalus engelmannii, Hieracium gracile, Lupinus argenteus, Luzula parviflora, Orthilia secunda, Poa nervosa, Pedicularis racemosa, Polemonium pulcherrimum, Orthilia secunda (= Pyrola secunda), Thalictrum occidentale, and *Trisetum spicatum* are commonly present with low cover values.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	.	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Abies lasiocarpa	Herb (field)	Dwarf-shrub	X	.	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Lupinus sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa var. *lasiocarpa*	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Arnica cordifolia	Herb (field)	Forb	X	.	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	X	.	.
Orthilia secunda	Herb (field)	Forb	X	.	.
Pedicularis racemosa	Herb (field)	Forb	X	.	.
Polemonium pulcherrimum	Herb (field)	Forb	X	.	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Vaccinium myrtillus* Forest (CEGL000343)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale* Forest (CEGL005919)
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Forest (CEGL005914)

Global Related Concepts:

- *Abies lasiocarpa - Picea engelmannii / Vaccinium myrtillus - Vaccinium scoparium* Plant Association (Baker 1984a) I
- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium* Plant Association (Johnston 1987) =

- *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium* Plant Association (Baker 1984a) =
- *Abies lasiocarpa / Vaccinium scoparium* Community Type (Cole 1982) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Mauk and Henderson 1984) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1976) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Wasser and Hess 1982) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1980) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hess and Alexander 1986) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Cooper 1975) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1983) B
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Komarkova et al. 1988b) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Alexander et al. 1986) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type/Association (Komarkova 1986) =
- *Abies lasiocarpa / Vaccinium scoparium* Plant Association (Lillybridge et al. 1995) ?
- *Abies lasiocarpa / Vaccinium scoparium* Plant Association (Williams et al. 1990b) B
- *Abies lasiocarpa / Vaccinium scoparium* Plant Association (Williams and Smith 1990) B
- *Abies lasiocarpa / Vaccinium scoparium* Plant Association (Williams and Lillybridge 1983) B
- *Abies lasiocarpa / Vaccinium scoparium* Plant Association (Johnson and Simon 1987) =
- *Abies lasiocarpa / Vaccinium scoparium* Plant Community (Hall 1973) =
- *Abies lasiocarpa / Vaccinium* Habitat Type (DeVelice and Ludwig 1983a) B
- *Abies lasiocarpa/Vaccinium scoparium* (Bourgeron and Engelking 1994) =
- *Picea engelmannii - Abies lasiocarpa / Vaccinium scoparium* Habitat Type (Hess and Wasser 1982) B
- *Picea engelmannii / Vaccinium scoparium / Polemonium delicatum* Habitat Type (Moir and Ludwig 1979) B
- *Picea engelmannii / Vaccinium scoparium* Habitat Type (Hess 1981) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- Spruce - Fir Climax Community (Harrington 1978) B
- Xeric *Picea, Abies* Forest (E5) (Peet 1981) B
- Xeric *Picea, Abies* Forest (E5) (Peet 1980) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Vaccinium scoparium* Habitat Type well. Several stands are dominated by *Abies lasiocarpa*, which Steele et al. describe as quite rare.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs on Burned Ridge, north of Owl Creek, in the upper elevations of Granite Canyon, in the North Fork of Moran Canyon, west of the Moose Post Office, on Hermitage Point, near the mouth of Arizona Creek, and in the Jedediah Smith Wilderness south of Indian Meadows.
Global Range: This subalpine forest association occurs throughout the Rocky Mountains and extends into the mountains in the eastern Cascades.
Nations: US
States/Provinces: AZ?, CO:S5, ID:S5, MT:S5, NM?, OR:S4, UT:S5, WA:S4, WY:S5
TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 20:C, 68:C
TNC Ecoregion Comments: ECO4, ECO7, ECO8, ECO68 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342C:CC, 342G:CC, M242C:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Arapaho-Roosevelt, Bighorn, Caribou-Targhee, Gunnison, Medicine Bow, Routt, San Juan, Shoshone, White River NF)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A070, GT-03B004, GT-03C004, GT-03C024, GT-03C073, GT-0201033, GT-0201055, GT-0201011
Accuracy Assessment Points: None

Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-068

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1986	.	X	.	X	.	.	.	.	.
Alexander et al. 1986	.	.	X	.	.	.	.	.	.
Amundsen 1967	.	X	.	X	.	.	.	.	.
Baker 1984a	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Boyce 1977	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cole 1982	.	X	X	X	.	.	.	.	.
Cooper 1975	.	X	X	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	X	X	.	.	.	.	.
DeVelice 1983	.	X	.	X	.	.	.	.	.
DeVelice and Ludwig 1983a	.	.	X	.	.	.	.	.	.
Dix and Richards 1976	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Fritz 1981	.	X	.	X	.	.	.	.	.
Giese 1975	.	X	.	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Harrington 1978	.	X	X	X	.	.	.	.	.
Hess 1981	.	X	X	X	.	.	.	.	.
Hess and Alexander 1986	.	X	X	X	.	.	.	.	.
Hess and Wasser 1982	.	.	X	.	.	.	.	.	.
Hoffman and Alexander 1976	.	X	X	X	.	.	.	.	.
Hoffman and Alexander 1980	.	X	X	X	.	.	.	.	.
Hoffman and Alexander 1983	.	.	X	.	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Fertig 1999d	.	.	.	.	X	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Klish 1977	.	X	.	X	.	.	.	.	.
Komarkova 1986	.	.	X	.	.	.	.	.	.
Komarkova et al. 1988b	.	X	X	X	.	.	.	.	.
Langenheim 1962	.	X	.	X	.	.	.	.	.
Lillybridge et al. 1995	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Marr et al. 1973a	.	X	.	X	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
McLean 1970	.	X	.	X	.	.	.	.	.
Mills 1962	.	X	.	X	.	.	.	.	.
Moir and Ludwig 1979	.	.	X	.	.	.	.	.	.
Peet 1975	.	X	.	X	.	.	.	.	.
Peet 1980	.	X	X	X	.	.	.	.	.
Peet 1981	.	X	X	X	.	.	.	.	.
Pfister 1972	.	X	.	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Raven 1948	.	X	.	X	.	.	.	.	.
Reed 1976	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.

Wasser and Hess 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Whipple 1975	.	X	.	X	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Williams and Smith 1990	.	X	X	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.

[CEGL002174] *Picea engelmannii / Galium triflorum* Forest

Translated Name: **Engelmann Spruce / Sweet-scent Bedstraw Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a wet forest type that occurs in southwestern Montana, eastern Idaho, and western Wyoming. It occurs on alluvial terraces and bottomlands, moist benches bordering streams, and it can also occur on moist toeslopes. It is not entirely restricted to riparian settings. It ranges in elevation from 854 to 2151 m (2800-7052 feet). Sites can be flat, gently sloping to undulating. Soils are mostly derived from alluvial deposits; litter is nearly always present, and wet sites can have organic layers over 50 cm thick. Stands are generally dominated in the upper canopy by *Picea engelmannii, Picea glauca*, or the hybrid between them. *Abies lasiocarpa* may be present but not abundant. *Pseudotsuga menziesii, Pinus contorta, Picea pungens*, and *Populus* species may be present in small amounts, especially if the site has been disturbed. Shrub layer is minor but may include *Alnus incana, Ribes* spp., *Rubus idaeus, Linnaea borealis, Symphoricarpos albus*, and *Lonicera utahensis*. The herbaceous layer is dominated by forbs and is depauperate of graminoid species. *Galium triflorum, Actaea rubra*, and *Streptopus amplexifolius* are generally abundant and are indicators of a wet site. Other common forbs include *Aconitum columbianum, Thalictrum* sp., *Rudbeckia occidentalis, Osmorhiza berteroi, Heracleum maximum*, and *Geranium richardsonii*. This type is distinguished from similar associations by the dominance of *Picea engelmannii* and the lack of robust *Abies lasiocarpa*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on north-facing slopes varying from 18 to 48% at elevations ranging from 2469 to 2743 m (8100-9000 feet). Soils range from well-drained sandy clay loams to moderately well-drained clay loams, silty clay loams, silty clays, and silt loams. The unvegetated and nonvascular ground surface is dominated by litter and duff, which composes 50 to 90% of the ground cover. Wood (5 to 30% cover) and mosses (1 to 30% cover) codominate the remaining surface. Rocks greater than 10 cm, gravel, bare soil, fungi, and lichen may be absent or present with up to 5% ground cover. Adjacent vegetation most often includes a continuation of this forest type. Drainages and canopy openings are often present and are dominated by high concentrations of forbs. Some stands of this association abruptly breaks into forb-dominated meadows with similar compositions but with higher density and species richness.

Global Environment: It occurs on alluvial terraces and bottomlands, moist benches bordering streams, and it can also occur on moist toeslopes. It is not entirely restricted to riparian settings. It ranges in elevation from 854 to 2151 m (2800-7052 feet). Sites can be flat, gently sloping to undulating. Soils are mostly derived from alluvial deposits; litter is nearly always present, and wet sites can have organic layers over 50 cm thick.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an upper montane forested community that occurs in mesic areas. The codominants within the tree canopy are always *Abies lasiocarpa* (10 to 40% cover) and *Picea engelmannii* (10 to 50% cover). *Pinus albicaulis* is present in the tree canopy in three stands with 1 to 3% cover. The shrub layer may have up to 20% canopy cover and always includes *Ribes* spp. (1 to 10% cover). Present in four out of six stands are *Lonicera* spp. and *Vaccinium scoparium*, each with 1 to 3% cover. *Picea engelmannii* (3 stands, 1 to 10% cover) and *Abies lasiocarpa* (4 stands, 1 to 10% cover) are present in the shrub layer as seedlings. The herbaceous layer has 20 to 80% canopy cover and is dominated by forbs. *Arnica latifolia* (10 to 30% cover), *Aquilegia* spp. (1 to 3% cover), and *Ligusticum filicinum* (1 to 10% cover) occupy all of the stands. Other common and high-constancy species include *Eucephalus engelmannii* (3 to 20% cover), *Pedicularis bracteosa* (1 to 3% cover), *Arnica cordifolia* (1 to 30% cover), and *Osmorhiza depauperata* (3 to 10% cover). Graminoids do not compose a significant portion of the herbaceous canopy. *Elymus glaucus* (4 stands, 1 to 3% cover) is the highest constancy species.

Global Vegetation: Stands are generally dominated in the upper canopy by *Picea engelmannii, Picea glauca*, or the hybrid between them. *Abies lasiocarpa* may be present but not abundant. *Pseudotsuga menziesii, Pinus contorta, Picea pungens*, and *Populus* species

may be present in small amounts, especially if the site has been disturbed. Shrub layer is minor but may include *Alnus incana*, *Ribes* spp., *Rubus idaeus*, *Linnaea borealis*, *Symphoricarpos albus*, and *Lonicera utahensis*. The herbaceous layer is dominated by forbs and is depauperate of graminoid species. *Galium triflorum*, *Actaea rubra*, and *Streptopus amplexifolius* are generally abundant and are indicators of a wet site. Other common forbs include *Aconitum columbianum*, *Thalictrum* sp., *Rudbeckia occidentalis*, *Osmorhiza berteroi*, *Heracleum maximum*, and *Geranium richardsonii*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Arnica latifolia	Herb (field)	Forb	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Osmorhiza depauperata	Herb (field)	Forb	.	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Aquilegia spp.	characteristic forbs
Lonicera spp.	characteristic shrubs
Ribes spp.	characteristic shrubs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Actaea rubra	Herb (field)	Forb	X	X	.
Galium triflorum	Herb (field)	Forb	X	.	.
Streptopus amplexifolius	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Actaea rubra* Forest (CEGL000295)
- *Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311)--has *Abies lasiocarpa* dominant and consistently present in the overstory, as well as a reproducing tree in the subcanopy.
- *Picea (engelmannii X glauca, engelmannii) / Carex disperma* Forest (CEGL000405)
- *Picea engelmannii / Maianthemum stellatum* Forest (CEGL000415)
- *Pseudotsuga menziesii / Angelica* spp. Forest (CEGL005853)

Global Related Concepts:

- *Picea - Abies lasiocarpa / Galium triflorum* Habitat Type (Cooper 1975) B
- *Picea engelmannii / Galium triflorum* Habitat Type (Pfister et al. 1977) B
- *Picea engelmannii / Galium triflorum* Habitat Type (Steele et al. 1983) B
- *Picea engelmannii/Galium triflorum* (Bourgeron and Engelking 1994) =
- *Picea* spp. / *Galium triflorum* Community Type (Hansen et al. 1995) =
- Conifer/ *Actaea rubra* (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) *Abies lasiocarpa / Arnica latifolia* Habitat Type well, although *Paxistima* is not as common as Steele et al. intimate.
Grand Teton National Park Other Comments:
Global Classification Comments: Former *Picea (engelmannii X glauca, engelmannii) / Galium triflorum* Forest (CEGL000409) in Montana has been merged with former *Picea engelmannii / Galium triflorum* Forest (CEGL000355) into a single entity which can include pure *Picea engelmannii*, pure *Picea glauca*, or *Picea engelmannii X glauca* hybrids, or both. This type was described in Montana as the *Picea* spp. / *Galium triflorum* Community Type by Hansen et al. (1995) and Pfister et al. (1977). The authors explain that the frequent absence of cones and similar morphology and ecological amplitudes caused them to lump stands dominated by *Picea engelmannii* and *Picea glauca* (hybrids) into a single type.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs at the upper elevations of Granite, Death, and Leigh canyons, as well as near Moose Basin.
Global Range: This association occurs in northwestern Wyoming, southwestern and central Montana, Idaho and possibly Utah.
Nations: US
States/Provinces: ID:S3, MT, UT?, WY:S2
TNC Ecoregions: 7:C, 8:C, 9:C, 10:C, 68:C
TNC Ecoregion Comments: ECO68 added (mjr 8-05).
USFS Ecoregions: M331A:CC, M331D:CC, M331J:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333C:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:
Grand Teton National Park Plots: GT-03A036, GT-03A091, GT-03C017, GT-03C020, GT-03C030, GT-0201084.

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	.	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Young 1982	.	X	.	X	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	.	.	.	.	.

I.A.8.N.e. Temporarily flooded temperate or subpolar needle-leaved evergreen forest

A.177 *Abies lasiocarpa* Temporarily Flooded Forest Alliance

Subalpine Fir Temporarily Flooded Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance includes semi-riparian or seep slope conifer forests in upper montane and subalpine areas in the Rocky Mountains. Snowpacks are typically deep and late-lying, and summers are cool. These forests occur in landscape positions where snowmelt moisture creates shallow water tables or seeps for a portion of the growing season. Sites include lower and middle slopes, stream terraces, benches, narrow valleys, or seep slopes. Slope aspects vary, but are often northerly, and can be flat to moderately steep. Soils often have high organic matter content and gleying due to temporarily saturated conditions. These conifer forests are characterized by the codominance of *Abies lasiocarpa* and *Picea engelmannii* in a moderate to dense tree canopy, but *Pinus contorta*

can be dominant on some sites. Other conifers can occur. In the northern Rockies, stands typically have a well-developed shrub layer that is dominated by *Alnus viridis ssp. sinuata*, with lesser amounts of *Vaccinium* spp. or *Xerophyllum tenax*. The herbaceous layer is not lush, and the most constant species are *Orthilia secunda* and *Arnica cordifolia*. In the southern Rockies, these forests do not have a significant layer of shrubs. Sparse cover of *Salix drummondiana, Lonicera involucrata*, and *Ribes* species may be present, and at high elevations the dwarf-shrub *Vaccinium myrtillus* occasionally is present. The herbaceous layer is a diverse mixture of mesophytic forbs and is often well over 80% in cover. Important species include *Cardamine cordifolia, Caltha leptosepala, Ligusticum porteri, Mertensia ciliata, Mitella pentandra, Oxypolis fendleri*, and *Senecio triangularis*. Diagnostic characteristics of these forests are that average tree canopy cover is greater than 60%, with *Abies lasiocarpa* being the predominant conifer in the tree-regeneration layer, and that they occur on sites less consistently saturated than forests in the similar seasonally flooded alliance.

Environment: These are semi-riparian or seep slope forests in upper montane and subalpine areas of the northern and central Rocky Mountains. Annual precipitation generally exceeds 75 cm in these forests in the northern Rockies, snowpacks are typically deep and late-lying, and summers are cool. Summer frosts are characteristic in these habitats, due to cold-air drainage. Elevations range from 1525-2290 m in the northern Rocky Mountains, and from 2500-3480 m in Colorado and New Mexico. These forests occur in landscape positions where snowmelt moisture creates shallow water tables or seeps for a portion of the growing season. Sites include lower and middle slopes, stream terraces, benches, narrow valleys, or seep slopes. Slope aspects vary, but are often northerly, and can be flat to moderately steep (up to 55%). When these forest occur along streams, they are usually within 5 m of the stream channel and within 2 m of channel bankfull height (Kittel et al. 1998). Soils often show evidence of podzolization processes and gleying due to seasonally saturated conditions. They often have high organic matter content throughout the profile. These forests are a specialized type within the *Abies - Picea* matrix type in subalpine areas of the Rocky Mountains, but may extend into montane habitats due to cold-air drainage and cool, moist microhabitats. Adjacent upland forests include *Picea engelmannii* or *Abies lasiocarpa* forests at the upper elevation boundary and *Pseudotsuga menziesii, Abies grandis*, or *Tsuga heterophylla - Thuja plicata* forests at lower elevations. Wetter sites often support herbaceous, cold-deciduous, or ericaceous riparian plant communities, or *Abies lasiocarpa* seasonally flooded forest communities.

Vegetation: These forests are characterized by the codominance of *Abies lasiocarpa* and *Picea engelmannii* in the tree canopy, but *Pinus contorta* can be dominant on some sites. Other conifers can occur, typically as individuals of *Picea pungens, Larix occidentalis*, or *Pseudotsuga menziesii*. In the northern Rockies, there is a well-developed shrub layer in these forests, although sometimes it can be patchy. *Alnus viridis ssp. sinuata* is the dominant shrub, averaging 35% cover, with lesser amounts of *Vaccinium membranaceum, Vaccinium scoparium*, or *Xerophyllum tenax*. The herbaceous layer in these northern Rockies stands is not lush, and the most constant species are *Orthilia secunda* and *Arnica cordifolia*. In the southern Rockies of Colorado and New Mexico, these forests do not have a significant layer of shrubs, but at high elevations *Vaccinium myrtillus* occasionally is present with 0-50% cover. *Salix drummondiana, Lonicera involucrata*, and *Ribes* species can be present, but with less than 10% cover. The herbaceous layer is a diverse mixture of mesophytic forbs and is often well over 80% in cover. Important species include *Cardamine cordifolia, Caltha leptosepala, Ligusticum porteri, Mertensia ciliata, Mitella pentandra, Oxypolis fendleri, Senecio triangularis*, and *Saxifraga odontoloma (= Micranthes odontoloma).*

Dynamics: *Abies lasiocarpa* Temporarily Flooded forests develop at sites with cool summer temperatures and wet soils. Tree growth is very slow in these habitats, and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pinus contorta, Populus tremuloides*, or *Alnus viridis ssp. sinuata* following fire, clearcut logging, or windthrow disturbance. Extensive windthrow is not common due to the relatively sheltered topographic positions. Removal of the tree layer at these sites can lead to rising water tables and expansion of anaerobic wetland soils, precluding recolonization by trees.

Similar Alliances:

- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)

Similar Alliance Comments: The *~Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)$$ is distinguished from the similar *Abies lasiocarpa* alliances by (1) including semi-riparian or seep slope forests which occur along streams or on mesic slopes, but not upland forests, or (2) being less consistently flooded than forests found in the *~Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)$$. The similar *Picea engelmannii* alliances differ in being (1) either strongly dominated by *Picea engelmannii* with little *Abies lasiocarpa* (if any) in the tree canopy, or (2) having a more open, woodland physiognomy (<60% cover).

ALLIANCE DISTRIBUTION

Range: This semi-riparian forest alliance has been reported from two distinct geographic areas: the central Rocky Mountains of Colorado and northern New Mexico; and the northern Rockies of western Montana, central Idaho, western Wyoming, and Alberta, Canada. It has not been documented from other areas, but is likely to also occur in Wyoming and Utah.

Nations: CA, US

Subnations: AB, CO, ID, MT, NM, OR, UT, WA, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 19:C, 20:C, 68:P
USFS Ecoregions: M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Grand Mesa, Gunnison, Pike-San Isabel, Rio Grande, Routt, San Juan, Uncompahgre)

ALLIANCE SOURCES

Author(s): M.S. Reid/D. Sarr
References: Alexander 1981, Baker 1989b, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Hess 1981, Hess and Alexander 1986, Johnston 1987, Kittel et al. 1996, Kittel et al. 1999a, Komarkova et al. 1988a, Komarkova et al. 1988b, Peet 1975, Peet 1981, Pfister et al. 1977, Steele et al. 1981, Steen and Dix 1974, Wasser and Hess 1982, Whipple 1975

[CEGL000336] *Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Clasping Twisted-stalk Forest**
Common Name: **Subalpine Fir / Clasping Twisted-stalk**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This is a very broadly distributed association occurring in the major ranges of northern Utah, Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta. In drier climates it is a small-patch type, but with higher precipitation regimes; it can expand to large patches in valley locations. Elevations range from 1250 m in the north to 3355 m at the highest in the south. In the southern portion of this type's distribution, parent materials are largely alluvium, soils are loamy to silty in texture, derived from the local country rock, which ranges from sandstone to basalt to granitics in the vicinity of major batholiths. In the north, sedimentary and metasediments are the rule with silty clay loams and loams predominating. Mottling and rust pockets are found in many soil pits, indicating high water tables or subirrigation for a portion of the year. Subirrigation is reflected by landscape positions on lower terraces and stringers of lower order streams, toeslopes and side-hill seeps. Most of the indicator forbs present are associated with the decidedly rich end of the soil-nutrient regime. The canopy for the most part is open, the modal cover ranging between 40-60%, dominated by *Abies lasiocarpa* and *Picea engelmannii*. *Pinus contorta* is the major seral species in the middle Rockies, whereas in the northern Rockies *Pseudotsuga menziesii, Larix occidentalis, Pinus monticola*, and *Abies grandis* are additional seral species. The dominant aspect of the undergrowth is an abundance of medium to tall forbs, though shrub cover can at times approach 50%; shrubs are a more important component in the northern distribution of the association. Shrubs with the highest constancy and cover include *Ribes lacustre, Vaccinium membranaceum, Alnus viridis ssp. sinuata, Lonicera utahensis, Cornus sericea*, and *Menziesia ferruginea*. The graminoid component is negligible. Of the forbs diagnostic for the association four, *Streptopus amplexifolius, Senecio triangularis, Heracleum maximum* and *Mitella pentandra*, are distributed across the breadth of the type, though there are numerous ancillary high-constancy forbs spanning the type's range including *Thalictrum occidentale, Geranium richardsonii, Osmorhiza berteroi, Maianthemum stellatum, Orthilia secunda*, and *Arnica cordifolia* (or *Arnica latifolia* at higher elevations). *Aconitum columbianum, Saxifraga odontoloma (= Saxifraga arguta), Mertensia ciliata*, and *Mertensia arizonica* are wet-site taxa occurring with relatively high constancy in the southerly portion of the association. The forb component of diagnostic species is more diverse from central Idaho northward.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The sampled stand of this association is situated on a shallow northeast-facing toeslope at an elevation of 2477 m (8126 feet). The poorly drained sandy loam soils are covered predominantly by mosses (50% cover) and litter and duff (40% cover). Wood contributes little ground coverage, and traces of lichens, fungi, bare soil, and gravel are present. Random fallen trees have created canopy openings throughout the forested area surrounding the plot.
Global Environment: This is a very broadly distributed association of the Intermountain West occurring from Utah's Uinta Mountains northward, occurring in the major ranges of Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta. In the south it is an incidental, small-patch type, but with higher precipitation regimes of northerly climes, it can expand to large patches in valley locations. Given this extensive latitudinal gradient it is not surprising that it occurs as high as 3355 m (11, 000 feet) in the south (Uintas) and as low as 1250 m (4100 feet) in northeastern Montana; however, within a given landscape (Glacier National Park, for example) it exhibits a 915-m (3000-foot) range (1280-2200 m [4200-7200 feet]). In the southern portion of this type's distribution parent materials are largely alluvium, loamy to silty in texture, derived from the local country rock, which ranges from sandstone to basalt to granitics in the vicinity of major batholiths. In the north, sedimentary and metasediments are the rule with silty clay loams and loams predominating. Mottling and rust pockets are found in many soil pits, indicating high water tables or subirrigation for a portion of the year. Subirrigation is reflected by landscape positions on lower terraces and stringers of lower order

streams, toeslopes and side-hill seeps where the moisture status is gauged to be hygric to subhydric. Most of the indicator forbs present are associated with the decidedly rich end of the soil-nutrient regime.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to upper montane forested community that occurs in mesic areas. The tree canopy is composed of *Picea engelmannii* (40% cover) and *Abies lasiocarpa* (20% cover). The shrub layer is underdeveloped; the only species present in greater than trace quantities are *Ribes* sp., *Vaccinium scoparium*, and *Abies lasiocarpa* seedlings with 3% cover each. The herbaceous layer is extremely diverse, composed of many mesic forbs and a few mesic graminoids. *Senecio triangularis* is the most abundant species with 20% cover. Well-represented species (10% cover each) include *Aconitum columbianum, Arnica latifolia, Bromus ciliatus, Chamerion angustifolium, Eucephalus engelmannii*, and *Thalictrum occidentale*. Common species (3% cover each) include *Carex geyeri, Fragaria virginiana, Galium triflorum, Heracleum maximum, Ligusticum filicinum*, and *Osmorhiza* sp.

Global Vegetation: The canopy for the most part is open, the modal cover ranging between 40-60%, dominated by *Abies lasiocarpa* and *Picea engelmannii*. In the south of the type's distribution *Picea engelmannii* is a long-lived seral species that dominates the canopy for 200 or more years. *Pinus contorta* is the other major seral species in the middle Rockies, whereas in the northern Rockies *Pseudotsuga menziesii, Larix occidentalis, Pinus monticola*, and *Abies grandis* are added to the seral species mix, though their cover is always less than that of the diagnostic tree species. The dominant aspect of the undergrowth is a predominance of medium to tall forbs, though shrub cover can at times approach 50%; shrubs are a more important component in the northern distribution of the association. Shrubs with the highest constancy and cover include *Ribes lacustre, Vaccinium membranaceum, Alnus viridis ssp. sinuata, Lonicera utahensis, Cornus sericea*, and *Menziesia ferruginea*. The graminoid component verges on negligible with only *Bromus vulgaris* (or the ecologically very similar *Bromus ciliatus*) having a constancy greater than 30%. Of the forbs diagnostic for the association four, *Streptopus amplexifolius, Senecio triangularis, Heracleum maximum* and *Mitella pentandra*, are distributed across the breadth of the type, though there are numerous ancillary high-constancy forbs spanning the type's range including *Thalictrum occidentale, Geranium richardsonii, Osmorhiza berteroi, Maianthemum stellatum, Orthilia secunda*, and *Arnica cordifolia* (or *Arnica latifolia* at higher elevations). *Aconitum columbianum, Saxifraga odontoloma (= Saxifraga arguta), Mertensia ciliata*, and *Mertensia arizonica* are wet-site taxa occurring with relatively high constancy in the southerly portion of the association. The forb component of diagnostic species is more diverse from central Idaho northward and includes *Ligusticum canbyi, Trautvetteria caroliniensis, Athyrium filix-femina, Mertensia paniculata, Veratrum viride, Heracleum maximum, Erigeron peregrinus, Gymnocarpium dryopteris, Angelica arguta* (or *Angelica dawsonii), Trollius laxus, Mitella breweri*, and *Viola glabella*. High-constancy forbs in the northern portion of the type's range include *Clintonia uniflora, Tiarella trifoliata, Eucephalus engelmannii, Galium triflorum, Actaea rubra, Valeriana sitchensis*, and *Xerophyllum tenax*.

Global Dynamics: Shrubs are usually a minor component of closed-canopy stands, but with canopy reduction they can begin to constitute a distinct layer. *Alnus viridis ssp. sinuata*, following fire or logging, especially where soils have been compacted, can form dense thickets in which conifers are very slow to reestablish.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Aconitum columbianum	Herb (field)	Forb	X	X	.
Arnica latifolia	Herb (field)	Forb	X	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	X	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Galium triflorum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	X	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Grand Teton National Park Higher Taxa					
Osmorhiza sp.	characteristic forb				
Ribes sp.	characteristic shrub				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.

Ribes lacustre	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Mitella pentandra	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	X	X	.
Streptopus amplexifolius	Herb (field)	Forb	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii / Actaea rubra* Forest (CEGL000295)
- *Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311)
- *Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius* Woodland (CEGL005897)
- *Abies lasiocarpa - Picea engelmannii / Mertensia ciliata* Forest (CEGL002663)
- *Abies lasiocarpa - Picea engelmannii / Oplopanax horridus* Forest (CEGL000322)
- *Abies lasiocarpa / Trautvetteria caroliniensis* Forest (CEGL000339)
- *Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest (CEGL005908)
- *Tsuga mertensiana / Streptopus amplexifolius* Forest (CEGL000511)

Global Related Concepts:

- *Abies lasiocarpa / Aconitum columbianum* Habitat Type (Youngblood et al. 1985b) B
- *Abies lasiocarpa / Streptopus amplexifolius* Forest (Kovalchik 1993) =
- *Abies lasiocarpa / Streptopus amplexifolius* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa/Streptopus amplexifolius* (Bourgeron and Engelking 1994) =
- Conifer / *Aconitum columbianum* Community Type (Padgett et al. 1989) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- O32: *Abies lasiocarpa / Valeriana sitchensis - Pedicularis bracteosa - Thalictrum occidentale* Vegetation Type (Achuff et al. 2002a) I
- S22: *Abies lasiocarpa / Arnica cordifolia* Vegetation Type (Achuff et al. 2002a) I

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The stand composing this association is similar to the Steele et al. (1983) *Abies lasiocarpa / Streptopus amplexifolius* Habitat Type. The stand is situated in an area with an abundance of moisture and evidently has a high water table throughout most of the growing season. Openings contain high quantities of *Senecio triangularis*. The Grand Teton National Park stand departs from this type in not having any *Streptopus amplexifolius* recorded. However, the ratio of *Senecio* and *Streptopus* varies with percent tree canopy cover. Sunnier sites have more *Senecio*, and as the canopy closes, the *Streptopus* increases cover.

Global Classification Comments: This association has a broad distribution and has been variously recognized by a stand having just a trace of the nominal species *Streptopus amplexifolius*, to any of a number of indicator species being present, singly or in combination, up to 5% canopy cover. There is considerable floristic diversity represented within the type given the broad geographical range, but the sites basically represent a rather narrow environmental spectrum, hygric to subhydric moisture regimes. All the globally similar associations have *Picea engelmannii* as an import canopy component, often having greater cover than *Abies lasiocarpa*, thus the adoption of the new dual designation of the upper canopy should be more meaningful. *Streptopus amplexifolius* should be retained to designate the undergrowth because it has relatively high constancy, a broad geographic distribution, priority of use, and there is no doubt of its association with wet sites. ~*Abies lasiocarpa / Trautvetteria caroliniensis* Forest (CEGL000339)$$ should be archived because it is virtually identical in terms of site parameters and composition to what has been defined elsewhere in the northern Rocky Mountains as ~*Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius* Forest (CEGL000336)$$. It is also unclear why various authors have recognized ~*Abies lasiocarpa - Picea engelmannii / Galium triflorum* Forest (CEGL000311)$$ as a separate entity; it would appear to have lower total forb cover, possibly because tree canopy cover is greater, though forb composition is virtually identical. It too should probably be synonymized with this association and archived.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs in between Moose Basin and Webb Canyon.
Global Range: This is a very broadly distributed association of the Intermountain West occurring from Utah's Uinta Mountains northward, occurring in the major ranges of Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta.
Nations: CA, US
States/Provinces: AB, ID:S4, MT:S3, OR:S2, UT:S2S3, WA:S2S3, WY:S2
TNC Ecoregions: 6:?, 7:C, 8:C, 9:C, 10:P, 68:P
TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO68:P, ECO9:C, ECO10:P added (MSR 3-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A043
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.V. Cooper, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnson and Simon 1987	.	X	.	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	.	.	.	.	.	.
Steele et al. 1981	.	X	.	X	.	.	.	.	.
Steele et al. 1983	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	.	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	X	.	.	.	.	.	.

I.A.8.N.f. Seasonally flooded temperate or subpolar needle-leaved evergreen forest

A.190 *Abies lasiocarpa* Seasonally Flooded Forest Alliance

Subalpine Fir Seasonally Flooded Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance includes subalpine riparian or seep slope conifer forests in the Rocky Mountains and portions of the Pacific Northwest. These forests occur in landscape positions where snowmelt moisture creates shallow water tables, seeps, or streamside flooding during much of the growing season. Sites include moist toeslopes, subirrigated stream terraces, alluvial benches, pond margins, wet meadows, or slopes and hillsides that are wet in spring and early summer. Soils often show evidence of podzolization processes and gleying due to seasonally saturated conditions, and tend to be acidic. They often have high organic matter content throughout the profile, but can vary from shallow to deep, and coarse to fine-textured. The moderately dense to dense tree canopy is

characterized by the codominance of the conifers *Abies lasiocarpa* and *Picea engelmannii*, with *Pinus contorta* codominant in some stands. Other conifers may also be present in small amounts. The shrub layer is often well-developed occurring as a dense ribbon along streams or where there is a break in the forest canopy. Important shrubs include *Ledum glandulosum, Vaccinium* spp., *Ribes lacustre, Oplopanax horridus, Alnus incana, Salix* spp., and *Lonicera* spp. The herbaceous layer is typically lush and dominated by a mixture of mesophytic forbs and graminoids, including *Calamagrostis* spp., *Carex* spp., *Caltha leptosepala, Dodecatheon jeffreyi, Deschampsia caespitosa, Equisetum* spp., *Ligusticum* spp., *Linnaea borealis, Senecio triangularis*, and *Streptopus amplexifolius*. Diagnostic characteristics of these forests are that the average tree canopy is greater than 60% cover with *Abies lasiocarpa* as the predominant conifer in the tree-regeneration layer, and they occur on sites saturated until late summer by snowmelt, occurring below seeps on lower hill slopes or in riparian habitats.

Environment: These are subalpine riparian or seep slope forests in the northern and central Rocky Mountains and portions of the Pacific Northwest. Precipitation generally exceeds 75 cm in these forests and may exceed 200 cm near the crest of the Cascades. Snowpacks are typically deep and late-lying, and summers are cool. Summer frosts are characteristic in these habitats, due to cold-air drainage. Elevations range from 1500 m in the northern Rocky Mountains and Cascades to over 3000 m in the higher ranges of the southern Rocky Mountains. *Abies lasiocarpa* seasonally flooded forests occur in landscape positions where snowmelt moisture creates shallow water tables, seeps, or streamside flooding during much of the growing season. Sites include moist toeslopes, subirrigated stream terraces, alluvial benches, pond margins, wet meadows, narrow valleys and valley bottoms, or slopes and hillsides that are wet in spring and early summer. Slopes and aspects vary, although flat to slight slopes are the most common. Parent materials and geologic substrate are highly variable, but are generally non-calcareous. Soils often show evidence of podzolization processes and gleying due to seasonally saturated conditions, and tend to be acidic. They often have high organic matter content throughout the profile, but can vary from shallow to deep, and coarse to fine-textured. These forests are typically adjoined by upland subalpine forests of *Abies lasiocarpa* and *Picea engelmannii*. Where they extend into montane habitats due to cold-air drainage, adjacent forests include *Pseudotsuga menziesii, Abies grandis*, or *Tsuga heterophylla - Thuja plicata* forests. Wetter sites often support wet meadows, or shrublands dominated by species of *Salix* or *Alnus*.

Vegetation: In many cases, these forests are characterized by the codominance of *Abies lasiocarpa* and *Picea engelmannii* in the tree canopy. *Pinus contorta* may be another codominant tree in some stands. A variety of other conifers may be present in small amounts, depending upon geographic region, site moisture and temperature, and successional status. In the northern Rockies these can include *Tsuga heterophylla, Thuja plicata, Abies grandis, Pinus albicaulis*, or *Pseudotsuga menziesii*. In the central Rockies other conifers might be *Picea pungens* or *Pseudotsuga menziesii*. The shrub layer in these forests is often well-developed when light reaches the forest floor, or as a dense layer occurring as a ribbon along streams where there is a break in the forest canopy. Important, to dominant, species include *Ledum glandulosum, Vaccinium membranaceum (= Vaccinium globulare), Vaccinium scoparium, Ribes lacustre, Oplopanax horridus, Alnus incana*, and species of *Salix* or *Lonicera*. The less moisture-tolerant shrubs tend to occur on low hummocks or topographic breaks where drainage and soil aeration are better. The herbaceous layer is typically lush and dominated by a mixture of mesophytic forb and graminoid species, including *Calamagrostis canadensis, Calamagrostis stricta, Carex* spp., *Caltha leptosepala, Dodecatheon jeffreyi, Deschampsia caespitosa, Equisetum* spp., *Ligusticum* spp., *Linnaea borealis, Senecio triangularis, Trautvetteria caroliniensis*, and *Streptopus amplexifolius*. Many other forb and graminoid species are commonly present; more than can be listed here.

Dynamics: *Abies lasiocarpa* Seasonally Flooded forests develop on sites with cool summer temperatures and wet soils. Tree growth is very slow in these habitats and forests are rapidly colonized by much more rapidly growing shade-intolerant species, such as *Pinus contorta* or *Populus tremuloides*, following fire, clearcut logging, or windthrow disturbance. Windthrow of individual trees is particularly common in these stands due to shallow rooting and moist soils. Windthrow of entire stands is a relatively rare occurrence due to the protected locations where these forests develop. Removal of the tree layer at these sites can lead to rising water tables and expansion of anaerobic wetland soils, precluding recolonization by trees. Undisturbed stands will show old-growth characteristics, with large, old trees, rootball hummock topography, downed logs, and snags.

Similar Alliances:

- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)

Similar Alliance Comments: The ~*Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)$$ is distinguished from the similar *Abies lasiocarpa* alliances by (1) including riparian forests which occur along streams or on mesic slopes, but not upland forests, or (2) being more consistently flooded than forests found in the ~*Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)$$. The similar *Picea engelmannii* and *Pinus contorta* alliances differ in being (1) either strongly dominated by *Picea engelmannii* or *Pinus contorta* with little *Abies lasiocarpa* (if any) in the tree canopy or regeneration layer, or (2) having a more open, woodland physiognomy (<60% cover).

ALLIANCE DISTRIBUTION

Range: These riparian forests are an important variant of the subalpine forests of the central and northern Rocky Mountains and interior Pacific Northwest ranges. They occur from southern Colorado north into Montana and Alberta, Canada, and west into Utah, Idaho, Oregon and Washington. They may be much more widespread than presently reported, but have not been documented from Arizona, New Mexico, Nevada, or California.
Nations: CA, US
Subnations: AB, CO, ID, MT, OR, UT, WA, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 10:C, 19:C, 20:C, 68:P
USFS Ecoregions: M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Yellowstone); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Boise, Caribou-Targhee, Challis, Colville NF?, Grand Mesa, Gunnison, Payette, Pike-San Isabel, Rio Grande, Routt, Salmon, San Juan, Uncompahgre)

ALLIANCE SOURCES

Author(s): M.S. Reid/D. Sarr
References: Baker 1986, Baker 1989b, Clausnitzer and Zamora 1987, Cooper and Cottrell 1990, Cooper et al. 1987, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Hansen et al. 1991, Hansen et al. 1995, Hess and Alexander 1986, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1996, Kittel et al. 1999a, Komarkova et al. 1988b, Kovalchik 1993, Kuchler 1964, Mauk and Henderson 1984, Padgett et al. 1988b, Peet 1975, Pfister et al. 1977, Richard et al. 1996, Steele et al. 1981, Steele et al. 1983, Steen and Dix 1974, Terwilliger et al. 1979a, Whipple 1975, Williams and Smith 1990, Williams et al. 1990b, Youngblood and Mauk 1985

[CEGL000300] *Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest

Translated Name: **Subalpine Fir - Engelmann Spruce / Bluejoint Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): L.D. Engelking

ELEMENT CONCEPT

Global Summary: This spruce-fir riparian forest type is a minor and sporadic plant association in the middle Rocky Mountains of Colorado and Utah, but is consistently present in most mountain ranges in the northern Rocky Mountains well into Canada. It occupies the lower to middle reaches of the subalpine zone, occurring from 1400 to 2776 m (4595-9075 feet), and occasionally to 3300 m (10,800 feet) in elevation. It has the coldest and wettest environment in the *Abies lasiocarpa* alliance because of high groundwater levels and cold-air drainage from surrounding uplands. Snowpack often persists late into the season. Sites include toeslopes and footslopes and stream terraces of all gradients. However, the most common landscape position is poorly drained depressions or basins, from pond margins, to fairly sizable kettleholes to minor swales. These depositional positions are typified by fine-textured soils. These sites are typically subirrigated and in the early portion of the growing season are saturated to the surface, but they become dry by mid summer or earlier. The canopy of this type is highly variable with some stands having a dense canopy of *Abies lasiocarpa*, with *Picea engelmannii* a lesser component and *Pinus contorta* or *Populus tremuloides* seral components. *Abies* and *Picea* are sometimes only poorly represented as stunted or very slow-growing individuals in old-growth stands of persistent *Pinus contorta*. These prolonged seral conditions typically occur with sites that are not too wet. Sites are sufficiently wet that *Pseudotsuga menziesii* and *Larix occidentalis* do poorly here as seral species. *Pinus albicaulis* may occur when this type extends into the upper subalpine zone in protected basins, where it is most commonly found on hummocks or drier sites within the stand. Shrub associates include *Ledum glandulosum, Lonicera involucrata, Ribes lacustre, Vaccinium caespitosum, Vaccinium myrtillus*, and *Vaccinium scoparium*. *Rubus parviflorus, Symphoricarpos albus*, and *Spiraea betulifolia*, can comprise a distinct layer in some stands. The modal undergrowth condition is characterized as a relatively lush sward of *Calamagrostis canadensis* (or *Calamagrostis stricta*) with scattered shrubs and herbs. Other graminoids can include *Carex aquatilis, Carex disperma, Carex microptera (= Carex festivella), Carex norvegica ssp. inferalpina (= Carex media), Carex utriculata, Luzula parviflora*, and *Poa reflexa*. Associated forbs are geographically variable, and occasionally they can be conspicuous. Those forbs with high constancy include *Thalictrum occidentale, Senecio triangularis, Veratrum viride, Heracleum maximum, Dodecatheon jeffreyi, Maianthemum stellatum (= Smilacina stellata), Streptopus amplexifolius*, and *Equisetum arvense*. Moss cover is typically high.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The two sampled stands of this association occur on flat terrain and on a shallow southeast-facing slope at elevations of 2012 and 2759 m (6601 and 9052 feet), respectively. Soil textures of the stands are sandy clays and clay loams. Fire scars are present on the boles of the trees in one stand.

Global Environment: This riparian forest type is a minor and sporadic plant association in the middle Rocky Mountains but is consistently present in most mountain ranges in the northern Rocky Mountains well into Canada. It occupies the lower to middle reaches of the subalpine zone, occurring at elevations as low as 1400 m (4600 feet, in frost pockets) to 2776 m (9100 feet), and occasionally as high as 3300 m (10,800 feet, Rocky Mountain National Park). It has the coldest and wettest environment in the *Abies lasiocarpa* alliance because of high groundwater levels and cold-air drainage from surrounding uplands (Hess and Alexander 1986). In Colorado, at the southern extreme of its distribution, this association is characterized as having a narrow niche, occurring on toeslopes adjacent to moderate-gradient streams. Snowpack often persists late into the season. Conversely, in the northern Rockies sites include toeslopes and footslopes and stream terraces of all gradients. However, the most common landscape position is poorly drained depressions or basins, from pond margins, to fairly sizable kettleholes to minor swales. Being predominantly depositional positions in the landscape, these sites are typified by fine-textured soils, clay loams being quite prevalent (Pfister et al. 1977). These sites are subirrigated and in the early portion of the growing season are saturated to the surface, some even having standing water; they become dry by mid summer or earlier. Permanently wet sites (seeps) have mucky surface soils below a typically thick organic layer. Better drained sites have a loamy surface soil texture, and often gravel. Areas of bare soil or rock are negligible on most sites. Average litter depths are extremely variable, ranging from almost none in stream bottom sites to depths of 15 cm in seepage or depression areas. Parent material for soils varies widely and includes granitics, quartzite, alluvium and colluvium, glacial till and drift of sedimentary origin (both calcareous and noncalcareous), and volcanics, both extrusive and intrusive.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs in mesic areas. The tree canopy in the stand at 2759 m (9052 feet) is dominated by *Abies lasiocarpa* (20% cover) and *Picea engelmannii* (20% cover). Seedlings within this plot are present in the dwarf-shrub stratum and include *Abies lasiocarpa* (10% cover) and *Pinus albicaulis* (1% cover). The tree canopy in the stand at 2012 m (6601 feet) is dominated by *Abies lasiocarpa* (40% cover) and *Pinus contorta* (20% cover). Seedlings within this plot are also present in the dwarf-shrub stratum and include *Abies lasiocarpa* (3% cover), *Picea pungens* (3% cover), and *Pinus contorta* (1% cover). Shrubs present in both stands include *Vaccinium scoparium* (10% cover) and *Vaccinium membranaceum* (1 and 3% cover). The herbaceous layer is dominated by mesic forbs and graminoids. *Calamagrostis canadensis* and *Calamagrostis scopulorum* comprise 30% cover in one stand each. The stands hold no other graminoid species in common, but the genera *Elymus* and *Carex* occur in both. There are no forb species that both stands hold in common. Common genera to the two stands include *Arnica* and *Hieracium*. Well-represented species that occur in one stand and that have 10% cover each include *Potentilla flabellifolia, Senecio crassulus, Viola* sp., and Asteraceae sp.

Global Vegetation: The canopy of this type is highly variable, with stands of the southern distribution having a dense canopy of *Abies lasiocarpa*, with *Picea engelmannii* a lesser component and *Pinus contorta* a highly constant seral component. *Populus tremuloides* is also present sometimes as a seral component. Often these *Abies lasiocarpa*-dominated stands represent a later successional stage, from which the formerly dominant *Pinus contorta* has been removed by natural mortality. According to Mauk and Henderson (1984), *Abies* and *Picea* are sometimes only poorly represented as stunted or very slow-growing individuals in old-growth stands of persistent *Pinus contorta*. These prolonged seral conditions typically occur with sites that are not too wet. In the north all degrees of canopy closer have been documented, with the cover usually not greater than 50% and dominated by highly variable combinations of *Abies lasiocarpa* and *Picea engelmannii*. Sites are sufficiently wet that *Pseudotsuga menziesii* and *Larix occidentalis* do poorly here as seral species, though *Pinus contorta* may constitute a significant component, its cover often exceeding that of climax dominants. Pfister et al. (1977) report that *Pinus albicaulis* may occur when this type extends into the upper subalpine zone in protected basins, where it is most commonly found on hummocks or drier sites within the stand. Shrub associates include *Ledum glandulosum, Lonicera involucrata, Ribes lacustre, Vaccinium caespitosum, Vaccinium myrtillus*, and *Vaccinium scoparium*. Shrubs characteristic of drier sites may grow on hummocks or at the base of trees (Steele et al. 1983). *Rubus parviflorus, Symphoricarpos albus*, and *Spiraea betulifolia*, can comprise a distinct layer in some stands.

The modal undergrowth condition is characterized as a relatively lush sward of *Calamagrostis canadensis* (or *Calamagrostis stricta*) with scattered shrubs and herbs. Other graminoids include *Carex aquatilis, Carex disperma, Carex microptera (= Carex festivella), Carex norvegica ssp. inferalpina (= Carex media), Luzula parviflora*, and *Poa reflexa*. Associated forbs are geographically variable, and occasionally they can be conspicuous. Those forbs with high constancy at least in the northern portion of this type's range include *Thalictrum occidentale, Senecio triangularis, Veratrum viride, Heracleum maximum, Dodecatheon jeffreyi, Maianthemum stellatum (= Smilacina stellata), Streptopus amplexifolius*, and *Equisetum arvense*. In particular geographic areas *Ligusticum* spp., *Trautvetteria caroliniensis*, and *Aconitum columbianum* can comprise significant cover; other important species include *Actaea rubra, Arnica cordifolia, Linnaea borealis, Mertensia ciliata, Mitella pentandra, Osmorhiza depauperata, Pyrola chlorantha, Saxifraga odontoloma (= Saxifraga arguta),*and *Trollius laxus*. Due to the high coverage values for both shrubs and graminoids, the forb component of some sites is negligible (Cooper 1975). Moss cover is typically high.

Global Dynamics: This type is not so constantly moist as to prevent burning as indicated by the predominance of *Pinus contorta* (Cooper 1975). Fischer and Bradley (1987) place this association in their fire group nine, except for the drier *Abies lasiocarpa/Calamagrostis canadensis, Vaccinium caespitosum* phase which is in fire group seven. Fire group nine represents the

moist, lower subalpine habitat types with infrequent but severe fires of long-lasting effect. The combination of deep duff and large amounts of dead rotten fuel can result in severe surface fire during unusually dry moisture conditions such as late-summer droughts. Where dense understories exist, such fires can easily spread to the tree crowns and destroy the stand. Even if a severe surface fire does not crown, there is a good chance the overstory trees will be killed by cambium heating. Under normal moisture conditions for these sites, a lush undergrowth of shrubs and herbs usually serves as an effective barrier to rapid fire spread.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium membranaceum	Herb (field)	Dwarf-shrub	.	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	X	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Calamagrostis scopulorum	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Arnica spp.	characteristic forbs
Carex spp.	characteristic graminoids
Elymus spp.	characteristic graminoids
Hieracium spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	X
Heracleum maximum	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	X
Equisetum arvense	Herb (field)	Fern	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex luzulina var. *ablata*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Picea engelmannii / Calamagrostis canadensis* Forest (CEGL002678)
- *Pinus contorta / Calamagrostis canadensis* Forest (CEGL000138)
- *Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest [Provisional] (CEGL005909)
- *Populus tremuloides / Calamagrostis canadensis* Forest (CEGL000574)

Global Related Concepts:

- *Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest (Carsey et al. 2003a) =
- *Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Plant Association (Baker 1984a) =
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Steele et al. 1981) B *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Hess and Alexander 1986) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Cooper 1975) ?
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Komarkova et al. 1988b) =
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type, *Calamagrostis canadensis* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type, *Ligusticum canbyi* Phase (Cooper et al. 1987) =

- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type, *Vaccinium caespitosum* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa/Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- Conifer / *Calamagrostis canadensis* Community Type (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The two sampled stands fit Steele et al.'s (1983) *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type, *Calamagrostis canadensis* Phase well. In neither stand does *Calamagrostis canadensis* occur with as much cover as Steele et al. intimate. In one stand *Calamagrostis scopulorum* is present instead of *Calamagrostis canadensis*.

Grand Teton National Park Other Comments:

Global Classification Comments: The association name proposed here is new and better reflects the fact that a mix of the two climax dominant tree species exists in these stands in all combinations of cover and structure. Prior classifications (Pfister et al. 1977, Steele et al. 1983) have recognized and termed this same type *Abies lasiocarpa / Calamagrostis canadensis*, accepting that *Picea engelmannii* might constitute anything from a dominant to a trace or even be absent. They viewed the absence of *Abies lasiocarpa*, where *Picea engelmannii* was dominant with the same undergrowth composition, as somehow different. We have recognized that *Abies lasiocarpa* and *Picea engelmannii* are close ecological analogues and that this community is the wettest in which these two species are capable of sharing dominance. There is presently no indication that *~Picea engelmannii / Calamagrostis canadensis* Forest (CEGL002678)$$, defined by a total lack of *Abies lasiocarpa*, is other than a stochastic phenomena, though in some portions of Montana the lower elevation limits of *Picea* are noted to exceed those of *Abies lasiocarpa*. In situations as wet as denoted by say *~Picea engelmannii / Equisetum arvense* Forest (CEGL000363)$$, *Abies lasiocarpa* is either not present, or found only in microsites, or as unthrifty specimens that will never reach the upper canopy.

A number of phases of the *Abies lasiocarpa / Calamagrostis canadensis* association have been recognized (Pfister et al. 1977, Steele et al. 1981, 1983, Cooper et al. 1987), but at this juncture we have considered those with an appreciable cover of forbs (for example the *Ligusticum canbyi* phase in northern Idaho) as just variation to be accepted within the association. There is no information to suggest they measurably differ in site parameters, rather they seem more to represent geographic floristic distinctions. The shrub-dominated phases (*Vaccinium caespitosum*, *Ledum glandulosum*) do exhibit differences in site parameters and probably should be elevated to the association level (for example *Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum / Calamagrostis canadensis*), but this has not yet been thoroughly reviewed. Some (including Hansen et al. (1995)) have apparently included stands with appreciable (>10%) cover of *Carex utriculata*, *Carex disperma*, or *Carex scopulorum* in this association, when in fact a yet wetter soil moisture regime is indicated by these species when exhibiting such relatively high cover.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands defining this association occur in the upper elevations of Paintbrush Canyon and adjacent to the Snake River south of Burned Ridge.

Global Range: This association occurs in Colorado, northern Utah, western Wyoming, Idaho, Montana, and north into Alberta, Canada.

Nations: CA, US

States/Provinces: AB, CO:S3, ID:S3, MT:S5, UT:S4?, WA?, WY:S2

TNC Ecoregions: 7:C, 8:C, 9:C, 10:C, 20:C, 68:P

TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO9:C, ECO68:P added (MSR 3-04).

USFS Ecoregions: M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Yellowstone); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Caribou-Targhee, Colville NF?, Gunnison)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-0201008, GT-0202078

Accuracy Assessment Points: None

Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga

Global Description Author(s): S.V. Cooper, mod. S.L. Neid

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1984a	.	.	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Cooper 1975	.	.	X	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	.	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Fischer and Bradley 1987	.	.	.	X	.	.	.	.	.
Hansen et al. 1995	.	.	.	X	.	.	.	.	.
Hess and Alexander 1986	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Komarkova et al. 1988b	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Padgett et al. 1989	.	.	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.191 *Picea engelmannii* Seasonally Flooded Forest Alliance

Engelmann Spruce Seasonally Flooded Forest Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:

- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Picea engelmannii* Forest Alliance (A.164)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in Utah, Idaho, Wyoming, Oregon, Colorado, Montana, and Washington, and Alberta, Canada.
Nations: CA, US
Subnations: AB, CO, ID, MT, OR, UT, WA, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C, 26:C, 68:P
USFS Ecoregions: 331D:CC, 342B:CC, M242C:CC, M331A:CC, M331B:C?, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Ashley, Bighorn, Bridger-Teton, Colville NF, Medicine Bow, Okanogan, Pike-San Isabel, Routt, Shoshone, Wasatch-Cache)

ALLIANCE SOURCES

Author(s): M.S. Reid
References: Cole 1982, Cooper 1975, Cooper 1986a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Hansen et al. 1991, Hansen et al. 1995, Jensen 1990, Johnston 1987, Kettler and McMullen 1996, Kittel et al. 1999a, Kovalchik 1987, Mauk and

Henderson 1984, Moseley et al. 1991, Padgett et al. 1989, Peet 1975, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Youngblood and Mueggler 1981

[CEGL005927] *Picea engelmannii / Equisetum arvense* Forest

Translated Name: **Engelmann Spruce / Field Horsetail Forest**
Common Name: **Engelmann Spruce / Field Horsetail**
Ecological System(s):
Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This spruce-dominated riparian forest association is widely distributed in the upper montane and subalpine zones of the central and northern Rocky Mountains. It occurs on gently sloping stream terraces, wet benches, flat, poorly drained sites, and sidehill seeps, from 1000 to 2880 m (3300-9440 feet) in elevation. It occurs on sites too cold or too wet for *Abies lasiocarpa* to be abundant. It can occur adjacent to the wet forest margins of lakes, fens or bogs, and is often associated with the margins of wet basins or subirrigated terraces and toeslopes. Soils are Mollisols, or Histosols, sandy loam to clay in texture, often with a mucky organic surface layer and usually over coarse alluvial or glacial material. The upper canopy is dominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids, with 20-70% cover. Other conifers typically present are *Pinus contorta* and *Abies lasiocarpa*. Other tree species occasionally present, depending on geographic location, are *Picea pungens, Populus tremuloides, Populus angustifolia*, and *Populus balsamifera ssp. trichocarpa*. Shrub cover is generally low (<5%), but has been reported as high as 50%. Typical species include *Alnus incana, Lonicera involucrata, Cornus sericea, Vaccinium scoparium, Ribes* spp., and *Salix* spp. Herbaceous species diversity is high and extremely variable between stands. However, herbaceous undergrowth is dominated by *Equisetum arvense*, which generally is the most abundant species, with average cover 30-40%, although it can have less than 10% cover. Other forbs and grasses present are mesic or hydric. Typical species include *Calamagrostis canadensis, Glyceria* spp., *Caltha leptosepala, Gymnocarpium dryopteris, Athyrium filix-femina, Osmorhiza berteroi (= Osmorhiza chilensis), Senecio triangularis, Cardamine cordifolia, Streptopus amplexifolius*, and *Maianthemum stellatum*, among many others. Disturbance from flooding is necessary to maintain this community.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on or near the valley floor. One stand occurs on a north-facing palustrine toeslope with a gradient of 20%. This stand is seasonally saturated. The elevations for these stands range from 2060 to 2180 m (6759-7152 feet). The soils are different for each stand; one has moderately well-drained silt clay, one has moderately well-drained silt clay loam, and one has poorly drained silt loam. The unvegetated and nonvascular ground cover is comprised primarily of litter and duff (50-80% cover), wood (5-20% cover), and mosses (5-20% cover). Surrounding vegetation is typically mixed conifers or willow shrublands.
Global Environment: This forested association occurs on gently sloping stream terraces, wet benches, flat, poorly drained sites, and sidehill seeps, from 1000 to 2880 m (3300-9440 feet) in elevation. It occurs in sites too cold or too wet for *Abies lasiocarpa* to be abundant. It can occur adjacent to the wet forest margins of lakes, fens or bogs, and is often associated with the margins of wet basins or subirrigated terraces and toeslopes. Soils are Mollisols, or Histosols, sandy loam to clay textures, often with a mucky organic surface layer and usually occur over coarse alluvial or glacial material.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane spruce woodland that occurs on mesic sites. The dominant tree canopy species is *Picea engelmannii* (20-40% cover). *Abies lasiocarpa* (3-10% cover) and *Pinus contorta* (1-3% cover) occur in two of the three stands. *Abies lasiocarpa* appears in the tree subcanopy in one stand. Seedlings of *Abies lasiocarpa* and *Pinus flexilis* occur in one stand each. *Lonicera utahensis* (1-3% cover) and *Vaccinium membranaceum* (1% cover) are the only shrubs that occur in every stand. The herbaceous layer is dominated in two stands by *Equisetum arvense* (10-20% cover) and in one stand by *Orthilia secunda* (1-20%). Graminoids occurring in two of three stands include *Calamagrostis rubescens* (10-20% cover), *Bromus ciliatus* (1-10% cover), and *Elymus glaucus* (1-3% cover). Other forbs occurring in every stand with 1-3% cover include *Aconitum columbianum, Arnica cordifolia*, and *Galium boreale*. Forbs occurring in every stand with 1% cover include *Actaea rubra, Chamerion angustifolium, Maianthemum stellatum, Osmorhiza berteroi*, and *Taraxacum officinale*.
Global Vegetation: This forested association is dominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids, with 20-70% cover. Other conifers typically present are *Pinus contorta* and *Abies lasiocarpa*. Other tree species occasionally present, depending on geographic location are *Picea pungens, Populus tremuloides, Populus angustifolia*, and *Populus balsamifera ssp. trichocarpa*. *Picea engelmannii* is typically successfully reproducing in the understory, with shrub-sized trees well-represented. Tall-shrub cover is highly variable and quite diverse, as is the short-shrub layer. Total shrub cover is generally low (<5%), but has been reported as high as 50%. Typical species include *Alnus incana, Cornus sericea, Lonicera involucrata, Vaccinium scoparium, Ribes* spp., *Rubus* spp., and *Salix* spp. The herbaceous undergrowth is dominated by *Equisetum arvense*, which generally is the most

abundant species, with average cover 30-40%, although it can have less than 10% cover. Other forbs and grasses present are mesic or hydric. Typical species include *Calamagrostis canadensis*, *Glyceria* spp., *Caltha leptosepala*, *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Osmorhiza berteroi (= Osmorhiza chilensis)*, *Senecio triangularis*, *Cardamine cordifolia*, *Streptopus amplexifolius*, and *Maianthemum stellatum (= Smilacina stellata)*, among many others. Occasionally stands may support *Viola glabella*, *Tiarella trifoliata*, or *Gymnocarpium dryopteris* with canopy cover of 20-25%.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium membranaceum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Actaea rubra	Herb (field)	Forb	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Orthilia secunda	Herb (field)	Forb	X	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Taraxacum officinale	Herb (field)	Forb	.	X	.
Equisetum arvense	Herb (field)	Fern	X	.	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Streptopus amplexifolius	Herb (field)	Forb	.	X	.
Equisetum arvense	Herb (field)	Fern	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Picea pungens / Equisetum arvense* Woodland (CEGL000389)
- *Populus balsamifera* ssp. *trichocarpa* - *Picea engelmannii / Equisetum arvense* Forest (CEGL005907)

Global Related Concepts:
- *Abies lasiocarpa* - *Picea engelmannii / Equisetum arvense* (Kittel et al. 1999b) =
- *Abies lasiocarpa* - *Picea engelmannii / Equisetum arvense* Forest (Carsey et al. 2003a) =
- *Picea / Equisetum arvense* Community Type (Youngblood et al. 1985b) B
- *Picea / Equisetum arvense* Habitat Type (Hansen et al. 1995) B
- *Picea engelmannii / Equisetum arvense* - *Streptopus* Association (Kovalchik 1987) =
- *Picea engelmannii / Equisetum arvense* Association (Kovalchik 1993) =
- *Picea engelmannii / Equisetum arvense* Community (Huckaby and Moir 1998) =
- *Picea engelmannii / Equisetum arvense* Habitat Type (Mauk and Henderson 1984) B
- *Picea engelmannii / Equisetum arvense* Habitat Type (Steele et al. 1981) B
- *Picea engelmannii / Equisetum arvense* Habitat Type (Steele et al. 1983) B
- *Picea engelmannii / Equisetum arvense* Plant Association (Crowe and Clausnitzer 1997) =
- *Picea engelmannii / Equisetum* Association (Williams et al. 1995) =
- *Picea engelmannii / Equisetum* Plant Association (Williams and Lillybridge 1983) =
- *Picea engelmannii / Equisetum* spp. Association (Kovalchik 1993) =

- *Picea engelmannii/Equisetum arvense* (Bourgeron and Engelking 1994) =
- *Picea pungens - Picea engelmannii / Equisetum arvense* Plant Association (Johnston 1987) =
- *Picea* spp./*Equisetum arvense* (Bourgeron and Engelking 1994) =
- C78: *Picea engelmannii / Equisetum arvense* Vegetation Type (Achuff et al. 2002a) I
- Conifer / *Equisetum arvense* Community Type (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association differs from that of Youngblood et al. (1985b). The shrub stratum is rather thin, but there are more species than Youngblood et al. write is normal. The cover for *Equisetum arvense* is not as dense as in Youngblood et al.'s description.

Global Classification Comments: This association now includes the former *Picea (engelmannii X glauca, engelmannii) / Equisetum arvense* Forest (CEGL000408), originally identified by Pfister et al. (1977) from throughout western Montana. *Picea engelmannii* and/or *Picea engelmannii X glauca* (hybrids) are the diagnostic overstory species in this plant association. Stands can include pure *Picea engelmannii* and *Picea engelmannii X glauca* hybrid, or both. Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type, as did Pfister et al. (1977).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: One stand occurs in the Owl/Webb Delta, one occurs in the Lizard Creek drainage, and one occurs in John D. Rockefeller, Jr. Memorial Parkway near campsite #7 off of Grassy Lake Road.

Global Range: This association occurs in the mountains of southeastern Oregon, eastern Washington, central and eastern Idaho, eastern Montana, western Wyoming, south into the Wasatch Range in Utah and into northern Colorado. It also is found in Alberta, Canada, and may occur in the Rocky Mountains of British Columbia.

Nations: CA, US

States/Provinces: AB, CO:S2, ID:S2, MT:S4, OR:S3, UT:S3?, WA:S3, WY:S2

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C, 68:P

TNC Ecoregion Comments: ECO6:C, ECO7:C, ECO8:C, ECO9:C, ECO68:P added (MSR 3-04).

USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Colville NF, Medicine Bow, Okanogan, Pike-San Isabel, Routt, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-03B062, GT-03B092, GT-03B118

Accuracy Assessment Points: None

Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga

Global Description Author(s): G. Kittel, mod. S.L. Neid

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Cooper 1975	.	X	.	X	.	.	.	.	.
Cooper 1986a	.	X	.	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	.	.	.	.	.	.
Huckaby and Moir 1998	.	.	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jensen 1990	.	.	.	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.

Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	.	.	.	.	.	.
Kovalchik 1987	.	X	X	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	.	X	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Moseley et al. 1991	.	.	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Peet 1975	.	X	.	X	.	.	.	.	.
Pfister et al. 1977	.	X	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Williams and Lillybridge 1985	.	X	.	X	.	.	.	.	.
Williams and Smith 1990	.	X	.	X	.	.	.	.	.
Williams et al. 1990b	.	X	.	X	.	.	.	.	.
Williams et al. 1995	.	.	X	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	.	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	X	.	.	.	.	.	.

A.188 *Pinus contorta* Seasonally Flooded Forest Alliance

Lodgepole Pine Seasonally Flooded Forest Alliance

ALLIANCE CONCEPT

Summary: This forest alliance occurs in upper montane, riparian or wetland areas in the Rocky Mountains and eastern Cascades, and on deflation plains of sea-level coastal dune systems in Oregon. Sites are flat, wet, relatively cold floodplain and basin landforms. Stands occur in forested margins of meadows, lake or forest basins, along valley bottoms and also occurs adjacent to or within open bogs. In all cases, the sites are flat to gently sloping. This coniferous forest alliance is characterized by a moderately closed to closed tree canopy composed primarily of *Pinus contorta*. Other conifers sometimes present may include *Abies grandis, Abies lasiocarpa, Abies X shastensis (= Abies magnifica ssp. shastensis), Picea engelmannii*, or *Tsuga mertensiana*. In most stands, only *Pinus contorta* is successfully reproducing, and cover of mature trees of the other species is low. The short-shrub layer, if present, is usually continuous and dense. *Vaccinium uliginosum* is the most frequent and dominant species in such a shrub layer, but other shrubs often present include *Ledum glandulosum, Vaccinium caespitosum, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera caerulea*, or *Spiraea douglasii*. Herbaceous species are not abundant in shrubby stands. Associate species often present can include *Carex angustata, Ligusticum grayi, Fragaria* spp., *Thalictrum occidentale, Geum macrophyllum, Maianthemum stellatum*, and *Trifolium longipes*. In stands with no dense short-shrub layer, the herbaceous layer is typically lush and dominated by tall graminoids such as *Calamagrostis canadensis* or *Carex obnupta*. Diagnostic of this lowland forest alliance is the dominance of *Pinus contorta* in the moderately dense to dense tree canopy without significant regeneration of other tree species, and the extended flooding and high water tables during the growing season.

Environment: This is an upper montane, riparian or wetland alliance where it occurs in the Rocky Mountains and eastern Cascades. In this region it is found from about 1200 m to over 3395 m in elevation, on flat, wet, relatively cold floodplain and basin landforms. Stands are in forested margins of meadows, lake or forest basins (Kovalchik 1987, Volland 1976), or along valley bottoms (Tuhy 1981, Tuhy and Jensen 1982). It also occurs adjacent to or within open bogs (Tuhy 1981). In all cases, the sites are flat to gentle in slope (0-7%), and microtopography can vary from concave to flat to slightly undulating or hummocky. Tuhy (1981) reports the alliance to be in valley bottoms from 30 m to over 100 m in width, with small sinuous, or larger meandering, streams. Generally stands are several meters away from the stream channel, but not much elevated above. In these valley bottoms there is cold-air drainage from higher elevation headwaters areas. Soils are derived from depositional events, either alluvial, glacial, or volcanic. In Cascade stands, the soils are from air-laid or alluvially deposited pumice or pumice lacustrine deposits around lake margins (Kovalchik 1987, Volland 1976). Textures are coarse, ranging from fine sandy loam to coarse sands. High seasonal water tables or flooding occurs in most stands, and water table depth can vary from near the surface year-round to over 1 m in dry seasons.

The coastal Oregon examples of this alliance are found on deflation plains of sea level coastal dune systems. In these deflation plains, wind-scour has removed dune sands until the water table is reached, and moist sands are no longer scoured. Some of these deflation plains can be up to 2 km in width. The water table is near the surface year-round, but seasonal flooding can occur during the rainy winter and spring months. Soils are poorly developed from sand deposits, with coarse textures.

Vegetation: This coniferous forest alliance is characterized by a moderately closed tree canopy composed primarily of *Pinus contorta*. Other conifers sometimes present, but usually not abundant, include *Abies grandis, Abies lasiocarpa, Abies X shastensis (= Abies magnifica var. shastensis), Picea engelmannii*, or *Tsuga mertensiana*. In most stands, only *Pinus contorta* is successfully reproducing, and cover of mature trees of the other species is low. Typically, there is no layer of tall shrubs. If there is a short-shrub layer, it is usually continuous and dense. *Vaccinium uliginosum* is the most frequent and dominant species in such a shrub layer, but other shrubs often present include *Ledum glandulosum, Vaccinium caespitosum, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera caerulea*, or *Spiraea douglasii*. In shrubby stands of the alliance, herbaceous species are not abundant; however, some species present can include *Carex angustata, Ligusticum grayi, Fragaria* spp., *Thalictrum occidentale, Geum macrophyllum, Maianthemum stellatum*, and *Trifolium longipes*. In stands with no dense short-shrub layer, the herbaceous layer is typically lush and dominated by tall graminoids. In northern Rockies stands, *Calamagrostis canadensis* is the dominant species, while in the Oregon coast stands *Carex obnupta* is dominant. In the coastal stands, there are no other herbaceous species reported, but *Sphagnum* spp. can be common.

Dynamics: *Pinus contorta* is sensitive to all but cool ground fires. Kovalchik (1987) reports that these communities dry enough during the summer to carry fires from adjacent upland areas. Most of the shrubs and herbaceous species found in this vegetation are well-adapted to regenerating following fire, therefore there should be little change in species composition (Kovalchik 1987). High livestock use will result in a decrease in shrub cover, and an increase in the introduced *Poa pratensis*.

Similar Alliances:
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Pinus contorta* Temporarily Flooded Forest Alliance (A.175)
- *Pinus contorta* Temporarily Flooded Woodland Alliance (A.562)

Similar Alliance Comments: The similar alliances are dominated by *Pinus contorta*, and are distinguished from this alliance by the flood regime, degree of canopy closure, and differences in the herbaceous and shrub layers.

ALLIANCE DISTRIBUTION

Range: Associations in this alliance have been documented from the Uintah Mountains of northern Utah, north into central Idaho, and in Oregon on the eastern side of the Cascades in the central Oregon "Pumice Zone." The alliance also occurs on the coast of Oregon and the Rocky Mountains of Montana and Wyoming.

Nations: US

Subnations: CA, ID, MT, OR, UT, WA?, WY

TNC Ecoregions: 7:C, 8:C, 9:C, 12:C

USFS Ecoregions: M242A:CC, M242B:CC, M242C:CC, M261E:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CP, M332C:CC, M332E:CP, M332F:CC, M332G:CC, M333C:CC, M333D:CP

Federal Lands: NPS (Glacier, Grand Teton?, Rockefeller, Yosemite); USFS (Bighorn)

ALLIANCE SOURCES

Author(s): M.S. Reid

References: Eyre 1980, Kovalchik 1987, Mauk and Henderson 1984, Moseley et al. 1994, Mutz and Queiroz 1983, Tuhy 1981, Tuhy and Jensen 1982, Volland 1976, Wiedemann 1966, Wiedemann 1984

[CEGL000138] *Pinus contorta / Calamagrostis canadensis* Forest

Translated Name: **Lodgepole Pine / Bluejoint Forest**

Common Name: **Lodgepole Pine / Bluejoint Reedgrass**

Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, seasonally moist sites. Elevations range between 968 and 3050 m (3175-10,000 feet) depending on longitude and aspect. Stands occur in narrow canyons, valley bottoms to lower slopes, small flats and benches with gentle slopes. Soils are seasonally moist either from an impermeable soil horizon that impedes drainage or are subirrigated from nearby riparian areas, but may dry out in late summer. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy is open to moderately dense (30-80% cover), but may be nearly closed and is often solely dominated by *Pinus contorta*. However, in some stands. *Populus tremuloides, Abies lasiocarpa*, or *Picea engelmannii* trees may be present, especially in the subcanopy. Scattered dwarf-, short and tall shrubs are often present, and may form a distinct layer. Common shrubs may include *Amelanchier alnifolia,*

Betula nana, Dasiphora fruticosa ssp. floribunda, Juniperus communis, Ribes spp., *Rosa* spp., *Rubus parviflorus, Salix* spp., *Spiraea betulifolia, Symphoricarpos albus, Vaccinium caespitosum, Vaccinium membranaceum,* or *Vaccinium scoparium*. The moderately dense to dense (30-90% cover) herbaceous layer is typically dominated by the perennial graminoid *Calamagrostis canadensis* (>5% cover) and diverse forbs. Wet-site forbs such as *Aconitum columbianum, Dodecatheon jeffreyi*, and *Senecio triangularis* are absent or have very low cover. Diagnostic of this association is the dominance of *Pinus contorta* in the tree canopy with *Calamagrostis canadensis* dominating the graminoid layer. Moss cover can be quite high (up to 98%).

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor or slopes of 10% or less near the valley floor at elevations of 6800 to 7000 feet. Soil data is available for two stands; the moderately well-drained loam soils for one stand are primarily covered with litter and duff, wood, and mosses. The other stand where soil data is available is situated in a palustrine area that has saturated and poorly-drained sandy clay loam soils that are covered primarily by mosses 98%. Adjacent vegetation may include *Pinus contorta* forests, *Salix* sp., or *Populus tremuloides stands*.

Global Environment: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, seasonally moist sites. Elevations range between 968 and 2985 m (3175-9800 feet) depending on longitude and aspect. Stands occur in narrow canyons, valley bottoms to lower slopes, small flats and benches with gentle slopes. Soils are seasonally moist from high water table or poor soil drainage that is often caused by an impermeable soil horizon that impedes drainage, or the site is subirrigated from nearby riparian areas. Soils generally dry out in late summer. Soil texture is variable (sandy loam to clay) and includes well-developed fine-textured loams with an agile horizon and poorly developed, coarse-textured alluvium. Substrates are derived from quartzite, granite, volcanic, and/or calcareous sedimentary alluvium. Litter dominates ground cover often over 3 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forest occurring on mesic sites. *Pinus contorta* (7 to 60% cover) dominates the tree canopy. Seedlings of *P. contorta, Picea engelmannii, Pinus albicaulis, Populus tremuloides, Pseudotsuga menziesii,* and/or *Abies lasiocarpa* may occur. The shrub layer is not well developed; *Vaccinium uliginosum* (1 to 10% cover) is the most constant shrub occurring in four of eleven stands. The herbaceous layer is diverse and contributes 12 to 80% ground cover. *Calamagrostis canadensis* (7 to 40% cover) is the dominant graminoid. *Phleum pratense* (1 to 7% cover) is the only other herbaceous species to occur in over half the stands. *Fragaria virginiana* (trace to 10% cover), *Geranium viscosissimum,* (1 to 7% cover), and *Lupinus argenteus* (1 to 7% cover) are the most constant forbs, each occurring in five stands.

Global Vegetation: This association is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The evergreen needle-leaved tree canopy is 5-15 m tall. It is open to moderately dense (30-80% cover), but may be nearly closed. The tree canopy is often solely dominated by *Pinus contorta*, however, in some stands *Populus tremuloides, Abies lasiocarpa*, or *Picea engelmannii* trees may be present, especially in the subcanopy. Stands are often relatively young (<150 years old) with evidence of past fire. Scattered dwarf-, short and tall shrubs are often present and may form a distinct layer. Common shrubs may include *Dasiphora fruticosa ssp. floribunda, Amelanchier alnifolia, Antennaria microphylla, Betula nana, Juniperus communis, Ribes* spp., *Rosa* spp., *Rubus parviflorus, Salix bebbiana, Salix drummondiana, Sorbus scopulina, Spiraea betulifolia, Symphoricarpos albus, Vaccinium caespitosum, Vaccinium membranaceum,* or *Vaccinium scoparium*. The herbaceous layer is moderately dense to dense (30-90% cover) and typically strongly dominated by the perennial graminoid *Calamagrostis canadensis* (with minimum cover of 5%) and diverse forbs. Common herbaceous species include *Angelica arguta, Arnica cordifolia, Eurybia conspicua (= Aster conspicuus), Astragalus miser, Carex rossii, Elymus caninus, Fragaria virginiana, Geum macrophyllum, Lupinus argenteus, Maianthemum stellatum, Poa wheeleri, Solidago simplex var. spathulata (= Solidago spathulata), Trifolium longipes,* and *Trisetum spicatum*. Wet-site forbs such as *Aconitum columbianum, Dodecatheon jeffreyi*, and *Senecio triangularis* are absent or have very low cover. Mosses may be very abundant with up to 98% cover on the ground surface.

Global Dynamics: This association is restricted to seasonally moist but not wet sites. The moist soil conditions are controlled by impermeable soil horizons and/or seasonal seeps or flowing streams. The dominance of *Pinus contorta* in stands in this association is related to fire history and topo-edaphic conditions (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984, Cooper et al. 1987). Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense stands of even-aged trees. Over time, many of these stands can succeed to dominance by other, more shade-tolerant conifer species. Most forests in this alliance are early- to mid-successional forests which developed following fires and are considered seral to *~Abies lasiocarpa / Calamagrostis canadensis* Forest (CEGL000300)$$ (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983, Tuhy and Jensen 1982), while other stands have a canopy that is dominated by more persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Picea engelmannii* or *Abies lasiocarpa* (Henderson et al. 1977).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium uliginosum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.

Lupinus argenteus	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Pinus contorta	Tree subcanopy	Needle-leaved tree	X	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex luzulina var. *ablata*	-	P	rare
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Cirsium arvense	-	P	exotic
Trifolium hybridum	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Apr-1999).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest (CEGL000300)
- *Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis* Forest [Provisional] (CEGL005909)
- *Populus tremuloides / Calamagrostis canadensis* Forest (CEGL000574)

Global Related Concepts:
- *Abies lasiocarpa / Calamagrostis canadensis - Calamagrostis canadensis* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Tuhy and Jensen 1982) B
- *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Cooper 1975) B
- *Pinus contorta / Calamagrostis canadensis - Thalictrum occidentale* Community Type (Tuhy 1981) B
- *Pinus contorta / Calamagrostis canadensis* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta / Calamagrostis canadensis* Community Type (Henderson et al. 1977) =
- *Pinus contorta / Calamagrostis canadensis* Community Type (Mutz and Queiroz 1983) F
- *Pinus contorta / Calamagrostis canadensis* Ecological Type (Girard et al. 1997) =
- *Pinus contorta/Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This association was considered seral and included in the *Abies lasiocarpa / Calamagrostis canadensis* Habitat Type (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983).

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Five sampled stands occur in the John D. Rockefeller Parkway, two occur west of String Lake, two occur near the Arizona Creek Drainage, one occurs west of Spalding Bay, and one occurs SE of the Snake River, off Grassy Lake Road

Global Range: This association occurs in subalpine riparian areas in the central and northern Rocky Mountains from the Uinta Mountains to northwestern Montana.
Nations: US
States/Provinces: CA?, ID:S5, MT, OR:SU, UT:S3S4, WY
TNC Ecoregions: 7:C, 8:C, 9:C

TNC Ecoregion Comments: ECO7, ECO8, ECO9 added (KAS 3-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CP, M332B:CP, M332C:CC, M332E:CP, M333C:CC, M333D:CP
Federal Lands: NPS (Glacier, Grand Teton, Rockefeller); USFS (Bighorn)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B096, GT-03B101
Accuracy Assessment Points: 04X444, 04S043, 04S042, 04S011, 04R225, 04R224, 04J099, 04R307, 04R305
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper 1975	.	.	X	X	.	.	.	.	.
Cooper et al. 1987	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1997	.	.	X	.	.	.	.	.	.
Henderson et al. 1977	.	.	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	.	.	.	.	.
Pfister et al. 1977	.	.	X	X	.	.	.	.	.
Steele et al. 1981	.	.	X	X	.	.	.	.	.
Steele et al. 1983	.	.	X	X	.	.	.	.	.
Tuhy 1981	.	X	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

I.B.2.N.b. Montane or boreal cold-deciduous forest

A.274 *Populus tremuloides* Forest Alliance

Quaking Aspen Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance is widespread in the western United States, the northern Great Plains, and extends into the western Great Lakes area. Stands are found on a variety of landscape positions but are consistently in mesic habitats. In the Midwest, average precipitation is usually enough to support associations in this alliance across broad areas of the landscape where other conditions favor it. In the Great Plains and western U.S., forests in this alliance are typically restricted to areas with above-average available moisture (lower slopes, near watercourses, basins) or where moisture stress is lessened (shaded canyons, cooler higher elevation sites, north-facing slopes). Stands in this alliance often occur between grasslands and other forest types. The soils are usually deep, well-developed, and loamy. Stands in this alliance often originate following disturbance. The dominant species of the canopy is *Populus tremuloides*. In the midwestern United States, *Quercus macrocarpa* and *Betula papyrifera* are common associates and can even be codominant in some stands. The shrub layer can be made up of several shrubs common to the Great Plains, including *Corylus cornuta, Corylus americana, Prunus virginiana, Symphoricarpos occidentalis, Amelanchier alnifolia*, and *Rubus* spp. In wetter stands *Cornus* spp. and *Salix* spp. may also be present. The herbaceous layer may contain *Aralia nudicaulis, Carex pensylvanica, Maianthemum canadense, Maianthemum stellatum, Viola* spp., and *Thalictrum dioicum*. In the western United States common associates include *Acer glabrum, Amelanchier alnifolia, Symphoricarpos oreophilus, Bromus carinatus, Calamagrostis rubescens, Thalictrum fendleri, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii*, and *Hesperostipa comata (= Stipa comata)*. In the Dakotas and Wyoming, these stands may remain successionally stable for many dozens of years, while in the more mesic, eastern portion of the range, *Populus tremuloides* forests succeed to other community types much more quickly. *Populus tremuloides* (the

species) reaches Texas, Virginia, and West Virginia, but it is unclear whether *Populus tremuloides* communities occur in any of these states. Stands of *Populus tremuloides* in the Trans-Pecos of western Texas occur in ravines and on open talus slopes above 2134 m (7000 feet) elevation; they may best be treated as *Populus tremuloides* communities, or merely as other communities with a component of aspen. Texas stands of *Populus tremuloides* are of limited extent and variable in structure.
Environment: Forests included in this alliance occur extensively in the western U.S., northern Great Plains, and extend into the western Great Lakes area. Elevations range from 900 to 3350 m. Climate is temperate with a relatively long growing season, typically cold winters and often deep snow. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm, except in semi-arid environments where stands are restricted to mesic microsites such as seeps or large snow drifts. Distribution of these forests is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable; sites range from level to steep slopes. Aspect varies according to the limiting factors. Stands at high elevations or northern latitudes are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations or southern latitudes stands are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well-developed with rock often absent from the soil. Soil texture ranges from sandy loams to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but stands appear to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Geography strongly influences this type. In the western U.S., stands occur on mesic upland sites and stream terraces above the floodplain. In the Rocky Mountains, a band of this type occurs at the lower treeline from the plains to toeslopes and slumps. In the Great Basin and southwestern U.S., the annual precipitation is typically low, and stands are found in areas where subsurface soil moisture accumulates or where temperature and evaporation rates are lower, such as in swales and canyons, below seeps, and on north aspects of slopes at higher elevations. Stands of *Populus tremuloides* in the Trans-Pecos of western Texas occur in ravines and on open talus slopes above 2135 m. In the northern Great Plains, these forests are typically found on rolling topography, such as the glacial moraines in Minnesota or the Turtle Mountains and Pembina Hills of North Dakota (Potter and Moir 1961, MNNHP 1993). They are often on the prairie-forest border between grasslands and other forest types from northern Minnesota to Iowa (Hoffman and Alexander 1987, MNNHP 1993).
Vegetation: Stands a have a somewhat closed to closed canopy of trees from 5-20 m tall, that is dominated or codominated by the cold-deciduous broad-leaved tree *Populus tremuloides*. Other broad-leaved trees, such as *Populus balsamifera ssp. trichocarpa*, *Quercus macrocarpa*, and *Betula papyrifera*, may be present to codominant depending on geography and topography. Several species of conifer trees may also be present in the tree canopy. Conifers include *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 25% of the tree canopy before the stand is reclassified as a mixed stand. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors such as disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just a herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

In the western U.S. common tree associates include *Populus balsamifera ssp. trichocarpa* in the northern Rocky Mountains (Cooper and Heidel 1997). Scattered conifer trees such as *Pseudotsuga menziesii* and species of *Pinus*, *Picea*, and *Abies* may also be present. Common shrubs include *Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium myrtillus*. The herbaceous layer may be lush and diverse. Common graminoids may include *Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi*, and *Hesperostipa comata (= Stipa comata)*. Associated forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium X occidentale, Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri, Valeriana occidentalis, Wyethia amplexicaulis*, and many others. Exotic grasses, such as the perennial *Poa pratensis* and the annual *Bromus tectorum*, are often common in stands disturbed by grazing.

In the midwestern United States, these forests are found along the prairie-forest border from northern Minnesota to Iowa. *Quercus macrocarpa* and *Betula papyrifera* are common associates and are codominant in some stands. Scattered *Fraxinus pennsylvanica, Populus balsamifera, Quercus ellipsoidalis, Tilia americana*, and *Ulmus americana* may also be present. The shrub layer can be made up of several shrubs common to the Great Plains, including *Corylus cornuta, Corylus americana, Prunus virginiana, Symphoricarpos occidentalis, Amelanchier alnifolia, Viburnum opulus var. americanum (= Viburnum trilobum)*, and *Rubus* spp. In wetter stands *Cornus* spp. and *Salix* spp. may also be present. The herbaceous layer may contain *Aralia nudicaulis, Carex pensylvanica, Maianthemum canadense, Maianthemum stellatum, Sanicula marilandica, Oryzopsis asperifolia, Schizachne purpurascens, Viola* spp., and *Thalictrum dioicum*.

Populus tremuloides (the species) reaches Texas, Virginia, and West Virginia, but it is unclear whether *Populus tremuloides* communities occur in any of these states. Texas stands of *Populus tremuloides* are of limited extent and variable in structure. More study is needed to determine this.

Dynamics: Stands in this alliance often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clear-cutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the stand will succeed to longer-lived conifer forest if undisturbed. Stands are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1994). In the Dakotas and Wyoming, these stands may remain successionally stable for many dozens of years (Girard et al. 1989). In the more mesic areas of the eastern segment of its range, they succeed to other community types much more quickly (MNNHP 1993).

Similar Alliances:
- *Abies concolor - Populus tremuloides* Forest Alliance (A.419)
- *Abies lasiocarpa - Populus tremuloides* Forest Alliance (A.422)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Picea glauca - Abies balsamea - Populus* spp. Forest Alliance (A.418)
- *Picea mariana - Populus tremuloides* Forest Alliance (A.414)
- *Picea pungens - Populus tremuloides* Forest Alliance (A.423)
- *Pinus banksiana - Populus tremuloides - Betula papyrifera* Forest Alliance (A.3503)
- *Pinus banksiana - Populus tremuloides* Forest Alliance (A.390)
- *Pinus contorta - Populus tremuloides* Forest Alliance (A.424)
- *Pinus contorta - Populus tremuloides* Seasonally Flooded Forest Alliance (A.440)
- *Pinus flexilis - Populus tremuloides* Forest Alliance (A.425)
- *Pinus ponderosa - Populus tremuloides* Forest Alliance (A.399)
- *Pinus strobus - (Pinus resinosa) - Populus tremuloides* Forest Alliance (A.400)
- *Populus tremuloides - Betula papyrifera* Forest Alliance (A.269)
- *Populus tremuloides - Pseudotsuga menziesii* Forest Alliance (A.426)
- *Populus tremuloides - Quercus* spp. - *Salix* spp. Shrubland Alliance (A.903)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Quercus macrocarpa* Woodland Alliance (A.620)

Similar Alliance Comments: There are currently 18 alliances with *Populus tremuloides* as a dominant or codominant species. Many of the stands in these alliances are floristically similar. One of the alliances is a wooded herbaceous, one is a shrubland and one is a woodland. Of the 15 remaining forest alliances, three are separated by temporarily or seasonally flooded hydrologic regimes. Most of the alliances are mixed stands with *Populus tremuloides* codominant with other broadleaf or conifer tree species.

ALLIANCE DISTRIBUTION

Range: Forests included in the alliance have been described from across the western United States, northern Great Plains, extending into the western Great Lakes area as far east as Michigan and Iowa. Its northern extent is in Canada in Saskatchewan, Manitoba, and Ontario. Additional associations need to be described in California, Arizona, and western Texas. It may also occur in West Virginia and Virginia.

Nations: CA, US

Subnations: AB, AZ?, CA, CO, IA, ID, MB, MN, MT, ND, NM, NV, ON, OR, SD, SK, TX?, UT, WA, WI, WY

TNC Ecoregions: 2:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 24:P, 25:C, 26:C, 34:C, 35:C, 46:C, 47:C

USFS Ecoregions: 212Hb:CPP, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Je:CPP, 212Jf:CPP, 212Jj:CPP, 212Jk:CPP, 212Jl:CPP, 212Jm:CPP, 212Ka:CPP, 212Mb:CCC, 212Nc:CCC, 222Md:CCC, 222Na:CCC, 242A:CC, 251Aa:CCC, 331D:CC, 331G:CC, 341B:CC, 341E:CC, 342B:CC, 342C:CC, 342D:CC, M242C:CC, M261E:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M334A:CC, M341C:CC

Federal Lands: BIA (Blackfeet); NPS (Black Canyon of the Gunnison, Capitol Reef, Colorado, Curecanti, Dinosaur, Florissant Fossil Beds, Glacier, Grand Teton, Jewel Cave, Rockefeller, Rocky Mountain, Yosemite, Zion); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Ashley, Bighorn, Black Hills, Bridger-Teton, Caribou-Targhee, Dixie, Fishlake, Grand Mesa, Gunnison, Medicine Bow, Pike-San Isabel, Rio Grande, Routt, Shoshone, Uinta, Uncompahgre, Wasatch-Cache, White River NF)

ALLIANCE SOURCES

Author(s): A.S. Weakle, mod. K.A. Schulz and J. Drake

References: Alexander 1986, Bader 1932, Baker 1982b, Baker and Kennedy 1985, Blackburn et al. 1968b, Blackburn et al. 1968c, Blackburn et al. 1969b, Blackburn et al. 1969d, Blackburn et al. 1971, Bond 1959, Boyce 1977, Bunin 1975a, Bunin 1975c, Coenenberg and Depuit 1979, Cooper and Heidel 1997, Cooper and Pfister 1981, Costello 1954, Cox 1968, Crouch 1983, Curry 1962, DeByle 1985, DeByle 1989, DeByle and Winokur 1985, Dick-Peddie 1993, Dorn 1969, Eyre 1980, Faber-Langendoen et al. 1996, Ferchau 1973, Fike 1999, Giese 1975, Girard et al. 1989, Hansen et al. 1988a, Hansen et al. 1991, Hansen et al. 1995, Hess

1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hoffman and Alexander 1987, Holland 1986b, Johnston 1987, Johnston and Hendzel 1985, Keammerer and Peterson 1981, Keammerer and Stoecker 1975, Keammerer and Stoecker 1980, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1999b, Knight 1994, Komarkova et al. 1988a, Komarkova et al. 1988b, Langenheim 1962, Lewis 1975a, Lynn et al. n.d., MNNHP 1993, MTNHP unpubl. data, Marr et al. 1973a, Marr et al. 1973b, Morgan 1969, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Murphy 1982, Mutel 1976, Palmer 1929, Paulsen 1969, Peet 1975, Peet 1981, Plumb 1988, Potter and Moir 1961, Powell 1988a, Reed 1971, Richard et al. 1996, Rominger and Paulik 1983, Sawyer and Keeler-Wolf 1995, Severson and Thilenius 1976, Shepherd 1975, Shepperd 1990, Smith 1991, Terwilliger et al. 1979a, Wasser and Hess 1982, Williams and Lillybridge 1983, Youngblood and Mueggler 1981

[CEGL000566] *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus* Forest

Translated Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / California Brome Forest**
Common Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / California Brome**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This mesic aspen forest is most likely a grazing-induced, less rich version of similar associations. It is a mesic forest that occupies low to moderate elevations, from 1965 to 2380 m (6448-7800 feet). It occurs on shallow to moderately steep slopes on all exposures, often on sedimentary sand- or claystone-derived soils. *Populus tremuloides* is the almost exclusive canopy occupant with 10-80% cover, average about 50%. Conifers may be present in low amounts (<1%). The undergrowth is essentially three strata: tall shrubs, low shrubs, and herbs. *Amelanchier alnifolia* and *Prunus virginiana* are the most common and abundant tall-shrub species. *Symphoricarpos oreophilus* usually dominates the lower shrub layer. The herbaceous undergrowth of this structurally complex community has been altered considerably by grazing. Heavy persistent grazing has reduced forbs and increased less palatable grass species. The herbaceous portion of the undergrowth is a highly variable group of species. Most abundant are tall grass species such as *Elymus glaucus, Bromus carinatus*, and *Elymus trachycaulus (= Agropyron trachycaulum). Poa pratensis* and *Poa wheeleri* can also be present in significant amounts (20-40% cover). A wide variety of forbs can occur, but the tall and low forbs that serve as indicators for other community types are never abundant. Most common are *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Chamerion angustifolium, Helianthella uniflora, Lupinus* spp., *Lathyrus* spp., and *Vicia americana*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stand for this association occurs on a 34% slope with a west-facing aspect. The elevation is 7079 feet.

Global Environment: This mesic forest occupies low to moderate elevations, from 1965 to 2400 m (6448-7800 feet). It occurs on shallow to moderately steep slopes on all exposures, often on sedimentary sand- or claystone-derived soils.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Populus tremuloides* (40 % cover) is the dominant tree canopy species. *Abies lasiocarpa* occurs in the subcanopy. Seedlings of *Pinus flexilis* occur in low amounts. The shrub layer is dominated by *Prunus virginiana* (3% cover) and *Amelanchier alnifolia* (3% cover) in the tall shrub stratum and *Symphoricarpos oreophilus* (10% cover) in the short shrub stratum. The only abundant graminoid is *Elymus glaucus* (40% cover). *Chamerion angustifolium* is the dominant forb with 10% cover. The only other forb occurring with more than scarce cover is *Thalictrum fendleri.*

Global Vegetation: This association is a montane forest that occurs on mesic sites. *Populus tremuloides* is the almost exclusive canopy occupant with 10-80% cover, average about 50%. Conifers may be present in low amounts (<1%), including *Abies concolor, Abies lasiocarpa, Pinus contorta*, and *Pseudotsuga menziesii*. The herbaceous undergrowth of this structurally complex community has been altered considerably by grazing. The undergrowth is essentially three strata: tall shrubs, low shrubs, and herbs. *Amelanchier alnifolia* and *Prunus virginiana* are the most common and abundant tall-shrub species. The tall-shrub stratum can be broken up and ill-defined, but various members of the tall-shrub group are, in total, a prominent part of the undergrowth. *Symphoricarpos oreophilus* usually dominates the lower shrub layer. *Rosa woodsii* and *Mahonia repens (= Berberis repens)* are also frequently present but not nearly as abundant as *Symphoricarpos*. In the northern part of the range *Paxistima myrsinites* frequently is an important constituent.

The herbaceous portion of the undergrowth is a highly variable group of species. Most abundant are tall grass species such as *Elymus glaucus, Bromus carinatus*, and *Elymus trachycaulus (= Agropyron trachycaulum). Poa pratensis* and *Poa wheeleri* can also be present in significant amounts (20-40% cover). A wide variety for forbs can occur, but the tall and low forbs that serve as indicators

for other community types are never abundant. Most common are *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Chamerion angustifolium, Helianthella uniflora, Lupinus* spp., *Lathyrus* spp., and *Vicia americana*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Elymus glaucus	Herb (field)	Graminoid	X	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Elymus glaucus	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)

Global Related Concepts:
- *Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Bromus carinatus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description very well. Even though *Bromus carinatus* is not present, *Elymus glaucus* is an indicator for this association.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The stand occurs on the west slope of Shadow Mountain on the Bridger-Teton National Forest.

Global Range: This association is known from Idaho, Utah and Wyoming.
Nations: US
States/Provinces: ID:S3, UT:S4S5, WY:S2S3
TNC Ecoregions: 9:C, 10:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Inventory Notes: The plot defining this association does not occur in GTNP.

GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407016

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000567] *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens* Forest

Translated Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass Forest**
Common Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a multi-layered deciduous forest that occurs at relatively low elevations in the Rocky Mountains. Most of the stands occur at less than 2135 m (7000 feet) elevation. Elevation range is 1680 to 2517 m (5500-8257 feet). It occurs on any aspect but can favor southerly and westerly aspects, on moderate to very steep slopes. The tree layer consists almost exclusively of *Populus tremuloides*. Conifers can be present in small amounts. The undergrowth is multi-structured. A tall-shrub stratum exists that is usually dominated by *Amelanchier alnifolia* or *Prunus virginiana*. Occasionally *Acer grandidentatum* is abundant. This layer may be broken or ill-defined but generally exceeds 10% cover. The low-shrub stratum is dominated by *Symphoricarpos oreophilus* or *Symphoricarpos albus*. Occasionally *Paxistima myrsinites* or *Spiraea betulifolia* can be abundant. The herbaceous layer is dominated by *Calamagrostis rubescens* and sometimes *Carex geyeri*. Other herbs present include *Elymus glaucus*, *Lupinus* spp., *Galium boreale*, and *Geranium viscosissimum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes with gradients ranging from 6 to 35% and aspects facing any direction. The elevations for these stands range from 6497 to 7277 feet. Where data are available the soils are moderately well- to well-drained loams or moderately well-drained silty clay loams or sandy clays. The unvegetated ground cover is comprised primarily of litter and duff (70 to 90% cover) and wood (1 to 20% cover). Two stands contain 5 and 10% cover of rocks greater than 10cm. Four stands show evidence of fire. Surrounding vegetation is typically *Populus tremuloides* stands or mixed aspen/conifer stands. One stand has adjacent vegetation of a *Mertensia ciliata* forbland.

Global Environment: This is a major aspen association, making up 22% of the aspen communities on the Targhee National Forest and 15% of those on the Caribou National Forest. It is known from Grand Teton National Park, northern Utah, Idaho, and western Colorado. It is a lush and relatively low-elevation type; most of the stands occur at less than 2100 m (7000 feet) elevation. Elevation range is 1675 to 2517 m (5500-8257 feet). It occurs on any aspect but can favor southerly and westerly aspects, on moderate to very steep slopes (3-27 degrees). It can occur in isolated clumps in moist depressions surrounded by *Artemisia - Symphoricarpos* meadows, or surrounded by aspen, conifer or mixed aspen-conifer forests. The soils are moderately well- to well-drained loams or moderately well-drained silty clay loams, mostly derived from sandstone.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on subxeric sites. The dominant tree canopy species is *Populus tremuloides* (20 to 60% cover). Incidental species in the tree canopy include *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and *Pseudotsuga menziesii*. The tree sub canopy may include all of the aforementioned species plus *Juniperus scopulorum*. *Amelanchier alnifolia* (1 to 20% cover) is co-dominant with *Symphoricarpos oreophilus* (1 to 40% cover) and *Prunus virginiana* (1 to 30% cover) in the shrub layer. *Mahonia repens* occurs in half the stands and contributes 1 to 3% cover. The herbaceous layer is dominated by *Calamagrostis rubescens* (10 to 60% cover). Other high constancy

species include *Poa pratensis* and *Phleum pratense*. High constancy forbs are *Chamerion angustifolium*, *Geranium viscosissimum*, and *Lupinus argenteus.*

Global Vegetation: This is a very lush, multi-layered deciduous forest. The tree layer consists almost exclusively of *Populus tremuloides*. Conifers, such as *Pseudotsuga menziesii*, *Abies lasiocarpa*, or *Picea engelmannii*, can be present in small amounts. The undergrowth is multi-structured. A tall-shrub stratum exists that is usually dominated by *Amelanchier alnifolia* or *Prunus virginiana*. Occasionally *Acer grandidentatum* is abundant. This layer may be broken or ill-defined but generally exceeds 10% cover. The low-shrub stratum is dominated by *Symphoricarpos oreophilus* or *Symphoricarpos albus*. Frequently *Paxistima myrsinites* and occasionally *Spiraea betulifolia* are abundant. The herbaceous layer is dominated by *Calamagrostis rubescens* and sometimes *Carex geyeri*. Other herbs present include *Elymus glaucus*, *Lupinus* spp., *Galium boreale*, and *Geranium viscosissimum*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic
Viola orbiculata	-	P	state rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Prunus virginiana* Forest (CEGL000596)--From the Black Hills, the shrub layer of this association is dominated by *Prunus virginiana* and can often have *Amelanchier alnifolia* and *Symphoricarpos* spp.
- *Populus tremuloides / Spiraea betulifolia* Forest (CEGL000607)--Two stands in the Black Hills (Marriott and Faber-Langendoen 2000) are very similar in woody canopy composition, but no *Calamagrostis rubescens* occurs in the rather depauperate herbaceous undergrowth.
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)

Global Related Concepts:

- *Populus tremuloides / Amelanchier alnifolia - Paxistima myrsinites* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Amelanchier alnifolia - Spiraea betulifolia* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* Community Type (Mueggler and Campbell 1982) I
- *Populus tremuloides / Prunus virginiana / Carex geyeri* Community Type (Mueggler and Campbell 1986) I
- *Populus tremuloides / Prunus virginiana* Community Type (Youngblood and Mueggler 1981) I
- *Populus tremuloides / Spiraea betulifolia* Community Type (Youngblood and Mueggler 1981) I
- *Populus tremuloides / Symphoricarpos oreophilus* Habitat Type (Hoffman and Alexander 1983) I
- *Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well, except for the invasion of *Poa pratensis* in some of the Grand Teton National Park stands. *Amelanchier alnifolia* is used in the name of this community type even though it does not occur in all the stands. This single species is used in the association name to represent the presence of any of the following species: *Amelanchier alnifolia, Prunus virginiana, Acer grandidentatum,* or *Salix scouleriana*. These species, alone or in combination, have at least 10% cover in the stand.
Global Classification Comments: Compare this association to ~*Populus tremuloides / Prunus virginiana* Forest (CEGL000596)$$.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* association, but is differentiated due to the presence of *Amelanchier alnifolia* and/or *Prunus virginiana* as a dominant species. It is also similar to the *Populus tremuloides / Calamagrostis rubescens* association, but is differentiated by having a well developed shrub layer consisting of the dominants *Amelanchier alnifolia, Prunus virginiana,* and/or *Symphoricarpos oreophilus.*

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in small stands throughout the park. They are located east of Apres Vous Peak northwest of Phelps Lake, northwest of Lupine Meadows trailhead, near Moose Headquarters, near the south end of Blacktail Butte, northeast of the seed barn, south of Wolff Ridge, east of kelly Warm Springs, on the western slope of Shadow Mountain, and south of Elk Ranch Reservoir.

Global Range: This association is known from eastern Idaho, western Wyoming, northern Utah, western Colorado, and southwestern Montana.
Nations: US
States/Provinces: CO, ID:S4, MT, UT:S4, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO20 and M331G added for BLCA (mjr 1-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M332E:CC
Federal Lands: NPS (Black Canyon of the Gunnison, Curecanti, Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A080, GT-03A116, GT-03B014, GT-03C087, GT-0202068, GT-03A125
Accuracy Assessment Points: 04J013, 04K008, 04K009, 04R010, 04X815, 04X904
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9409303, BT-9507001

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel, mod. J. Drake

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hoffman and Alexander 1983	.	X	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.

Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000569] *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri* Forest

Translated Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Fendler's Meadowrue Forest**
Common Name: **Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Fendler's Meadowrue**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a low- to moderate-elevation aspen forest, occurring between 1770 to 2470 m (5800-8100 feet). It generally occurs on gentle slopes (<25%) on lower and midslope positions, and occasionally on the valley bottom. Soils are sandy loams to fine loams, usually derived from sandstone. This montane deciduous forest is multi-layered. The forest canopy consists primarily of *Populus tremuloides*.. The undergrowth has a multi-layered structure of tall shrubs, low shrubs, and a fairly low-growing layer of herbaceous species. The association is characterized by the lack of conifers in the tree stratum, the presence of both a tall- and short-shrub layer, and the lack of significant quantities of both tall forbs and the graminoids *Calamagrostis rubescens* and *Carex geyeri*. The most common tall shrubs are *Amelanchier alnifolia* and *Prunus virginiana*. The low-shrub component is always present, with *Symphoricarpos oreophilus* and *Rosa woodsii* the most abundant species. The herbaceous layer is dominated by low-growing species such as *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Osmorhiza depauperata*, and *Lupinus argenteus*. Occasional tall forbs, such as *Agastache urticifolia, Senecio serra* or *Eucephalus engelmannii (= Aster engelmannii)*, may be present, but they never form a prominent part of the undergrowth. Graminoids can present with <3% cover, such as *Calamagrostis rubescens, Carex geyeri, Carex hoodii, Elymus trachycaulus*, and *Poa secunda*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on southeast-facing slopes of 50 to 80% at elevations of 6400 to 6900 feet. Common signs of disturbance include the presence of *Carduus nutans* and disease on *Prunus virginiana*. One stand has bare soil present, and one stand has 80% litter and duff. Adjacent to one stand is and *Artemisia tridentata* ssp. *vaseyana* shrubland to one side and the Snake River to the other side. Another stand has a meadow adjacent to it.

Global Environment: This is a low- to moderate-elevation aspen forest, occurring between 1770 to 2470 m (5800-8100 feet). It generally occurs on gentle slopes (<25%) on lower and midslope positions, and occasionally on the valley bottom. Soils are sandy loams to fine loams, usually derived from sandstone.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Populus tremuloides* usually dominates the tree canopy and subcanopy, however one stand has 20% *Populus tremuloides* in the subcanopy and 20% *Populus balsamifera* in the tree canopy. Other species in the tree canopy with less than 5% cover include *Abies lasiocarpa* and *Pseudotsuga menziesii.* The subcanopy may have *Pinus contorta* and/or *Pseudotsuga menziesii* in low covers. Shrubs present in all stands are *Amelanchier alnifolia* (3 to 20% cover), *Prunus virginiana* (3 to 30% cover) and *Symphoricarpos oreophilus* (averaging 8% cover), and *Mahonia repens* (averaging 2% cover). The herbaceous layer is not consistently dominated by one species. *Carex hoodii* and *Lupinus argenteus* are in 3 out of 4 stands, and each averages 4% cover. Other species in half the sampled stands with an average of at least 2% cover include *Calamagrostis rubescens, Poa pratensis*, and *Thalictrum* sp.

Global Vegetation: This montane deciduous forest is multi-layered. The forest canopy consists primarily of *Populus tremuloides*. *Abies lasiocarpa* or *Pseudotsuga menziesii* are occasionally present in small amounts. The undergrowth has a multi-layered structure of tall shrubs, low shrubs, and a fairly low-growing layer of herbaceous species. The association is characterized by the lack of significant amounts of cover by conifers in the tree stratum, the presence of both a tall- and short-shrub layer, and the lack of significant quantities of both tall forbs and the graminoids *Calamagrostis rubescens* and *Carex geyeri*. The most common tall shrubs are *Amelanchier alnifolia* and *Prunus virginiana*. This stratum can be open and scattered but usually has at least 10% cover, and is often greater than 50%. The low-shrub component is always present, with *Symphoricarpos oreophilus* and *Rosa woodsii* the most abundant species. Occasionally *Symphoricarpos albus* replaces *Symphoricarpos oreophilus*. Some stands have high abundance of *Paxistima myrsinites*. The herbaceous layer is dominated by low-growing species such as *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Osmorhiza depauperata*, and *Lupinus argenteus*. Occasional tall forbs, such as *Agastache urticifolia, Senecio serra* or *Eucephalus engelmannii (= Aster engelmannii)*, may be present, but they never form a prominent part of the undergrowth. Graminoids can present with <3% cover, such as *Calamagrostis rubescens, Carex geyeri, Carex hoodii, Elymus trachycaulus*, and *Poa secunda*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Dwarf shrub	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Thalictrum fendleri	Herb (field)	Forb	X	.	.

Higher Taxon	Note
Geranium spp.	dominant forbs
Osmorhiza spp.	dominant forbs

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	Invasive
Poa pratensis	-	P	Invasive
Carduus nutans	-	P	Invasive
Taraxacum officinale	-	P	Invasive
Tragopogon dubius	-	P	Invasive

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)

Global Related Concepts:

- *Populus tremuloides / Amelanchier alnifolia - Prunus virginiana* (Johnston and Hendzel 1985) I
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* Habitat Type (Komarkova et al. 1988a) =
- *Populus tremuloides/Amelanchier alnifolia-Symphoricarpos oreophilus/Thalictrum fendleri* (Bourgeron and Engelking 1994) = DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association differs from the Mueggler (1988) *Populus tremuloides / Amelanchier alnifolia – Symphoricarpos oreophilus / Thalictrum fendleri* c.t. by one stand occurring on an 80% slope and the herbaceous layer is not as robust as Mueggler describes. Although no forbs were noted as being in all stands or with more than 1% cover, the forbs that describe this association occur in small amounts. This association is similar to the *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* association, but is differentiated by the absence of either *Prunus virginiana* and/or *Amelanchier alnifolia* as a co-dominant species in the shrub layer.

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near the Granite Canyon trail head, near Emma Matilda Lake, near Pacific Creek, and off the Baseline Flat Road above the Snake River.

Global Range: This association is known from Nevada, Utah, Idaho, Wyoming, and Colorado.

Nations: US
States/Provinces: CO:S3S4, ID:S3?, NV, UT:S4S5, WY:S3?
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:C?, M332E:CC
Federal Lands: NPS (Curecanti, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201016, GT-03A003
Accuracy Assessment Points: 04M016, 04X068
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker and Kennedy 1985	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP Ecology Team 2001	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston and Hendzel 1985	.	X	X	X	.	.	.	.	.
Komarkova et al. 1988a	.	X	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	.	X	.	.	.	.	.

[CEGL000565] *Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum* Forest

Translated Name: **Quaking Aspen / Saskatoon Serviceberry / Northern Bracken Forest**
Common Name: **Quaking Aspen / Saskatoon Serviceberry / Northern Bracken Fern**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This deciduous forest occurs on primarily on northerly and easterly exposures but has been seen on southeastern and southern exposures as well. It occurs at relatively low elevations in the mountains of northern Utah and western Wyoming. It is know from 2135 to 2193 m (7000-7195 feet) elevation. Soils are primarily derived from sandstone. It occurs on mid to lower slopes on up to 34% grades. The tree layer is almost exclusively *Populus tremuloides*. *Abies concolor* or *Abies lasiocarpa* may be present in the tree layer or as seedlings, but not in such abundance as to suggest eventual replacement of aspen dominance in the overstory. The tall-shrub stratum is dominated by *Acer grandidentatum*, *Prunus virginiana*, or *Amelanchier alnifolia*, or any combination of those species. Low shrubs, such as *Symphoricarpos oreophilus*, *Rosa woodsii*, or *Mahonia repens*, are also often present, sometimes in substantial amounts. The most distinctive feature is the abundance of *Pteridium aquilinum* in the herbaceous undergrowth. Forbs are often also present with *Osmorhiza* spp., *Galium boreale*, *Rudbeckia occidentalis*, and *Thalictrum occidentale*. Graminoids are also common with *Elymus glaucus*, *Bromus carinatus*, *Agrostis exarata*, *Calamagrostis rubescens*, *Juncus saximontanus*, *Carex laeviculmis*, and *Carex lenticularis*. This association is differentiated from the similar ~*Populus tremuloides / Pteridium aquilinum* Forest (CEGL000597)$$ by the presence of an abundant tall-shrub layer.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The stand sampled for this association occurs on a southeast-facing slope with a gradient of 34%. The elevation for this stand is 2193 m (7195 feet). The soils are well-drained, stony sandy loams (Young 1982). There is an eight-inch layer of organic matter above bedrock.

Global Environment: This deciduous forest occurs on primarily on northerly and easterly exposures but has been seen on southeastern and southern exposures as well. It occurs at relatively low elevations in the mountains of northern Utah and western Wyoming. It is know from 2100 to 2193 m (7000-7195 feet) elevation. Soils from one stand have a rich organic layer over well-drained, sandy loams. Soils are primarily derived from sandstone. It occurs on mid to lower slopes up to 34%.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs on mesic sites. *Populus tremuloides* (60% cover) is the dominant tree canopy species. *Abies lasiocarpa* occurs as an incidental species, and seedlings of *Populus tremuloides* are present. The understory has very diverse shrub and herbaceous layers. Shrubs with 3 to 10% cover include *Amelanchier alnifolia* and *Prunus virginiana* in the tall-shrub stratum and *Vaccinium membranaceum* in the dwarf-shrub stratum. *Pteridium aquilinum* is the dominant herbaceous species contributing 40% cover. Graminoids with 3 to 10% cover include *Bromus vulgaris, Agrostis exarata, Calamagrostis rubescens, Juncus saximontanus, Carex laeviculmis, Carex lenticularis*, and *Elymus glaucus*. Forbs with 3% cover include *Galium triflorum, Osmorhiza berteroi, Rudbeckia occidentalis*, and *Thalictrum occidentale*.
Global Vegetation: The tree layer is almost exclusively *Populus tremuloides*. *Abies concolor* or *Abies lasiocarpa* may be present in the tree layer or as seedlings, but not in such abundance as to suggest eventual replacement of aspen dominance in the overstory. The tall-shrub stratum is dominated by *Acer grandidentatum, Prunus virginiana, Amelanchier alnifolia*, or any combination of those species. Low shrubs, such as *Symphoricarpos oreophilus, Rosa woodsii*, or *Mahonia repens*, are also often present, sometimes in substantial amounts. The most distinctive feature is the abundance of *Pteridium aquilinum* in the herbaceous undergrowth. Forbs are often also present with *Osmorhiza* spp., *Galium boreale, Rudbeckia occidentalis*, and *Thalictrum occidentale*. Graminoids are also common with *Elymus glaucus, Bromus carinatus, Agrostis exarata, Calamagrostis rubescens, Juncus saximontanus, Carex laeviculmis*, and *Carex lenticularis*. This association is differentiated from the similar ~*Populus tremuloides / Pteridium aquilinum* Forest (CEGL000597)$$ by the presence of an abundant tall-shrub layer.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Bromus vulgaris	Herb (field)	Graminoid	.	X	.
Pteridium aquilinum	Herb (field)	Fern	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Acer grandidentatum	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Pteridium aquilinum	Herb (field)	Fern	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex laeviculmis	-	P	state rare
Stellaria crispa	-	P	state rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Corylus cornuta* Forest (CEGL000583)
- *Populus tremuloides / Pteridium aquilinum* Forest (CEGL000597)

Global Related Concepts:
- *Populus tremuloides / Acer grandidentatum / Pteridium aquilinum* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides/Amelanchier alnifolia/Pteridium aquilinum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well. Mueggler notes that this habitat type was not found outside of Utah.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The stand occurs on the eastern slope of Mount Moran.
Global Range: This association is known from Utah and Wyoming.
Nations: US
States/Provinces: UT:S2S3, WY
TNC Ecoregions: 9:C, 10:C, 19:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: M331D:CC, M331E:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202048
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-087] *Populus tremuloides / Amelanchier alnifolia / Carex geyeri* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on gentle to moderate slopes and ridges with gradients ranging from 6 to 48% and aspects facing southeast to southwest. The elevations for these stands range from 6900 to 7100 feet. Game trails and weeds are common signs of disturbance. Surrounding vegetation is typically *Prunus virginiana*, stands of other *Populus tremuloides* communities, or mixed aspen/conifer stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on subxeric sites. *Populus tremuloides* saplings and poles dominate the tree canopy with an average of 24% cover. One stand has 10% cover of mature *P. tremuloides*, and most stands have minimal (1-3%) cover from *Abies lasiocarpa*, *Pseudotsuga menziesii*, or *Pinus contorta*. The shrub layer is dominated by *Prunus virginiana* (averaging 13% cover) and seedlings of *P. tremuloides* (averaging 10% cover). Shrubs occurring in three of four stands, and averaging 1-2% cover, include *Amelanchier alnifolia* and *Mahonia repens*. The dominant species in the herbaceous layer is *Carex geyeri*, averaging 19% cover. Other species that occur in at least half the sampled stands, and average 1-5% cover, include *Calamagrostis rubescens*, *Elymus glaucus*, *Eucephalus engelmannii*, *Geranium viscosissimum*, *Angelica arguta*, *and Heracleum maximum*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Populus tremuloides*
TALL SHRUB	*Prunus virginiana*
GRAMINOID	*Carex geyeri*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Populus tremuloides, Amelanchier alnifolia, Mahonia repens, Prunus virginiana, Calamagrostis rubescens, Elymus glaucus, Eucephalus engelmannii, Geranium viscosissimum, Angelica arguta, Heracleum maximum

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: *Amelanchier alnifolia* is used in the name of this community type even though it doesn't have high cover. This single species is used in the association name to represent dominance by any of the following species: *Amelanchier alnifolia*, *Prunus virginiana*, or *Salix scouleriana*. These species, alone or in combination, have at least 10% cover in the sampled stands. It may be very similar to the NVC type CEGL0000567 *Populus tremuloides /Amelanchier alnifolia – Symphoricarpos oreophilus / Carex geyeri* (concept author Mueggler 1988).

GRAND TETON NATIONAL PARK Other Comments:
Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in small stands on the foothills of the Teton Range. They are located west of Spalding Bay, south and southwest of Jenny Lake, and just west of Jackson Lake.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04S005, 04S013, 04S021, 04J161
Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-087
Local Author: Klara Varga
Date: 5 January 2005
Local Editor: Klara Varga
Date: 25 January 2005

Global Author:

REFERENCES: Mueggler 1988

[CEGL000575] *Populus tremuloides / Calamagrostis rubescens* Forest

Translated Name: **Quaking Aspen / Pinegrass Forest**
Common Name: **Quaking Aspen / Pinegrass**
Ecological System(s):
- Northwestern Great Plains Aspen Forest and Parkland (CES303.681)
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a relatively common deciduous forest known from Washington, Idaho, Montana, Wyoming, and Utah. It is described from over 100 plots. It occurs on benches and slopes irrespective of slope steepness or aspect. It occurs primarily below 2440 m (8000 feet) in elevation, ranging from 1829 to 2440 m (6000-8000 feet). Soils are primarily derived from sandstone. The vegetation of this major association is comparatively simple both in structure and in composition. Most of the time, *Populus tremuloides* is the only tree in the overstory. Conifers, if present, are incidental and can include *Pinus contorta, Picea engelmannii*, and *Pseudotsuga menziesii*. Shrubs such as *Symphoricarpos oreophilus, Rosa woodsii, Amelanchier alnifolia*, and *Juniperus communis* may be present but never form a distinct layer. The herbaceous undergrowth is dominated by *Calamagrostis rubescens*. Other graminoids include *Elymus trachycaulus (= Agropyron trachycaulum), Bromus carinatus, Elymus glaucus*, and *Poa pratensis*. Commonly found forbs include *Geranium viscosissimum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Fragaria vesca*, and *Achillea millefolium var. occidentalis (= Achillea lanulosa).*

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on shallow to moderate slopes with aspects facing any direction. The elevations for these stands range from 2120 to 2277 m (6956-7470 feet). The unvegetated ground cover consists of litter and duff (20-70%), wood (3-20%), and basal vegetation (10-70%).
Global Environment: This is a relatively common deciduous forest known from Washington, Idaho, Wyoming, and Utah. It is described from over 100 plots. It occurs on benches and slopes irrespective of slope steepness or aspect. It occurs primarily below 2440 m (8000 feet) in elevation, ranging from 1829 to 2440 m (6000-8000 feet). Soils are primarily derived from sandstone.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs on mesic to subxeric sites. *Populus tremuloides* is the dominant tree canopy species contributing 1 to 70% cover. Incidental species in the tree canopy include *Pinus contorta, Picea engelmannii*, and *Pseudotsuga menziesii*. The tree subcanopy layer may include all of the species in the canopy layer plus *Pinus flexilis*. In nine of sixteen stands *Populus tremuloides* is the only tree species present. The highest constancy shrubs are *Symphoricarpos oreophilus* (10 stands, 1-3% cover) and *Amelanchier alnifolia* (8 stands, 1-3% cover). The herbaceous layer is dominated by *Calamagrostis rubescens* (10-40% cover). No other graminoid occurs in more than two stands. High-constancy forbs include *Geranium viscosissimum* (1-20% cover) in 14 stands, *Chamerion angustifolium* (1-50%) in 13 stands, and *Lupinus argenteus* (1-10% cover) in 12 stands.
Global Vegetation: The vegetation of this major association is comparatively simple both in structure and in composition. Most of the time, *Populus tremuloides* is the only tree in the overstory. Conifers, if present, are incidental and can include *Pinus contorta, Picea engelmannii*, and *Pseudotsuga menziesii*. Shrubs such as *Symphoricarpos oreophilus, Rosa woodsii, Amelanchier alnifolia*, and *Juniperus communis* may be present but never form a distinct layer. The herbaceous undergrowth is dominated by *Calamagrostis rubescens*. Other graminoids include *Elymus trachycaulus (= Agropyron trachycaulum), Bromus carinatus, Elymus glaucus*, and *Poa pratensis*. Commonly found forbs include *Geranium viscosissimum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Fragaria vesca*, and *Achillea millefolium var. occidentalis (= Achillea lanulosa).*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612)

Global Related Concepts:
- *Populus tremuloides / Calamagrostis rubescens - Poa pratensis* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides / Calamagrostis rubescens* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides / Calamagrostis rubescens* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Calamagrostis rubescens* Habitat Type (Alexander 1986) =
- *Populus tremuloides / Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1983) =
- *Populus tremuloides/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well.
Global Classification Comments: Some stands included in the *Populus tremuloides / Calamagrostis rubescens* Community Type described in Mueggler (1988) belong to ~*Populus tremuloides / Carex geyeri* Forest (CEGL000579)$$.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: All stands sampled for this association occur on the western slope of Shadow Mountain in the Bridger-Teton National Forest.
Global Range: This association is known from north-central Washington, Idaho, northern Utah, western Wyoming, and Montana, and may also occur in Nevada and Oregon.
Nations: US
States/Provinces: ID:S3?, MT:S4, NV?, OR?, UT:S5, WA:S2, WY:S3S4
TNC Ecoregions: 8:C, 9:C, 10:C, 20:C, 26:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 331D:CC, M331A:CC, M331D:CC, M331H:CC, M331I:CC, M332C:CC, M332D:CC, M332E:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, Medicine Bow)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: All plots that describe this association occur outside the park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None

Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407019, BT-9407024, BT-9407025, BT-9407051, BT-9407108, BT-9511206, BT-9407002, BT-9409300, BT-9409302, BT-9409305, BT-9409308, BT-9409314, BT-9409316, BT-9409319, BT-9409320, BT-9409328

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1986	.	X	X	X	.	.	.	.	.
Bader 1932	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Pfister 1981	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000581] *Populus tremuloides / Ceanothus velutinus* Forest

Translated Name: **Quaking Aspen / Tobacco-brush Forest**
Common Name: **Quaking Aspen / Tobacco-brush**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): J. Thompson and J. Stevens

ELEMENT CONCEPT

Global Summary: This association is known from the western slope of Colorado and in northwestern Wyoming, at elevations of 2225-2650 m (7300-8700 feet). These forests occur on very well-drained, non-skeletal loams to very coarse rocky soils with a variety of slope aspects. Stands are often located at the middle to upper portions of the slope. *Populus tremuloides* makes up a pure, but often open, tree canopy, while the shrub layer consists of a variable mix of *Ceanothus velutinus, Paxistima myrsinites, Rubus parviflorus, Symphoricarpos oreophilus, Amelanchier alnifolia, Spiraea betulifolia*, and *Sorbus scopulina*. The herbaceous layer is abundant and rich with *Eucephalus engelmannii (= Aster engelmannii), Thalictrum fendleri, Arnica cordifolia, Iliamna rivularis, Calamagrostis rubescens*, and *Carex geyeri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur a step-in-slope or on shallow to moderate south-facing slopes at elevations of 6700 to 7667 feet. Soil data is available for one stand; the loam soils contain no gravels. Two stands show evidence of recent fire and one has been affected by snow pack.

Global Environment: This association occurs at elevations of 2225-2650 m (7300-8700 feet). These forests occur on very well-drained, non-skeletal loams to very coarse rocky soils with a variety of slope aspects. Soils are shallow to deep, with an average depth of 38 cm. Stands are often located at the middle to upper portions of the slope; slopes range from 0-50%, with an average around 22%.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on subxeric sites. There are no species in the tree canopy stratum for any stand. *Populus tremuloides* (7 to 10% cover) and *Pinus contorta* (1 to 3% cover) are the only tree species in the stands, occurring in the subcanopy or short shrub strata. *Ceanothus velutinus* contributes 7 to 30% cover in the short shrub stratum and is the dominant shrub species. *Spiraea betulifolia, Amelanchier alnifolia, Symphoricarpos oreophilus*, and *Mahonia repens* are other shrub species that occur in at least half of the stands. The herbaceous layer is diverse, but

most species occur in trace amounts. *Calamagrostis rubescens* and *Achillea millefolium* occur in each sampled stand and *Carex geyeri*, *Geranium viscosissimum*, and *Balsamorhiza sagittata* occur in two stands each.

Global Vegetation: *Populus tremuloides* makes up a pure, but often open, tree canopy, while the shrub layer consists of a variable mix of *Ceanothus velutinus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Symphoricarpos oreophilus*, *Amelanchier alnifolia*, *Spiraea betulifolia*, and *Sorbus scopulina*. The herbaceous layer is dominated by *Eucephalus engelmannii (= Aster engelmannii)*, *Thalictrum fendleri*, *Arnica cordifolia*, *Iliamna rivularis*, *Calamagrostis rubescens*, and *Carex geyeri*.
Global Dynamics: This association appears to be maintained by stand-replacing fire, as *Ceanothus velutinus* will resprout after a cool fire, and seeds will germinate after heat treatment of a hot fire.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	.	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Mahonia repens	Herb (field)	Dwarf shrub	.	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	-	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (16-Dec-1999). This association is known from fewer than 30 stands in Colorado. The literature indicates that stands occur on very well drained soils at the middle to upper position of slopes. Confusion over the classification of these forest stands will require additional survey and classification work to determine if this association is a distinct vegetation association.

RELATED CONCEPTS

Global Similar Associations:
- *Ceanothus velutinus* Shrubland (CEGL002167)
- *Populus tremuloides / Rubus parviflorus* Forest (CEGL000602)

Global Related Concepts:
- *Populus tremuloides / Amelanchier alnifolia - Prunus virginiana* plant association (Johnston 1987) ?
- *Populus tremuloides/Ceanothus velutinus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This association is only known from Colorado and Wyoming. No other studies reviewed mentioned *Populus tremuloides*-dominated communities with any *Ceanothus* spp. in the understory. Bunin (1975) indicated the existence of a variant of this association in which *Rubus parviflorus* was the dominant shrub; however, there are no other references to *Ceanothus* spp. as a component of ~*Populus tremuloides / Rubus parviflorus* Forest (CEGL000602)$$. Other studies did mention *Populus tremuloides* associations with some of the same understory species (such as *Symphoricarpos oreophilus* and *Amelanchier alnifolia*); however, these did not include reference to any *Ceanothus* spp. Johnston (1987) suggested that this association would fit better as a phase of his *Populus tremuloides / Amelanchier alnifolia - Prunus virginiana* Plant Association; however, no *Ceanothus* is mentioned. This is probably a fire-maintained type that succeeds to another association with enough time post fire.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur in the John D. Rockefeller, Jr. Memorial Parkway northeast of Steamboat Mountain, north of Climber's Ranch, and on the slopes of Mt. St. John on the west side of String Lake.

Global Range: This association is known from Montrose, Gunnison, and Routt counties of Colorado, and north of Grand Teton National Park, Wyoming.
Nations: US
States/Provinces: CO:S2S3, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331E:CC, M331H:CC
Federal Lands: NPS (Curecanti, Dinosaur, Grand Teton, Rockefeller)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202086
Accuracy Assessment Points: 04X432, 04M020
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): J. Thompson and J. Stevens, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Bunin 1975a	.	X	.	X	X	.	.	.	.
Bunin 1975c	.	X	.	X	X	.	.	.	.
CONHP unpubl. data	.	.	.	.	X	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL003148] *Populus tremuloides / Poa pratensis* Forest

Translated Name: **Quaking Aspen / Kentucky Bluegrass Forest**
Common Name:
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): T. Keeler-Wolf

ELEMENT CONCEPT

Global Summary: This association is known only from Rocky Mountain National Park where it is known to occur within the elevational range of 2500-2830 m (8260-9280 feet) on gentle to moderate (1-25%) west-facing low slopes. The sandy loam soil is derived from granite and is moderately well-drained. The canopy of this association ranges from 5-15 m in height and is typically 40-60% cover. It is composed of *Populus tremuloides* but may include sparse and scattered conifers such as *Pinus contorta var. latifolia*. There is no distinct shrub stratum; however, shrubs such as *Dasiphora fruticosa ssp. floribunda*, *Juniperus communis var. montana*, *Ribes inerme*, and *Rosa woodsii* may be present in trace quantities. The diagnostic feature of the understory is in the herbaceous layer, particularly in the graminoid stratum. This lush herbaceous layer is consistently abundant with more than 60% cover and is dominated by *Poa pratensis* (20-30%). Other graminoid species often found include *Phleum pratense*, *Bromus ciliatus*, *Bromus inermis*, and *Carex* spp. The forbs do not play a large role in defining the understory. GRTE information not incorporated into Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor at elevations of 6500 and 6700 feet; one stand occurs in a channel. The most significant evidence of disturbance to both stands is a large amount of

non-native species. Browsing, and dead and down *Populus tremuloides* occur in one stand each. Adjacent to one stand is a *Picea pungens* forest and adjacent to the other stand is weedy herbaceous vegetation.

Global Environment:

VEGETATION DESCRIPTION

Global Vegetation:
GRAND TETON NATIONAL PARK Vegetation: This association is an aspen woodland that occurs on mesic sites. The dominant tree species is *Populus tremuloides* in either the tree or subcanopy strata. One stand contributes a small amount of *P. tremuloides* as seedlings. The shrub layer is poorly developed in both stands. The herbaceous layer contributes 50 and 60% cover, dominated by *Poa pratensis* (20 and 30% cover) and *Cirsium arvense* (12 and 20% cover). *Carduus nutans* (trace and 3% cover) also occurs in both sampled stands. Many other species contribute 3% or more cover to one stand.

Global Dynamics:

GRAND TETON NATIONAL PARK Floristic Compostiion

Stratum	Species
TREE CANOPY	*Populus tremuloides*
GRAMINOID	*Poa pratensis*
FORB	*Cirsium arvense*

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Populus tremuloides, Poa pratensis, Carduus nutans, Cirsium arvense

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Phleum pratense, Poa pratensis, Carduus nutans, Cirsium arvense*

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (26-May-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association fits the Mueggler et al. *Populus tremuloides / Poa pratensis* ct. very well.

Global Classification Comments:
GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides / Phleum pratense* Semi-Natural Forest association, but is differentiated due to the dominance of *Poa pratensis* instead of *Phleum pratense*.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the Snake River Channel north of Blacktail overlook and west of Hwy 89 near Elk Ranch.

Global Range: This association is only known from Yosemite National Park in California and Rocky Mountain National Park in Colorado. Information about its global range is not available without additional inventory. Stands having these features have been described by Wexelman et al. (1999) in the Carson and Walker river drainages of California and Nevada. It may be widespread in the Great Basin. This association was observed in Grand Teton National Park during map accuracy assessment, but was not sampled.
Nations: US
States/Provinces: CA, CO, NV, WY?
TNC Ecoregions: 12:C, 20:C
TNC Ecoregion Comments: ECO20 added for ROMO (KAS 5-04).
USFS Ecoregions: M261E:CC, M331I:CC
Federal Lands: NPS (Curecanti, Rocky Mountain, Yosemite)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R046, 04X621
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:
Local Author: Mark Fain
Date: 09 November 2004
Local Editor: Klara Varga
Date: 17 December 2004

Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Wexelman et al. 1999	.	.	.	.	X	.	.	.	.

[CEGL000604] *Populus tremuloides / Salix scouleriana* Forest

Translated Name: **Quaking Aspen / Scouler's Willow Forest**
Common Name: **Quaking Aspen / Scouler's Willow**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This common deciduous forest occurs on midslopes on low to moderately steep north-, east- and south-facing aspects. Elevation ranges from 1770 to 2338 m (5800-7670 feet). Soils are variable. The primary distinguishing feature of this association is the abundance of *Salix scouleriana* comprising the tall-shrub layer under an exclusive canopy of *Populus tremuloides*. The shrub layer can be variable with high abundance of *Amelanchier alnifolia* or *Prunus virginiana* mixed in with the *Salix scouleriana*. Low shrubs are frequently present such as *Symphoricarpos oreophilus*, *Sorbus scopulina*, and *Rosa woodsii*. The herbaceous layer is also diverse with forbs dominating over graminoids. Common forbs include *Osmorhiza berteroi (= Osmorhiza chilensis)*, *Thalictrum fendleri*, *Ligusticum filicinum*, *Fragaria virginiana*, *Geranium viscosissimum*, *Delphinium X occidentale*, and others. Graminoids can be numerous but not abundant, with such species as *Elymus glaucus*, *Bromus carinatus*, and *Poa pratensis*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The one sampled stand for this association occurs on a shallow slope (7%) with a south-facing aspect. The elevation for this stand is 2338 m (7670 feet). The soil is silt loam with less than 5% gravel. Adjacent vegetation includes a continuation of this stand and scattered *Picea engelmannii*.
Global Environment: This common deciduous forest occurs on midslopes on low to moderately steep north-, east- and south-facing aspects. Elevation ranges from 1800 to 2338 m (5800-7670 feet). Soils are variable.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane aspen community that occurs on mesic sites. *Populus tremuloides* (70% cover) is the only tree species present and ranges from (6-10 feet) tall. Seedlings of *Populus tremuloides* contribute 10% cover to the dwarf-shrub stratum. The shrub layer is well-defined. Dominant species include *Salix scouleriana* (10% cover), which ranges from (6-7 feet) in height, and *Prunus virginiana* (10% cover) in the tall-shrub stratum. *Sorbus scopulina* (10% cover) and *Symphoricarpos oreophilus* (3% cover) dominate the short-shrub stratum. The herbaceous layer is also diverse with forbs dominating over graminoids. Although there are numerous graminoid species, none of them occur in greater than trace amounts. Abundant or well-represented forbs include *Ligusticum filicinum* (30% cover), *Thalictrum* sp. (30% cover), *Fragaria virginiana* (20% cover), *Geranium viscosissimum* (20% cover), *Delphinium X occidentale* (10% cover), *Valeriana* sp. (10% cover), *Eucephalus engelmannii* (10% cover), and *Osmorhiza occidentalis* (10% cover). There are five other species that occur with 3% cover.
Global Vegetation: The primary distinguishing feature of this association is the abundance of *Salix scouleriana* comprising the tall-shrub layer under an exclusive canopy of *Populus tremuloides*. The shrub layer can be variable with high abundance of *Amelanchier alnifolia* or *Prunus virginiana* mixed in with the *Salix scouleriana*. Low shrubs are frequently present such as *Symphoricarpos oreophilus*, *Sorbus scopulina*, and *Rosa woodsii*. The herbaceous layer is also diverse with forbs dominating over graminoids. Common forbs include *Osmorhiza berteroi (= Osmorhiza chilensis), Thalictrum fendleri, Ligusticum filicinum, Fragaria virginiana, Geranium viscosissimum, Delphinium X occidentale*, and others. Graminoids can be numerous but not abundant, with such species as *Elymus glaucus, Bromus carinatus*, and *Poa pratensis*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix scouleriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Sorbus scopulina	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Delphinium x *occidentale*	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	X	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Osmorhiza occidentalis	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Thalictrum sp.	dominant and characteristic forb
Valeriana sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Salix scouleriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Fragaria virginiana	Herb (field)	Forb	X	.	.
Geranium viscosissimum	Herb (field)	Forb	X	.	.
Ligusticum filicinum	Herb (field)	Forb	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Populus tremuloides/Salix scouleriana* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description fairly well. The only difference is in the species composition of the herbaceous layer.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This stand occurs in Granite Canyon.
Global Range: This association occurs in Oregon, Nevada, Utah, Idaho, and Wyoming.
Nations: US
States/Provinces: ID:S3, NV, OR:S1, UT:S2S3, WY
TNC Ecoregions: 6:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202055
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000606] *Populus tremuloides / Shepherdia canadensis* Forest

Translated Name: **Quaking Aspen / Russet Buffaloberry Forest**
Common Name: **Quaking Aspen / Russet Buffaloberry**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This *Populus tremuloides* forest association occurs in eastern Idaho, western Wyoming, and central Colorado. It occurs on dry ridges between 2092 and 3078 m (6860-10,100 feet) elevation. This association is considered one of the driest aspen types. Stands usually occur on steep low to midslopes, although stands have also occurred on near-flat terraces. Soils are often dry, well-drained sandy loams. The tree canopy is dominated by *Populus tremuloides*. Scattered conifers, such as *Abies lasiocarpa, Picea engelmannii, Pseudotsuga menziesii*, or *Pinus contorta*, are frequently present in small amounts. The shrub layer is characterized by the dominance of *Shepherdia canadensis*. *Juniperus communis* can also have high cover. Additional shrub associates can include *Amelanchier alnifolia, Rosa woodsii, Symphoricarpos oreophilus, Arctostaphylos uva-ursi*, and *Paxistima myrsinites* among others. The herbaceous layer is composed of a mix of graminoids and forbs, the latter often more abundant and diverse. Common (but not consistent) graminoid species include *Elymus trachycaulus (= Agropyron trachycaulum), Bromus ciliatus*, and sometimes *Calamagrostis rubescens*. Forbs usually present (but no one species consistently so) include *Geranium viscosissimum, Lupinus argenteus, Thalictrum fendleri, Osmorhiza berteroi (= Osmorhiza chilensis), Fragaria vesca, Galium boreale*, and *Achillea millefolium*. Diagnostic for this association is the prominence of *Shepherdia canadensis* in the shrub layer, below a *Populus tremuloides*-dominated overstory.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a terrace or moderate, north-facing footslopes with elevations of 6863 to 7300 feet. Soil data is available for one stand; the soils are sandy clay. Adjacent vegetation includes a *Pinus contorta* stand, a dry meadow, and a continuation of the herbaceous layer of this stand. Dead standing snags are noted in one stand.

Global Environment: This Rocky Mountain association occurs on dry ridges between 2092 and 2400 m (6863-8000 feet) elevation in Idaho and Wyoming and between 2774 and 3078 m (9100-10,100 feet) in Colorado. This association is considered one of the driest aspen types. Stands usually occur on steep low to midslopes, although stands have also occurred on near-flat terraces. Soils are often dry, well-drained sandy loams or clays.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on mesic sites. *Populus tremuloides* (12 to 50% cover) is the only trees species in any of the stands. Seedlings of *P. tremuloides* are present in all stands. The shrub and herbaceous layers are both well developed. Shrubs occurring in all stands include *Shepherdia canadensis* (10 to 30% cover), *Symphoricarpos oreophilus* (3 to 20% cover), *Dasiphora floribunda* (1 to 3% cover), and *Rosa* sp. (7 to 10% cover). Although the herbaceous layer is diverse, no species were observed in all stands. Graminoids occurring in two stands include *Poa pratensis*, *Phleum pratense*, and *Elymus glaucus*. Forbs that occur in two stands include *Geranium viscosissimum*, *Potentilla gracilis*, and *Fragaria virginiana*.

Global Vegetation: This *Populus tremuloides* forest association has a tree canopy dominated by *Populus tremuloides*. Scattered conifers, such as *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, or *Pinus contorta*, are frequently present in small amounts. The shrub layer is characterized by dominance of *Shepherdia canadensis*. *Juniperus communis* can also have high cover. Additional shrub associates can include *Amelanchier alnifolia*, *Rosa woodsii*, *Symphoricarpos oreophilus*, *Arctostaphylos uva-ursi*, and *Paxistima myrsinites*, among others. The herbaceous layer is composed of a mix of graminoids and forbs, the latter often more abundant and diverse. Typical (but not consistent) graminoid species include *Elymus trachycaulus (= Agropyron trachycaulum)*, *Bromus ciliatus*, and sometimes *Calamagrostis rubescens*. Forbs usually present (but no one species consistently so) include *Geranium viscosissimum*, *Lupinus argenteus*, *Thalictrum fendleri*, *Osmorhiza berteroi (= Osmorhiza chilensis)*, *Fragaria vesca*, *Galium boreale*, and *Achillea millefolium*.

Global Dynamics: *Shepherdia canadensis* is a nitrogen-fixing shrub that rapidly colonizes or expands following low-intensity fire (Walkup 1991). This association rapidly succeeds to conifer-dominated forests, often ~*Populus tremuloides - Abies lasiocarpa / Shepherdia canadensis* Forest (CEGL000529)$$, especially at higher elevations (Youngblood and Mueggler 1981, Mueggler 1988). These will ultimately result in conifer-dominated forests. Rate of succession is dependent on rate of conifer establishment.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Dasiphora floribunda	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Rosa sp.	dominant and characteristic dwarf-shrub
Taraxacum sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Shepherdia canadensis	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Juniperus communis var. *montana*	Short shrub/sapling	Needle-leaved shrub	X	.	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic
Silene latifolia	-	P	exotic
Trifolium hybridum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	invasive

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Populus tremuloides - Abies lasiocarpa / Shepherdia canadensis* Forest (CEGL000529)--comprises a later successional stage following fir establishment.
- *Populus tremuloides / Juniperus communis* Forest (CEGL000587)--has similar species composition, but shrub layer is dominated by *Juniperus communis<i/>*.

Global Related Concepts:

- *Abies lasiocarpa / Arnica cordifolia* Habitat Type, *Shepherdia canadensis* Phase (Steele et al. 1981) I
- *Populus tremuloides / Juniperus communis* Community Type (Youngblood and Mueggler 1981) B
- *Populus tremuloides / Shepherdia canadensis* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Shepherdia canadensis* Community Type (Powell 1988a) =
- *Populus tremuloides / Shepherdia canadensis* Community Type (Mueggler 1988) I
- *Populus tremuloides/Shepherdia canadensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association fits the Mueggler (1988) description fairly well. The only deviation from Mueggler's description is the absence of any coniferous tree species and the occurrence of the non-native grasses *Phleum pratense* and *Poa pratensis.*

Global Classification Comments: Distinction between this association and ~*Populus tremuloides / Juniperus communis* Forest (CEGL000587)$$ is lacking in terms of species composition and is distinct only by the relatively high cover of *Shepherdia canadensis*. This community may be better classified as a woodland because most stands are relatively open (<60% cover).

GRAND TETON NATIONAL PARK Other Comments: This association has been described using accuracy assessment points evaluated during the 2004 field season as well as full plots from previous years. Complete species lists and environmental data were not taken for these points. Since incomplete species lists were used to describe this association, overall species composition may be more diverse than is noted. The points were also evaluated over a larger area which may affect total cover for some species. Detailed soil and ground cover data for the accuracy assessment points were not taken, so this information in the description is based solely on the full plot data.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur east of Cunningham Cabin and east of Elk Ranch Reservoir.

Global Range: This association is known from eastern Idaho, western Wyoming, and central Colorado.
Nations: US
States/Provinces: CO:S3?, ID:S2S3, WY:S2S3
TNC Ecoregions: 6:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331F:CC, M331I:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bridger-Teton, Caribou-Targhee, Pike-San Isabel)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202026
Accuracy Assessment Points: 04R320, 04R322
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel, mod. S.L. Neid and K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	X	X	.	.	.	.	.
Powell 1988a	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	.	.	.	.	.	.
Walkup 1991	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000609] *Populus tremuloides / Symphoricarpos albus* Forest

Translated Name: **Quaking Aspen / Common Snowberry Forest**
Common Name: **Aspen / Snowberry Forest**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a minor type described from only a few plots in Montana, Wyoming, and north-central Washington. It occurs adjacent to very wet sites, irrigation ditches, marshes or wet meadows. It occurs from 1155 to 1973 m (3790-6473 feet) in elevation. It occurs on basin floors to slopes up to 48%. Soils are fine-textured. This is a wet, low-lying aspen forest, distinguished by an abundant layer of *Symphoricarpos albus*. The overstory canopy is dominated by *Populus tremuloides*. Conifers when present are low in abundance and include *Pinus contorta* or *Larix occidentalis, Pinus ponderosa*, or *Pseudotsuga menziesii*. Tall shrubs may be present but do not form a distinct layer, with *Amelanchier alnifolia* and sapling *Populus tremuloides*. The short-shrub layer is distinct, with *Symphoricarpos albus* the dominant. Other low-stature shrubs include *Rosa woodsii* and *Mahonia repens*. The herbaceous layer is diverse with many grasses and forbs. Graminoids include *Achnatherum nelsonii, Elymus trachycaulus, Phleum pratense*, and *Poa pratensis*. Forbs include *Actaea rubra, Helianthella uniflora, Lupinus sericeus*, and *Symphyotrichum spathulatum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a basin floor or a shallow shoulder at elevations of 6473 and 7500 feet. The soils for one stand are a silty loam with woody debris scattered throughout as ground cover. This stand lies within 0.1 miles of an irrigation ditch and may have hydrological and grazing disturbances. Adjacent to one stand is an *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Bromus carinatus* stand.

Global Environment: This is a minor type described from only a few plots in Montana, Wyoming, and north-central Washington. It occurs adjacent to very wet sites, irrigation ditches, marshes or wet meadows. It occurs from 1155 to 1973 m (3790-6473 feet) in elevation. It occurs on basin floors to slopes up to 48%. Soils are fine-textured.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community located on mesic sites. *Populus tremuloides* (20 and 50% cover) is the dominant species, occurring in the tree canopy or in the shrub layer as seedlings. *Symphoricarpos albus* (7 and 10% cover) dominates the short shrub stratum and is the only shrub species to occur in both sampled stands. The herbaceous layer is very diverse, though not necessarily abundant, with forbs dominating over graminoids. Species that occur in both stands include *Elymus trachycaulus, Poa pratensis,* and *Geranium viscosissimum.* Many more forb and graminoid species occur in one stand with 3% cover.

Global Vegetation: This is a wet, low-lying aspen forest, distinguished by an abundant layer of *Symphoricarpos albus*. The overstory canopy is dominated by *Populus tremuloides*. Conifers when present are low in abundance and include *Pinus contorta* or *Larix occidentalis, Pinus ponderosa*, or *Pseudotsuga menziesii*. Tall shrubs may be present but do not form a distinct layer, with *Amelanchier alnifolia* and sapling *Populus tremuloides*. The short-shrub layer is distinct, with *Symphoricarpos albus* the dominant. Other low-stature shrubs include *Rosa woodsii* and *Mahonia repens*. The herbaceous layer is diverse with many grasses and forbs. Graminoids include *Achnatherum nelsonii, Elymus trachycaulus, Phleum pratense*, and *Poa pratensis*. Forbs include *Actaea rubra, Helianthella uniflora, Lupinus sericeus*, and *Symphyotrichum spathulatum*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Elymus trachycaulus	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	.	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Mahonia repens	Herb (field)	Dwarf-shrub	X	.	.
Rosa woodsii	Herb (field)	Dwarf-shrub	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Lactuca serriola	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Trifolium hybridum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Spiraea betulifolia* Forest (CEGL000607)
- *Populus tremuloides / Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848)
- *Populus tremuloides / Urtica dioica* Forest [Provisional] (CEGL005849)

Global Related Concepts:
- *Populus tremuloides / Symphoricarpos albus* Plant Association (Williams and Lillybridge 1983) =
- *Populus tremuloides/Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: These stands occur in the John D. Rockefeller, Jr. Memorial Parkway west of Flagg Ranch and in Eynon Draw.

Global Range: The association is known from western Montana, western Wyoming, and north-central Washington.
Nations: US
States/Provinces: MT:S3?, OR:S3, WA:S2?, WY
TNC Ecoregions: 4:C, 7:C, 9:C, 68:C
TNC Ecoregion Comments: ECO68 added (mjr 7-05). ECO4 & ECO7 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: M242C:CC, M331D:CC, M333A:CC, M333B:C?, M333C:CC
Federal Lands: NPS (Grand Teton, Rockefeller)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-0201104
Accuracy Assessment Points: 04J216
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Pfister 1981	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.

[CEGL000612] *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest

Translated Name: **Quaking Aspen / Mountain Snowberry / Pinegrass Forest**
Common Name: **Quaking Aspen / Mountain Snowberry / Pinegrass**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a common aspen forest type and is known from much of eastern Idaho, western Wyoming, northern Nevada, and occurs as far south as the Abajo Mountains in Utah. Stands occur on slopes that are gentle to moderately steep, on any exposure, but never along stream bottoms. Elevation ranges from 1829 to 2438 m (6000-8000 feet). The undergrowth of this association is much less complex than that in ~*Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)$$. Both types have three strata, but the herbaceous undergrowth is comparatively simple and dominated by graminoids. Conifers, if present, are varied but never in abundance. Species include *Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pseudotsuga menziesii*, or *Pinus flexilis*. However, many stands lack conifer presence. A low-shrub layer is prominent and is usually dominated by *Symphoricarpos oreophilus*. Other low shrubs that can also be abundant are *Rosa woodsii, Paxistima myrsinites, Symphoricarpos albus, Shepherdia canadensis*, or *Mahonia repens*. Tall shrubs such as *Amelanchier alnifolia* and *Prunus virginiana* are frequently present but never abundant. The herbaceous layer is thick and dominated by graminoids. *Calamagrostis rubescens* is in high abundance and is always present. *Carex geyeri* is also sometimes present and is considered an indicator of the type. Other graminoids frequently present are *Elymus glaucus, Poa pratensis*, and *Elymus trachycaulus (= Agropyron trachycaulum)*. Several forbs are usually present, but never in such abundance as the graminoid species. Forbs species include *Geranium viscosissimum, Galium boreale, Lupinus argenteus, Thalictrum fendleri*, and *Osmorhiza berteroi (= Osmorhiza chilensis)*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes with gradients ranging from 6% to 41% and aspects facing any direction. The elevations for these stands range from 6600 to 7500 feet. Where data are available the soils are well-drained clay loams or silt loams, to moderately well-drained clay. The unvegetated ground surface is comprised primarily of litter and duff (60 to 90% cover) and wood (10 to 20% cover). Surrounding vegetation for most of these stands consists of *Populus tremuloides* woodlands or various shrublands. Surrounding shrublands may include the following species: *Symphoricarpos oreophilus, Artemisia tridentata* ssp. *vaseyana, Amelanchier alnifolia, Dasiphora floribunda, Poa pratensis,* and *Calamagrostis rubescens.*

Global Environment: This is a common aspen forest type and is known from much of eastern Idaho, western Wyoming, northern Nevada, and occurs as far south as the Abajo Mountains in Utah. Stands occur on slopes that are gentle to moderately steep, on any exposure, but never along stream bottoms. Elevation ranges from 1829 to 2438 m (6000-8000 feet).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on mesic or subxeric sites. *Populus tremuloides* dominates the tree species contributing 7 to 50% cover in either the tree canopy, subcanopy, or as

regeneration. Numerous conifer species may occur in the tree canopy or subcanopy. Seedlings of *Populus tremuloides, Picea pungens, Pinus contorta, Pinus flexilis,* and *Pseudotsuga menziesii* occur in many of the stands. The shrub layer is dominated by *Symphoricarpos oreophilus,* which contributes trace to 30% cover. The only other highly constancy shrub is *Rosa* sp. The herbaceous layer is very diverse. *Calamagrostis rubescens* occurs in every stand and contributes 7 to 50% cover. *Poa pratensis* and *Geranium viscosissimum* are the only other species that occur in over half the stands. Numerous other forbs and graminoids occur with 7% or more cover, but are not high constancy species.

Global Vegetation: The undergrowth of this association is much less complex than that in ~*Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)$$. Both types have three strata, but the herbaceous undergrowth is comparatively simple and dominated by graminoids. Conifers, if present, are varied but never in abundance. Species include *Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pseudotsuga menziesii*, or *Pinus flexilis*. Many stands lack conifer presence. A low-shrub layer is prominent and is usually dominated by *Symphoricarpos oreophilus*. Other low shrubs that can also be abundant are *Rosa woodsii, Paxistima myrsinites, Symphoricarpos albus, Shepherdia canadensis*, or *Mahonia repens*. Tall shrubs such as *Amelanchier alnifolia* and *Prunus virginiana* are frequently present but never abundant. The herbaceous layer is thick and dominated by graminoids. *Calamagrostis rubescens* is in high abundance and is always present. *Carex geyeri* is also sometimes present and is considered an indicator of the type. Other graminoids frequently present are *Elymus glaucus, Poa pratensis*, and *Elymus trachycaulus (= Agropyron trachycaulum).* Several forbs are usually present, but never in such abundance as the graminoid species. Forbs species include *Geranium viscosissimum, Galium boreale, Lupinus argenteus, Thalictrum fendleri*, and *Osmorhiza berteroi (= Osmorhiza chilensis).*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	.	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Geranium viscosissimum	Herb (field)	Other shrub	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Poa bulbosa	-	P	exotic
Poa compressa	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Capsella bursa-pastoris	-	P	exotic
Taraxacum officinale	-	P	exotic
Thlaspi arvense	-	P	exotic
Trifolium hybridum	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Populus tremuloides / Calamagrostis rubescens* Forest (CEGL000575)

- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)--The herbaceous undergrowth is dominated by abundant tall forb species, which are in greater abundance than the graminoids present.
- *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000616)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)

Global Related Concepts:
- *Populus tremuloides / Pachistima myrsinites - Calamagrostis rubescens* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Spiraea betulifolia - Calamagrostis rubescens* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Spiraea betulifolia* Community Type (Youngblood and Mueggler 1981) B
- *Populus tremuloides / Symphoricarpos oreophilus / Carex geyeri* Community Type (Mueggler and Campbell 1986) B
- *Populus tremuloides / Symphoricarpos oreophilus / Carex geyeri* Community Type (Youngblood and Mueggler 1981) B
- *Populus tremuloides/Symphoricarpos oreophilus/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well.
Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides – Pinus contorta / Calamagrostis rubescens* association, but is differentiated by the absence of *Pinus contorta* as a co-dominant species and the presence of *Symphoricarpos oreophilus* as a dominant species and is similar to the *Populus tremuloides / Calamagrostis rubescens* association, but is differentiated by the presence of *Symphoricarpos oreophilus* as a dominant species. It is also similar to the *Populus tremuloides / Amelanchier alnifolia – Symphoricarpos oreophilus / Calamagrostis rubescens* association, but is differentiated due to the lack of either *Amelanchier alnifolia* and/or *Prunus virginiana* as a dominant species.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur over a large range within the park, all below 7500 feet and one stand occurs in the National Elk Refuge south of Gros Venture Campground.

Global Range: This association is known from throughout eastern Idaho, western Wyoming, and Utah.
Nations: US
States/Provinces: ID:S3, UT:S5, WY:S3
TNC Ecoregions: 6:C, 8:C, 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M332E:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A104, GT-03A118, GT-03C071, GT-03C090, GT-0201027
Accuracy Assessment Points: 04J012, 04J016, 04J173, 04J237, 04J240, 04R009, 04R080, 04R319, 04R350, 04R999, 04S015, 04X013, 04X809, 04X816
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507007, BT-9409301, BT-9409304, BT-9409327

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	.	.	.	.	.	.

[CEGL000615] *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest

Translated Name: **Quaking Aspen / Mountain Snowberry / Tall Forbs Forest**

Common Name: **Quaking Aspen / Mountain Snowberry / Tall Forbs**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This deciduous forest association is widespread in the Intermountain region on the western U.S. It is found at montane and subalpine elevations from 1890 to 2960 m (6200-9700 feet) across its latitudinal range. Sites include lower slopes and benches, draws, sheltered slopes, and high benches that range from flat to moderate slopes of any aspect. Northern to eastern aspects are common in the drier and warmer environments in the southern portions of its range. Soils are variable but include loams or sandy loams that are often derived from sandstone parent material. The vegetation is characterized by a moderately dense to dense tree canopy of *Populus tremuloides* with a short-shrub layer with at least 10% cover that is dominated by *Symphoricarpos oreophilus*. The herbaceous layer present with at least 10% cover is dominated by tall forbs such as *Agastache urticifolia, Eucephalus engelmannii, Hackelia floribunda, Mertensia arizonica, Osmorhiza occidentalis, Senecio serra*, and *Valeriana occidentalis*. Occasional conifer trees are possible in a stand but do not make up more than 10% of the tree canopy.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor or on west-facing slopes with gradients of 18 to 20%. The elevations for the stands are 6800 to 7377 feet. Unvegetated ground cover for one stand is comprised of 60% basal vegetation, 30% litter and duff, and 10% wood.

Global Environment: This deciduous forest association is widespread in the Intermountain region of the western U.S. It is found at montane and subalpine elevations from 1890 to 2960 m (6200-9700 feet) across its latitudinal range. Sites include lower slopes and benches, draws, sheltered slopes, and high benches that range from flat to moderate slopes of any aspect. Northern to eastern aspects are common in the drier and warmer environments in the southern portions of its range. Soils are variable but are generally well-developed, well-drained loams or sandy loams that are often derived from sandstone parent material.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community occurring on mesic sites. *Populus tremuloides* (12 to 40% cover) is dominant in the tree canopy and subcanopy. Seedlings of *P. tremuloides* occur in the majority of the stands. The dominant shrub is *Symphoricarpos oreophilus* (10 to 20% cover) in the short shrub stratum. The herbaceous layer is diverse with forbs dominating over graminoids. High constancy graminoids are *Phleum pratense* and *Elymus* spp. The only forb to occur in all stands is *Lupinus argenteus.* Other forbs occurring in two of three stands are *Rudbeckia occidentalis, Senecio serra,* and *Fragaria virginiana.* Numerous other forbs occur in one stand with 7% or more cover.

Global Vegetation: This deciduous forest association is characterized by a moderately dense to dense tree canopy of *Populus tremuloides* with a short-shrub layer with at least 10% (typically 30%) cover that is dominated by *Symphoricarpos oreophilus*. Occasional conifer trees are possible in stands but do not make up more than 25% of the tree canopy. Conifer species include *Pinus flexilis, Abies lasiocarpa, Abies concolor*, or *Picea pungens*. Occasional *Prunus virginiana* or *Amelanchier alnifolia* tall shrubs may be present. Other short shrubs include *Rosa woodsii, Mahonia repens, Paxistima myrsinites*, and *Ceanothus velutinus*. An herbaceous layer present with at least 10% cover is characteristically dominated by tall forbs such as *Agastache urticifolia, Eucephalus engelmannii, Hackelia floribunda, Mertensia arizonica, Osmorhiza occidentalis, Senecio serra*, and *Valeriana occidentalis*. Other forbs may include *Lathyrus* spp., *Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Rudbeckia occidentalis, Thalictrum fendleri*, and *Vicia americana*. Graminoids may be present and often include taller species such as *Bromus carinatus, Elymus glaucus*, and introduced species *Thinopyrum intermedium* or *Poa pratensis*.
Global Dynamics: These communities can provide good forage for livestock, especially sheep (Mueggler 1988). However, with excessive livestock grazing *Lathyrus* spp., *Rudbeckia occidentalis, Vicia americana*, and *Poa pratensis* will dominate the understory.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Senecio serra	Herb (field)	Forb	.	X	.
Elymus spp.	Herb (field)	Graminoid	X	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Agastache urticifolia	Herb (field)	Forb	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Hackelia floribunda	Herb (field)	Forb	.	X	.
Mertensia arizonica	Herb (field)	Forb	X	X	.
Osmorhiza berteroi	Herb (field)	Forb	X	.	.
Osmorhiza occidentalis	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	X	.	.
Senecio serra	Herb (field)	Forb	X	X	.
Thalictrum fendleri	Herb (field)	Forb	X	.	.
Valeriana occidentalis	Herb (field)	Forb	.	X	.
Bromus carinatus	Herb (field)	Graminoid	X	.	.
Elymus glaucus	Herb (field)	Graminoid	X	.	.

Higher Taxon Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive,Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	Introduced forage species.
Thinopyrum intermedium	-	P	Introduced forage species.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000566)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000567)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000568)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000569)
- *Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus* Forest (CEGL000598)
- *Populus tremuloides / Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000611)
- *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612)
- *Populus tremuloides / Symphoricarpos oreophilus / Carex rossii* Forest (CEGL000613)
- *Populus tremuloides / Symphoricarpos oreophilus / Festuca thurberi* Forest (CEGL000614)
- *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000616)
- *Populus tremuloides / Symphoricarpos oreophilus / Wyethia amplexicaulis* Forest (CEGL000617)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618)

Global Related Concepts:

- *Populus tremuloides / Symphoricarpos oreophilus / Rudbeckia occidentalis* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Symphoricarpos oreophilus / Senecio serra* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forb Community Type (Mueggler 1988) = *Populus tremuloides / Symphoricarpos oreophilus* Community Type (Youngblood and Mueggler 1981) B
- *Populus tremuloides/Symphoricarpos oreophilus*/Tall forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description well.

Global Classification Comments: Confusion between this association and the more broadly defined and distributed ~*Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)$$ is not uncommon. This association was once part of the more broadly defined association, which needs review and refinement. Currently this aspen forest association is characterized by the presence of (1) a low-shrub layer with over 10% cover that is dominated by *Symphoricarpos oreophilus*, (2) an herbaceous layer with

at least 10% cover that is dominated by one or more of several tall forb species, and (3) the absence of a tall-shrub layer (<10% cover) (Mueggler 1988).

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides /* Tall Forbs and the *P. tremuloides – Abies lasiocarpa* / Tall Forbs associations, but is differentiated due to the dominance of *Symphoricarpos oreophilus* in the shrub layer and that *A. lasiocarpa* is either absent from these stands or occurs as an incidental species with low cover.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Bridger-Teton National Forest south of Hedrick Pond and in GTNP across the cove from Lizard Creek Campground, and north of Sergeant Bay Picnic Area.

Global Range: This deciduous forest association occurs in the mountains and plateaus of Utah, western Wyoming, northern Nevada, and southern Idaho.
Nations: US
States/Provinces: ID:S2S3, NV, UT:S5, WY
TNC Ecoregions: 6:C, 9:C, 11:C, 18:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 6-04). ECO18 added (KAS 9-01).
USFS Ecoregions: 341E:CC, 342B:CC, M331A:CC, M331D:CC, M341C:CC
Federal Lands: NPS (Grand Teton, Zion); USFS (Bridger-Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04X483, 04X485
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407027

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000616] *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest

Translated Name: **Quaking Aspen / Mountain Snowberry / Fendler's Meadowrue Forest**
Common Name: **Quaking Aspen / Mountain Snowberry / Fendler's Meadowrue**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This forested association is a common aspen type, occurring from the Abajo Mountains in southern Utah, northern Nevada, eastern Idaho, and into western Wyoming. It occurs between 1585 and 2715 m (5200-8900 feet) elevation. Generally it occurs at moderate elevations, between 1830 and 2655 m (6000-8700 feet). Stands grow on gentle slopes of less the 25%, rather than on benches or flats. They are found on all aspects and on soil derived from igneous and sedimentary parent materials. The vegetation structure is relatively simple, with an open and scattered, yet distinct low-shrub stratum comprised of *Symphoricarpos oreophilus*. The dominant overstory canopy is *Populus tremuloides*, with a cover range of 40-100% and an average of about 70%.

Other trees present are typically conifers but rarely occur over 5%. Conifer species include *Abies lasiocarpa* and *Pseudotsuga menziesii*. The low-shrub stratum is dominated by *Symphoricarpos oreophilus*. Other low shrubs include *Rosa woodsii, Mahonia repens (= Berberis repens)*, and *Paxistima myrsinites*. Tall shrubs such as *Acer glabrum, Amelanchier alnifolia*, and *Prunus virginiana* may be present but are never abundant enough to form a distinct stratum. The herbaceous layer is rich with many forbs. The most common forbs are *Thalictrum fendleri, Geranium viscosissimum, Helianthella uniflora, Osmorhiza berteroi (= Osmorhiza chilensis), Achillea millefolium*, and *Taraxacum officinale*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: One sampled stand for this association occurs in a channel at an elevation of 6600 feet and the other stand occurs on a north-facing shoulder with a gradient of 11% and an elevation of 6991 feet. The soils for the stand located on the shoulder are loam with very little gravel present. Adjacent to one stand is an *Artemisia tridentata* ssp. *vaseyana* shrubland.

Global Environment: This forested association is a common aspen type, occurring from the Abajo Mountains in southern Utah, northern Nevada, eastern Idaho, and into western Wyoming. It occurs between 1585 and 2112 m (5200-8900 feet) elevation. Generally it occurs at moderate elevations, between 1828 and 2651 m (6000-8700 feet). Stands grow on gentle slopes of less the 25%, rather than on benches or flats. They are found on all aspects and on soil derived from igneous and sedimentary parent materials.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on subxeric sites. *Populus tremuloides* (7 and 40% cover) is the dominant tree canopy species. Seedlings of *P. tremuloides* are present in both stands. The dominant shrub is *Symphoricarpos oreophilus* (10 and 20% cover) in the short shrub stratum, with *Artemisia tridentata* ssp. *vaseyana* also occurring in both stands. The herbaceous layer is very diverse; forbs comprise the majority of the herbaceous cover. *Poa pratensis* (10 and 12% cover), *Geranium viscosissimum* (7 and 20% cover), and *Lupinus argenteus* (1 and 10% cover) occur in both stands. Species that occur in only one stand, but contribute 7% or more cover include *Achnatherum nelsonii, Poa secunda, Carex hoodii, Helianthella uniflora, Eucephalus elegans*, and *Potentilla arguta*.

Global Vegetation: The vegetation structure is relatively simple, with an open and scattered, yet distinct low-shrub stratum comprised of *Symphoricarpos oreophilus*. The dominant overstory canopy is *Populus tremuloides*, with a cover range of 40-100% and an average of about 70%. Other trees present are typically conifers but rarely occur over 5%. Conifer species include *Abies lasiocarpa* and *Pseudotsuga menziesii*. Several other conifers may be present in trace amounts, such as *Abies concolor, Picea pungens, Pinus contorta*, and *Pinus flexilis*. The low-shrub stratum is dominated by *Symphoricarpos oreophilus*. Other low shrubs include *Rosa woodsii, Mahonia repens (= Berberis repens)*, and *Paxistima myrsinites*. Tall shrubs such as *Acer glabrum, Amelanchier alnifolia* and *Prunus virginiana* may be present but are never abundant enough to form a distinct stratum. The herbaceous layer is rich with many forbs. The most common forbs are *Thalictrum fendleri, Geranium viscosissimum, Helianthella uniflora, Osmorhiza berteroi (= Osmorhiza chilensis), Achillea millefolium*, and *Taraxacum officinale*. Graminoids include *Bromus carinatus, Poa pratensis, Poa secunda*, and *Elymus trachycaulus*. This association is differentiated from the similar ~*Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612)$$ by the lack of the principal indicator species *Calamagrostis rubescens* or *Carex geyeri*, reduced prominence of *Lupinus argenteus*, and a greater abundance of *Bromus carinatus, Pseudostellaria jamesiana (= Stellaria jamesiana)*, and annuals.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	.	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Geranium viscosissimum	Herb (field)	Forb	X	.	.
Thalictrum fendleri	Herb (field)	Forb	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612)
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610)

Global Related Concepts:
- *Populus tremuloides / Arnica cordifolia* Community Type (Youngblood and Mueggler 1981) I
- *Populus tremuloides / Astragalus miser* Community Type (Youngblood and Mueggler 1981) I
- *Populus tremuloides / Paxistima myrsinites - Geranium viscosissimum* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Symphoricarpos oreophilus - Poa pratensis* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Symphoricarpos oreophilus / Carex geyeri* Community Type (Mueggler and Campbell 1986) I
- *Populus tremuloides / Symphoricarpos oreophilus* Community Type (Youngblood and Mueggler 1981) I
- *Populus tremuloides / Symphoricarpos oreophilus* Habitat Type (Hoffman and Alexander 1980) I
- *Populus tremuloides/Symphoricarpos oreophilus/Thalictrum fendleri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description well.
Global Classification Comments: This association is differentiated from the similar *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Community Type (Mueggler 1988) by the lack of the principal indicator species *Calamagrostis rubescens* or *Carex geyeri*, reduced prominence of *Lupinus argenteus*, and a greater abundance of *Bromus carinatus, Pseudostellaria jamesiana (= Stellaria jamesiana)*, and annuals.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides – Thalictrum fendleri* association, but is differentiated due to the dominance of *Symphoricarpos oreophilus* in the shrub layer.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur northeast of Cunningham Cabin and east of Schwabachers landing parking area.

Global Range: This association occurs in the mountains of Utah, Nevada, Idaho and Wyoming. It may occur in Colorado.
Nations: US
States/Provinces: CO, ID:S3?, NV, UT:S5, WY:S3?
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332E:CC
Federal Lands: NPS (Curecanti, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201030
Accuracy Assessment Points: 04R081
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.

Hoffman and Alexander 1980	.	X	X	.	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	X	.	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	X	.	.	.	.	.

[CEGL000618] *Populus tremuloides* / Tall Forbs Forest

Translated Name: **Quaking Aspen / Tall Forbs Forest**
Common Name: **Quaking Aspen / Tall Forbs**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): M.S. Reid

ELEMENT CONCEPT

Global Summary: This *Populus tremuloides* forest is one of the most common and abundant aspen forest types in the Rocky Mountains. It occurs throughout the mountainous areas and occurs on any aspect but tends to occur more often on north-facing slopes. It can be found on steep hillsides and often along narrow riparian areas. The broad-leaved, deciduous tree canopy in dominated by *Populus tremuloides*. The undergrowth is characterized by a thick carpet of tall forbs (<1 m) with no one species dominant. Low shrubs are virtually absent from this type. Forb species along streambank stands can be different from hillside stands.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes, interfluves, and the valley floor. Two stands occur on flat ground, two on shallow slopes (5 and 6%) with westerly aspects and four occur on moderate to steep slopes (20 to 48%) with a southerly aspects. The elevations for these stands range between 6858 and 7640 feet. The soils are generally well-drained loams to silt loams. Litter and duff (90% cover) comprise the majority of the unvegetated ground cover. Wood (up to 10% cover) and trace amounts of gravel, bare soil, and moss make up the rest. Game trails and/or browsing is a common disturbance to almost all stands. One plot is surrounded by meadows that transition into mixed coniferous forests on all sides and another is surrounded by mixed coniferous forests and an *Artemisia tridentata* ssp. *vaseyana* shrubland.

Global Environment: This community type occupies flat to gently sloping, moist to wet sites, often adjacent to streams. Slope positions are topographically low-lying, such as toeslopes or lower sidehills, flats, valley bottoms, and stream terraces. It is generally found on concave landforms where moisture can accumulate, rarely on convex topography. Aspect is variable, but many easterly or northerly stands were reported in the literature. Elevations are upper montane to lower subalpine and range from about 2100-3080 m (7000-10,000 feet), with most examples reported above 9000 feet. Soils underlying this community type are derived from alluvial deposition of a variety of parent materials, but rarely is it found on volcanic soils (Mueggler 1988). The soils are deep, well-drained loams, sandy loams to clay loams in texture (Boyce 1977, Hess and Wasser 1982). With increasing depth, coarse and rock fragments increase in proportion. Hess and Wasser (1982) report very thin litter layers, and Boyce (1977) reports a low percentage of organic matter in the A horizon.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on mesic sites. The dominant tree canopy species is *Populus tremuloides*, which contributes 20 to 80% cover. The shrub layer is thin and inconsistent throughout the stands. The only shrub to occur in more than half the stands is *Symphoricarpos oreophilus*. The herbaceous layer is very diverse with forbs more abundant than graminoids. The highest constancy graminoids are *Phleum pratense, Poa pratensis,* and *Elymus glaucus*, which generally contribute less than 3% cover, although *P. pratense* contributes 20 and 30% cover to two stands. The forbs with the highest constancy are *Geranium viscosissimum, Lupinus argenteus, Helianthella quinquenervis, Heracleum maximum, Galium boreale, Rudbeckia occidentalis, Achillea millefolium, Perideridia gairdneri,* and *Potentilla gracilis,* which may contribute up to 20% cover each.

Global Vegetation: The vegetation of this type is structurally simple but may be compositionally complex. The canopy is dominated by *Populus tremuloides*, with occasional small amounts of conifer species present (particularly *Abies lasiocarpa* and *Picea engelmannii*). Shrubs are poorly represented, but *Sambucus racemosa* and *Symphoricarpos oreophilus* do occur. The herbaceous layer is characterized by the presence of several species of tall forbs, accompanied by a mixture of low forbs and graminoids. The unifying characteristic of this type is the presence and usual prominence of one or more members of the tall forb group of species, the absence of distinct shrub layers, and a lack of substantial amounts of conifers in the tree layer. Members of the tall forb guild are *Valeriana occidentalis, Osmorhiza occidentalis, Hackelia floribunda, Senecio serra, Agastache urticifolia, Mertensia arizonica, Delphinium X occidentale, Eucephalus engelmannii (= Aster engelmannii),* and *Heracleum maximum (= Heracleum lanatum)*. No

one member of this group is consistently dominant or even present, but as a group they form the dominant cover of the herbaceous layer, often exceeding 10%. Additional low forbs may include *Achillea millefolium var. occidentalis (= Achillea lanulosa), Galium boreale, Galium triflorum, Geranium richardsonii, Hydrophyllum fendleri, Maianthemum stellatum, Streptopus amplexifolius, Thalictrum fendleri,* and *Viola* spp. Common graminoids include *Bromus* spp., *Calamagrostis canadensis, Carex* spp., *Elymus glaucus*, and *Poa pratensis*. At higher elevations, with cooler conditions, Powell (1988a) described two stands of this community type with *Elymus glaucus* dominating, which otherwise were floristically the same as described here. Many of the stands of this type are species-rich, and cover of the herbaceous understory is very high, usually over 200%.
Global Dynamics: Successionally, this community type appears to be stable and, therefore, near climax (Mueggler 1988, Powell 1988a). Aspen is regenerating in some of the stands reported, while conifer regeneration is very low.

The primary source of disturbance for this community is livestock grazing, which can have severe impacts. Species diversity will be decreased and palatable tall forbs may be eliminated with a shift in species composition to dominance by unpalatable forbs, such as *Lathyrus* and *Rudbeckia* spp. Extreme cases of abusive grazing, by either sheep or cattle, may result in a species-poor community, dominated by annuals (Mueggler 1988). Livestock may also significantly impact the growth of aspen shoots, impeding regeneration (Johnston and Hendzel 1985).

Additional disturbance may be caused by timbering operations, which will adversely impact the wet soils of this type.

Fire is important to the initiation of these stands. The layer of tall forbs may help to carry fires, particularly during the dry fall season. Light fires will stimulate aspen suckering but may also kill the canopy trees.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Helianthella quinquenervis	Herb (field)	Forb	X	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Perideridia gairdneri	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Valeriana occidentalis	Herb (field)	Forb	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Agastache urticifolia	Herb (field)	Forb	.	X	.
Delphinium x *occidentale*	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Hackelia floribunda	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Mertensia arizonica	Herb (field)	Forb	.	X	.
Osmorhiza occidentalis	Herb (field)	Forb	X	X	.
Senecio serra	Herb (field)	Forb	.	X	.
Valeriana occidentalis	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Dianthus armeria	-	P	exotic
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium hybridum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Carex siccata* Forest (CEGL000578)
- *Populus tremuloides / Heracleum maximum* Forest (CEGL000595)
- *Populus tremuloides / Heracleum sphondylium* Forest (CEGL000586)
- *Populus tremuloides / Ligusticum filicinum* Forest (CEGL000591)
- *Populus tremuloides / Rudbeckia occidentalis* Forest (CEGL000603)
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615)

Global Related Concepts:
- *Populus tremuloides / Elymus glaucus* Plant Association (Powell 1988a) ?
- *Populus tremuloides / Heracleum lanatum* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Heracleum lanatum* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Ligusticum filicinum* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Rudbeckia occidentalis* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides / Rudbeckia occidentalis* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides / Senecio serra* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides* / Tall Forb Community Type (Mueggler 1988) =
- *Populus tremuloides*/Tall forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well.
Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides – Abies lasiocarpa* / Tall Forbs and the *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs association, but is differentiated from them by the absence of *Abies lasiocarpa* or *Symphoricarpos oreophilus* as dominant species.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur south of Mt. Reid, near Lizard Creek Campground, southeast of Uhl Hill, near Arizona Creek, north of Oxbow Bend, and west of the Death Canyon Overlook.

Global Range: This community type is distributed and has been described from throughout the northwestern mountains of Colorado (Marr et al. 1973), including in Pike-San Isabel (Powell 1988a), Routt (Bunin 1975a, 1975b, Hoffman and Alexander 1980, Johnston and Hendzel 1985), and White River national forests (Boyce 1977, Hess and Wasser 1982, Hoffman and Alexander 1983). It has also been reported from throughout the Intermountain region (Mueggler 1988) in Montana, Wyoming, Idaho, Nevada, and Utah.
Nations: US
States/Provinces: CO:S5, ID:S3?, MT:S3, NV, UT:S5, WY:S3S4
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 19:C, 20:C, 26:C
TNC Ecoregion Comments: ECO8 & ECO19 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 331G:CC, 341B:CC, 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332C:CC, M332D:CC, M332E:CC
Federal Lands: NPS (Curecanti, Grand Teton); USFS (Pike-San Isabel, Routt, White River NF)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201053, GT-03C041, GT-0201051
Accuracy Assessment Points: 04J036, 04X082, 04X427, 04X513
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9902055

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): M.S. Reid, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Boyce 1977	.	X	.	X	X	.	.	.	.
Bunin 1975a	.	X	.	X	X	.	.	.	.
Bunin 1975c	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hess and Wasser 1982	.	X	.	X	X	.	.	.	.
Hoffman and Alexander 1980	.	X	.	X	X	.	.	.	.
Hoffman and Alexander 1983	.	X	.	X	X	.	.	.	.
Johnston and Hendzel 1985	.	X	.	X	X	.	.	.	.
Keammerer and Stoecker 1980	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Lewis 1975a	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
MTNHP unpubl. data	.	X	.	X	.	.	.	.	.
Marr et al. 1973a	.	X	.	X	.	.	.	.	.
Mueggler 1988	.	X	X	X	X	.	.	.	.
Mueggler and Campbell 1982	.	X	X	.	.	.	.	.	.
Mueggler and Campbell 1986	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Powell 1988a	.	X	X	X	X	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	X	X	.	.	.	.	.	.

[CEGL000619] *Populus tremuloides / Thalictrum fendleri* Forest

Translated Name: **Quaking Aspen / Fendler's Meadowrue Forest**
Common Name: **Quaking Aspen / Fendler's Meadowrue**
Ecological System(s):
- Rocky Mountain Aspen Forest and Woodland (CES306.813)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This in an infrequent forest association known from Idaho, western Wyoming, Utah, and Colorado. It occurs on sheltered sites, swales, benches and lower slopes, on moderately deep well-drained soils, moist deep loamy sand to silty loam to clay loam soils. Slopes are moderate (17-65%), straight to concave, and occur on all aspects. Elevation ranges from 1737 to 3414 m (5700-11,200 feet). The vegetation of this type is essentially two-layered: a tree stratum usually of only *Populus tremuloides* and a low-herb stratum. An occasional conifer, usually *Abies lasiocarpa* but sometimes *Pseudotsuga menziesii* or *Pinus contorta*, may be present. Although a well-defined shrub layer is lacking, small amounts of shrubs may be present, including *Symphoricarpos oreophilus*, *Rosa woodsii*, and *Mahonia repens (= Berberis repens)*. The herbaceous layer is usually abundant and rich in forbs. Most abundant are *Thalictrum fendleri*, *Geranium viscosissimum*, or *Osmorhiza berteroi (= Osmorhiza chilensis)*. Other forbs frequently present in substantial amounts include *Lupinus argenteus*, *Fragaria vesca*, *Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus)*, *Ligusticum porteri*, *Vicia americana*, and *Achillea millefolium*. Graminoids are common and can be abundant and include *Bromus carinatus* and *Elymus glaucus*. This association is characterized by the lack of conifers and the lack of a distinct shrub layer, the absence of substantial amounts of *Carex geyeri* or *Calamagrostis rubescens*, and the prominence of *Thalictrum fendleri*, *Geranium viscosissimum*, or *Osmorhiza berteroi*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: One stand sampled for this association occurs on the valley floor and two occur on slopes of 5 and 17% with west- and southeast-facing aspects. The elevational range for these stands is 6850 to 7491 feet.

The unvegetated ground cover for one stand consists of 60% litter and duff, 30% basal vegetation, 10% wood, and traces of bare soil. No other environmental data is available. Adjacent vegetation for one stand is a meadow made up of the understory species found in the sampled stand.

Global Environment: This forested association occurs on sheltered sites, swales, benches and lower slopes, on moderately deep well-drained soils, moist deep sandy loam or loamy sand to silty loam to clay loam soils. pH is 5.2-7.0, without surface rock. Slopes are moderate (17-65%), straight to concave, often at mid- and lower slope positions, and occur in all aspects. Elevation ranges from 1737 to 3414 m (5700-11,200 feet).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on mesic sites. *Populus tremuloides* is the only tree species present, occurring in the tree canopy, subcanopy, and/or as regeneration. The shrub layer is not well developed. *Symphoricarpos oreophilus* is the only shrub present in more than one stand. *Poa pratensis* (trace to 7% cover) and *Geranium viscosissimum* (3 to 12% over) are the only herbaceous species to occur in all sampled stands. *Calamagrostis rubescens* and *Helianthella uniflora* each occur in two stands.

Global Vegetation: The vegetation of this type is essentially two-layered: a tree stratum usually of only *Populus tremuloides* and a low-herb stratum. An occasional conifer, unusually *Abies lasiocarpa* but sometimes *Pseudotsuga menziesii, Pinus contorta*, or *Pinus ponderosa*, may be present. Although a well-defined shrub layer is lacking, small amounts of shrubs may be present, including *Symphoricarpos oreophilus, Rosa woodsii, Juniperus communis, Dasiphora fruticosa*, and *Mahonia repens (= Berberis repens)*. The herbaceous layer is usually abundant and rich in forbs. Most abundant are *Thalictrum fendleri, Geranium viscosissimum*, or *Osmorhiza berteroi (= Osmorhiza chilensis)*. Other forbs frequently present in substantial amounts include *Lupinus argenteus, Thermopsis divaricarpa, Fragaria vesca, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Ligusticum porteri, Vicia americana*, and *Achillea millefolium*. Graminoids are common and can be abundant and include *Bromus carinatus, Poa pratensis, Phleum pratense*, and *Elymus glaucus*. This association is characterized by the lack of conifers, the lack of a distinct shrub layer, the absence of substantial amounts of *Carex geyeri* or *Calamagrostis rubescens*, and the prominence of *Thalictrum fendleri, Geranium viscosissimum*, or *Osmorhiza berteroi*. This association has less than 10% cover of tall or short shrubs, less than 10% cover by any of the "tall forb" species, and less than 10% cover of *Calamagrostis rubescens* or *Carex geyeri*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb		X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Thalictrum fendleri	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Populus tremuloides/Thalictrum fendleri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well. Although this stand has no *Thalictrum fendleri*, it has 10% cover of *Geranium viscosissimum*, which puts the stand into the *Populus tremuloides / Thalictrum fendleri* Habitat Type.
Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides – Symphoricarpos oreophilus / Thalictrum fendleri* association, but is differentiated because *S. oreophilus* is not a dominant species in the shrub layer.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One stand is located in Bridger-Teton National Forest southeast of Teton Science School, one occurs in the Pacific Creek Area, and one occurs east of McAllister's.

Global Range: This in an infrequent forest association known from Idaho, western Wyoming, Utah, and Colorado, and possibly California.
Nations: US
States/Provinces: CA?, CO:S5, ID:S3, UT:S4S5, WY:S3
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332E:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bridger-Teton, Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J024, 04X070
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507045

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Boyce 1977	.	X	.	X	.	.	.	.	.
Bunin 1975a	.	X	.	X	.	.	.	.	.
Bunin 1975c	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Crouch 1983	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
Hess and Alexander 1986	.	X	.	X	.	.	.	.	.
Hoffman and Alexander 1980	.	X	.	X	.	.	.	.	.
Hoffman and Alexander 1983	.	X	.	X	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Johnston and Hendzel 1985	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Keammerer and Stoecker 1980	.	X	.	X	.	.	.	.	.
Komarkova et al. 1988a	.	X	.	X	.	.	.	.	.
Langenheim 1962	.	X	.	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Powell 1988a	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

I.B.2.N.d. Temporarily flooded cold-deciduous forest

A.311 *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance

Black Cottonwood Temporarily Flooded Forest Alliance

ALLIANCE CONCEPT

Summary: This riparian forest alliance occurs on alluvial terraces along major streams and rivers throughout the western United States, west of the Continental Divide. Elevations range from sea level in California to 1800 m. They can occur on alluvial terraces of major streams and rivers, margins of lakes, meadows, deltas, river mouths, and terraces. Stands can occupy broad floodplains or form narrow stringers adjacent to streams with a much steeper slope. Soils typically overlay river gravel and/or cobbles and are coarse-textured. Water tables usually drop below 1 m of the soil surface in summer, but can remain moist due to capillary action. Vegetation within this alliance is characterized by an open to moderately dense tree layer that is dominated by *Populus balsamifera ssp. trichocarpa*. Tree associates include *Populus deltoides, Populus angustifolia, Pinus ponderosa, Picea* spp., and *Alnus rhombifolia, Alnus rubra*, and *Fraxinus latifolia* in stands along the west coast. A shrub layer is usually present and may be dominated by *Alnus incana, Betula papyrifera, Cornus sericea, Crataegus douglasii, Prunus virginiana, Ribes americanum, Salix exigua*, and *Symphoricarpos albus*. The herbaceous layer is usually relatively sparse and is dominated by either forbs or graminoids. Common species include *Actaea rubra, Cicuta douglasii, Equisetum sylvaticum, Mentha arvensis*, and *Symphyotrichum spathulatum (= Aster occidentalis)*. The graminoid cover is usually less than 10%, but can be up to 80% consisting mainly of introduced hay grasses on disturbed sites. Species information on the graminoid and forb layers is lacking for much of the range of this alliance. Diagnostic of this alliance is the dominance of *Populus balsamifera ssp. trichocarpa* in the tree canopy in forests that are briefly flooded during the growing season.

Environment: Vegetation types in this alliance occur on alluvial terraces along major streams and rivers throughout the western United States, west of the Continental Divide. Elevations range from sea level in California to 1800 m. They can occur on alluvial terraces of major streams and rivers, margins of lakes, meadows, deltas, river mouths, and terraces. Stands can occupy broad floodplains (1-3% slopes) or form narrow stringers adjacent to streams with a much steeper slope (10-15%). Soils are typically Entisols, usually up to 1 m of mineral soil overlying river gravel and/or cobbles. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m of the soil surface in summer, but can remain moist due to capillary action. A fluctuating water table in these soils is evidenced by the common presence of mottles.

Adjacent wetter communities may be dominated by a variety of types including *Salix exigua* and *Salix lucida ssp. lasiandra* community types, or the *Typha latifolia*- and *Eleocharis* spp.-dominated habitat types. Adjacent drier communities may be dominated by coniferous or aspen forests.

Vegetation: Vegetation types within this alliance are classified as temporarily flooded forests, but many individual stands have cover less than 60% (see Classification comments). The tree layer is dominated by an open to moderately dense canopy (>50%) of *Populus balsamifera ssp. trichocarpa*. *Populus deltoides, Populus angustifolia, Pinus ponderosa*, and *Picea* spp. can occur in the canopy with *Populus balsamifera* in the Montana stands. The Oregon, Washington, and California data state that *Alnus rhombifolia, Alnus rubra*, and *Fraxinus latifolia* occur in the tree canopy. The shrub layer in the Montana stands typically is dominated by *Cornus sericea, Alnus incana, Betula papyrifera, Prunus virginiana*, and *Ribes americanum*. The Pacific Northwest and California stands contain *Crataegus douglasii, Salix exigua*, and *Symphoricarpos albus* in the shrub layer, and the forb *Cicuta douglasii* is common. The forb layer from the Montana stands ranges from 1-20%, dominated by *Actaea rubra, Mentha arvensis*, and *Symphyotrichum spathulatum (= Aster occidentalis)*. The graminoid cover is usually less than 10%, but can be up to 80%, and mainly consists of introduced hay grasses. *Equisetum sylvaticum* can dominate the fern layer with up to 40% cover. There was no species information on the graminoid and forb layers for the Pacific Northwest and California types.

Dynamics: *Populus balsamifera ssp. trichocarpa* is susceptible to fire during the late summer and fall. This species is adapted to light and in some instances to moderate-intensity fires and may produce new sprouts following burns (Hansen et al. 1995). In Montana, many of these sites are seral to *Picea engelmannii* (including *Picea engelmannii X glauca*) and *Thuja plicata* forests.

Similar Alliances:

- *Picea sitchensis - Populus balsamifera* ssp. *trichocarpa* Seasonally Flooded Woodland Alliance (A.690)
- *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance (A.635)

Similar Alliance Comments: The similar alliances differ either in vegetation structure or hydrologic regime. The woodland alliances are open stands of trees with crowns not touching. The seasonally flooded alliances are defined as having surface water persisting well into the growing season and water tables near the soil surface. Individual stands in the ~*Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)$$ may have open tree canopies (cover <60%) and so be difficult to classify into the riparian woodland or forest alliance.

ALLIANCE DISTRIBUTION

Range: This alliance has been described for Washington, Oregon, California, Colorado, Wyoming, Montana, and Alberta, Canada. *Populus balsamifera ssp. trichocarpa* ranges from Alaska to southern California and northern Baja California, Mexico, east to western Montana, Idaho, and western Wyoming and the Deep Creek Mountains in western Utah (Hitchcock et al. 1964). The alliance may occur over this wider range.

Nations: CA, MX?, US

Subnations: AB, BC, CA, ID, MT, NV, OR, WA, WY

TNC Ecoregions: 1:C, 2:C, 3:P, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 68:C, 81:C
USFS Ecoregions: 242A:CC, 331A:CC, 341:?, 342A:CC, 342B:CC, 342C:CC, 342G:CC, 342H:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M261E:CC, M261G:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: BIA (Blackfeet); NPS (Glacier, Grand Teton, Olympic NP?, Yosemite); PC (Waterton Lakes); USFS (Fremont, Hells Canyon)

ALLIANCE SOURCES

Author(s): D. Culver
References: Blackburn et al. 1968a, Brown 1982, Crowe and Clausnitzer 1997, Daubenmire 1970, Eyre 1980, Franklin and Dyrness 1969, Franklin and Dyrness 1973, Hansen et al. 1991, Hansen et al. 1995, Hitchcock et al. 1964, Johnston 1987, Kartesz 1994a, Kauffman 1982, Kauffman et al. 1985, Kovalchik 1987, Manning and Padgett 1991, Manning and Padgett 1992, Moseley and Bursik 1994, Pfister et al. 1977, Poulton 1955, Reid et al. 1994, Sawyer and Keeler-Wolf 1995

[CEGL000677] *Populus balsamifera (ssp. trichocarpa, ssp. balsamifera) / Symphoricarpos (albus, oreophilus, occidentalis)* Forest

Translated Name: **(Black Cottonwood, Balsam Poplar) / (Common Snowberry, Western Snowberry, Mountain Snowberry) Forest**
Common Name: **Balsam Poplar / Common Snowberry**
Ecological System(s):
- Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)
- North Pacific Lowland Riparian Forest and Shrubland (CES204.869)
- Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): C. Murphy

ELEMENT CONCEPT

Global Summary: This association is known from the Blue Mountains of eastern Oregon, through the Columbia Basin to the Cascades of eastern Washington, into central and northern Idaho, western Wyoming, and north to the mountains of southern British Columbia. This late-seral association typically occurs at low elevations from 579 to 2040 m (1900-6693 feet) in broad mountain valleys and canyons of low- to moderate-gradient streams and rivers. The association occupies alluvial terraces with deep silty loam soils (over cobble and gravel) on infrequently flooded sites well above the average high-water line and summer water table. Tall and mature *Populus balsamifera ssp. trichocarpa* form the open to closed overstory canopy, with occasional understory asexual reproduction and conifers present. Conifer species, especially *Pinus ponderosa* and *Pseudotsuga menziesii*, may indicate the potential successional pathway on these relatively dry terrace sites. The shrub layer is clearly dominated by one species of *Symphoricarpos*, either *Symphoricarpos albus*, *Symphoricarpos oreophilus*, or *Symphoricarpos occidentalis* (usually with at least 20% cover), although a variety of other tall and medium shrubs (all with cover less than *Symphoricarpos albus*) are often present. The most consistently prominent shrubs are *Acer glabrum*, *Amelanchier alnifolia*, *Crataegus douglasii*, *Philadelphus lewisii*, *Prunus virginiana*, *Rosa* spp., and *Rubus parviflorus*, the presence of which may reflect successional relationships with other alluvial terrace associations. The herbaceous layer is diverse, but has only moderate cover, and often includes exotic species indicative of past disturbance. Perennial grasses, especially *Elymus glaucus*, *Phalaris arundinacea*, and *Poa pratensis*, often codominate with various tall forbs and *Equisetum* spp. The most important forbs include *Clematis ligusticifolia*, *Heracleum maximum*, *Maianthemum* spp., *Thalictrum occidentale*, and *Urtica dioica*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The three sampled stands of this association occur on the valley floor and in a channel at elevations between 1985 to 2040 m (6511-6693 feet). The soils are moderately well-drained silty clays and poorly drained loamy sands with 10% gravel. The unvegetated and nonvascular ground surface in one stand is composed of litter and duff (80% cover), wood (20% cover), rocks greater than 10 cm (1% cover), gravel (1% cover), bare soil (1% cover), and lichens (1% cover). Adjacent to these stands are riparian communities.
Global Environment: This late-seral association typically occurs at low elevations from 579 to 2040 m (1900-6693 feet) in broad mountain valleys and canyons of low- to moderate-gradient streams and rivers. The association occupies alluvial terraces and elevated streambanks with deep silty loam soils (over cobble and gravel) on infrequently flooded sites well above the average high-water line and summer water table.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a deciduous forested community that occurs on mesic sites. *Populus balsamifera* (50 and 60% cover) is dominant in the tree canopy in all stands. The shrub layer in two plots is dominated by *Symphoricarpos oreophilus* (20% cover) and *Mahonia repens* (10% cover), while in the third plot the dominant shrub is *Symphoricarpos albus* (10% cover). Tree seedlings present in two of the stands include *Populus balsamifera* (3 and 10% cover) and *Populus tremuloides* (1 and 3% cover). *Poa pratensis* (3 to 50% cover) and *Elymus glaucus* (3 to 10% cover) are present in all stands. Forbs present in all stands with 1 to 3% cover include *Galium boreale* and *Achillea millefolium*. *Thalictrum* spp. are present in all stands with 1 to 20% cover. One stand has 40% cover of *Wyethia amplexicaulis*. A variety of other forbs and a few other graminoids occur in trace quantities.

Global Vegetation: Tall and mature *Populus balsamifera ssp. trichocarpa* form the open to closed overstory canopy, with occasional understory asexual reproduction and conifers present. Conifer species, especially *Pinus ponderosa* and *Pseudotsuga menziesii*, may indicate the potential successional pathway on these relatively dry terrace sites. The shrub layer is clearly dominated by one species of *Symphoricarpos*, either *Symphoricarpos albus, Symphoricarpos oreophilus*, or *Symphoricarpos occidentalis* (usually with at least 20% cover), although a variety of other tall and medium shrubs (all with cover less than *Symphoricarpos* sp.) are usually present. The most consistently prominent shrubs are *Acer glabrum, Amelanchier alnifolia, Crataegus douglasii, Philadelphus lewisii, Prunus virginiana, Rosa* spp., and *Rubus parviflorus*, the presence of which may reflect successional relationships with other alluvial terrace associations. The herbaceous layer is diverse, but has only moderate cover, and often includes exotic species indicative of past disturbance. Perennial grasses, especially *Elymus glaucus, Phalaris arundinacea*, and *Poa pratensis*, often codominate with various tall forbs and *Equisetum* spp. The most important forbs include *Clematis ligusticifolia, Heracleum maximum, Maianthemum* spp., *Wyethia amplexicaulis, Thalictrum occidentale, Urtica dioica, Geranium viscosissimum*, and *Helianthella uniflora*.

Global Dynamics: This association is a mid- to late-seral association that usually occurs on inactive floodplain terraces that flood only episodically. Over time, these terraces may wash away from lateral movement of the channel (Moseley and Bursik 1994, Hansen et al. 1995). In addition, *Populus balsamifera ssp. trichocarpa* reproduction is low and limited to less vigorous asexual suckering. Without intact ecological processes promoting stand replacement and succession, long-term persistence of this type will decrease. Young stands of *Populus balsamifera ssp. trichocarpa* establish on fresh alluvium found on point bars and banks of rivers with intact, natural flooding regimes (Moseley and Bursik 1994, Hansen et al. 1995, Crowe and Clausnitzer 1997, Crawford 2001, Jankovsky-Jones et al. 2001, Kovalchik 2001). As rivers downcut and channels migrate over time, these point bars and banks are less frequently flooded and loamy soils develop. These sites are favorable for *Symphoricarpos albus* establishment and formation of new stands of this association.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus balsamifera	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.
Populus tremuloides	Herb (field)	Other herbaceous	.	X	.

Grand Teton National Park Higher Taxa	
Thalictrum sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus balsamifera	Tree canopy	Broad-leaved deciduous tree	X	X	X
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos occidentalis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Urtica dioica	Herb (field)	Forb	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Carduus nutans	-	P	exotic
Cynoglossum officinale	-	P	exotic
Dactylis glomerata	-	P	exotic
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (22-Oct-2002). This association is a relatively wide-ranging and broadly defined association occurring on infrequently flooded alluvial terraces of low-elevation streams and rivers of the inland Pacific Northwest. It is usually distinct from related *Populus balsamifera ssp. trichocarpa* stands with tall-shrub understories. This type is not as immediately affected by flow alteration as some other *Populus balsamifera ssp. trichocarpa* types, but the quality and viability of most occurrences are decreased due to many anthropogenic disturbances, including flow regime changes. These disturbances include clearing for road building and urbanization; recreation impacts; dams, flood control levees, and diversions reducing flood peaks and deposition necessary for *Populus balsamifera ssp. trichocarpa* reproduction; and cattle grazing (decreasing *Populus balsamifera ssp. trichocarpa* and *Symphoricarpos* spp. reproduction while promoting exotic species). Interruption of the natural flooding regime on many low-elevation rivers with potential to support this association have occurred resulting in long-term declines from lack of stand replacement. Although there are about 40 to 50 known occurrences, most stands cover relatively small areas and are in poor to fair ecological condition. For these reasons, changing the original rank from G2? to G2 is justified.

RELATED CONCEPTS

Global Similar Associations:
- *Populus balsamifera* ssp. *trichocarpa - Acer macrophyllum / Symphoricarpos albus* Forest (CEGL003363)
- *Populus balsamifera* ssp. *trichocarpa - Alnus rubra / Symphoricarpos albus* Forest (CEGL003362)

Global Related Concepts:
- *Populus balsamifera ssp. trichocarpa / Symphoricarpos albus / Poa pratensis* Association (Kovalchik 1987) =
- *Populus balsamifera* ssp. *trichocarpa / Symphoricarpos albus* Association (Crowe et al. 2004) =
- *Populus trichocarpa / Symphoricarpos albus* Community Type (Evans 1989a) =
- *Populus trichocarpa / Symphoricarpos albus* Community Type (Crowe and Clausnitzer 1997) =
- *Populus trichocarpa / Symphoricarpos occidentalis* Community Type (Hall and Hansen 1997) =
- *Populus trichocarpa / Symphoricarpos occidentalis* Habitat Type (Hansen et al. 1995) I
- *Populus trichocarpa/Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.d. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This association has been quantitatively described by eight different studies with at least 49 plots (Kovalchik 1987, Crowe and Clausnitzer 1997, Moseley and Bursik 1994, Crawford 2001, Jankovsky-Jones et al. 2001, Kovalchik 2001, Crowe et al. 2002, Grand Teton National Park 2004-2005). This association belongs to a complex of ecologically related associations with similar species composition, including ~*Populus balsamifera ssp. trichocarpa / Alnus incana* Forest (CEGL000667)$$, ~*Populus balsamifera ssp. trichocarpa / Crataegus douglasii* Forest (CEGL000673)$$, and others not yet incorporated into the National Vegetation Classification, including *Populus balsamifera ssp. trichocarpa / Acer glabrum* and *Populus balsamifera ssp. trichocarpa / Philadelphus lewisii* (Crowe and Clausnitzer 1987, Crawford 2001, Holmstead 2001, Jankovsky-Jones et al. 2001, Crowe et al. 2002). The understory dominance by *Symphoricarpos albus*, with higher cover and constancy than tall shrubs, separates this association from those where *Acer glabrum*, *Alnus incana*, *Crataegus douglasii*, or *Philadelphus lewisii* have equal or greater cover and constancy. We include stands dominated by *Populus balsamifera ssp. trichocarpa* and any species of *Symphoricarpos* because they all occupy a similar ecological niche within the riparian zone, that is the higher, older terraces. In addition, some studies had more than one species of *Symphoricarpos* dominating the shrub layer [see Hall and Hansen (1997)]. *Symphoricarpos* species are wide ranging across the West and even into the Midwest, while the cottonwood dominating the overstory is the better indicator for the geographic distribution for the association.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: One of the sampled stands occurs at the confluence of Cottonwood Creek and the Snake River, and the other stands occur near Cottonwood Creek.
Global Range: This association is known from low-elevation, large rivers in Oregon, Washington, Idaho, western Wyoming, and British Columbia. It has been report from Montana as part of another community [see Hansen et al. (1995)].
Nations: CA?, US
States/Provinces: BC?, ID:S2, MT?, OR:S2, WA:S1S2, WY
TNC Ecoregions: 3:P, 4:C, 6:C, 7:C, 9:C, 10:C, 81:C
TNC Ecoregion Comments: ECO4 & ECO7 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 6-04). ECO3 & ECO81 added (MSR/CM 10-02).

USFS Ecoregions: 342A:CC, 342B:C?, 342C:CC, 342H:C?, 342I:CC, M242B:C?, M242C:CC, M331D:CC, M332G:CC, M333C:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Plots: GT-03C044, GT-0201088, GT-03C002. **Accuracy Assessment Points:** None. **Other plots within park boundaries, from other projects:** None. **Other plots outside park boundaries but within 2 miles:** None.

Grand Teton National Park Description Author(s): C.B. Villalobos, mod. K. Varga
Global Description Author(s): C. Murphy, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Crawford 2001	.	X	.	X	X	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	X	.	.	.	.
Crowe et al. 2002	.	X	.	X	X	.	.	.	.
Crowe et al. 2004	.	.	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Evans 1989a	.	X	X	X	.	.	.	.	.
Hall and Hansen 1997	.	.	X	.	.	.	.	.	.
Hansen and Hall 2002	.	.	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
Holmstead 2001	.	.	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
IDCDC unpubl. data 2002	.	.	.	X	X	.	.	.	.
Jankovsky-Jones et al. 2001	.	X	.	X	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kauffman et al. 1985	.	X	.	X	.	.	.	.	.
Kovalchik 1987	.	X	X	X	X	.	.	.	.
Kovalchik 2001	.	X	.	X	X	.	.	.	.
Moseley and Bursik 1994	.	X	.	X	X	.	.	.	.
Sunderman 2000	.	.	.	.	X	.	.	.	.
WANHP unpubl. data 2002	.	.	.	.	X	.	.	.	.
Walford et al. 2001	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000672] *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* Forest

Translated Name: **Black Cottonwood / Red-osier Dogwood Forest**
Common Name: **Balsam Poplar / Red-osier Dogwood**
Ecological System(s):

- Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)
- North Pacific Lowland Riparian Forest and Shrubland (CES204.869)
- Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)
- Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This association has been documented from Washington south to northern California and eastward to Idaho and Montana west of the Continental Divide, as well as central Montana. It occurs over a broad elevation range of 610 to 2135 m (2000-7000 feet) where *Populus balsamifera ssp. trichocarpa* is the dominant cottonwood at elevations considered relatively low to mid gradient. This forest type occupies alluvial terraces of major rivers and streams, point bars, side bars, mid-channel bars, delta bars, an occasional lake or pond margin, and even creeps onto footslopes and lower subirrigated slopes of hilly or mountainous terrain. Stands occasionally occur on upper positions of moderate to steep toeslopes and colluvial fans at the base of avalanche chutes. Many of these sites are flooded in the spring and dry deeply by summer's end; capillary action keeps upper portions of the soil profile moist. Other sites are merely subirrigated. *Populus balsamifera ssp. trichocarpa* dominates the overstory with average cover values ranging from approximately 30-90%. *Populus angustifolia, Populus tremuloides, Betula papyrifera,* and *Salix amygdaloides* are common

subordinates. Several conifer species can be present with low cover (2-10%) in the upper canopy or as young saplings and are never consistently present. Conifers include *Tsuga heterophylla, Pseudotsuga menziesii, Abies lasiocarpa*, and *Picea engelmannii*. The shrub layer comprises at least 25% cover, with *Cornus sericea* diagnostic for the type and having anywhere from 1-90% cover; other shrub taxa with high constancy include *Symphoricarpos* spp., *Rosa* spp., *Salix* spp., *Crataegus* spp., *Amelanchier alnifolia, Salix lutea, Acer glabrum*, and *Alnus incana*. There are no graminoids exhibiting high constancy, though any one of a number of disturbance-associated exotics can manifest high coverages. Native grasses such as *Calamagrostis canadensis, Glyceria striata*, and *Deschampsia caespitosa* can be abundant in undisturbed stands, but this is increasingly less common. *Maianthemum stellatum, Galium triflorum, Solidago canadensis*, and *Equisetum* spp. are the only forbs that exhibit even relatively high constancy across the range of the type.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The sampled stand of this association occurs on a steep southeast-facing footslope at an elevation of 2161 m (7091 feet). The well-drained loam soils are covered predominantly by litter and duff. Small quantities of rocks greater than 10 cm, gravel, wood, bare soil, and mosses are also present. A drainage gully that has been created by erosion runs through the stand and is in places 1 m (3 feet) deep. Limestone is thought to occur somewhere above the stand, explaining the moist yet waterless gully. *Populus balsamifera* and *Populus tremuloides* continue up and down the slope more or less in the gully. Adjacent ridges on the slope support *~Pinus contorta / Vaccinium scoparium* Forest (CEGL000172)$$, *~Pinus contorta / Carex geyeri* Forest (CEGL000141)$$, and *~Pinus contorta / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000169)$$.

Global Environment: This association has been documented from Washington south to northern California and eastward to Idaho, Montana and Wyoming. It occurs over a broad elevational range of 610 to 2135 m (2000-7000 feet) where *Populus balsamifera ssp. trichocarpa* is the dominant cottonwood. This forest type occupies alluvial terraces of major rivers and streams, point bars, side bars, mid-channel bars, delta bars, an occasional lake or pond margin, and even creeps onto footslopes and lower subirrigated slopes of hilly or mountainous terrain. Stands occasionally occur on upper positions of moderate to steep toeslopes and colluvial fans at the base of avalanche chutes or erosional gullies, where they are subject to avalanche or flash-flood disturbance. Many of these sites are flooded in the spring and dry deeply by summer's end; capillary action keeps upper portions of the soil profile moist. Other sites are merely subirrigated. Adjacent wetter sites are dominated by a suite of wetland *Salix* spp., *Alnus incana*, wetland-associated *Carex* spp. often including *Carex utriculata, Carex aquatilis* and *Carex buxbaumii*, or *Typha latifolia*-dominated communities. Adjacent drier sites are dominated by *Populus balsamifera ssp. trichocarpa* or *Populus tremuloides* types or any of a number of conifer-dominated types.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous forested community that occurs in mesic areas. Dominant tree species occupying the tree canopy layer include *Populus balsamifera* (30% cover) and *Populus tremuloides* (10% cover). A variety of tree seedlings are present and compose 3% cover or less in either the short- or dwarf-shrub stratum, including *Abies lasiocarpa, Picea engelmannii, Pinus contorta, Pinus flexilis, Populus balsamifera*, and *Populus tremuloides*. The shrub strata are diverse and well-developed. Well-represented species with 10% cover include *Amelanchier alnifolia, Cornus sericea*, and *Shepherdia canadensis*. Common shrub species with 3% cover include *Vaccinium scoparium, Symphoricarpos albus, Spiraea betulifolia*, and *Prunus virginiana*. The herbaceous layer has an abundance of mesic forb and graminoid species. Well-represented species with 10% cover include *Calamagrostis rubescens, Carex geyeri, Eucephalus engelmannii, Helianthella quinquenervis*, and *Lupinus argenteus*. Common species with 3% cover include *Thalictrum occidentale, Osmorhiza berteroi, Ligusticum filicinum, Heracleum maximum, Geranium viscosissimum, Angelica arguta*, and *Apocynum androsaemifolium*.

Global Vegetation: *Populus balsamifera ssp. trichocarpa* dominates the overstory with cover values ranging from approximately 30-90%. *Populus angustifolia, Populus tremuloides, Betula papyrifera*, and *Salix amygdaloides* are common subordinates. Several conifer species can be present with low cover (2-10%) in the upper canopy or as young saplings and are never consistently present. Conifers include *Tsuga heterophylla, Abies lasiocarpa, Pseudotsuga menziesii*, and *Picea engelmannii*. The shrub layer comprises at least 10% cover, with *Cornus sericea* diagnostic for the type and having anywhere from 1-90% cover; other shrub taxa with high constancy include *Symphoricarpos* spp., *Ribes* spp., *Rosa* spp., *Salix* spp., *Crataegus* spp., *Amelanchier alnifolia, Salix lutea*, and *Alnus incana*. There are no graminoids exhibiting high constancy, though any one of a number of disturbance-associated exotics can manifest high coverages. Native grasses such as *Calamagrostis canadensis, Calamagrostis rubescens, Carex geyeri, Glyceria striata*, and *Deschampsia caespitosa* can be abundant in undisturbed stands, but this is increasingly less common. *Maianthemum stellatum, Galium triflorum, Solidago canadensis*, and *Equisetum* spp. are the only forbs that exhibit even relatively high constancy across the range of the type.

Global Dynamics: This is a successional community that colonizes moist, newly deposited alluvium exposed to full sunlight; in the absence of fluvial disturbance it is capable of developing into conifer-dominated communities belonging to alliances as diverse as *Tsuga heterophylla, Pseudotsuga menziesii*, or *Picea* spp. if sites are no longer subject to flooding or avalanche disturbance. This association is also found on frequently avalanched sites, with subirrigation during the summer form snowmelt. In these situations the trees may be dwarfed, broken, bent or otherwise damaged by avalanche impacts, resulting in the canopy being a mix of both *Populus* and *Cornus* or other shrubs.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus balsamifera	Tree canopy	Broad-leaved deciduous tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Cornus sericea	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Spiraea betulifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Vaccinium scoparium	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Angelica arguta	Herb (field)	Forb	.	X	.
Apocynum androsaemifolium	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	X	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Helianthella quinquenervis	Herb (field)	Forb	X	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	X	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus balsamifera ssp. *trichocarpa*	Tree canopy	Broad-leaved deciduous tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	.	.
Cornus sericea	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Symphoricarpos albus	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Taraxacum officinale	Herb (field)	Forb	X	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	.	.
Elymus glaucus	Herb (field)	Graminoid	X	.	.
Poa pratensis	Herb (field)	Graminoid	X	.	.
Equisetum arvense	Herb (field)	Fern	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Feb-2004). Association rank has been changed from G3? to G3G4 on the basis of this type's broad geographic distribution and the fact that within local landscapes, say western Montana, it is relatively common. A thorough crosswalk of this type across its range of distribution is needed; there may be local variations in composition and ecology that would bear recognition of separate associations. Threats to this type include floodplain harvesting of cottonwood and over-browsing from livestock and wildlife, which both find *Cornus sericea* extremely palatable to the point of extirpating it from local floodplain landscapes. The more serious over-browsing consequences are reduced diversity, the introduction of weedy species, and the increase in unpalatable native taxa such as *Symphoricarpos occidentalis*, *Ribes* spp., and *Urtica dioica*.

RELATED CONCEPTS

Global Similar Associations:

- *Picea engelmannii / Cornus sericea* Woodland (CEGL002677)
- *Populus tremuloides / Cornus sericea* Forest (CEGL000582)
- *Pseudotsuga menziesii / Cornus sericea* Woodland (CEGL000899)

Global Related Concepts:

- *Populus trichocarpa - Picea engelmannii / Alnus incana - Cornus stolonifera* Community Type (Kovalchik 1987) =

- *Populus trichocarpa / Cornus stolonifera* Community Type (Hall and Hansen 1997) =
- *Populus trichocarpa / Cornus stolonifera* Community Type (Hansen et al. 1995) =
- *Populus trichocarpa / Cornus stolonifera* Forest (Evans 1989a) =
- *Populus trichocarpa / Cornus stolonifera* Forest (Kovalchik 1993) =
- *Populus trichocarpa/Cornus sericea* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.d. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The sampled stand for this association fits Walford et al.'s (2001) *Populus balsamifera / Cornus sericea* Community Type only reasonably well. The vegetation structure and species composition within these two stands have marked differences. The Walford stand is growing on a river sandbar and has several tall-shrub strata which are absent in the Grand Teton National Park stand. Forbs are much more abundant and diverse within the herbaceous layer in the Grand Teton stand. The successional trend for the Walford stand seems to be a tall shrubland with scattered *Pseudotsuga menziesii* in the tree canopy because *Populus balsamifera* is not reproducing. The Grand Teton stand has 3% cover of *Populus balsamifera* seedlings in the shrub layer as well as many others.
Global Classification Comments: In the concept for this association, stands containing both *Populus balsamifera ssp. trichocarpa* and *Populus tremuloides* are defined as belonging to a *Populus balsamifera ssp. trichocarpa* alliance, rather than the ~*Populus tremuloides* Forest Alliance (A.274)$$. This is because *Populus balsamifera ssp. trichocarpa* generally has a narrower ecological amplitude and better serves as a diagnostic species. More than half of the identified stands in Glacier National Park have less than 60% tree canopy cover, which means that a significant portion of this association qualifies physiognomically as woodland, rather than as forest as currently classified. There are strongly discordant criteria as to how much *Cornus sericea* cover should be represented (ranging from 1-25%) for a stand to be considered a member of this association, however, if *Cornus* is the dominant, or at least the most abundant of all shrubs present, it would fall into this type.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs near Arizona Creek.
Global Range: This association has been documented from Washington south to northern California and eastward to Idaho, Montana and Wyoming. It also occurs north along the Front Range of Montana into southern Alberta, Canada.
Nations: CA, US
States/Provinces: AB, CA:S1?, ID:S3, MT:S3?, OR:S2, WA:S2?, WY
TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 68:P
TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO9:C, ECO68:P, ECO4:C added (MSR 2-04).
USFS Ecoregions: 342B:CC, 342C:CC, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C043
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.V. Cooper, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Caicco 1988	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Evans 1989a	.	X	X	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	X	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kovalchik 1987	.	X	X	X	X	.	.	.	.

Kovalchik 1993	.	X	X	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Walford et al. 2001	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-086] *Populus balsamifera (ssp. trichocarpa, ssp. balsamifera) / Prunus virginiana* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: Two sampled stands for this association occur on flat terrain in a channel or on a terrace at elevations of 6500 and 6600 feet. The other sampled stand occurs on a southwest-facing backslope with a gradient of 55% at an elevation of 7100 feet. The stand on the slope has numerous large boulders and a fair amount of cobble. Adjacent vegetation may include *Acer glabrum* and/or *Populus tremuloides* regeneration.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane cottonwood woodland that occurs on mesic sites. *Populus balsamifera* is the dominant tree species in both the tree canopy and subcanopy. *Populus tremuloides* may be co-dominant in both tree strata. Seedlings of *P. balsamifera, P. angustifolia,* and *P. tremuloides* may exist with up to 12% cover. The shrub layer is diverse for all sampled stands. *Prunus virginiana* (averaging 7% cover), *Amelanchier alnifolia* (averaging 2% cover), and *Mahonia repens* (averaging 5% cover) occur in each stand. Other high constancy shrubs include *Symphoricarpos oreophilus* (averaging 2% cover) and *Ribes* spp. Overall the herbaceous layer is sparse with no species contributing more than 3% cover, except in one stand where *Bromus inermis* contributes 20% cover. The only herbaceous species or genera to occur in more than one stand are *Elymus* spp. and *Agastache urticifolia*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
CANOPY	*Populus balsamifera*
SUBCANOPY	*Populus balsamifera, Populus tremuloides*
SHORT SHRUB	*Prunus virginiana*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Populus angustifolia, Populus balsamifera, Populus tremuloides, Amelanchier alnifolia, Mahonia repens, Prunus virginiana, Ribes spp., *Symphoricarpos oreophilus, Elymus* spp., *Agastache urticifolia*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near Moose, near Cottonwood Creek, and in Death Canyon below the cabin.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J152, 04X058, 04X627
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-086
Local Author: Mark Fain
Date: 05 November 2004
Local Editor: Klara Varga
Date: 17 December 2004

Global Author:

REFERENCES: None

[CEGL000675] *Populus balsamifera* ssp. *trichocarpa* / Mixed Herbs Forest

Translated Name: **Black Cottonwood / Mixed Herbs Forest**
Common Name: **Balsam Poplar / Grass - Forb**
Ecological System(s):
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)
- Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This cold-deciduous riparian forest occurs in lower mountains and foothills at 610 to 2013 m (2000-6591 feet) elevation, on alluvial terraces and floodplains of major and minor rivers and streams. Soils are poorly developed, loamy to cobbly Entisols. It is thought to be a grazing-induced type; the trees are mature and the herbaceous layer predominantly dominated by non-native graminoid species. The canopy cover is *Populus balsamifera ssp. trichocarpa (= Populus trichocarpa)* with 30-60% cover. There are very few shrubs and, if present, do not form a stratum layer. The herbaceous layer is dominated by either non-native graminoids or increaser species such as *Phleum pratense*, *Poa pratensis*, *Bromus vulgaris*, and *Elymus glaucus*. Forbs are in low abundance and are also dominated by increaser species.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on level terrain in channels or on the valley floor at elevations between 6871 and 7200 feet, except two that occur on southeast-facing slopes of 20 and 25% that divide two terraces on the valley floor. Soil data are available for two stands; the soils of the stands are loamy sands and moderately well-drained sandy loams. The latter soil type is covered predominantly by litter and duff, though wood and sand are present in small quantities. Ground cover of rocks and cobbles noted for half the stands. Adjacent to one stand is a *Betula glandulosa* shrubland, scattered *Populus tremuloides*, and mixed coniferous/deciduous forest. Other adjacent communities include *Artemisia* spp., *Purshia tridentata*, and various willows. Many stands show evidence of ungulate use and a fair amount of dead and down wood. One stand lies below an avalanche chute.

Global Environment: This cold-deciduous riparian forest is common in low mountains and foothills. It occurs from 610 to 2013 m (2000-6591 feet) elevation on alluvial terraces and floodplains of major and minor rivers and streams. Soils are poorly developed, loamy to cobbly Entisols. It is thought to be a grazing-induced type; the trees are mature and the herbaceous layer predominantly dominated by non-native graminoid species.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous forested community that occurs in mesic areas. *Populus balsamifera* is the dominant tree species present, composing 7 to 60% cover in the tree canopy or subcanopy. *Populus angustifolia* and *Populus tremuloides* occur in half the stands in either the canopy or subcanopy. Seedlings of all the aforementioned species plus *Abies lasiocarpa* may occur. The shrub layers are not well developed; *Symphoricarpos oreophilus* (trace to 3% cover) is the only species to occur in the majority of the stands. The herbaceous layer is diverse with total cover ranging from 3% to 60%. Graminoids present in half the stands are *Poa pratensis, Elymus glaucus,* and *Bromus carinatus*. Forbs within the herbaceous layer are more diverse and abundant than graminoids; the most constant species include *Thalictrum* sp., *Rudbeckia occidentalis, Geranium viscosissimum,* and *Achillea millefolium.*

Global Vegetation: This association is thought to be a grazing-induced type. The trees are mature and the herbaceous layer is predominantly dominated by non-native graminoid species. The canopy cover is *Populus balsamifera ssp. trichocarpa (= Populus trichocarpa)* with 30-60% cover. *Populus angustifolia* and *Pinus ponderosa* may also be present in low amounts. There are very few shrubs and, if present, do not form a stratum layer. Scattered shrub species include *Ribes inerme, Lonicera involucrata, Cornus sericea, Rosa woodsii,* and *Rubus idaeus*. The herbaceous layer is dominated by either non-native graminoids or increaser species such as *Phleum pratense, Poa pratensis, Bromus vulgaris*, and Elymus glaucus. Forbs present include *Tanacetum vulgare, Centaurea biebersteinii (= Centaurea maculosa), Urtica dioica, Thalictrum, Aconitum columbianum, Angelica arguta, Fragaria virginiana, Galium boreale, Geranium viscosissimum, Rudbeckia occidentalis,* and *Achillea millefolium*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	.	X	.
Populus balsamifera	Tree canopy	Broad-leaved deciduous tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	X	X	.
Bromus carinatus	Herb (field)	Graminoid	.	.	.
Elymus glaucus	Herb (field)	Graminoid	.	.	.
Poa pratensis	Herb (field)	Graminoid	.	.	.

Grand Teton National Park Higher Taxa

Thalictrum sp.	dominant and characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus balsamifera ssp. *trichocarpa*	Tree canopy	Broad-leaved deciduous tree	X	X	.
Urtica dioica	Herb (field)	Forb	X	.	.
Bromus vulgaris	Herb (field)	Graminoid	X	.	.
Phleum pratense	Herb (field)	Graminoid	X	.	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carduus nutans	-	P	exotic
Cynoglossum officinale	-	P	exotic
Silene latifolia	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Bromus tectorum	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus trichocarpa* / Grass-Forb Habitat Type (Blackburn et al. 1968a) =
- *Populus trichocarpa* / Herbaceous Community Type (Hansen et al. 1995) =
- *Populus trichocarpa*/Grass-Forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.d. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Hansen et al. (1995) mention a similar type described by Kovalchik (1987), who mentions one stand of three of *Populus trichocarpa / Symphoricarpos albus / Poa pratensis* that had no shrubs present (p.136). Hansen et al. also cite a similar community as described from central Idaho by Tuhy and Jenson (1982), but only a reference to *Populus trichocarpa* communities with shrubby understories (*Alnus incana*, *Cornus sericea*, and *Salix exigua* on p.119) could be found.

Global Classification Comments: Hansen et al. (1995) mention a similar type described by Kovalchik (1987), who mentions one stand of three of *Populus trichocarpa / Symphoricarpos albus / Poa pratensis* that had no shrubs present (p.136). Hansen et al. also cite a similar community as described from central Idaho by Tuhy and Jensen (1982), but only a reference to *Populus trichocarpa* communities with shrubby understories (*Alnus incana*, *Cornus sericea*, and *Salix exigua* on p.119) could be found.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur near the Colter Bay Corral, three are adjacent to Cottonwood Creek, one occurs on the valley floor at the mouth of Leigh Canyon, one occurs east of Colter Bay, and two occur east of timbered island.

Global Range: This association is reported from Montana, Nevada, and Wyoming.
Nations: US
States/Provinces: MT, NV:S3?, WY
TNC Ecoregions: 6:C, 9:C, 11:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: 341:?, 342B:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: .

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur near the Colter Bay Corral, three are adjacent to Cottonwood Creek, one occurs on the valley floor at the mouth of Leigh Canyon, one occurs east of Colter Bay, and two occur east of timbered island.

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Blackburn et al. 1968a	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	.	.	.	.	.	.
Kovalchik 1987	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Tuhy and Jensen 1982	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.300 *Populus tremuloides* Temporarily Flooded Forest Alliance

Quaking Aspen Temporarily Flooded Forest Alliance

ALLIANCE CONCEPT

Summary: This alliance contains a number of communities found from the Great Lakes to the western and southwestern United States. Most stands of this alliance are found in riparian zones. Some may be near lakes where the ground is flooded or saturated for a short time in the spring. The moderate to closed tree canopy is dominated by *Populus tremuloides*, sometimes with *Populus balsamifera* codominant. More open stands have a prominent shrub layer containing species such as *Alnus incana, Cornus sericea*, and *Salix* spp. The sole reference cited for the ~*Populus tremuloides* Canyon Formation Forest (CEGL000576)$$ does not mention *Populus tremuloides*.

Environment: Forests included in this alliance occur extensively in the western U.S., northern Great Plains and extend into the western Great Lakes area. Elevations range from 600 to 3230 m. Climate is temperate with a relatively long growing season, typically cold winters and often deep snow. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm, except in semi-arid environments. Most of these temporarily flooded stands are found in riparian zones. Some may occur near lakes where the ground is flooded or saturated for a short time in the spring or on upland slopes below seepage areas. Distribution of these forests is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable. Sites are typically gently sloping but also include steep slopes near upland seeps. Aspect varies according to the limiting factors. Stands at high elevations or northern latitudes are restricted by cold temperatures and found on warmer southern aspects. At lower elevations and southern latitudes stands are restricted by lack of moisture and are found on cooler northern aspects and mesic microsites. The soils are typically deep and well-developed with rock often absent from the soil. Soils are typically mesic or hydric, poorly drained, and fine-textured, consisting of silts and clays, often with an organic surface layer. Many are gleyed and would be classified as wetland soils. However, some of the alluvial soils are coarser so soil texture ranges from clay to sandy loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but these forests appear to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: Vegetation included in this widespread forest alliance occurs in temporarily flooded sites in the western U.S. to the western Great Lakes area. Stands a have a somewhat closed to closed canopy of trees to 5-20 m tall, that is dominated or codominated by the cold-deciduous broad-leaved tree *Populus tremuloides*. Other broad-leaved trees, such as *Populus balsamifera ssp. trichocarpa, Populus balsamifera ssp. balsamifera, Quercus macrocarpa*, and *Betula papyrifera* may be present to codominant depending on geography and topography. Several species of conifer trees may also be present in the tree canopy. Conifers include *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 25% of the tree canopy before the stand is reclassified as a mixed stand.

Because of the open growth form of *Populus tremuloides* enough light can penetrate for lush understory development depending on available soil moisture and other factors. The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer.

In the western U.S. common tree associates include *Populus balsamifera ssp. trichocarpa* in the northern Rocky Mountains (Cooper and Heidel 1997). One or more of the conifer trees listed above are often scattered in the canopy or understory of stands occurring in the montane and subalpine zones. If present the tall-shrub layer may be dominated by *Quercus gambelii, Amelanchier alnifolia, Alnus incana, Betula occidentalis, Betula nana, Prunus virginiana* or *Salix* species such as *Salix bebbiana, Salix drummondiana, Salix monticola* or many others. Common short shrubs include *Cornus sericea, Ribes montigenum, Rosa woodsii, Symphoricarpos albus*, and *Symphoricarpos oreophilus*. The dwarf-shrubs *Mahonia repens* and *Vaccinium myrtillus* are common. The herbaceous layer may be lush and diverse, dominated by graminoids or tall forbs. Other common graminoids may include *Bromus ciliatus, Bromus carinatus, Calamagrostis canadensis, Carex siccata (= Carex foenea), Carex hoodii, Elymus glaucus, Elymus trachycaulus*, and *Festuca thurberi*. Forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium X occidentale, Equisetum arvense, Fragaria virginiana, Geranium richardsonii, Ligusticum porteri, Maianthemum stellatum, Mertensia arizonica*,

Osmorhiza occidentalis, Senecio bigelovii var. bigelovii, Thalictrum occidentale, Veratrum californicum and many others. Exotic grasses such as the perennial *Poa pratensis* and the annual *Bromus tectorum* are often common in stands disturbed by grazing.

In the northern Great Plains and western Great Lakes areas, these stands have a moderate to closed tree canopy that is dominated by *Populus tremuloides* with *Populus balsamifera* codominant. More open stands have a prominent shrub layer containing species such as *Alnus incana, Cornus sericea*, and *Salix* spp. Little information was available for stands in the northern Great Plains and midwestern U.S.

Dynamics: Stands in this alliance often originate and likely are maintained by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man and beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires. They can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1994). Stands are favored by fire in the conifer zone (Mueggler 1988). The stems are relatively short-lived (100-150 years) and individual stands will be succeed to longer-lived conifer forest if undisturbed. With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because the long warm, moist conditions required to establish are rare in the habitats where it occurs.

Similar Alliances:

- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Quercus gambelii* Shrubland Alliance (A.920)
- *Veratrum californicum* Temporarily Flooded Herbaceous Alliance (A.1663)

Similar Alliance Comments: There are currently 18 alliances with *Populus tremuloides* as a dominant or codominant species. Many of the stands in these alliances are floristically similar. One of the alliances is a wooded herbaceous, one is a shrubland and one is a woodland. Of the 15 remaining forest alliances, three are separated by temporarily or seasonally flooded hydrologic regimes. Most of the alliances are mixed stands with *Populus tremuloides* codominant with other broadleaf or conifer tree species.

ALLIANCE DISTRIBUTION

Range: Forests included in this alliance have been described from across the western and southwestern U.S., northern Great Plains, and extend into the western Great Lakes area from California to Michigan. Its northern extent is in Canada in Saskatchewan, Manitoba, and Ontario.

Nations: CA, US

Subnations: AB, CA, CO, ID, MB, ME, MI, MN, MT, NB, ND, NH?, NM, NV, ON, OR, QC, SK, UT, VT?, WA, WI

TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 11:C, 12:C, 18:C, 19:C, 20:C, 24:C, 27:C, 34:C, 35:C, 47:P, 48:C, 63:C, 68:C

USFS Ecoregions: 212Ib:CCC, 212Ja:CPP, 212La:CCC, 212Mb:CPP, 212Na:CP?, 212Nb:CPP, 212Nc:CP?, 222Na:CCC, 251Aa:CCC, 321A:CC, 331I:CC, 341B:CC, 341E:CC, 342B:CC, 342C:C?, 342H:CP, 342I:CP, M242C:CC, M261E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:C?, M332B:CC, M332C:CC, M332D:C?, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M341A:CC, M341C:CC

Federal Lands: NPS (Colorado, Curecanti, Glacier, Isle Royale, Rocky Mountain, Voyageurs, Yosemite, Zion); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Gunnison, Pike-San Isabel, San Juan, Uncompahgre, White River NF)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Chappell et al. 1997, Cooper and Heidel 1997, Cooper and Pfister 1981, Evans 1989a, Evenden 1990, Eyre 1980, Faber-Langendoen et al. 1996, Freeman and Dick-Peddie 1970, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, Hoffman and Alexander 1980, Holland 1986b, Johnston and Hendzel 1985, Kagan 1985, Kettler and McMullen 1996, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1997a, Kittel et al. 1999b, Klimas 1988a, Knight 1994, Kovalchik 1987, Manning and Padgett 1991, Manning and Padgett 1995, Mueggler 1988, Mueggler and Campbell 1986, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Powell 1988a, Richard et al. 1996, Sawyer and Keeler-Wolf 1995, Smith 1994b, Van Auken and Bush 1988, WANHP unpubl. data, Watson 1912

[CEGL005829] *Populus tremuloides / Phleum pratense* Semi-natural Forest

Translated Name: **Quaking Aspen/ Timothy Semi-natural Forest**

Common Name:

Ecological System(s):

Status: Standard **Circumscription Confidence:**

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is known only from Rocky Mountain National Park where it occurs within the elevational range of 2400-2810 m (7870-9220 feet) on flat to moderate (0-25%), variably facing basin floors, bottomlands, mountain valleys, and floodplains. Soil is composed of granitic material, and the texture can vary from sandy loam, loamy sand, sandy clay or loam. The canopy of this association ranges from 5-20 m in height and can cover 30-90% of the stand. It is composed solely of *Populus tremuloides*. Other trees such as *Juniperus scopulorum, Abies lasiocarpa var. lasiocarpa, Picea engelmannii*, and *Pinus ponderosa*

var. scopulorum may exist beneath the deciduous canopy. There is typically not a distinct shrub layer; however, some shrubs may exist sparsely. The more common ones include *Rosa woodsii, Juniperus communis var. montana*, and *Ribes inerme*. The herbaceous layer, however, is plentiful and may cover 40-90% of the stand. It is dominated by the omnipresent *Phleum pratense* (10-40%) or codominated with *Thermopsis divaricarpa* (10-50%). Typically, alien species also may occur, especially *Poa pratensis, Agrostis gigantea*, and *Taraxacum officinale*. GRTE information not incorporated into Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevation of 6800 to 6900 feet. Disturbance common to all stands include proximity to roads, a high amount of non-natives, and encroachment of adjacent *Pinus contorta* forests. Common to two stands is a power-line corridor and no regeneration of *Populus tremuloides.* Adjacent vegetation may include *Pinus contorta* forests, *Salix* spp. shrublands, and/or mixed conifer forests.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane aspen community that occurs on mesic sites. *Populus tremuloides* dominates with 12 to 20% cover in either the tree canopy or subcanopy. *Pinus contorta* occurs in all stands in trace amounts. Regeneration of *Populus tremuloides* is only occurring in one stand. The shrub layer is generally not well developed, although *Dasiphora floribunda* contributes 7% cover to one stand. The herbaceous layer contributes 60 to 70% total cover and is dominated by non-native grasses. *Phleum pratense* (30 to 40% cover) occurs in all stands, with *Poa pratensis* (trace and 3% cover) occurring in two of three stands, and *Bromus inermis* contributing 12% cover to one stand. Forbs occurring in all stands include *Achillea millefolium* and *Cirsium arvense*. Species occurring in two of three stands include *Rudbeckia occidentalis, Eucephalus engelmannii, Geranium viscosissimum,* and *Lupinus argenteus*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Populus tremuloides*
GRAMINOID	*Phleum pratense*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Pinus contorta, Populus tremuloides, Phleum pratense, Poa pratensis, Achillea millefolium, Cirsium arvense, Eucephalus engelmannii, Geranium viscosissimum, Lupinus argenteus, Rudbeckia occidentalis

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Phleum pratense, Poa pratensis, Cirsium arvense, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides / Poa pratensis* Forest association, but is differentiated due to the dominance of *Phleum pratense* instead of *Poa pratensis*.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur along the north road into Triangle X Ranch and along Arizona Creek.

Global Range:
Nations: US
States/Provinces: CO
TNC Ecoregions: 20:C
TNC Ecoregion Comments:
USFS Ecoregions: M331I:CC
Federal Lands: NPS (Rocky Mountain)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04X511, 04X512, 04X616
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** CEGL005829
Local Author: Mark Fain
Date: 09 November 2004
Local Editor: Klara Varga
Date: 17 December 2004

Global Author:

REFERENCES: None

ELEMENT SOURCES

Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

I.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous forest

A.422 *Abies lasiocarpa - Populus tremuloides* Forest Alliance

Subalpine Fir - Quaking Aspen Forest Alliance

ALLIANCE CONCEPT

Summary: Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the Rocky Mountains from Alberta, Canada, to Colorado, west into Utah. Stands occur on gentle to steep slopes on all aspects but are most common on cooler and more mesic, north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials. The mixed coniferous and deciduous tree canopy is open to moderately closed and is dominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*. Several other species of conifers may be scattered within the stands, including *Pseudotsuga menziesii*, *Abies concolor*, *Picea pungens*, *Pinus contorta*, and *Pinus flexilis*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* or *Picea engelmannii* mixed in. As the stands age in this typically seral forest association, *Populus tremuloides* is slowly reduced until conifers become dominant. Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is typically composed of a short-shrub layer, often dominated by *Juniperus communis*, *Shepherdia canadensis*, or *Symphoricarpos oreophilus*. Other shrubs may include *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, and *Rosa woodsii*. If present, the tall-shrub layer often consists of scattered

Amelanchier alnifolia, Acer grandidentatum, and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Carex rossii, Pedicularis racemosa*, or *Thalictrum fendleri*. Diagnostic of these seral forests is the open to moderately closed, mixed coniferous and deciduous tree canopy codominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*.

Environment: Stands included in this mixed evergreen-deciduous forest alliance have been described from mountain slopes and plateaus in the Rocky Mountains from Alberta, Canada, to Colorado, west into Utah. Elevations range from 1700 to 3000 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Sites occur on gentle to steep slopes on all aspects but are most common on north and east aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials. Adjacent stands above these forests are typically mixed conifer forests dominated by *Abies lasiocarpa* and *Picea engelmannii*. Stands below may include grasslands, shrublands or pure *Populus tremuloides* forests.

Vegetation: Seral forests are included in this Rocky Mountain alliance. The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees and is codominated by *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii*. Several other species of conifers may be scattered within the stands, including *Pseudotsuga menziesii, Abies concolor, Picea pungens, Pinus contorta*, and *Pinus flexilis*. Younger stands typically have dense *Populus tremuloides*, with *Abies lasiocarpa* or *Picea engelmannii* mixed in. As the stands age in this typically seral forest association, *Populus tremuloides* is slowly reduced until conifers become dominant (Mueggler 1988). Mixed stands must have at least 25% relative tree cover of both aspen (deciduous) and conifers. The understory is typically moderately dense to sparse and becomes sparser as *Abies lasiocarpa* or *Picea engelmannii* become more dominant. The understory is typically dominated by a short-shrub layer, with sparse tall-shrub and herbaceous layers. The short-shrub layer is often dominated by *Juniperus communis, Shepherdia canadensis*, or *Symphoricarpos oreophilus*. Other shrubs may include *Mahonia repens, Paxistima myrsinites, Physocarpus malvaceus*, and *Rosa woodsii*. If present, the tall-shrub layer often consists of scattered *Amelanchier alnifolia, Acer grandidentatum*, and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Carex rossii, Pedicularis racemosa*, or *Thalictrum fendleri*. Other common graminoids include *Bromus ciliatus, Elymus glaucus, Elymus trachycaulus*, and *Achnatherum occidentale (= Stipa occidentalis)*. Forbs, such as *Achillea millefolium, Arnica cordifolia, Eucephalus engelmannii (= Aster engelmannii), Chamerion angustifolium (= Epilobium angustifolium), Fragaria vesca, Geranium* spp., *Lathyrus* spp., *Lupinus* spp., *Osmorhiza berteroi (= Osmorhiza chilensis), Senecio serra*, and *Pseudostellaria jamesiana (= Stellaria jamesiana)*, are common. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands (Mueggler 1988). Annuals are typically uncommon.

Dynamics: Stems of *Populus tremuloides* are thin-barked and readily killed by fire. It is a fire-adapted species that generally needs fire or some other stand-replacing disturbance to establish and maintain dominance in a forest. These mixed forests are seral and in the absence of disturbance will slowly convert to late-successional forests dominated by *Abies lasiocarpa* or *Picea engelmannii* (Mueggler 1988). Most of the stands sampled by Mueggler (1988) have had a history of livestock grazing as evidenced by relative abundance of the exotic plants *Taraxacum officinale* and *Poa pratensis* and the scarcity of grazing-susceptible plants (Mueggler 1988).

Similar Alliances:
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Populus tremuloides* Forest Alliance (A.274)

Similar Alliance Comments: The coniferous similar alliances are included because disturbed stands may have significant cover of *Populus tremuloides*; however, conifers are always dominant. There are currently 18 alliances with *Populus tremuloides* as a dominant or codominant species. Many of the stands in these alliances are floristically similar. One of these alliances is a wooded herbaceous, one is a shrubland and one is a woodland. Of the 15 remaining forest alliances, three are separated by temporarily or seasonally flooded hydrologic regimes. Most of the alliances are mixed stands with *Populus tremuloides* codominant with other broad-leaved or coniferous tree species.

ALLIANCE DISTRIBUTION

Range: Forests included in this alliance are scattered in the mountains and plateaus of Utah, Wyoming, Colorado, Montana, and Idaho, and may occur elsewhere in the western U.S. where both *Populus tremuloides* and *Abies lasiocarpa* or *Picea engelmannii* are common. It is also known from Alberta, Canada.

Nations: CA, US

Subnations: AB, CO, ID, MT, UT, WY

TNC Ecoregions: 6:C, 7:C, 9:C, 10:C, 11:C, 19:C, 20:C

USFS Ecoregions: 341:C, M331D:CC, M331E:CC, M331J:CC, M332C:CC, M341A:CC, M341C:CC

Federal Lands: BIA (Blackfeet); NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); PC (Waterton Lakes); USFS (Bridger-Teton, Dixie, Fishlake)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Eyre 1980, Mauk and Henderson 1984, Mueggler 1988, Mueggler and Campbell 1986, Youngblood and Mueggler 1981

[CEGL000525] *Populus tremuloides - Abies lasiocarpa / Carex geyeri - Calamagrostis rubescens* Forest

Translated Name: **Quaking Aspen - Subalpine Fir / Geyer's Sedge - Pinegrass Forest**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Mueggler (1988)

ELEMENT CONCEPT

Global Summary: This is a widely distributed forest association from Idaho and Wyoming to southern Utah. It is documented to occur between 1800 and 3000 m (6000-10,000 feet) elevation. This type occurs on gentle and moderately steep slopes and on igneous- and sedimentary-derived soils. In one stand soils are described as poorly drained silt loam with high organic matter. The prominence of either *Carex geyeri* or *Calamagrostis rubescens* in the herbaceous layer and the lack of a distinct shrub layer characterize the undergrowth of this type. The tree layer is a variable mixture of *Populus tremuloides* and either *Abies lasiocarpa* or *Picea engelmannii* or both. Other conifers may be present, including *Pseudotsuga menziesii* and *Pinus contorta*. Shrubs can occur within the type; no single characterizing species is prominent. Common shrub species present can be *Symphoricarpos oreophilus, Lonicera utahensis, Rosa woodsii*, and *Mahonia repens*. Additional herbaceous species include *Elymus glaucus, Bromus ciliatus, Thalictrum fendleri, Achillea millefolium, Osmorhiza berteroi (= Osmorhiza chilensis), Taraxacum officinale, Arnica cordifolia, Astragalus miser, Fragaria virginiana, Galium boreale, Geranium viscosissimum*, and *Lathyrus* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The single sampled stand of this association occurs on a flat interfluve at an elevation of 2112 m (6929 feet). The soil is a poorly drained silt loam that contains a lot of organic matter. There is an abundance of downed woody material greater than 7.6 cm (3 inches) in diameter.
Global Environment: This is a widely distributed forest association from Idaho and Wyoming to southern Utah. It is documented to occur between 1800 and 3000 m (6000-10,000 feet) elevation. This type occurs on gentle and moderately steep slopes and on igneous- and sedimentary-derived soils. In one stand soils are described as poorly drained silt loam with high organic matter.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs on mesic sites. *Abies lasiocarpa* (30% cover), *Picea engelmannii* (3% cover), *Pinus contorta* (10% cover), and *Populus tremuloides* (20% cover) make up the tree canopy. *Lonicera utahensis* (3% cover) is the only common short shrub. *Abies lasiocarpa* seedlings (3% cover) occur in the dwarf-shrub layer. *Calamagrostis rubescens* is the only abundant graminoid with 30% cover. Common graminoids with 3% cover include *Carex geyeri* and *Elymus glaucus*. *Arnica cordifolia* (10% cover) is the only well-represented forb. Common forbs each with 3% cover include *Fragaria virginiana, Galium boreale, Geranium viscosissimum*, and *Thalictrum* sp. A variety of forbs and a few graminoids occur in trace quantities.
Global Vegetation: The prominence of either *Carex geyeri* or *Calamagrostis rubescens* in the herbaceous layer and the lack of a distinct shrub layer characterize the undergrowth of this type. The tree layer is a variable mixture of *Populus tremuloides* and either *Abies lasiocarpa* or *Picea engelmannii* or both. Other conifers may be present, including *Pseudotsuga menziesii* and *Pinus contorta*. Shrubs can occur within the type; no single characterizing species is prominent. Common shrub species present can be *Symphoricarpos oreophilus, Lonicera utahensis, Rosa woodsii*, and *Mahonia repens*. Additional herbaceous species include *Elymus glaucus, Bromus ciliatus, Thalictrum fendleri, Achillea millefolium, Osmorhiza berteroi (= Osmorhiza chilensis), Taraxacum officinale, Arnica cordifolia, Astragalus miser, Fragaria virginiana, Galium boreale, Geranium viscosissimum*, and *Lathyrus* spp.
Global Dynamics: This type is considered seral and will become dominated by *Abies lasiocarpa* with *Picea engelmannii*. In the southern part of the range it is considered part of the *Abies lasiocarpa / Carex geyeri* Habitat Type, and in the northern part of its range, part of the *Abies lasiocarpa / Calamagrostis rubescens* Habitat Type. Grazing will degrade the site and increase *Taraxacum officinale, Astragalus miser*, and *Achillea millefolium* (Mueggler 1988). Periodic fire will maintain this type as a mixed deciduous-conifer forest.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Arnica cordifolia	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.

Geranium viscosissimum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Thalictrum sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	X
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus tremuloides - Abies lasiocarpa / Carex geyeri* Community Type (Mueggler 1988) =
- *Populus tremuloides-Abies lasiocarpa/Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs south of Mount Reid.
Global Range: This forest association occurs from Idaho and Wyoming to southern Utah.
Nations: US
States/Provinces: ID:S2S3, UT:S3?, WY:S3?
TNC Ecoregions: 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201052
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.

Mueggler 1988*	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL000533] *Populus tremuloides - Abies lasiocarpa* / Tall Forbs Forest

Translated Name: **Quaking Aspen - Subalpine Fir / Tall Forbs Forest**
Common Name: **Quaking Aspen - Subalpine Fir / Tall Forbs**
Ecological System(s):
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a common aspen forest association in western Wyoming, and it also occurs in Utah and Idaho. It occurs from 2015 to 3110 m (6600-10,200 feet) in elevation. It often occurs on northerly or easterly exposures on moderately steep slopes. Soils were often derived from sandstone or limestone parent materials, but it is not restricted to those substrates. The upper canopy is dominated by *Populus tremuloides*, with a significant amount of conifers present, generally at least 10% cover, commonly *Abies lasiocarpa*, but *Pinus contorta* and *Picea engelmannii* can be present as well. There is no defined shrub layer, although shrub species are often present, such as *Amelanchier alnifolia, Symphoricarpos oreophilus*, and *Ribes montigenum*. The herbaceous layer is abundant and rich. Commonly encountered tall forbs include *Rudbeckia occidentalis, Eucephalus engelmannii (= Aster engelmannii), Valeriana occidentalis, Delphinium X occidentale, Heracleum maximum*, and *Osmorhiza occidentalis*. There are often many low-stature forbs as well, including *Thalictrum fendleri, Geranium* spp., *Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Pseudostellaria jamesiana (= Stellaria jamesiana)*. This type is distinguished from similar aspen forests by the combination of conifers with aspen in the overstory, the lack of a distinct shrub layer (tall or dwarf), and abundant tall forbs.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on an east-facing, shallow or moderate toeslopes at elevations of 6926 and 7200 feet. One stand has loam soils. One stand shows evidence of recent fire and ungulate browsing. Adjacent vegetation to one stand includes a *Pinus contorta – Abies lasiocarpa* forest.

Global Environment: It occurs from 2000 to 3100 m (6600-10,200 feet) in elevation. It often occurs on northerly or easterly exposures on moderately steep slopes. Soils were often derived from sandstone or limestone parent materials, but it is not restricted to those substrates. Soils textures are often loams.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Populus tremuloides* (20 to 60% cover) and *Abies lasiocarpa* (7 to 10% cover) are the dominant tree canopy or subcanopy species. *Pinus contorta* occurs as an incidental species in one stand. Seedlings of *P. tremuloides* occur with trace to 3% cover in both stands and *A. lasiocarpa* seedlings contribute 7% cover to one stand. No shrubs are present in both stands and none contribute more than 3% cover. *Elymus glaucus* is the only graminoid to occur in both sampled stands; *Calamagrostis rubescens* and *Carex geyeri* contribute 20% cover to one stand each. Forbs are extremely diverse with *Heracleum maximum* (1 and 20% cover), *Ligusticum filicinum* (3 to 7% cover), *Eucephalus engelmannii* (3% cover), *Geranium viscosissimum* (3% cover), and *Perideridia gairdneri* (1% cover) occurring in all stands. Forbs with 10% cover in one stand include *Geranium richardsonii, Lupinus argenteus*, and *Rudbeckia occidentalis.* Numerous other forbs occur in one stand with 3% cover.

Global Vegetation: The upper canopy is dominated by *Populus tremuloides*, with a significant amount of conifers present, generally at least 10% cover, commonly *Abies lasiocarpa*, but *Pinus contorta* and *Picea engelmannii* can be present as well. There is no defined shrub layer, although shrub species are often present, such as *Amelanchier alnifolia, Symphoricarpos oreophilus*, and *Ribes montigenum*. The herbaceous layer is abundant and rich. Commonly encountered tall forbs include *Rudbeckia occidentalis, Eucephalus engelmannii (= Aster engelmannii), Valeriana occidentalis, Delphinium X occidentale, Heracleum maximum*, and *Osmorhiza occidentalis*. There are often many low-stature forbs as well, including *Thalictrum fendleri, Geranium* spp., *Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Pseudostellaria jamesiana (= Stellaria jamesiana)*. Graminoids are also commonly present and abundant and include *Calamagrostis rubescens, Bromus carinatus, Elymus glaucus, Elymus trachycaulus (= Agropyron trachycaulum)*, and *Poa nervosa*. This type is distinguished from similar aspen forests by the combination of conifers with aspen in the overstory, the lack of a distinct shrub layer (tall or dwarf), and abundant tall forbs.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.

Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Geranium richardsonii	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Perideridia gairdneri	Herb (field)	Forb	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Delphinium x *occidentale*	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	.	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus tremuloides-Abies lasiocarpa*/Tall forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association is similar to the *Populus tremuloides*/Tall forbs and the *Populus tremuloides/Symphoricarpos oreophilus*/Tall Forbs associations, but differs due to the co-dominance of *Abies lasiocarpa* and because *S. oreophilus* is either absent or not a dominant species within these stands.

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur east of Steamboat Mountain in the John D. Rockefeller, Jr. Memorial Parkway and on the west side of Jackson Lake across from Leeks Marina.

Global Range: This association is known from western Wyoming, Utah and Idaho.
Nations: US
States/Provinces: ID, UT:S5, WY:S3?
TNC Ecoregions: 6:?, 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331J:CC
Federal Lands: NPS (Grand Teton, Rockefeller)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202065
Accuracy Assessment Points: 04S033
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga

Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.424 *Pinus contorta - Populus tremuloides* Forest Alliance

Lodgepole Pine - Quaking Aspen Forest Alliance

ALLIANCE CONCEPT

Summary: This mixed evergreen-deciduous forest alliance has been described on mountain slopes and plateaus in Utah. Sites occur on gentle to steep slopes on all aspects. Soils are derived from alluvium and colluvium. Seral forests included in this alliance are characterized by an open to moderately closed, mixed evergreen-deciduous tree canopy that is codominated by *Populus tremuloides* and *Pinus contorta*. Several other species of conifers may be scattered within the stands, including *Pseudotsuga menziesii, Abies lasiocarpa, Picea engelmannii, Picea pungens,* and *Pinus flexilis*. Younger stands typically have dense *Populus tremuloides* with *Pinus contorta* mixed in. As stands age, *Populus tremuloides* cover is slowly reduced until *Pinus contorta* becomes dominant. The understory is moderately dense to sparse and becomes sparser as *Pinus contorta* becomes more dominant. The short-shrub layer is often dominated by *Juniperus communis* or *Symphoricarpos oreophilus*. Other shrubs may include *Arctostaphylos uva-ursi, Artemisia tridentata, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Shepherdia canadensis,* and *Symphoricarpos albus*. Scattered tall shrubs *Amelanchier alnifolia* and *Prunus virginiana* may be present. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Calamagrostis rubescens, Carex geyeri, Lathyrus lanszwertii,* or *Thalictrum fendleri*. Other common graminoids include *Bromus carinatus, Carex rossii, Elymus glaucus, Elymus trachycaulus,* and *Achnatherum occidentale (= Stipa occidentalis).* Forbs, such as *Achillea millefolium, Arnica cordifolia, Balsamorhiza* spp., *Fragaria vesca, Geranium* spp., *Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis),* and *Potentilla* spp., may be present. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands. Diagnostic of this forest alliance is the codominance of *Pinus contorta* and *Populus tremuloides* in the tree canopy.

Environment: Stands included in this mixed evergreen-deciduous forest alliance have been described on mountain slopes and plateaus in Utah. Elevations range above 1700-3000 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Sites occur on gentle to steep, slopes on all aspects. Soils are derived from alluvium and colluvium from sedimentary, metamorphic and igneous parent materials. However, stands are found mainly on sandstone and quartzite. Adjacent stands above these mixed forests are typically pure *Pinus contorta* or mixed conifer forests. Stands below may include grasslands, shrublands or pure *Populus tremuloides* forests.

Vegetation: Seral forests are included in this alliance. They occur on mountain slopes and plateaus in Utah, Wyoming, and Idaho. The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees, and is codominated by *Populus tremuloides* and *Pinus contorta*. Several other species of conifers may be scattered within the stands, including *Pseudotsuga menziesii, Abies lasiocarpa, Picea engelmannii, Picea pungens,* and *Pinus flexilis*. Younger stands typically have dense *Populus tremuloides* with *Pinus contorta* mixed in. As the stands age, *Populus tremuloides* cover is slowly reduced until *Pinus contorta* becomes dominant (Mueggler 1988).

The understory is typically moderately dense to sparse and becomes sparser as *Pinus contorta* becomes more dominant. It is typically dominated by a short-shrub sparse with tall-shrub or herbaceous layers. The short-shrub layer is often dominated by *Juniperus communis* or *Symphoricarpos oreophilus*. Other shrubs may include *Arctostaphylos uva-ursi, Artemisia tridentata, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Shepherdia canadensis,* and *Symphoricarpos albus*. The tall-shrub layer consists of scattered *Amelanchier alnifolia* and *Prunus virginiana*. The relatively sparse herbaceous layer is a mixture of graminoids and forbs and is often dominated by *Calamagrostis rubescens, Carex geyeri, Lathyrus lanszwertii,* or *Thalictrum fendleri*. Other common graminoids include *Bromus carinatus, Carex rossii, Elymus glaucus, Elymus trachycaulus,* and *Achnatherum occidentale (= Stipa occidentalis).* Forbs include *Achillea millefolium, Arnica cordifolia, Balsamorhiza* spp., *Fragaria vesca, Geranium* spp., *Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis),* and *Potentilla* spp. The exotic species *Poa pratensis* and *Taraxacum officinale* are common in livestock-impacted stands (Mueggler 1988). Annuals are typically uncommon.

Dynamics: Both *Populus tremuloides* and *Pinus contorta* are thin-barked and readily killed by fire, and both are fire-adapted species that generally need disturbance to establish and maintain dominance in a forest. These mixed forests are seral and in the absence of stand replacing disturbance such as fire, will slowly convert to a *Pinus contorta*-dominated forest and then eventually to a *Picea engelmannii - Abies lasiocarpa*-dominated forest if subalpine or a *Pseudotsuga menziesii*-dominated forest if montane (Mueggler

1988). Most of the stands sampled by Mueggler (1988) have had a history of livestock grazing as evidenced by relative abundance of the exotic plants *Taraxacum officinale* and *Poa pratensis* and the scarcity of grazing susceptible plants (Mueggler 1988).

Similar Alliances:

- *Pinus contorta* Forest Alliance (A.118)
- *Pinus contorta* Woodland Alliance (A.512)
- *Populus tremuloides* Forest Alliance (A.274)

Similar Alliance Comments: This similar alliance is included because disturbed stands may have significant cover of *Populus tremuloides*, however, conifers are always dominant. There are currently 18 alliances with *Populus tremuloides* as a dominant or codominant species. Many of the stands in these alliances are floristically similar. One of these alliances is a wooded herbaceous, one is a shrubland and one is a woodland. Of the 15 remaining forest alliances, three are separated by temporarily or seasonally flooded hydrologic regimes. Most of the alliances are mixed stands with *Populus tremuloides* codominant with other broadleaf or conifer tree species.

ALLIANCE DISTRIBUTION

Range: Forests included in this alliance are scattered in the mountains and plateaus of Utah, Wyoming, and Idaho, and may occur elsewhere in the western United States where both *Populus tremuloides* and *Pinus contorta* are common.

Nations: US

Subnations: ID, UT, WY

TNC Ecoregions: 9:C, 10:C, 11:C

USFS Ecoregions: 341:C, 342:C, M331A:CC, M331D:CC, M331E:CC, M341C:CC

Federal Lands: NPS (Grand Teton?); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Eyre 1980, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986

[CEGL000536] *Populus tremuloides - Pinus contorta / Carex geyeri - Calamagrostis rubescens* Forest

Translated Name: **Quaking Aspen - Lodgepole Pine / Geyer's Sedge - Pinegrass Forest**

Common Name: **Quaking Aspen - Lodgepole Pine / Geyer's Sedge**

Ecological System(s):

- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)

Status: Standard **Circumscription Confidence:** 1 - Strong

Concept Author(s): Mueggler (1988)

ELEMENT CONCEPT

Global Summary: This forested association is known only from eastern Idaho, western Wyoming and northern Utah, the Utah - Wyoming Rocky Mountain Ecoregion. This mixed broadleaf deciduous-needleleaf evergreen forest occurs in the mountains between 1900 and 2900 m (6200-9400 feet) elevation, on gentle slopes of all aspects, on soils from sandstone or quartzite rock. It has little structural diversity and is fairly simple compositionally. The tree layer is dominated by both *Populus tremuloides* and *Pinus contorta*, with the occasional presence of other conifers, such as *Abies lasiocarpa* or *Pseudotsuga menziesii*. A few scattered shrub species may be present, but these do not form a distinct shrub layer. Shrub species may include *Juniperus communis, Mahonia repens*, or *Shepherdia canadensis*. The herbaceous layer consists of either *Carex geyeri* or *Calamagrostis rubescens*, sometimes with appreciable amounts of forbs such as *Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Geranium viscosissimum, Chamerion angustifolium, Heracleum maximum*, or *Thalictrum fendleri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands that define this association occur on the valley floor, interfluves, or slopes up to 35% with various aspects at elevations of 6400 to 7284 feet. Unvegetated ground cover for two stands consists of litter and duff (60 and 30% cover), basal vegetation (50 and 20% cover), wood (20% cover), and mosses (1 stand, 3% cover). Adjacent communities may include *Populus tremuloides* woodlands, mixed coniferous forests, *Salix boothii* shrublands, or *Salix drummondiana* shrublands. Three of the sampled stands have been affected by fire in the past, and half the sampled stands have a significant amount of standing dead or dead and down woody debris.

Global Environment: This mixed forest occurs in the mountains between 1900 and 2900 m (6200-9400 feet) elevation, on gentle slopes of all aspects, on soils from sandstone or quartzite rock.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community occurring on mesic sites. The tree canopy is comprised of *Populus tremuloides* (3 to 40% cover) and *Pinus contorta* (3 to 10% cover), occurring either in the tree canopy, subcanopy, and/or as regeneration. *Shepherdia canadensis* (trace to 12% cover) is the only shrub that occurs in over half

the stands. *Calamagrostis rubescens* (3 to 30% cover) dominates the graminoids. No other graminoid occurs in the majority of the stands, but species that may contribute high cover to individual stands include *Poa pratensis*, *Elymus glaucus*, *Phleum pratense*, and *Bromus inermis*. Forbs that occur in at least half the stands include *Lupinus argenteus*, *Geranium viscosissimum*, *Chamerion angustifolium*, and *Heracleum maximum*.

Global Vegetation: This mixed forest type has little structural diversity and is fairly simple compositionally. The tree layer is dominated by both *Populus tremuloides* and *Pinus contorta*, with the occasional presence of other conifers, such as *Abies lasiocarpa* or *Pseudotsuga menziesii*. A few scattered shrub species may be present, but these do not form a distinct shrub layer. Shrub species may include *Juniperus communis*, *Mahonia repens*, or *Shepherdia canadensis*. The herbaceous layer consists of either *Carex geyeri* or *Calamagrostis rubescens*, sometimes with appreciable amounts of forbs such as *Lupinus argenteus*, *Osmorhiza berteroi (= Osmorhiza chilensis)*, *Geranium viscosissimum*, *Chamerion angustifolium*, *Heracleum maximum*, or *Thalictrum fendleri*.
Global Dynamics: This type is considered a seral forest. *Pinus contorta* may be the dominant, or, if there are *Abies lasiocarpa* seedlings in the understory, it may succeed to an *Abies lasiocarpa / Calamagrostis rubescens* forest type, barring any fire or other disturbance in the next 200+ years.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	X
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	X
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area),Invasive,Animal,or Other*)
Bromus inermis	-	P	exotic
Dactylis glomerata	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus tremuloides - Pinus contorta / Carex geyeri* Community Type (Mueggler 1988) =
- *Populus tremuloides - Pinus contorta / Vaccinium scoparium* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides-Pinus contorta/Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus tremuloides / Calamagrostis rubescens* association, but is differentiated by the presence of *Pinus contorta* as a co-dominant species. It is also similar to the *Pinus contorta / Calamagrostis rubescens* association, but is differentiated by the presence of *Populus tremuloides* as a co-dominant species, and similar to the *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* association, but is differentiated by the presence of *Pinus contorta* as a co-dominant species and the absence of *Symphoricarpos oreophilus* as a dominant species.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur on the western slope of Shadow Mountain in Bridger-Teton National Forest, near McAllisters, near the Teton Science School Road, the south end of JY Ranch, near Arizona Creek, and north of Sergeant's Bay Picnic Area.

Global Range: This mixed deciduous-coniferous forest is known from northern Utah, western Wyoming, and eastern Idaho.
Nations: US
States/Provinces: ID, UT:S3?, WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The two stands that define this association do not occur in Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J023, 04J039, 04K021, 04K056, 04R199, 04X458, 04X482, 04X484
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407011, BT-9409307

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988*	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	.	X	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL000538] *Populus tremuloides - Pinus contorta / Symphoricarpos oreophilus* Forest

Translated Name: **Quaking Aspen - Lodgepole Pine / Mountain Snowberry Forest**
Common Name: **Quaking Aspen - Lodgepole Pine / Mountain Snowberry**
Ecological System(s):
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This mixed deciduous-evergreen association appears to be adapted to a wide range of environments. It occurs at elevations ranging from 1740 to 2990 m (5700-9800 feet) and does not appear confined by slope, exposure or soil parent materials. *Populus tremuloides* forms the dominant overstory canopy with an average cover of 55%. *Pinus contorta* is the only prominent conifer in the tree layer, always present with 22% average cover. Other conifers with less cover include *Pseudotsuga menziesii*, *Picea pungens*, and *Abies lasiocarpa*. Seedlings of both aspen and lodgepole are also usually present. The low-shrub layer is dominated by *Symphoricarpos oreophilus* with 10-30% cover. Other shrubs present include *Shepherdia canadensis*, *Rosa woodsii*, or *Paxistima myrsinites*. Tall shrubs such as *Amelanchier alnifolia* and *Prunus virginiana* may be present but in low abundance, never forming a distinct layer. The herbaceous undergrowth is generally dominated by graminoids such as *Calamagrostis rubescens* and *Carex geyeri*.

A variety of forbs are usually present; most frequent are *Thalictrum fendleri, Lupinus argenteus, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Chamerion angustifolium*. The undergrowth may not be abundant but is usually quite diverse.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The single stand sampled for this association occurs on a southwest-facing slope with a gradient of 9%. The elevation for this stand is 2202 m (7223 feet). The unvegetated and nonvascular ground cover includes litter and duff (60% cover), wood (20% cover), basal vegetation (20% cover), and a trace cover of moss.

Global Environment: This mixed deciduous-evergreen association appears to be adapted to a wide range of environments. It occurs at elevations ranging from 1700 to 3000 m (5700-9800 feet) and does not appear confined by slope, exposure or soil parent materials.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forested community that occurs on mesic sites. The dominant tree canopy species are *Populus tremuloides* (30% cover) and *Pinus contorta* (10% cover); *Pseudotsuga menziesii* occurs as an incidental species. Seedlings of *Populus tremuloides* and *Pinus contorta* each contribute 3% cover to the short-shrub stratum. *Symphoricarpos oreophilus* is the dominant shrub species with 10% cover in the short-shrub stratum. Other species with 3% cover include *Shepherdia canadensis* in the short-shrub stratum and *Rosa woodsii* in the dwarf-shrub stratum. *Calamagrostis rubescens* (10% cover) is the only graminoid present. Forbs with 3 to 10% cover include *Chamerion angustifolium, Thalictrum fendleri, Geranium viscosissimum*, and *Lupinus argenteus*.

Global Vegetation: *Populus tremuloides* forms the dominant overstory canopy with an average cover of 55%. *Pinus contorta* is the only prominent conifer in the tree layer, always present with 22% average cover. Other conifers with less cover include *Pseudotsuga menziesii, Picea pungens*, and *Abies lasiocarpa*. Seedlings of both aspen and lodgepole are also usually present. The low-shrub layer is dominated by *Symphoricarpos oreophilus* with 10-30% cover. Other shrubs present include *Shepherdia canadensis, Rosa woodsii*, or *Paxistima myrsinites*. Tall shrubs such as *Amelanchier alnifolia* and *Prunus virginiana* may be present but in low abundance, never forming a distinct layer. The herbaceous undergrowth is generally dominated by graminoids such as *Calamagrostis rubescens* and *Carex geyeri*. A variety of forbs are usually present; most frequent are *Thalictrum fendleri, Lupinus argenteus, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Chamerion angustifolium*. The undergrowth may not be abundant but is usually quite diverse.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Rosa woodsii	Herb (field)	Dwarf-shrub	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Thalictrum fendleri	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus contorta	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Rosa woodsii	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Thalictrum fendleri	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus tremuloides - Pinus contorta / Calamagrostis rubescens* Community Type (Mueggler and Campbell 1982) =
- *Populus tremuloides - Pinus contorta / Symphoricarpos oreophilus* Community Type (Mueggler 1988) = *Populus tremuloides-Pinus contorta/Symphoricarpos oreophilus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This stand occurs east of Teton Science School in Bridger-Teton National Forest.
Global Range: This association is known to occur in Idaho, Utah, and Wyoming.
Nations: US
States/Provinces: ID, UT:S3S4, WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Bridger-Teton and Grand Teton (mjr 6-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton?); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The one stand sampled for this association does not occur within the park boundary.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9409325

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.426 *Populus tremuloides - Pseudotsuga menziesii* Forest Alliance

Quaking Aspen - Douglas-fir Forest Alliance

ALLIANCE CONCEPT

Summary: This mixed evergreen-deciduous forest alliance has been described on lower montane slopes and plateaus in western Wyoming, Idaho, Utah, and eastern Nevada. Sites occur on gentle to steep slopes on any aspect. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials. Forests included in this seral alliance are characterized by an open to moderately closed, mixed conifer and deciduous tree canopy that is codominated by *Pseudotsuga menziesii* and *Populus tremuloides*. Several other species of conifers may be scattered within the stands, including *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pinus flexilis*, and *Pinus ponderosa*. Younger stands typically have dense *Populus tremuloides* with *Pseudotsuga menziesii* mixed in. As stands age, *Populus tremuloides* cover is slowly reduced until the conifer species become

dominant. The sparse to moderately dense understory may be structurally complex and includes tall-shrub, short-shrub and herbaceous layers, or simple with just an herbaceous layer. If present, the tall-shrub layer may be dominated by *Amelanchier alnifolia, Prunus virginiana* or *Acer grandidentatum*, and short-shrub by *Symphoricarpos oreophilus, Juniperus communis*, or *Mahonia repens*. Where dense, the herbaceous layer is often dominated by graminoids such as *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Stipa* spp. The sparser herbaceous layers are generally a more even mixture of forbs like *Achillea millefolium, Arnica cordifolia, Eucephalus engelmannii (= Aster engelmannii), Erigeron speciosus, Fragaria vesca, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. Diagnostic of this forest alliance is the codominance of *Populus tremuloides* and *Pseudotsuga menziesii* in the tree canopy.
Environment: Stands included in this mixed evergreen-deciduous forest alliance have been described on lower montane slopes and plateaus in western Wyoming, Idaho, Utah, eastern Nevada. Elevations range from 1700-2800 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Sites occur on gentle to steep slopes on any aspect. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials, but most typically occur on sedimentary rocks. Adjacent stands above these mixed forests are typically pure *Pseudotsuga menziesii* or mixed conifer forests. Stands below may include grasslands, shrublands or pure *Populus tremuloides* forests.
Vegetation: Forests included in this seral alliance occur on mountain slopes and plateaus in Utah, Wyoming, and Idaho. The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees, and is codominated by *Populus tremuloides* and *Pseudotsuga menziesii*. Several other species of conifers may be scattered within the stands, including *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pinus flexilis*, and *Pinus ponderosa*. Younger stands typically have dense *Populus tremuloides* with *Pseudotsuga menziesii* mixed in. As the stands age, *Populus tremuloides* cover is slowly reduced until the conifer species become dominant (Mueggler 1988).

The sparse to moderately dense understory may be structurally complex and includes tall-shrub, short-shrub and herbaceous layers, or simple with just a herbaceous layer. Because of the open growth form of *Populus tremuloides*, more light can penetrate the canopy than in a pure conifer stand. Typically the understory is usually denser in younger stands that are dominated by *Populus tremuloides*, and in more mesic sites with open canopies. If present the tall-shrub layer may be dominated by *Amelanchier alnifolia, Prunus virginiana* or *Acer grandidentatum*, and short-shrub by *Symphoricarpos oreophilus, Juniperus communis*, or *Mahonia repens*. Other common shrubs include *Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, Symphoricarpos albus*, and in wet areas *Salix scouleriana*. Where dense, the herbaceous layer is often dominated by graminoids such as *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Hesperostipa* spp. The sparser herbaceous layers are generally a more even mixture of forbs like *Achillea millefolium, Arnica cordifolia, Eucephalus engelmannii (= Aster engelmannii), Erigeron speciosus, Fragaria vesca, Galium boreale, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. Annuals are typically uncommon. The exotic species *Poa pratensis* and *Taraxacum officinale* are more common in livestock-impacted stands (Mueggler 1988).
Dynamics: *Populus tremuloides* is thin-barked and readily killed by fire. It is a fire-adapted species that generally needs a large disturbance to establish and maintain dominance in a forest. These mixed forests are seral and in the absence of stand replacing disturbance such as fire, will slowly convert to a *Pseudotsuga menziesii*-dominated climax forest. (Mueggler 1988). Although the young *Pseudotsuga menziesii* trees in these stands are susceptible to fire, older individuals develop self-prune lower branches and develop a thick corky bark that make them resistant to ground fires. Most of the stands sampled by Mueggler (1988) have had a history of livestock grazing as evidenced by relative abundance of the exotic plants *Taraxacum officinale, Poa pratensis* and other grazing-tolerant plants, and the scarcity of grazing susceptible plants (Mueggler 1988).
Similar Alliances:
- *Pinus ponderosa - Populus tremuloides* Forest Alliance (A.399)
- *Populus tremuloides* Forest Alliance (A.274)
- *Pseudotsuga menziesii* Forest Alliance (A.157)

Similar Alliance Comments: This similar alliance is included because disturbed stands may have significant cover of *Populus tremuloides*, however, conifers are always dominant. There are currently 18 alliances with *Populus tremuloides* as a dominant or codominant species. Many of the stands in these alliances are floristically similar. One of the alliances is a wooded herbaceous, one is a shrubland and one is a woodland. Of the 15 remaining forest alliances, three are separated by temporarily or seasonally flooded hydrologic regimes. Most of the alliances are mixed stands with *Populus tremuloides* codominating with other broadleaf or conifer tree species.

ALLIANCE DISTRIBUTION

Range: Forests included in this alliance occur in the mountains and plateaus of western Wyoming, Idaho, Colorado, Utah and eastern Nevada. Both *Populus tremuloides* and *Pseudotsuga menziesii* are widespread in the western U.S. and likely occur together in forests elsewhere.
Nations: US
Subnations: CO, ID, NV, UT, WY
TNC Ecoregions: 9:C, 11:C, 19:C, 20:C
USFS Ecoregions: M331A:CC, M331D:CC, M341A:CC, M341C:CC

Federal Lands: NPS (Curecanti, Grand Teton); USFS (Gunnison)

ALLIANCE SOURCES

Author(s): K. Schulz
References: DeByle and Winokur 1985, Eddleman and Jaindl 1994, Eyre 1980, Johnston and Hendzel 1985, Mueggler 1988, Mueggler and Campbell 1986, Youngblood and Mueggler 1981

[CEGL000543] *Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia* Forest

Translated Name: **Quaking Aspen - Douglas-fir / Saskatoon Serviceberry Forest**
Common Name: **Quaking Aspen - Douglas-fir / Saskatoon Serviceberry**
Ecological System(s):
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This predominantly deciduous, part evergreen forest is uncommon but wide-ranging, occurring from southern Utah mountains to the Yellowstone Plateau of eastern Idaho and northwestern Wyoming. It occurs between 1700 and 2300 m (5600-7500 feet) elevation. Stands are usually on moderate to steep slopes of various aspects, and soils are generally derived from sedimentary parent materials. The vegetative structure of this association is complex. It consists of multilayers of trees, shrubs and herbs. The characteristic feature is the prominence of *Pseudotsuga menziesii* in the overstory canopy (average cover 20%), along with a strong dominance of *Populus tremuloides* (average cover 60%). A tall-shrub stratum is present and dominated by one or a combination of the following shrubs: *Amelanchier alnifolia, Prunus virginiana*, or *Acer grandidentatum*. A distinct low-shrub layer is also present and is comprised of *Symphoricarpos* spp., *Rosa woodsii, Mahonia repens, Spiraea betulifolia*, and *Paxistima myrsinites*. The herbaceous layer is an abundant mix of graminoids and forbs. Common species include *Elymus* spp., *Thalictrum* spp., *Osmorhiza* spp., and *Geranium viscosissimum*. Occasionally *Calamagrostis rubescens, Carex geyeri*, or *Arnica cordifolia* may be abundant.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes of minimal gradients to 43% near the valley floor at elevations of 6400 to 6950 feet. Soil data is available for one stand; the loam soils have very little gravel, but boulders are present. Vegetation adjacent to the plot is a continuation of this association, *Artemisia tridentata* ssp. *vaseyana* shrublands, *Prunus virginiana* shrublands, or *Populus tremuloides* forests. Two stands note a significant amount of dead standing *Populus tremuloides.*

Global Environment: This predominantly deciduous, part evergreen forest is uncommon but wide-ranging, occurring from southern Utah mountains to the Yellowstone Plateau of eastern Idaho, and northwestern Wyoming. It occurs between 1700 and 2300 m (5600-7500 feet) elevation. Stands are usually on moderate to steep slopes of various aspects, and soils are generally derived from sedimentary parent materials.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. *Populus tremuloides* (7 to 70% cover) and *Pseudotsuga menziesii* (7 to 12% cover) are the dominant tree canopy or subcanopy species. Seedlings of *P. tremuloides, Pseudotsuga menziesii, Abies lasiocarpa,* and *Pinus flexilis* may occur. The shrub layer is well developed for all stands. *Amelanchier alnifolia* (1 to 20% cover) and *Prunus virginiana* (3 to 12% cover) occur in each stand. Other high constancy shrubs include *Symphoricarpos oreophilus, Spiraea betulifolia, Paxistima myrsinites, Purshia tridentata,* and *Mahonia repens*. The herbaceous layer is not well developed, though many species occur in at least half of the stands, usually having 3% or less cover. These include *Calamagrostis rubescens, Pseudoroegneria spicata, Carex hoodii, Poa pratensis, Lupinus argenteus, Arnica cordifolia, Helianthella uniflora,* and *Geranium viscosissimum.*

Global Vegetation: The vegetative structure of this association is complex. It consists of multilayers of trees, shrubs and herbs. The characteristic feature is the prominence of *Pseudotsuga menziesii* in the overstory canopy (average cover 20%), along with a strong dominance of *Populus tremuloides* (average cover 60%). A tall-shrub stratum is present and dominated by one or a combination of *Amelanchier alnifolia, Prunus virginiana,* or *Acer grandidentatum.* A distinct low-shrub layer is also present and is comprised of *Symphoricarpos* spp., *Rosa woodsii, Mahonia repens, Spiraea betulifolia,* and *Paxistima myrsinites*. The herbaceous layer is an abundant mix of graminoids and forbs. Common species include *Elymus* spp., *Thalictrum* spp., *Osmorhiza* spp., and *Geranium viscosissimum*. Occasionally *Calamagrostis rubescens, Carex geyeri,* or *Arnica cordifolia* may be abundant.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	.	X	.

Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Lonicera utahensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Purshia tridentata	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Paxistima myrsinites	Herb (field)	Dwarf-shrub	.	X	.
Spiraea betulifolia	Herb (field)	Dwarf-shrub	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Populus tremuloides	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Mahonia repens	Herb (field)	Dwarf-shrub	X	.	.
Rosa woodsii	Herb (field)	Dwarf-shrub	X	.	.

Higher Taxon	Note
Symphoricarpos spp.	dominant dwarf-shrubs

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area),Invasive,Animal,or Other*)
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia* Community Type (Mueggler 1988) = *Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia* Community Type (Mueggler and Campbell 1982) = *Populus tremuloides - Pseudotsuga menziesii / Spiraea betulifolia* Community Type (Youngblood and Mueggler 1981) = *Populus tremuloides- Pseudotsuga menziesii/Amelanchier alnifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits Mueggler's (1988) description extremely well.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur near the mouth of Granite Canyon, south of Granite Canyon east of the Valley Trail, and on both the east and west facing slopes of Blacktail Butte.

Global Range: This association is known from northern Utah, eastern Idaho and northwestern Wyoming.
Nations: US
States/Provinces: CO, ID, UT:S3?, WY:S1S2
TNC Ecoregions: 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO20 added for CURE (mjr 6-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Curecanti, Grand Teton); USFS (Gunnison)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201071
Accuracy Assessment Points: 04R003, 04R005, 04J044

Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mueggler 1988	.	X	X	X	.	.	.	.	.
Mueggler and Campbell 1982	.	.	X	.	.	.	.	.	.
Mueggler and Campbell 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	.	X	.	.	.	.	.	.

II. Woodland

II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

A.531 *Pinus albicaulis* Woodland Alliance

Whitebark Pine Woodland Alliance

ALLIANCE CONCEPT

Summary: This subalpine woodland alliance occurs locally on warm, dry, rocky, exposed sites in the mountains of the interior northwestern U.S. and the central and northern Rocky Mountains. Stands typically occur intermittently between the closed-canopy subalpine forestline and upper treeline, but may occur at lower elevations on rocky wind-swept ridges or where disturbance has reduced the cover of shade-tolerant tree species. Above the continuous forestline, these woodlands form patches separated by subalpine meadow or rock outcrops. Landforms include ridgetops, mountain slopes, and cirque headwalls and basins. Sites occur on all aspects, but are more typically south-facing. Substrates are generally rocky, shallow, coarse-textured soils. Woodlands included in this alliance have a sparse to moderate conifer tree canopy dominated or codominated by *Pinus albicaulis*. High-elevation stands are often stunted and may be only a few meters tall, and *Pinus albicaulis* may be the only tree in the canopy. *Abies lasiocarpa* is the most common associated tree species. Other associated tree species may include *Pinus contorta, Pseudotsuga menziesii, Picea engelmannii, Tsuga mertensiana*, and *Pinus flexilis*. There may be a sparse to moderate shrub layer consisting of tree regeneration and other woody species such as *Arctostaphylos uva-ursi, Juniperus communis, Ribes* spp., *Shepherdia canadensis, Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The herbaceous layer ranges from absent on rocky sites to moderately dense cover of graminoids or forbs on more mesic sites. Associated herbaceous species include *Achillea millefolium, Arnica* spp., *Calamagrostis rubescens, Carex geyeri, Cassiope mertensiana, Festuca idahoensis, Juncus parryi, Ligusticum grayi, Luzula glabrata var. hitchcockii, Phyllodoce empetriformis, Solidago multiradiata*, and *Xerophyllum tenax*. Diagnostic of this alliance is the dominance of *Pinus albicaulis* in the open tree canopy.

Environment: Woodlands included in this subalpine alliance occur locally on warm, dry, rocky, exposed sites. Elevations range from 1750-3400 m depending on latitude and geography. Climate is mostly semi-arid, temperate continental with maritime influences in the Cascades and northwestern Rocky Mountains which may approach subhumid conditions. Winter temperatures range from very cold in the Rocky Mountains to moderately cold in the Cascades. Mean annual precipitation ranges from 60-180 cm occurring mostly in the winter. Snowpack is often deep, especially in the western ranges, and may linger into summer. Some sites have little snow accumulation because of high winds and sublimation. Summers are cool and typically dry from July to September. Stands typically occur intermittently between the closed-canopy subalpine forestline and upper treeline, but may occur at lower elevations on rocky, wind-swept ridges or where disturbance such as avalanche or fire has temporarily reduced more shade-tolerant tree species. Above the continuous forestline, these woodlands occur as a mosaic of tree islands or patches separated by subalpine meadow or rock outcrops. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, land and rock slides, and cirque headwalls and basins. Sites may be nearly level to steep sloping, on all aspects, but are more typically south-facing. Some northern stands near treeline occur in mesic protected pockets away from the extremely harsh environmental conditions. Substrates are generally lithic, coarse-textured soils such as shallow, gravelly sands or loams derived from colluvium, glacial till and residuum from a variety of volcanic, igneous, sedimentary and metamorphic rocks. Parent materials include pumice, basalt, gneiss, granite, quartzite, siltite, argillite, sandstone, shale, siltstone, limestone, dolomite or rhyolite. Soils may be calcareous and alkaline, but are more typically non-calcareous and acidic. Calcareous soils are more common in more mesic northern stands.

Adjacent vegetation at higher elevations is typically alpine and subalpine meadows. At lower elevations, there are subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii, Pinus contorta, Tsuga mertensiana*, or *Pseudotsuga menziesii*.

Vegetation: Stands included in this subalpine woodland alliance occur locally on typically dry, rocky, exposed sites in the mountains of the interior northwestern U.S. and adjacent southwestern Canada from the central and northern Rocky Mountains to the Sierra Nevada, Klamath Mountains and Cascade Range. These woodlands have a sparse to moderate conifer tree cover to 10 m tall (rarely to 20 m) that is dominated or codominated by the evergreen needle-leaved tree *Pinus albicaulis*. High-elevation stands are often stunted and may be only a few meters tall, and *Pinus albicaulis* may be the only tree in the canopy. *Abies lasiocarpa* is the most common associated tree species. Other associated tree species vary by geography and elevation zones throughout the alliance's range. In the lower subalpine, *Pinus contorta* and *Pseudotsuga menziesii* are present to codominant.

In mesic stands in Canada *Picea engelmannii* may codominate, but is not uncommon elsewhere. *Tsuga mertensiana* may be found in mesic stands in the Cascades. Near the southern range extent, *Pinus flexilis* is often present. The understory vegetation is typically sparse because sites are often dry and have large amounts of surface rock. There may be a sparse to moderate shrub layer consisting of juvenile trees and other woody species such as *Arctostaphylos uva-ursi, Juniperus communis, Ribes montigenum, Ribes viscosissimum, Shepherdia canadensis, Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The herbaceous layer ranges from absent on rocky sites to moderately dense cover of graminoids or forbs on more mesic sites. Characteristic species include *Achillea*

millefolium, Arnica spp., *Calamagrostis rubescens, Carex geyeri, Cassiope mertensiana, Festuca idahoensis, Juncus parryi, Ligusticum grayi, Luzula glabrata var. hitchcockii, Phyllodoce empetriformis, Solidago multiradiata*, and *Xerophyllum tenax*.
Dynamics: *Pinus albicaulis* is a slow-growing, long-lived conifer that is common at higher elevations in the upper subalpine zone. It typically occurs in a mosaic of tree islands and meadows where it often colonizes sites and creates habitat for less hardy tree species. In lower subalpine forests, it is a seral species, establishing after a large disturbance such as stand-replacing fire or avalanche, or it is restricted to dry, rocky ridges where it competes well with shade-tolerant tree species. Without disturbance it will be overtopped in 100-120 years by faster growing, shade-tolerant species such as *Abies lasiocarpa, Picea engelmannii, Pseudotsuga menziesii*, and *Tsuga mertensiana*. Although *Pinus albicaulis* is killed by crown fires and hot ground fires, it tolerates low-intensity ground fires that will kill the shade-tolerant understory. Fire intervals range from 30-300 years.

Birds and small mammals often eat and cache the large, wingless pine seeds and are responsible for the dispersal of this species. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept and burned-over sites. This results in the regeneration of pines in clumps from forgotten caches (Burns and Honkala 1990a, Eyre 1980, Schmidt and McDonald 1990, Steel et al. 1983).

Pests include the mountain pine beetle, *Dendroctonus ponderosae*, which has killed many mature trees in the past, during epidemics where populations of the beetles build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steel et al. 1983). The exotic pathogen, white pine blister rust, *Cronartium ribicola*, is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host, *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steel et al. 1983).
Similar Alliances:
- *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus albicaulis* Forest Alliance (A.132)
- *Pinus flexilis* Woodland Alliance (A.540)

Similar Alliance Comments: The similar alliances have the same diagnostic species as this alliance, and stands may be quite similar in species composition. Structure and relative abundance of the important species will vary, with stands in the *Pinus albicaulis* woodland alliance having an open canopy (generally less than 60% cover), and dominated by *Pinus albicaulis*.

ALLIANCE DISTRIBUTION

Range: These subalpine woodlands occur intermittently throughout much of the interior northwestern U.S. from the northern and central Rocky Mountains of Montana and Wyoming west to the Cascades. Stands are reported from Montana to British Columbia and Alberta, Canada, south to northern California and Nevada.
Nations: CA, US
Subnations: AB, BC?, CA, ID, MT, NV, OR, WA, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C
USFS Ecoregions: 342B:CC, M242C:CC, M261E:CC, M331A:CC, M331D:CC, M331J:CC, M332A:CC, M332C:CC, M332D:CC, M332E:CC, M332F:C?, M332G:CC, M333A:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton, Kings Canyon?, Sequoia?, Yellowstone, Yosemite); PC (Waterton Lakes); USFS (Caribou-Targhee, Shoshone)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Achuff 1989, Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff and Dudynsky 1984b, Achuff et al. 1993, Arno and Weaver 1990, Barrows et al. 1977, Bowerman et al. 1997, Burns and Honkala 1990a, Chappell et al. 1997, Cole 1982, Cooper 1975, Cooper et al. 1987, Cooper et al. 1995, Daubenmire and Daubenmire 1968, Eyre 1980, Hall 1973, Holland 1986b, Johnson and Clausnitzer 1992, Johnston 1987, Loope 1969, MTNHP unpubl. data, Murray 1996, Pfister et al. 1977, Reed 1969, Rust 1998, Sawyer and Keeler-Wolf 1995, Schmidt and McDonald 1990, Steele and Geier-Hayes 1987, Steele et al. 1981, Steele et al. 1983, Weaver and Dale 1974, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b

[CEGL000128] *Pinus albicaulis - Abies lasiocarpa* Woodland

Translated Name: **Whitebark Pine - Subalpine Fir Woodland**
Common Name: **Whitebark Pine - Subalpine Fir**
Ecological System(s):
- Northern Rocky Mountain Subalpine Dry Parkland (CES306.807)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This patchy or open woodland association occurs in the upper subalpine zone at, or just below, treeline across the central and northern Rocky Mountains. Elevations range from 2180-2870 m (5428-9400 feet). Sites are cold with a short growing season. They range from dry to relatively mesic depending on elevation, slope and aspect as they relate to wind exposure and snow accumulation. Stands occur predominantly on moderately to very steep slopes but also are found on exposed, wind-scoured flats. Substrates are typically rocky, with shallow to moderately deep soils, which are well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, both calcareous and noncalcareous but are more often igneous or metamorphic, acidic rocks rather than calcareous sedimentary rocks, which seem to favor *Pseudotsuga menziesii* regeneration. This association is characterized by an open canopy (15-40% cover). *Pinus albicaulis* with scattered *Picea engelmannii* and *Abies lasiocarpa* form the overstory with the subcanopy dominated by *Abies lasiocarpa*. Trees may be scattered or clustered in groves and are often wind-deformed and stunted, growing only 6-18 m (20-60 feet) tall or less. Occasionally *Pinus flexilis* or *Pseudotsuga menziesii* may be present, but sites are generally too cold. The undergrowth is variable, depending on relative moisture, and typically depauperate. Shrub cover is highly variable in amount and species composition. *Juniperus communis* often dominates the dwarf-shrub layer (<0.5 m tall, though a short shrub in more optimal habitats) with 5-15% cover; *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present; *Ribes montigenum, Ribes lacustre*, and *Vaccinium scoparium* occur scattered. The herbaceous layer is typically sparse (<15% cover). Herbaceous species of moderate to high constancy include *Antennaria* spp., *Arnica cordifolia, Carex geyeri, Carex rossii, Chamerion angustifolium, Lupinus argenteus, Penstemon virens, Sedum lanceolatum, Selaginella densa, Packera neomexicana (= Senecio neomexicanus), Thalictrum fendleri*, and *Thermopsis divaricarpa*. Disturbed sites often have higher cover of *Polygonum phytolaccifolium.*

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stands defining this association occur on shallow to very steep slopes with aspects facing east through north-northwest. The elevations for these stands range from 7800 feet to 10,200 feet. The soils tend to be well-drained and loam based. Ground cover for three stands is composed primarily of litter and duff with large amounts of rocks greater than 10cm, gravel, and wood. Bedrock, mosses, and lichens may occur in smaller quantities. Surrounding vegetation is highly variable, but is usually some sort of upper timberline or alpine community.

Global Environment: This patchy or open woodland association occurs in the upper subalpine zone at, or just below, treeline across the central and northern Rocky Mountains. Elevations range from 2180-2987 m (5428-9800 feet). Sites are cold with a short growing season. They range from dry to relatively mesic depending on elevation, slope and aspect as they relate to wind exposure and snow accumulation. Stands occur predominantly on moderately to very steep slopes but also are found on exposed, wind-scoured flats. Substrates are typically rocky, with shallow to moderately deep soils, which are well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, both calcareous and noncalcareous but are more often igneous or metamorphic, acidic rocks rather than calcareous sedimentary rocks, which seem to favor *Pseudotsuga menziesii* regeneration (Pfister et al. 1977).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is an upper-montane woodland occurring on mesic sites. The dominant tree canopy species are *Pinus albicaulis* (averaging 13% cover in the mature tree layer) and *Abies lasiocarpa* (averaging 8% cover in the mature tree layer). Incidental species occurring in the tree canopy include *Picea engelmannii* and *Pseudotsuga menziesii.* The tree subcanopy has *Pinus albicaulis* and *Abies lasiocarpa* in most stands, with the average cover for both species at 7%. Seedlings of *P. menziesii, P. albicaulis,* and *A. lasiocarpa* may occur in over half the stands. The understory is not well developed. The only high constancy shrubs are *Ribes montigenum* (10 stands, trace to 20% cover), and *Vaccinium scoparium* (18 stands, averaging 2% cover). Only three graminoids have over 20% constancy. These are *Carex geyeri* (22 stands, averaging 10% cover), *Juncus parryi* (22 stands, averaging 3% cover), and *Carex rossii* (10 stands, averaging 1% cover). The only forbs to occur in at least 20% of the stands are *Ligusticum filicinum* and *Eucephalus engelmannii*, with 3-4% cover.

Global Vegetation: This association is characterized by an open canopy (15-40% cover). *Pinus albicaulis* with scattered *Picea engelmannii* and *Abies lasiocarpa* form the overstory with the subcanopy dominated by *Abies lasiocarpa*. Trees may be scattered or clustered in groves and are often wind-deformed and stunted, growing only 6-18 m (20-60 feet) tall or less. Occasionally *Pinus flexilis* or *Pseudotsuga menziesii* may be present, but sites are generally too cold (Pfister et al. 1977). The undergrowth is variable, depending on relative moisture, and typically depauperate. Shrub cover is highly variable in amount and species composition. *Juniperus communis* can dominate the dwarf-shrub layer (<0.5 m tall, though a short shrub in more optimal habitats) with 5-15% cover; *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present; *Ribes montigenum, Ribes lacustre, Vaccinium membranaceum*, and *Vaccinium scoparium* occur scattered. The herbaceous layer is typically sparse (<15% cover). Herbaceous species of moderate to high constancy include *Antennaria* spp., *Arnica latifolia, Carex geyeri, Carex rossii, Chamerion angustifolium, Ligusticum filicinum, Lupinus argenteus, Penstemon virens, Sedum lanceolatum, Senecio crassulus, Selaginella densa, Solidago multiradiata, Thalictrum fendleri*, and *Thermopsis divaricarpa*. Disturbed sites, especially those impacted by sheep grazing, often have a high cover of *Polygonum phytolaccifolium*.

Global Dynamics: *Pinus albicaulis* is a slow-growing, long-lived conifer that is common at higher elevations in the upper subalpine zone. It typically occurs in a mosaic of tree islands and meadows where it often colonizes sites and creates habitat for less hardy tree species. In lower subalpine forests, it is a seral species, establishing after a large disturbance such as stand-replacing fire or avalanche, or it is restricted to dry, rocky ridges where it competes well with shade-tolerant tree species. Without disturbance it will be overtopped in 100-120 years by faster growing, shade-tolerant species such as *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, and *Tsuga mertensiana*. Although crown fires and hot ground fires kill *Pinus albicaulis*, it tolerates low-intensity ground fires that will kill the shade-tolerant understory. Fire intervals range from 30-300 years.

Birds and small mammals often eat and cache the large, wingless pine seeds and are responsible for the dispersal of this species. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept and burned-over sites. This results in the regeneration of pines in clumps from forgotten caches (Eyre 1980, Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990).

Pests include the mountain pine beetle (*Dendroctonus ponderosae*), which has killed many mature trees in the past, during epidemics where populations of the beetles build up in lower elevation *Pinus contorta* stands then move up into the *Pinus albicaulis* (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990). The exotic pathogen white pine blister rust (*Cronartium ribicola*) is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease; incidence of resistant trees is on the order of 1 in 10,000 trees. The best hope of salvaging this species as a viable and influential ecosystem component is propagating individuals that have high genetic resistance to blister rust (Steel et al. 1983, Burns and Honkala 1990a, Schmidt and McDonald 1990).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Ribes montigenum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Abies lasiocarpa	Tree subcanopy	Needle-leaved tree	.	X	.
Ribes montigenum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Arctostaphylos uva-ursi	Herb (field)	Dwarf-shrub	.	X	.
Juniperus communis	Herb (field)	Dwarf-shrub	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Poa compressa	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Pinus albicaulis / Arctostaphylos uva-ursi* Woodland (CEGL000751)
- *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Woodland (CEGL000752)

- *Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri* Woodland (CEGL000754)
- *Pinus albicaulis / Carex rossii* Forest (CEGL000129)
- *Pinus albicaulis / Juniperus communis* Woodland (CEGL000756)

Global Related Concepts:

- *Picea engelmannii - Abies lasiocarpa - Pinus albicaulis / Shepherdia canadensis* Vegetation Type (Achuff et al. 2002a) I
- *Pinus albicaulis - Abies lasiocarpa* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Pinus albicaulis - Abies lasiocarpa* Habitat Type (Steele et al. 1981) B
- *Pinus albicaulis - Abies lasiocarpa* Habitat Type (Pfister et al. 1977) B
- *Pinus albicaulis - Abies lasiocarpa* Habitat Types (Cooper et al. 1987) B
- *Pinus albicaulis - Abies lasiocarpa* Habitat Types (Cooper 1975) B
- *Pinus albicaulis - Picea engelmannii / Dryas octopetala* Vegetation Type (Achuff et al. 2002a) I
- *Pinus albicaulis-Abies lasiocarpa* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This type is undoubtedly a concept that includes several associations. It may prove to be particularly depauperate occurrences of the similar associations.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Forty-two stands were sampled within GTNP: These occur in the high country from Mount Hunt Divide to Waterfalls Canyon on the west side of Jackson Lake. Another six stands occur in Caribou-Targhee National Forest: one occurs west of Fox Creek Pass, one occurs in Alaska Basin, and four occur north or west of Dead Horse Pass.

Global Range: This association occurs in the northern Rockies in northwestern Montana, northern Idaho, and western Wyoming.
Nations: US
States/Provinces: ID:S3, MT:S5, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added for Glacier (mjr 2-04).
USFS Ecoregions: M331D:CC, M332C:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202130, GT-0201047, GT-03C053, GT-0202076, GT-03B065, GT-03A023
Accuracy Assessment Points: 04J062, 04J073, 04J180, 04J190, 04J191, 04J203, 04J254, 04J255, 04K099, 04K101, 04R275, 04R276, 04R277, 04R278, 04R279, 04R281, 04R283, 04R284, 04R286, 04R288, 04R289, 04R290, 04R291, 04R292, 04R294, 04R295, 04S023, 04X305, 04X312, 04X323, 04X324, 04X337, 04X339, 04X495, 04X496
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-96-KV-095, CT-95-JD-086, CT-95-JD-074, CT-95-JD-064, CT-95-JD-058, CT-95-JD-057
Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): S.V. Cooper and K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Burns and Honkala 1990a	.	.	.	X	.	.	.	.	.
Cooper 1975	.	.	X	.	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Eyre 1980	.	.	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Schmidt and McDonald 1990	.	.	.	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.540 *Pinus flexilis* Woodland Alliance

Limber Pine Woodland Alliance

ALLIANCE CONCEPT

Summary: Woodlands included in this alliance occur intermittently from timberline to lower montane and foothill zones throughout much of the Rocky Mountains, on escarpments and other geographic breaks in the northwestern Great Plains, and in mountains in the Great Basin and southern California. Elevations range from 850-3500 m. Sites are typically xeric on exposed, wind-swept rocky slopes and ridges from subalpine to foothills and prairie breaks. Some stands are on eroded substrates and resemble 'badlands' while others may occur on lava flows. These open woodlands occur on all aspects, but are most common on dry south- and west-facing slopes. Soils are typically shallow, skeletal and coarse-textured, such as gravelly, sandy loams or loams, but may include alkaline clays. Exposed bedrock is common and many stands have over 50% bare soil. The vegetation is characterized by an open canopy typically 3-10 m tall, but individuals may reach 15 m. Stands are solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*. Other trees species that may be present to codominant vary by geography and elevation zones throughout the woodland's range and include *Pinus albicaulis, Picea engelmannii*, or *Pseudotsuga menziesii* in the subalpine; *Pinus contorta, Pinus ponderosa*, or *Pseudotsuga menziesii* in the montane zone; and *Juniperus osteosperma* or *Juniperus scopulorum* in the lower montane transition zone from woodlands to grasslands or shrublands. In California, other associates may include *Abies concolor, Pinus albicaulis, Pinus balfouriana, Pinus contorta, Pinus jeffreyi*, and *Pinus longaeva*.

The understory vegetation is typically sparse because sites are dry and have a large cover of rock. A sparse shrub layer may be present that includes tall shrubs such as *Artemisia tridentata, Cercocarpus ledifolius, Jamesia americana, Rhus trilobata, Shepherdia canadensis*, and *Symphoricarpos oreophilus*. *Arctostaphylos uva-ursi, Artemisia arbuscula, Artemisia nova, Juniperus communis, Mahonia repens, Purshia tridentata*, and *Yucca glauca* are the most frequent low shrubs. The herbaceous layer often dominates the understory and is composed primarily of graminoids such as *Bouteloua gracilis, Calamagrostis purpurascens, Carex rossii, Festuca idahoensis, Festuca campestris, Leucopoa kingii (= Festuca kingii), Koeleria macrantha, Achnatherum hymenoides (= Oryzopsis hymenoides)*, and *Pseudoroegneria spicata*. Scattered forbs may include species of *Achillea, Antennaria, Arenaria, Arnica, Astragalus, Erigeron, Eriogonum, Hymenopappus, Hymenoxys, Liatris, Sedum, Solidago*, and *Thermopsis*.

Environment: Woodlands included in this alliance occur intermittently from timberline to lower montane and foothill zones throughout much of the Rocky Mountains, on escarpments and other geographic breaks in the northwestern Great Plains, and in mountains in the Great Basin and southern California. Elevations range from 850-3500 m. Climate is semiarid, cold temperate. Annual precipitation patterns and amounts are variable, but locally the sites are typically xeric on exposed, windswept rocky slopes and ridges from subalpine to foothills and prairie breaks. Some stands are on eroded substrates and resemble 'badlands' while others may occur on lava flows. These open woodlands occur on all aspects, but are most common on dry south- and west-facing slopes. Soils are typically shallow, skeletal and coarse-textured such as gravelly, sandy loams or loams, but may include alkaline clays. Stands grow best on calcareous soils derived from limestone or sandstone, but parent material is variable and includes a variety of igneous, sedimentary, and metamorphic rocks. Depending on the stand bedrock may include a mixture of andesite, basalt, lava, limestone, dolomite, granite, gneiss, quartzite, rhyolite, schist, sandstone, serpentine, shale. Exposed bedrock is common and many stands have over 50% bare soil. Soil pH is typically neutral or slightly alkaline, but ranges from acid to alkaline.

Adjacent vegetation at high elevations includes alpine meadows and shrublands and subalpine forests dominated by *Picea, Abies* or *Pseudotsuga*. Adjacent montane stands are dominated by *Pinus ponderosa, Pinus contorta* or *Pseudotsuga menziesii*. At lower elevations adjacent vegetation may include *Juniperus*-dominated woodland and savannas; shrublands dominated by species of *Artemisia, Cercocarpus*, or *Purshia tridentata*; dry prairie; or riparian woodland dominated by *Pseudotsuga menziesii*. The transition can be abrupt or an extended ecotone where the woodlands grade into a savanna.

Vegetation: Stands included in this widespread woodland alliance occur locally on warm, dry, rocky, exposed sites in the Rocky Mountain west, northwestern Great Plains, and desert mountains in the Great Basin and in southern and eastern California. Stands have an open canopy typically 3-10 m tall, but individuals may reach 15 m. The stands are solely dominated or codominated by the evergreen needle-leaved tree *Pinus flexilis*. Other trees species that may be present to codominant vary by geography and elevation zones throughout the woodland's range. In the subalpine, *Pinus albicaulis, Picea engelmannii* or *Pseudotsuga menziesii* may be present. In the montane zone, *Pinus contorta, Pinus ponderosa* or *Pseudotsuga menziesii* are frequently present, and in the lower montane transition zone from woodlands to grasslands or shrublands, *Juniperus osteosperma* or *Juniperus scopulorum* may co-occur with *Pinus flexilis*. In California, associates may include *Abies concolor, Pinus albicaulis, Pinus balfouriana, Pinus contorta, Pinus jeffreyi*, and *Pinus longaeva* (Sawyer and Keeler-Wolf 1995).

The understory vegetation is typically sparse because sites are dry and have a large cover of rock. On stands occurring in the breaks in the plains, Johnson (1987) reported 18% exposed rock and 25% bare soil. A sparse shrub layer may be present. The taller shrubs may include *Artemisia tridentata, Cercocarpus ledifolius, Jamesia americana, Rhus trilobata, Shepherdia canadensis, Symphoricarpos oreophilus* and immature tree species. The most frequent low shrubs are *Arctostaphylos uva-ursi, Artemisia arbuscula, Artemisia nova, Juniperus communis, Mahonia repens, Purshia tridentata*, and *Yucca glauca*. The herbaceous layer often dominates the

understory. The most common species are graminoids such as *Bouteloua gracilis, Calamagrostis purpurascens, Carex rossii, Festuca idahoensis, Festuca campestris, Leucopoa kingii (= Festuca kingii), Koeleria macrantha, Achnatherum hymenoides (= Oryzopsis hymenoides)*, and *Pseudoroegneria spicata*. Scattered forbs may include species of *Achillea, Antennaria, Arenaria, Arnica, Astragalus, Erigeron, Eriogonum, Hymenopappus, Hymenoxys, Liatris, Sedum, Solidago*, and *Thermopsis*. In six plots in the Little Missouri National Grassland in western North Dakota, the average cover for each of the strata was trees 38%, shrubs 21%, graminoids 20%, and forbs 9% (USFS 1992).

Dynamics: Although some of the conifers that are typically codominant in *Pinus flexilis* stands are late successional species, they are not likely to displace *Pinus flexilis*. This is because most of these stands occur on harsh sites where *Pinus flexilis* is more competitive than most other conifer species. These stands are generally considered to be topographic or edaphic 'climax' stands (Cooper 1975, Eyre 1980). Even in stands at lower elevations, such as prairie breaks, it is unlikely that other coniferous species will become dominant (Eyre 1980). Because *Pinus flexilis* occurs over a broad range of elevations, it can also be important as a post-fire seral species on drier sites in the Rocky Mountains (Cooper 1975, Peet 1988). Peet (1978a) reported apparent competitive displacement with *Pinus flexilis* in Colorado. He noted that *Pinus flexilis* may dominate xeric sites from low to high elevations, except where *Pinus aristata* or *Pinus albicaulis* occur. There, *Pinus flexilis* is largely restricted to lower elevation, rocky sites. Peet (1978a) also reported that *Pinus flexilis* occurs in the less xeric *Pinus contorta* and *Pinus ponderosa* habitats.

Birds and small mammals often eat and cache the large, wingless pine seeds. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept sites (Lanner and Vander Wall 1980). This results in the regeneration of pines in clumps from forgotten caches (Eyre 1980, Steele et al. 1983).

Similar Alliances:
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Pinus albicaulis* Woodland Alliance (A.531)
- *Pinus aristata* Woodland Alliance (A.537)
- *Pinus flexilis - Populus tremuloides* Forest Alliance (A.425)
- *Pinus flexilis* Temporarily Flooded Woodland Alliance (A.564)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

Similar Alliance Comments: Stands in the similar *Pinus flexilis* alliances are either codominated by *Populus tremuloides* or are temporarily flooded annually. Stands in the other similar alliances are separated by dominance of the codominating trees.

ALLIANCE DISTRIBUTION

Range: Stands included in this widespread woodland alliance occur intermittently throughout the Rocky Mountains and on mountains and plateaus in the Great Basin and Colorado Plateau, and on breaks in the northwestern Great Plains. The alliance ranges from Montana to New Mexico and from western North Dakota to southern California. It also occurs in southern Alberta and is likely in southeastern British Columbia, Canada.

Nations: CA, US

Subnations: AB, CA, CO, ID, MT, ND, NM, NV, OR, UT, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 17:P, 20:C, 26:C

USFS Ecoregions: 322A:CC, 331D:CC, 331F:CC, 331J:CC, 332:C, 341A:CC, 341D:CC, 341E:CC, 341F:CC, 342A:CC, 342B:CC, 342D:CC, M261E:CC, M262B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333:?, M341A:CC, M341C:CC

Federal Lands: NPS (Craters of the Moon, Dinosaur, Glacier, Grand Teton, Rocky Mountain, Theodore Roosevelt, Yellowstone, Yosemite); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Beaverhead, Bighorn, Bridger-Teton, Caribou-Targhee, Gunnison, Little Missouri, Medicine Bow, Pike-San Isabel, Routt, Shoshone)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Alexander 1985, Alexander 1986, Barrows et al. 1977, Burns and Honkala 1990a, Cole 1982, Cooper 1975, Day 1985, Day and Wright 1985, DeVelice 1983, DeVelice 1992, DeVelice and Lesica 1993, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eddleman and Jaindl 1994, Eggler 1941, Eyre 1980, Faber-Langendoen et al. 1996, Girard et al. 1989, Hess 1981, Hess and Alexander 1986, Hoffman and Alexander 1980, Holland 1986b, Johnston 1987, Johnston and Hendzel 1985, Jones 1989b, Keeler-Wolf and Thomas 2000, Lanner and Vander Wall 1980, Larson and Moir 1987, Lesica and DeVelice 1992, Loope 1969, MTNHP unpubl. data, Mauk and Henderson 1984, Peet 1978a, Peet 1981, Peet 1988, Pfister et al. 1977, Sawyer and Keeler-Wolf 1995, Steele et al. 1981, Steele et al. 1983, Terwilliger et al. 1979a, USFS 1992, Wasser and Hess 1982

[CEGL000813] *Pinus flexilis / Pseudoroegneria spicata* Woodland

Translated Name: **Limber Pine / Bluebunch Wheatgrass Woodland**

Common Name: **Limber Pine / Bluebunch Wheatgrass Woodland**

Ecological System(s):
- Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)

- Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): J. Drake

ELEMENT CONCEPT

Global Summary: This limber pine woodland is a dry evergreen woodland found in the northern Rocky Mountains and adjacent northwestern Great Plains of the United States. Soils are dry, shallow, and rocky. The parent material is commonly limestone or sandstone, and there is a significant amount of unvegetated ground. The woodland overstory is dominated by *Pinus flexilis*, with lesser amounts of *Juniperus scopulorum*. Shrubs are present but not common. They are typically low shrubs, such as *Opuntia* spp. and *Yucca glauca*. The most common species of the herbaceous layer is *Pseudoroegneria spicata*. Other graminoids are *Bouteloua gracilis, Leucopoa kingii (= Festuca kingii), Koeleria macrantha*, and *Achnatherum hymenoides (= Oryzopsis hymenoides)*. Forbs species typical of this community are *Draba* spp., *Liatris* spp., and *Phlox* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stands defining this association occur on slopes of 15 to 40% with west-facing aspects. The elevations for these stands are 6800 to 7364 feet. Soils for one stand are well-drained sandy clays. The unvegetated and nonvascular ground cover in one stand it is comprised of bare soil (70% cover), basal vegetation (20% cover), gravel (4% cover), and traces of litter and duff and wood. Another stands has 60% cover of litter and duff, 10% cover of bare soil and rocks greater than 10cm, 5% cover of gravel, and traces of moss, lichen, and wood. Adjacent vegetation may include *Pseudotsuga menziesii / Calamagrostis rubescens* association with occasional *Symphoricarpos oreophilus* in the understory, grasslands composed primarily of *Poa pratensis* and *Hesperostipa comata* with stringers of *Artemisia tridentata* ssp. *vaseyana*, or *Populus tremuloides* stands.

Global Environment: This community occurs on shallow, dry, rocky soils on mid to upper slopes (Johnston 1987). The slopes in the Dakota Badlands of North Dakota averaged around 30% (Girard et al. 1989). In Grand Teton National Park, this association occurs at elevations of 2159 and 2245 m (7082-7364 feet), on slopes between 28 and 40%. The parent material is commonly limestone or sandstone; soil textures are highly skeletal, well-drained sandy clays.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community occurring on subxeric sites. *Pinus flexilis* (7 to 40% cover) dominates the tree canopy and subcanopy. Incidental species that may occur in the subcanopy include *Pseudotsuga menziesii, Populus tremuloides*, and/or *Pinus contorta.* Seedlings of *Pinus flexilis, Pseudotsuga menziesii*, or *Populus tremuloides* may occur in trace quantities. The shrub layer overall may be diverse, but constitutes high cover in only two stands (12 and 30%). Shrubs occurring in half the stands include *Amelanchier alnifolia, Purshia tridentata, Symphoricarpos oreophilus*, and *Mahonia repens*. High constancy graminoids are *Pseudoroegneria spicata* and *Poa pratensis.* No other herbaceous species occurs in more than one stand, although individual species may contribute up to 20% cover.

Global Vegetation: The vegetation is dominated by *Pinus flexilis* with an open canopy of 10-40% cover. Other tree species present include *Juniperus scopulorum.* A shrub layer is generally present with 20% cover and includes *Purshia tridentata, Symphoricarpos oreophilus, Rhus trilobata var. trilobata*, and lower statured *Juniperus scopulorum*. The most frequent low shrubs are *Opuntia* spp. and *Yucca glauca*. The herbaceous layer is highly variable, from sparse to abundant and diverse in cover. The most common species of the herbaceous layer is *Pseudoroegneria spicata*. Other graminoids are *Bouteloua gracilis, Leucopoa kingii (= Festuca kingii), Koeleria macrantha, Agrostis stolonifera*, and *Achnatherum hymenoides (= Oryzopsis hymenoides).* Forbs may be well-represented or depauperate. Typical species include *Astragalus miser, Antennaria microphylla, Machaeranthera canescens, Draba* spp., *Liatris* spp., and *Phlox* spp.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus flexilis	Tree canopy	Needle-leaved tree	X	X	.
Purshia tridentata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pinus flexilis	Tree canopy	Needle-leaved tree	X	X	X
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Agrostis stolonifera	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (9-Mar-2000). This type occupies approximately 495 ha in North Dakota (Girard et al. 1989). Its abundance in Montana is presumably much more extensive, given the state S4 rank.

RELATED CONCEPTS

Global Similar Associations:
- *Pinus flexilis / Leucopoa kingii* Woodland (CEGL000810)

Global Related Concepts:
- *Pinus flexilis / Agropyron spicatum* Community Type (Girard et al. 1989) =
- *Pinus flexilis / Agropyron spicatum* Habitat Type (Alexander 1985) F
- *Pinus flexilis / Roegneria spicata* Plant Association (Johnston 1987) =
- *Pinus flexilis/Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- *Pinus flexilis* Habitat Type (USFS 1992) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand in Bridger-Teton National Forest occurs on the western slope of Shadow Mountain and the GTNP stands occur on the western slope of Uhl Hill or northeast of kelly.

Global Range: This limber pine woodland is a dry evergreen woodland found in the northern Rocky Mountains and adjacent northwestern Great Plains of the United States.
Nations: US
States/Provinces: MT:S4, ND:S1, WY
TNC Ecoregions: 8:C, 9:C, 10:C, 26:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331F:CC, M331A:CC, M331B:C?, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC
Federal Lands: NPS (Grand Teton, Theodore Roosevelt); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A112
Accuracy Assessment Points: 04M031, 04X020
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407006

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): J. Drake, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Alexander 1985	.	.	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1989	.	.	X	X	X	.	.	.	.
Johnston 1987	.	.	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
NDNHI unpubl. data	.	.	.	.	.	.	.	.	.

Pfister et al. 1977	.	X	.	X	.	.	.	.	.
USFS 1992	.	.	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

II.A.4.N.b. Conical-crowned temperate or subpolar needle-leaved evergreen woodland

A.552 *Pseudotsuga menziesii* Woodland Alliance

Douglas-fir Woodland Alliance

ALLIANCE CONCEPT

Summary: This widespread coniferous woodland alliance occurs across the western U.S., typically on relatively poor sites for tree growth. Environmental factors, such as harsh substrate, desiccating winds or frequent disturbances that limit the tree canopy density, vary geographically. Stands are typically restricted to hot, dry slopes with southern and western exposures at higher elevations and latitudes. At lower elevations and latitudes stands are found on relatively mesic northern aspects. Where there is adequate moisture to develop a closed tree canopy, shallow rocky soils, talus and scree have so little moisture-holding capacity that these sites are effectively very dry for plant growth. Other harsh substrates, such as serpentine, or frequent disturbance from fire may also limit tree canopy development. Substrates are typically shallow, lithic, course-textured and well-drained. Woodlands included in this alliance have a sparse to moderately dense canopy, or may occur as patchy stands that are dominated by *Pseudotsuga menziesii*. Other trees in the canopy and subcanopy may include *Pinus ponderosa, Tsuga mertensiana* or *Quercus chrysolepis* in Oregon, and *Pinus flexilis* or *Juniperus scopulorum*. Typically sparse tall-shrub/small-tree layer may include *Acer circinatum* or any of the above trees depending on the species range. Shrub cover is scattered to patchy. Common shrubs include *Cercocarpus ledifolius, Cercocarpus montanus, Holodiscus dumosus, Purshia tridentata*, or *Toxicodendron diversilobum*. The herbaceous layer is often dominated by perennial graminoids such as *Festuca campestris, Festuca idahoensis, Leucopoa kingii (= Festuca kingii), Piptatherum micranthum (= Oryzopsis micrantha), Pseudoroegneria spicata*, or *Schizachyrium scoparium*. Forbs important in this layer include *Aspidotis densa* and *Penstemon fruticosus*. Annual grasses and forbs may be present, especially on disturbed sites. Diagnostic of this alliance is the *Pseudotsuga menziesii*-dominated tree canopy with less than 60% cover on average.

Environment: Associations included in this woodland alliance occur on dry sites in Washington and Oregon in the Cascade, Okanogan, Blue and Klamath mountains, and in the Rocky Mountains. Elevations vary with latitude from 300 m in the Northern Cascades to 3000 m in New Mexico and Arizona. The climate regime is strongly influenced by the rainshadow effect of the Cascade Range or Coastal Ranges of southern Oregon. Climate is mostly temperate, continental with maritime influences in the Cascades and northwestern Rocky Mountains. Annual precipitation ranges from approximately 40 cm in drier habitats in the Blue Mountains and southern Rocky Mountains to 150-230 cm in the Cascades. There are usually environmental factors, such as harsh substrate or frequent disturbance, that limit these open (25-60% canopy cover) stands from developing closed canopies. Stands are typically restricted to hot, dry slopes with southern and western exposures and shallow soils. This is true of many stands in the Cascades and northern Rocky Mountains. However, in some stands, serpentine soils limit tree density. In more xeric habitats and the southern Rocky Mountains, stands occur on relatively mesic sites and have been described from scree slopes at high elevations or north slopes.

Stands occur on moderate to steep slopes. Substrates are typically shallow, lithic, course-textured soils derived from colluvium and residuum. Soil texture ranges from gravelly sand to loam. There is typically high surface cover of rock, as well as coarse fragments within the soil. Soil pH varies from acidic to alkaline depending on parent material. Parent materials are extremely varied in these widespread associations and may include volcanic, sedimentary, metamorphic and igneous rocks such as lava, basalt, tuff, granite, gneiss, rhyolite, andesite, dolomite, limestone, mudstone and sandstone. These rocky, shallow soils have so little moisture-holding capacity that these sites are effectively very dry for plant growth even where there is substantial precipitation. In some cases, these sites are exposed to high winds. Wind detracts from soil moisture status by blowing off snow, directly desiccating plants, and eroding soil.

Adjacent stands at higher elevations include mixed-conifer subalpine forests. At lower elevations these stands often grade into woodlands and savannas dominated by *Pinus ponderosa, Pinus edulis*, or *Juniperus* spp., or montane grassland parks dominated by *Pseudoroegneria spicata* or *Festuca idahoensis* with scattered shrubs such as *Purshia tridentata* or *Cercocarpus* spp.

Vegetation: These coniferous woodlands occur in the mountains of the western U.S. They have a sparse to moderately dense, open canopy, or may occur as patchy stands, dominated by *Pseudotsuga menziesii*. Other trees in the canopy and subcanopy may include *Pinus ponderosa, Tsuga mertensiana* or *Quercus chrysolepis* in Oregon, and *Pinus flexilis* or *Juniperus scopulorum* in the Rocky Mountains. A typically sparse tall-shrub/small-tree layer may include *Acer circinatum* or any of the above trees depending on the species range. The short-shrub layer is scattered to patchy, and may be dominated by *Cercocarpus ledifolius, Cercocarpus montanus, Holodiscus dumosus, Purshia tridentata* or *Toxicodendron diversilobum*, but can include numerous other species. The herbaceous layer is sparse to moderately dense in more open stands. It is often dominated by perennial graminoids such as *Festuca campestris, Festuca idahoensis, Leucopoa kingii (= Festuca kingii), Piptatherum micranthum (= Oryzopsis micrantha), Pseudoroegneria spicata*

or *Schizachyrium scoparium*. Forbs important in this layer include *Aspidotis densa* and *Penstemon fruticosus*. Numerous other graminoid and forb species may be present, but cover is generally sparse. Annual grasses and forbs may be present, especially on disturbed sites.

Dynamics: *Pseudotsuga menziesii* is tolerant of ground fires. Many mature trees have fire scars. The fire frequency is 5-30 years in many montane stands, but may be much longer in stands on talus slopes in the subalpine (Williams and Smith 1990). The exotic grass *Bromus tectorum* often invades the herbaceous layer of disturbed stands in the interior northwestern U.S.

Similar Alliances:
- *Abies grandis* Woodland Alliance (A.558)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa - Pseudotsuga menziesii* Woodland Alliance (A.533)
- *Pseudotsuga menziesii* Forest Alliance (A.157)

Similar Alliance Comments: There are 16 alliances that share *Pseudotsuga menziesii* as a diagnostic species, five are woodlands and 11 are forests. *Pseudotsuga menziesii* is widespread in mountainous areas in the western U.S., and is frequently an important to codominant species in stands of many forest and woodland vegetation types that may be classified in other alliances.

ALLIANCE DISTRIBUTION

Range: Woodlands included in this alliance are found on dry sites in mountains of the northwestern U.S. from California to Washington, east to the Rocky Mountains in Montana, Wyoming and Utah. The alliance also occurs in New Mexico, Arizona, Colorado, and southern British Columbia, Canada.

Nations: CA, US

Subnations: AZ, BC, CA, CO, ID, MT, NM, OR, UT, WA, WY

TNC Ecoregions: 2:C, 6:C, 7:C, 8:C, 9:C, 10:C, 18:C, 19:C, 20:C, 26:C, 68:C, 144:C

USFS Ecoregions: 313E:CC, 331D:CC, 331J:CC, 341B:CC, 342A:C?, 342B:CC, 342C:CC, M242B:CC, M242C:CC, M261A:CC, M261B:C?, M261D:C?, M261G:C?, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341C:CC

Federal Lands: BIA (Blackfeet); NPS (Black Canyon of the Gunnison, Capitol Reef, Curecanti, Dinosaur, Glacier, Grand Teton, Rocky Mountain); USFS (Bridger-Teton, Medicine Bow, Shoshone)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Atzet and Wheeler 1984, Atzet et al. 1996, Chappell et al. 1997, Cole 1982, Cooper 1975, Cooper et al. 1995, DeVelice 1992, DeVelice et al. 1986, DeVelice et al. 1991, DeVelice et al. 1995, Fitzhugh et al. 1987, Johnson and Clausnitzer 1992, Johnston 1987, Larson and Moir 1986, Larson and Moir 1987, MTNHP unpubl. data, Mauk and Henderson 1984, Pfister et al. 1977, Roberts et al. 1979a, Sawyer and Keeler-Wolf 1995, Steele et al. 1981, Steele et al. 1983, Williams and Smith 1990, Williams et al. 1990b, Youngblood and Mauk 1985

[CEGL000429] *Pseudotsuga menziesii / Calamagrostis rubescens* Woodland

Translated Name: **Douglas-fir / Pinegrass Woodland**

Common Name: **Douglas-fir / Pinegrass Woodland**

Ecological System(s):
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

Status: Standard **Circumscription Confidence:** 1 - Strong

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This lower to mid montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and British Columbia, and south to western Wyoming, Idaho and eastern Oregon. Elevations range from 825 to 2400 m (2700-7900 feet). Stands occur on cool, dry sites on mid to upper slopes and benches on all aspects at middle elevations. At lowest elevations stands are restricted to north aspects, and at upper elevations stands are found on warm and dry southerly exposures. Substrates are variable (sandy to clayey), but are generally well-drained, coarser-textured gravelly soils and derived from a variety of noncalcareous, acid, parent materials. Surface rock usually is low to moderate, and litter cover high. The typically open tree canopy is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa* or *Larix occidentalis*. Large *Pinus albicaulis* or *Pinus contorta* trees may be present in the upper tree canopy. The subcanopy is *Pseudotsuga menziesii*. Scattered shrubs such as *Amelanchier alnifolia*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Symphoricarpos oreophilus* and dwarf-shrubs such as *Arctostaphylos uva-ursi* and *Mahonia repens* may also be present. The dense to moderately dense (20-60% cover) perennial graminoid layer characteristically dominates the understory. *Calamagrostis rubescens* typically is the dominant, with

Carex geyeri, *Festuca idahoensis*, and *Pseudoroegneria spicata* often present to codominant. There is often a high diversity of forbs, but typically all have low cover. Forb species present are highly variable, but the most common forbs species are *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Balsamorhiza sagittata*, *Eurybia conspicua*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Geum triflorum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on moderate slopes (5-38%) of any aspect. The elevations of these stands range from 2136 to 2296 m (7008-7533 feet). Two stands occur on soils of loam or clay loam; soil descriptions are not available for other stands. Ground cover is comprised of up to 70% litter and duff, 20% wood, and 40% basal vegetation. Litter and duff are the prominent ground cover for all but two plots where it contributes 40% cover and basal vegetation has 40% cover. One plot has 20% bare soil.

Global Environment: This lower to mid montane woodland association occurs in central and northern Rocky Mountains. Elevations range from 825 to 2400 m (2700-7900 feet). Stands occur on cool, dry sites on mid to upper slopes and benches on all aspects at middle elevations. At lowest elevations stands are restricted to north aspects, and at upper elevations stand are found on warm and dry southerly exposures. Substrates are variable (sandy to clayey) but are generally well-drained, coarser-textured gravelly soils and derived from a variety of noncalcareous, acidic parent materials including andesite, basalt, granites, quartzite, quartz monzonite, and glacial drift. Surface rock usually is low to moderate, and litter cover is high. Some stands can have up to 30% exposed bedrock.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane mixed coniferous forest that occurs on subxeric or mesic sites. *Pseudotsuga menziesii* is the dominant tree species. *Pseudotsuga menziesii* that make up the overstory canopy contribute 10-40% cover. *Pseudotsuga menziesii* is absent from the tree canopy layer in one plot but contributes 30% canopy cover in the short-shrub layer. Some plots contain *Pseudotsuga menziesii*, *Pinus contorta*, *Pinus flexilis*, and *Populus tremuloides* in the tree subcanopy. Seedlings of *Pseudotsuga menziesii*, *Pinus flexilis*, *Picea engelmannii*, and *Abies lasiocarpa* are found in most of the plots. The shrub layer is dominated by *Symphoricarpos oreophilus* which contributes 1-20% canopy cover. Other common or high-constancy species include *Mahonia repens* and *Paxistima myrsinites*. The herbaceous layer is dominated by *Calamagrostis rubescens*, which contributes 3-60% canopy cover. *Calamagrostis rubescens* is usually the only species in this association with the exception of one stand which has nine other graminoid species associated with it. Common forbs include *Eurybia conspicua*, *Balsamorhiza sagittata*, and *Geranium viscosissimum*.

Global Vegetation: This association typically has an open tree canopy that is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa* or *Larix occidentalis*. Large *Pinus albicaulis* or *Pinus contorta* trees may be present in the upper tree canopy. The subcanopy is *Pseudotsuga menziesii*. Scattered shrubs such as *Amelanchier alnifolia*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Symphoricarpos oreophilus* and dwarf-shrubs such as *Arctostaphylos uva-ursi* and *Mahonia repens* may also be present. The dense to moderately dense (20-60% cover) perennial graminoid layer characteristically dominates the understory. *Calamagrostis rubescens* typically is the dominant, with *Carex geyeri*, *Festuca idahoensis*, and *Pseudoroegneria spicata* often present to codominant. Although some stands may have only *Calamagrostis rubescens*. There is often a high diversity of forbs, but typically all have low cover. The most common forbs species are *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Balsamorhiza sagittata*, *Eurybia conspicua*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Geum triflorum*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eurybia conspicua	Herb (field)	Forb	X	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudotsuga menziesii	Tree canopy	Needle-leaved tree	X	X	X
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	X
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens* Forest (CEGL000301)
- *Picea engelmannii / Maianthemum stellatum* Forest (CEGL000415)
- *Pinus contorta / Calamagrostis rubescens* Forest (CEGL000139)
- *Pinus contorta / Spiraea betulifolia* Forest (CEGL000164)
- *Pseudotsuga menziesii / Arctostaphylos uva-ursi* Forest (CEGL000424)
- *Pseudotsuga menziesii / Carex geyeri* Forest (CEGL000430)
- *Pseudotsuga menziesii / Spiraea betulifolia* Forest (CEGL000457)
- *Pseudotsuga menziesii / Symphoricarpos albus* Forest (CEGL000459)

Global Related Concepts:
- *Pseudotsuga menziesii / Calamagrostis rubescens* Community Type (Cole 1982) F
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Mauk and Henderson 1984) B
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii / Calamagrostis rubescens* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Williams et al. 1990b) F
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Williams and Smith 1990) F
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1983) F
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Johnston 1987) F
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Johnson and Clausnitzer 1992) =
- *Pseudotsuga menziesii / Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1985) F
- *Pseudotsuga menziesii/Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description well.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs primarily in two areas, the western slope of Shadow Mountain and northeast of Lower Slide Lake. One stand occurs east of Hedrick Lake and another is located north of Toppings Lake.
Global Range: This lower to mid montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and British Columbia, and south to western Wyoming, Idaho and eastern Oregon.
Nations: CA, US
States/Provinces: BC:S3?, ID:S4?, MT:S5, OR:S3, UT:S2?, WA:S5, WY:S4?
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 19:C, 26:C, 68:C
TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO9:C, ECO19:C, ECO68:C added (MSR 4-04).
USFS Ecoregions: 331D:CC, 342B:CC, 342C:CC, M242C:CC, M331A:CC, M331B:CC, M331D:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Bridger-Teton, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202029, GT-0202138
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: BT-9407033, BT-9407038, BT-9407040, BT-9507014, BT-9407003, BT-9407112, BT-9507002

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Clausnitzer and Zamora 1987	.	X	.	X	.	.	.	.	.
Cole 1982	.	X	X	X	.	.	.	.	.
Collins et al. 1984	.	X	.	X	.	.	.	.	.
Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Daubenmire 1952	.	X	.	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	.	X	.	.	.	.	.
Horton 1971	.	X	.	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mauk and Henderson 1984	.	X	X	X	.	.	.	.	.
McLean 1970	.	X	.	X	.	.	.	.	.
Ogilvie 1962	.	X	.	X	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Lillybridge 1983	.	X	X	X	.	.	.	.	.
Williams and Lillybridge 1985	.	X	X	X	.	.	.	.	.
Williams and Smith 1990	.	X	X	X	.	.	.	.	.
Williams et al. 1990b	.	X	X	X	.	.	.	.	.
Zamora 1983	.	X	.	X	.	.	.	.	.

II.A.4.N.c. Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland

A.559 *Abies lasiocarpa* Woodland Alliance

Subalpine Fir Woodland Alliance

ALLIANCE CONCEPT

Summary: These upper montane or subalpine conifer woodlands are found in many of the mountainous areas of the western United States within cool and relatively dry climate regimes. Stands may also occur at montane elevations where cold-air drainage modifies the environment. These woodlands are typically found where marginal growing conditions such as low precipitation, or droughty sites or substrates produce an open tree canopy. Parent materials and soils are variable across the distribution of the alliance. In mature stands, the association is characterized by *Abies lasiocarpa* as the dominant tree species, often with *Picea engelmannii*. In seral stands other conifers can be important or even dominant, but *Abies lasiocarpa* is always present in the regeneration layer. Other tree associates include *Pinus albicaulis*, *Pinus contorta*, *Picea glauca*, *Pseudotsuga menziesii*, *Tsuga* spp., *Larix* spp., and *Chamaecyparis nootkatensis*. Most woodlands in this alliance have well-developed shrub layers. Important to dominant species include *Phyllodoce empetriformis*, *Vaccinium* spp., *Vaccinium myrtillus*, *Juniperus communis*, *Shepherdia canadensis*, *Paxistima myrsinites*, and *Rhododendron albiflorum*. Stands with sparse shrub layers are typically a reflection of dry conditions, such as vegetated scree slopes or lava fields, and may include species such as *Salix brachycarpa*, *Salix glauca*, *Holodiscus dumosus*, *Juniperus communis*, *Acer circinatum*, and *Ribes* spp. The herbaceous layer is generally sparse. Important forbs include species of *Arnica*, *Thalictrum*,

Pedicularis, Lupinus, and *Fragaria*. Graminoids are rarely important in these woodlands. Diagnostic of woodlands in this alliance is that they are upland (non-flooded) with average tree canopy of less than 60% cover that is either dominated by *Abies lasiocarpa* or has *Abies lasiocarpa* as the predominant conifer in the tree-regeneration layer.

Environment: These upper montane or subalpine woodlands occur in many of the mountainous areas of the western United States. They are found in cool and relatively dry climate regimes. In the Olympic and Cascade ranges, they occupy areas with pronounced rainshadow effects, where precipitation is more limited than in the surrounding areas. Henderson et al. (1989) report annual precipitation of less than 20 cm where these woodlands occur in the Olympics. In areas with higher precipitation totals, these woodlands will be found at the lower elevational limits for *Abies lasiocarpa* to successfully occupy a site, on droughty substrates such as scree slopes or lava fields, or on southerly or westerly slopes and ridgetops. Snowpacks can be deep, but often melt quickly, and summers are cool. Summer frosts are characteristic, especially in sites where cold air pools. Elevations range from 1300-1950 m in the Olympics and eastern Cascades, and increase with decreasing latitude (from roughly 2200 m in central Idaho to over 3200 m in Utah, Colorado and New Mexico). In some locations where there is cold-air drainage, these woodlands extend down in elevation into the montane zone, where they will occupy dry stream terraces or toeslopes. Parent materials and soils are variable across the distribution of the alliance. Parent materials include ash, tuff, lava, basalt, granitics, colluvium and talus (of various rock types), but often are non-calcareous. Soils are typically shallow, poorly developed, with significant amounts of rock and gravel in the profile. Adjacent forest vegetation types include *Abies lasiocarpa* or *Picea engelmannii* forests, *Pinus albicaulis* or *Abies amabilis* forests at the upper elevation boundary and *Pseudotsuga menziesii, Abies grandis*, or *Tsuga heterophylla* at the lower zonal boundary. Wetter sites adjoining wet meadows often support forests of *Picea engelmannii, Pinus contorta*, or riparian plant communities.

Vegetation: Older stands of these woodlands are characterized by *Abies lasiocarpa* as the dominant tree species in an open tree canopy, often with *Picea engelmannii*. Total canopy cover averages <60%, but some stands may have somewhat higher cover. In younger stands, other conifers can be important or even dominant, but *Abies lasiocarpa* is always present in the regeneration layer. In the Pacific Northwest, tree associates include *Tsuga heterophylla, Tsuga mertensiana, Pseudotsuga menziesii, Pinus albicaulis, Pinus contorta*, and *Chamaecyparis nootkatensis*. In the eastern Cascades and northern Rockies, other occasionally present conifers include *Pinus albicaulis, Pinus contorta, Picea glauca, Pseudotsuga menziesii, Larix occidentalis*, and *Larix lyallii*. Cold-deciduous trees, such as *Populus tremuloides*, are very infrequently present. In the central and southern Rockies, *Abies lasiocarpa, Picea engelmannii, Pseudotsuga menziesii*, and *Pinus contorta* are the major trees in these woodlands.

Most associations in this alliance have well-developed shrub layers, with the herbaceous layer being relatively depauperate and sparse. The shrub layer is typically less than 2 m in height, and can be up to 80% in cover, although in some stands may be under 20%, a reflection of dry conditions. Important to dominant species include *Phyllodoce empetriformis, Vaccinium scoparium, Vaccinium membranaceum, Vaccinium myrtillus, Juniperus communis, Shepherdia canadensis, Paxistima myrsinites*, and *Rhododendron albiflorum*. Vegetated scree slopes or lava fields will typically have a scattered shrub layer. Important species in these associations include *Salix brachycarpa, Salix glauca, Holodiscus dumosus, Juniperus communis, Acer circinatum* (in Oregon), and *Ribes* spp. (in Colorado and New Mexico). The herbaceous layer in most associations is relatively depauperate. One exception is in the Olympics where there is a lush forb layer, dominated by *Lupinus arcticus ssp. subalpinus* (up to 40% cover, Henderson et al. 1989), with lesser amounts of *Arnica cordifolia, Orthilia secunda, Lomatium martindalei, Hieracium albiflorum*, and *Valeriana sitchensis*. Important forbs in the Rocky Mountains from Idaho and Montana south into New Mexico include *Arnica cordifolia, Arnica latifolia, Chamerion angustifolium (= Epilobium angustifolium), Galium triflorum, Orthilia secunda, Polemonium pulcherrimum, Saxifraga bronchialis*, and species of *Thalictrum, Pedicularis, Lupinus*, and *Fragaria*. Graminoids are rarely important in these woodlands. Where these woodlands occur on sites with some soil development, there may be a nonvascular layer on the ground surface, composed primarily of mosses (Henderson et al. 1989, Steele et al. 1981). Epiphytic lichens are common in the Olympics.

Dynamics:

Similar Alliances:

- *Abies lasiocarpa - Acer glabrum* Shrubland Alliance (A.1052)
- *Abies lasiocarpa - Larix lyallii* Forest Alliance (A.421)
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa - Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Picea engelmannii* Forest Alliance (A.164)
- *Picea engelmannii* Sparsely Vegetated Alliance (A.556)
- *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance (A.560)
- *Pinus contorta* Woodland Alliance (A.512)
- *Pseudotsuga menziesii* Forest Alliance (A.157)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

Similar Alliance Comments: The *~Abies lasiocarpa* Woodland Alliance (A.559)$$ is distinguished from the similar *Abies lasiocarpa* alliances by (1) not including riparian forests which occur along streams or on mesic slopes, (2) being of woodland physiognomy with the tree canopy averaging <60% cover, or (3) by having *Abies lasiocarpa* being the predominant conifer in the tree

regeneration layer. The similar *Picea engelmannii* and *Pseudotsuga menziesii* alliances differ in being (1) either strongly dominated by *Picea engelmannii* or *Pseudotsuga menziesii* with little *Abies lasiocarpa* (if any) in the tree canopy or regeneration layer, or (2) by having a closed forest physiognomy, where tree canopy cover is usually >60%.

ALLIANCE DISTRIBUTION

Range: These subalpine woodlands have been reported from scattered locations, from southern British Columbia, Canada, the Olympic Peninsula of Washington, east into the northern Rocky Mountains, and south into the southern Rocky Mountains of Arizona and New Mexico. It is likely they occur throughout the range of *Abies lasiocarpa*.
Nations: CA, US
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV?, OR, UT, WA, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 10:C, 19:C, 20:C, 68:C, 144:C
USFS Ecoregions: 313A:CC, 321A:CC, 341B:CC, M242A:CC, M242B:CC, M242C:CC, M313A:CC, M313B:C?, M331A:CC, M331B:C?, M331D:CC, M331E:CC, M331F:C?, M331I:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341C:CC
Federal Lands: NPS (Glacier, Grand Teton, Olympic NP?, Rocky Mountain); PC (Banff?, Jasper?, Waterton Lakes); USFS (Bighorn, Challis, Clearwater, Dixie, Fishlake, Gunnison, Medicine Bow, Olympic NF, Salmon, Shoshone, Uinta)

ALLIANCE SOURCES

Author(s): M.S. Reid/D. Sarr
References: Baker 1984a, Brockway et al. 1983, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Eyre 1980, Fitzhugh et al. 1987, Henderson 1981, Henderson et al. 1986, Henderson et al. 1989, Hess 1981, Hess and Wasser 1982, Johnson and Clausnitzer 1992, Johnston 1984, Johnston 1987, Komarkova 1986, Kovalchik 1993, Kuchler 1964, Larson and Moir 1987, Mauk and Henderson 1984, McLean 1970, Moir and Ludwig 1979, Peet 1975, Peet 1981, Pfister et al. 1977, Roach 1952, Roberts 1980, Steele et al. 1981, Steele et al. 1983, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Youngblood and Mauk 1985

[CEGL000317] *Abies lasiocarpa - Picea engelmannii / Luzula glabrata* var. *hitchcockii* Woodland

Translated Name: **Subalpine Fir - Engelmann Spruce / Hitchcock's Smooth Woodrush Woodland**
Common Name: **Subalpine Fir / Smooth Woodrush**
Ecological System(s):
- Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is a minor one, occurring as small-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains, southern portion of the Canadian Rockies and west to the eastern slope of the Cascade Range. Across the core area of its distribution its known elevational range is 1830 to 2500 m (6000-8200 feet). It occupies cold sites that receive snow in excess of what is received by surrounding topography and also retains the snow cache late into summer. Sites may occur on all aspects and degrees of slope so long as snowpack is long-persisting. Parent materials are various, including extrusive and intrusive volcanics (primarily granitics), sedimentary colluvium and morainal detritus; regardless of parent material, kind/source soils weather to coarse-textured, extremely acid soils (usually less than pH of 4.2). Stands are usually very open with short-stature *Abies lasiocarpa* and *Picea engelmannii* dominating the canopy. Scattered seral tree species include *Pinus albicaulis* and *Pinus contorta*. The shrub component is generally depauperate with thin patches of a variable mix of *Vaccinium scoparium, Vaccinium membranaceum* (dwarfed in size to less than 0.2 m), *Lonicera utahensis, Ribes montigenum*, and *Phyllodoce empetriformis*. The forb component is strongly dominated by *Luzula glabrata*, which can occur as a dense sward (cover approaching 100%) to the near exclusion of other herbs. *Arnica latifolia* is universally the most abundant and constant forb in a very depauperate layer.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stands of this association occur on shallow and moderate west- and north-facing slopes at elevations of 2682 and 2777 m (8800 and 9111 feet). The soil textures are clay loams that contain about 10% gravel and moderately well-drained clays. Unvegetated and nonvascular ground surface data from one stand indicate that litter and duff dominate the ground surface. Rocks greater than 10 cm and wood are well-represented, bare soil is common, and bedrock, gravel, and mosses occur in trace quantities. Although not recorded within one stand, *Pinus albicaulis* and *Picea engelmannii* are present in the adjacent area.
Global Environment: This association is a minor one, occurring as small- or infrequently as large-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains and southern portion of the Canadian Rockies. Across the core area of its distribution its known elevational range is 1830 to 2500 m (6000-8200 feet); outliers of the association are found in Wyoming's Teton Range at 2990 m (9800 feet) and higher. It occupies cold sites that receive snow in excess of what is received by surrounding

topography and also retains the snow cache late into summer. Sites may occur on all aspects and degrees of slope so long as snowpack is long-persisting. Parent materials are various, including extrusive and intrusive volcanics (primarily granitics), sedimentary colluvium and morainal detritus; regardless of parent material, kind/source soils weather to coarse-textured, extremely acid soils (usually less than pH of 4.2) with a high gravel content, reflected in the considerable amount displayed on the surface. Soils are poorly developed (Inceptisols, Entisols) with virtually no horizonation.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to upper montane forested community. The tree canopy of both stands is dominated by *Abies lasiocarpa* (20 and 40% cover). *Pinus albicaulis* is present in one stand in the subcanopy with 3% cover. *Abies lasiocarpa* seedlings are present in both stands in either the short- or dwarf-shrub stratum with 3% cover, and *Picea engelmannii* seedlings are present in one stand with 3% in the short-shrub stratum. The only shrub present in both stands is *Sambucus racemosa* (1% cover). Shrub genera present in both stands include *Ribes* and *Vaccinium*. The herbaceous layer is dominated by a variety of forbs and graminoids. Graminoids present in both stands include *Elymus glaucus* (3 and 10% cover) and *Phleum alpinum* (1% cover). The dominant graminoid in one stand is *Luzula glabrata var. hitchcockii* (20% cover). The other stand is dominated by *Luzula parviflora* (10% cover) and *Luzula* sp. (10% cover). Other graminoid genera common to both stands include *Carex, Juncus*, and *Poa*. Forbs present in both stands include *Pedicularis racemosa* (1 and 10% cover), *Sibbaldia procumbens* (1 and 10% cover), *Arnica latifolia* (3% cover), *Ligusticum filicinum* (1% cover), and *Erigeron* spp. (3% cover). Well-represented forbs with 10% cover and present in one stand each include *Eucephalus engelmannii* and *Lupinus* sp.

Global Vegetation: Stands are usually very open with short-stature *Abies lasiocarpa* and *Picea engelmannii* dominating the canopy. Scattered seral tree species include *Pinus albicaulis* and *Pinus contorta*. The shrub component is generally depauperate with thin patches of a variable mix of *Vaccinium scoparium, Vaccinium myrtillus, Vaccinium membranaceum* (dwarfed in size to less than 0.2 m), *Lonicera utahensis, Sambucus racemosa, Ribes montigenum*, and *Phyllodoce empetriformis*. The forb component is strongly dominated by *Luzula glabrata*, which can occur as a dense sward (cover approaching 100%) to the near exclusion of other herbs; most studies report an average cover between 20 and 40%. Other graminoids present vary by region with *Juncus parryi, Carex rossii*, and *Carex geyeri* being most prevalent in central and northern Idaho where the type is ostensibly most extensive. *Arnica latifolia* is universally the most abundant and constant forb in a very depauperate layer. In Idaho *Chionophila tweedyi, Pedicularis contorta, Polemonium pulcherrimum*, and *Valeriana sitchensis* are the species with highest constancy; with the exception of *Chionophila tweedyi*, the same expression is found on the east slope of the Cascades (Lillybridge et al. 1995). In Montana *Arnica latifolia, Hieracium gracile, Viola orbiculata*, and *Xerophyllum tenax* tend to be consistently present, though only the first and last named attain high coverages. In Grand Teton National Park, forbs include *Pedicularis racemosa, Sibbaldia procumbens, Arnica latifolia, Ligusticum filicinum, Erigeron* spp., *Eucephalus engelmannii*, and *Lupinus* sp.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Pedicularis racemosa	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Luzula glabrata var. *hitchcockii*	Herb (field)	Graminoid	X	X	.
Luzula parviflora	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	characteristic graminoids
Erigeron spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	X
Picea engelmannii	Tree canopy	Needle-leaved tree	X	X	X
Arnica latifolia	Herb (field)	Forb	.	X	X
Carex geyeri	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	X	.
Luzula glabrata var. *hitchcockii*	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata* var. *hitchcockii* Woodland (CEGL005898)
- *Abies lasiocarpa / Phyllodoce empetriformis* Woodland (CEGL000920)
- *Abies lasiocarpa / Valeriana sitchensis* Forest (CEGL000345)
- *Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Luzula glabrata* var. *hitchcockii* Woodland (CEGL005839)

Global Related Concepts:
- *Abies lasiocarpa / Luzula hitchcockii* Habitat Type (Cooper et al. 1987) =
- *Abies lasiocarpa / Luzula hitchcockii* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1981) =
- *Abies lasiocarpa / Luzula hitchcockii* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1983) =
- *Abies lasiocarpa / Luzula hitchcockii* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) =
- *Abies lasiocarpa / Luzula hitchcockii* Plant Association (Lillybridge et al. 1995) =
- *Abies lasiocarpa/Luzula glabrata var. hitchcockii* (Bourgeron and Engelking 1994) =
- *Picea engelmannii - Abies lasiocarpa - Larix lyallii / Luzula wahlenbergii* Habitat Type (Ogilvie 1969) I
- *Pinus albicaulis - Abies lasiocarpa / Luzula hitchcockii - Vaccinium myrtillus* Vegetation Type (Achuff et al. 2002a) I
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The sampled stands fit the Steele et al. (1983) *Abies lasiocarpa / Luzula hitchcockii (= Luzula glabrata var. hitchcockii*) Habitat Type well. Unlike the Steele et al. description, *Abies lasiocarpa* is the dominant tree species present with little to no *Picea engelmannii*, *Pinus contorta*, or *Pinus albicaulis*. Steele et al. also intimate that *Vaccinium scoparium* forms a layer under which *Luzula glabrata var. hitchcockii* grows. In the Grand Teton National Park stands, *Vaccinium scoparium* is either absent or occurs in low quantities.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: One of the sampled stands occurs on the saddle between Owl Creek and Berry Creek and the other stand occurs on Forellen Peak.
Global Range: This association is a minor one, occurring as small- or infrequently as large-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains and southern portion of the Canadian Rockies. Documented outliers occur in the Teton Range of Wyoming.
Nations: CA, US
States/Provinces: AB, ID:S5, MT:S5, WA:S2, WY:S1
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO7, ECO8, ECO9 added (MSR 2-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier?, Grand Teton); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C080, GT-0202115
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.V. Cooper, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	X	X	X	.	.	.	.	.

Cooper et al. 1987	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Lillybridge et al. 1995	.	X	X	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Ogilvie 1969	.	.	X	.	.	.	.	.	.
Pfister et al. 1977	.	X	X	X	.	.	.	.	.
Steele et al. 1981	.	X	X	.	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams and Smith 1990	.	X	.	X	.	.	.	.	.

A.560 *Pinus albicaulis - Abies lasiocarpa* Woodland Alliance

Whitebark Pine - Subalpine Fir Woodland Alliance

ALLIANCE CONCEPT

Summary:

Environment: Woodlands included in this subalpine alliance occur locally on warm, dry, rocky, exposed sites in the Rocky Mountains from Montana west to dry mountains in northeastern Washington and northeastern Oregon. Elevations range from 1750-2750 m depending on latitude and geography. Climate is mostly semiarid, temperate continental with maritime influences in the northwestern Rocky Mountains. Winter temperatures range from very cold to moderately cold where maritime affected. Mean annual precipitation ranges from 60-180 cm occurring mostly in the winter. Snowpack is often deep and may linger into summer. Some sites have little snow accumulation because of high winds and sublimation. Summers are cool and typically dry from July to September. Stands occur intermittently between the closed-canopy subalpine forestline and upper timberline, but may occur at lower elevations on rocky, windswept ridges or where disturbance such as avalanche or fire has temporarily reduced more shade-tolerant tree species. Above the continuous forestline, these woodlands occur as mosaics of tree islands or patches separated by subalpine meadow or rock outcrops. Sites include ridgetops, mountain slopes, and may be nearly level to steep sloping, on any aspect, but are more typically south-facing. Some northern stands near timberline occur in mesic protected pockets away from the extremely harsh environmental conditions. Substrates are generally lithic, coarse-textured soils such as shallow, gravelly sands or loams derived from colluvium, glacial till and residuum from a variety of volcanic, igneous, sedimentary and metamorphic rocks. Parent materials include pumice, basalt, gneiss, granite, quartzite, siltite, argillite, sandstone, shale, siltstone, limestone and dolomite. Soils may be calcareous and alkaline, but are more typically non-calcareous and acidic. Calcareous soils are more common in more mesic northern stands.

Adjacent vegetation at higher elevations is typically alpine and subalpine meadows. At lower elevations, there are subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii, Pinus contorta, Tsuga mertensiana* or *Pseudotsuga menziesii*.

Vegetation: Stands included in this subalpine woodland alliance occur locally on typically dry, rocky, exposed sites in the Rocky Mountains in Montana and mountains in eastern Washington and eastern Oregon. These woodlands have a sparse to moderate conifer tree cover to 10 m tall (rarely to 20 m) that is codominated by the evergreen needle-leaved trees *Abies lasiocarpa* and *Pinus albicaulis*. High elevation stands are often stunted and may be only a few meters tall. Other associated tree species vary by geography and elevation zones throughout the alliance's range. In the lower subalpine, *Pinus contorta* and *Pseudotsuga menziesii* are present. In more mesic stands *Picea engelmannii* may be present. Near the southern range extent, *Pinus flexilis* is often present. The understory vegetation is typically sparse because sites are often dry and have large amounts of surface rock. There may be a sparse to moderate shrub layer consisting of juvenile trees and other woody species such as *Arctostaphylos uva-ursi, Juniperus communis, Ribes montigenum, Ribes viscosissimum, Shepherdia canadensis, Symphoricarpos oreophilus,* and *Vaccinium scoparium*. The herbaceous layer ranges from absent on rocky sites to moderately dense cover of graminoids or forbs on more mesic sites. Characteristic species include *Achillea millefolium, Arnica* spp., *Calamagrostis rubescens, Carex geyeri, Cassiope mertensiana, Festuca idahoensis, Juncus parryi, Ligusticum grayi, Luzula glabrata var. hitchcockii, Phyllodoce empetriformis, Solidago multiradiata,* and *Xerophyllum tenax*.

Dynamics: *Pinus albicaulis* is a slow-growing, long-lived conifer that is common at higher elevations in the upper subalpine zone. It typically occurs in a mosaic of tree islands and meadows where it often colonizes sites and creates habitat for less hardy tree species. In lower subalpine forests, it is a seral species, establishing after a large disturbance such as stand-replacing fire or avalanche, or it is restricted to dry, rocky ridges where it competes well with shade-tolerant tree species. Without disturbance it will be overtopped in 100-120 years by faster growing, shade-tolerant species such as *Abies lasiocarpa, Picea engelmannii, Pseudotsuga menziesii,* and *Tsuga mertensiana*. Although *Pinus albicaulis* is killed by crown fires and hot ground fires, it tolerates low-intensity ground fires that will kill the shade-tolerant understory. Fire intervals range from 30-300 years.

Birds and small mammals often eat and cache the large, wingless pine seeds and are responsible for the dispersal of this species. Most important is the Clark's nutcracker, which can transport the seeds long distances and cache them on exposed windswept and burned over sites. This results in the regeneration of pines in clumps from forgotten caches (Burns and Honkala 1990a, Eyre 1980, Schmidt and McDonald 1990, Steele et al. 1983).

Pests include the mountain pine beetle, *Dendroctonus ponderosae*, which has killed many mature trees in the past, during epidemics where populations of the beetles build up in lower elevation *Pinus contorta* stands, then move up into the *Pinus albicaulis* (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steele et al. 1983). The exotic pathogen, white pine blister rust, *Cronartium ribicola*, is attacking and killing *Pinus albicaulis* trees in many parts of the interior northwestern U.S. It is especially destructive in more mesic habitats that favor infection of its alternate host, *Ribes* spp. *Pinus albicaulis* is very susceptible to this disease, and the only real hope is propagating individuals that have high genetic resistance to blister rust (Burns and Honkala 1990a, Schmidt and McDonald 1990, Steele et al. 1983).

Similar Alliances:
- *Abies lasiocarpa - Picea engelmannii* Forest Alliance (A.168)
- *Abies lasiocarpa* Woodland Alliance (A.559)
- *Pinus albicaulis* Forest Alliance (A.132)
- *Pinus albicaulis* Woodland Alliance (A.531)

Similar Alliance Comments: The three *Pinus albicaulis* alliances need to be reviewed and their associations compared. It is likely the three alliances should be merged into one *Pinus albicaulis* woodland alliance. The similar alliances have the same diagnostic species as stands included in this alliance. They may be quite similar in species composition, but vary in structure and relative abundance of the species.

ALLIANCE DISTRIBUTION

Range: Woodlands included in this alliance have been reported from subalpine slopes in the Rocky Mountains from Alberta and central Montana, west into the Wallowa Mountains in northeastern Oregon, the Okanogan Highlands in northeastern Washington, and into British Columbia. The alliance likely occurs in adjacent Idaho and Wyoming.

Nations: CA, US

Subnations: AB, BC, ID, MT, OR, WA, WY

TNC Ecoregions: 6:P, 7:C, 8:C, 9:C, 68:C, 144:C

USFS Ecoregions: M242C:??, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton); PC (Banff?, Jasper?, Waterton Lakes); USFS (Caribou-Targhee, Clearwater, Colville NF?, Nez Perce, Okanogan, Wenatchee)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Achuff 1989, Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff and Dudynsky 1984b, Achuff et al. 1993, Arno and Weaver 1990, Burns and Honkala 1990a, Chappell et al. 1997, Clausnitzer and Zamora 1987, Cole 1982, Cooper 1975, Cooper et al. 1987, Cooper et al. 1995, Daubenmire and Daubenmire 1968, Eyre 1980, Hall 1973, Johnson and Clausnitzer 1992, Loope 1969, Pfister et al. 1977, Reed 1969, Schmidt and McDonald 1990, Steele and Geier-Hayes 1987, Steele et al. 1981, Steele et al. 1983, Weaver and Dale 1974, Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b

[CEGL000752] *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Woodland

Translated Name: **Subalpine Fir - Whitebark Pine / Grouseberry Woodland**

Common Name: **Subalpine Fir - Whitebark Pine Woodland**

Ecological System(s):
- Northern Rocky Mountain Subalpine Dry Parkland (CES306.807)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): Pfister et al. (1977)

ELEMENT CONCEPT

Global Summary: This is an extensive forest type in much of the highest forest belt east of the Continental Divide in Montana and is also known from western Wyoming and as far west as eastern Oregon. It is found on all exposures at elevations ranging from 2200 to 3070 m (7200-10,075 feet). Soils are generally thin and poorly developed from a variety of parent materials and are usually acidic to very acidic in the surface layers. Soil textures range from gravelly loams to silts. Ground cover typically has moderate amounts of bare ground and rock. Tree cover is typically open, rarely exceeding 50% total over. *Abies lasiocarpa* shares dominance with *Pinus albicaulis* with 10-60% cover, averaging about 20-30%, each. Higher canopy cover occurs in more protected locations. Other tree species may be present and include *Picea engelmannii*, *Pinus flexilis*, and *Pinus contorta*. Understory growth is usually dominated by *Vaccinium scoparium*, and on drier sites *Carex geyeri* can be more abundant. *Arnica latifolia* is the only consistently present forb across all studies. This association is differentiated from pure *Pinus albicaulis* associations by the consistent codominance of *Abies lasiocarpa* in the overstory canopy.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on shallow to very steep slopes with aspects ranging from south through northwest. The elevations for the sampled stands range from 8947 feet to 10075 feet. The Wineger and Koffgo soils for two stands are derived from glacial till from granite and/or loess. The other stands have well-drained, loam based soils with up to 10% gravel content. The unvegetated and nonvascular ground cover data is only available for two stands; ground cover consists primarily of litter and duff (60% and 40% cover), rocks larger than 10cm (10% and 30% cover), gravel (10% cover), wood (10% cover), and bare soil (5% and 10% cover). Fungi, mosses, and lichens may be present in trace amounts. Surrounding vegetation for two stands consists of mixed coniferous stands with high amounts of *Vaccinium scoparium* and *Carex* spp.

Global Environment: This is an extensive forest type in much of the highest forest belt east of the Continental Divide in Montana and is also known from western Wyoming and as far west as eastern Oregon. It is found on all exposures at elevations ranging from 2200 to 3070 m (7200-10,075 feet). Elevation range changes depending on the limits of treeline north to south and on moisture gradients of different exposures whether on the east or west side of mountains. In central Montana, elevation ranges from 2200 to 2500 m (7200-8100 feet), in southwestern Montana from 2440 to 2700 m (8000-8800 feet), in south-central Montana from 2500 to 2740 m (8100-9000 feet), in northwestern Wyoming from 2700 to 3070 m (8900-10,075 feet), and in northeastern Oregon from 2300 to 2600 m (7600-8500 feet). Soils are generally thin and poorly developed from a variety of parent materials and are usually acidic to very acidic in the surface layers. Soil textures range from gravelly loams to silts. Ground cover typically has moderate amounts of bare ground and rock.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane coniferous forest community occurring on mesic and subxeric sites. The co-dominant tree canopy species are *Pinus albicaulis* (3% to 60% cover) and *Abies lasiocarpa* (7 of 8 stands, 10% to 30% cover). *Picea engelmannii* occurs in the tree canopy in half of the stands with 3% to 10% cover. *P. albicaulis, A. lasiocarpa,* and *P. engelmannii* may be found in the subcanopy and as seedlings. The only shrub species to occur in more than one stand is *Vaccinium scoparium* (10% to 30% cover). Herbaceous species that occur in at least half of the stands include *Pedicularis racemosa* (7 stands, 1% to 3% cover), *Arnica latifolia* (5 stands, 1% to 10% cover), *Juncus parryi* (4 stands, 1% to 10% cover), *Carex rossii* (4 stands, 1% to 3% cover), and *Poa wheeleri* (4 stands, 1% to 3% cover).

Global Vegetation: Tree cover is typically open, rarely exceeding 50% total over. *Abies lasiocarpa* shares dominance with *Pinus albicaulis* with 10-60% cover, averaging about 20-30%, each. Higher canopy cover occurs in more protected locations. Other tree species may be present and include *Picea engelmannii, Pinus flexilis,* and *Pinus contorta*. Understory growth is usually dominated by *Vaccinium scoparium,* and on drier sites *Carex geyeri* can be more abundant. Species composition is highly variable, influenced by neighboring forest types. *Arnica latifolia, Carex rossii,* and *Juncus parryi* are among the more commonly encounter herbaceous species.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	.	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Pedicularis racemosa	Herb (field)	Forb	.	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.
Poa wheeleri	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Pinus albicaulis	Tree canopy	Needle-leaved tree	X	X	.
Vaccinium scoparium	Herb (field)	Dwarf-shrub	.	X	.
Arnica latifolia	Herb (field)	Forb	.	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Poa compressa	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- Pinus albicaulis - Abies lasiocarpa Woodland (CEGL000128)
- *Pinus albicaulis / Vaccinium scoparium* Forest (CEGL000131)--may have *Abies lasiocarpa* present but its never a codominant.

Global Related Concepts:
- *Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium* Habitat Type (Pfister et al. 1977) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type, *Pinus albicaulis* Phase (Steele et al. 1983) =
- *Abies lasiocarpa / Vaccinium scoparium* Habitat Type, *Pinus albicaulis* Phase (Cooper 1975) B
- *Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium* (Bourgeron and Engelking 1994) =
- *Pinus albicaulis - Abies lasiocarpa* Community Type (Cole 1982) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Steele et al. (1983) description of the *Abies lasiocarpa / Vaccinium scoparium* Habitat Type, *Pinus albicaulis* Phase well.
Global Classification Comments: This type is differentiated from similar association by the consistent mix of *Abies lasiocarpa* with *Pinus albicaulis*.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Two sampled stands occur in Caribou-Targhee National Forest: one occurs west of Basin Lakes and one occurs west of Crows Nest. The remainder of the sampled stands occur in GTNP. One occurs on Forellen Peak, one occurs in South Fork of Cascade Canyon, one occurs in Paintbrush Canyon, and the remaining four are on the north side of Cascade Canyon.

Global Range: This high-elevation, open forest occurs near treeline in Montana, Idaho, Wyoming, Oregon, and is expected to occur in Washington, Alberta and British Columbia.
Nations: CA?, US
States/Provinces: AB?, BC?, ID, MT:S5, OR:S4, WA?, WY
TNC Ecoregions: 6:P, 7:C, 8:P, 9:C
TNC Ecoregion Comments: ECO6, ECO7, ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332G:CC, M333D:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A087, GT-03B050, GT-0202075, GT-0202077, GT-0202081, GT-0202118
Accuracy Assessment Points: 04R282
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-088, CT-95-JD-056

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cole 1982	.	X	X	X	.	.	.	.	.
Cooper 1975	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Pfister et al. 1977*	.	X	X	X	.	.	.	.	.
Steele et al. 1983	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

II.A.4.N.d. Temporarily flooded temperate or subpolar needle-leaved evergreen woodland

A.567 *Picea pungens* Temporarily Flooded Woodland Alliance

Blue Spruce Temporarily Flooded Woodland Alliance

ALLIANCE CONCEPT

Summary: This riparian woodland alliance is found at middle elevations (from 1900-2900 m) of the central and southern Rocky Mountains and the Colorado Plateau region. Stands typically occur in narrow, or V-shaped, valleys and canyons subject to cold-air drainage and limited sunlight. They occupy streambanks, terraces, narrow floodplains or benches, and subirrigated toeslopes; stream gradients are often steep. These sites can be subject to spring flooding, and usually water tables are within 1 m of the soil surface even late in the growing season. The soils are somewhat variable often with signs of mottling. This alliance is characterized by the dominance of *Picea pungens* in the tree canopy. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Pseudotsuga menziesii, Abies lasiocarpa, Abies concolor, Picea engelmannii, Pinus ponderosa*, and *Pinus contorta*. *Populus angustifolia* is the most commonly present deciduous tree species, although *Populus tremuloides* may persist as a seral species on well-drained sites of this alliance. There is often an abundant tall-shrub layer; common species include *Alnus incana, Betula occidentalis, Cornus sericea, Rosa woodsii*, and several species of *Salix*. Other shrubs that may be present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera involucrata*, and *Acer glabrum*. Because of favorable soil moisture, the herbaceous layer is usually a luxuriant mixture of forbs and graminoids, including *Equisetum arvense, Calamagrostis canadensis, Carex siccata (= Carex foenea), Heracleum sphondylium, Rudbeckia laciniata, Mertensia ciliata, Fragaria virginiana, Conioselinum scopulorum*, and *Maianthemum stellatum*. The herbaceous layer can have very high cover in some stands. Diagnostic of this woodland alliance is the dominance of *Picea pungens* with an open to moderately closed canopy, occurring on sites that have surface water for brief periods during the growing season.

Environment: This alliance is found at middle elevations (from 1900-2900 m) of the central and southern Rocky Mountains and the Colorado Plateau region. Precipitation averages 46-60 cm annually, with the majority falling as growing-season rainfall. The temperature regime is continental and winters are moderately severe. Stands of this alliance typically occur in narrow, or V-shaped, valleys and canyons subject to cold-air drainage and limited sunlight. They occupy streambanks, terraces, narrow floodplains or benches, and subirrigated toeslopes; stream gradients are often steep. These sites can be subject to spring flooding, and usually water tables are within 1 m of the soil surface even late in the growing season. The soils are somewhat variable, but are primarily derived from glacial or alluvially deposited materials. They range from shallow silty loams over cobbles and gravel, to deep dark-colored clay loams with signs of mottling. The percentage of coarse fragments increases with soil depth, and most sites are well-drained. The pH is neutral to slightly alkaline.

Stands of these riparian woodlands are found within *Pinus ponderosa* or *Pseudotsuga menziesii* montane upland forests. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or other woody riparian communities where this vegetation grades into wetter streamside sites.

Vegetation: These riparian woodlands are characterized by the dominance of *Picea pungens* in the canopy. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. Common associates include *Pseudotsuga menziesii, Abies lasiocarpa, Abies concolor, Picea engelmannii, Pinus ponderosa*, and *Pinus contorta*. The presence of these conifers is usually associated with raised microsites created by root crown hummocks and wind-throw mounds. *Populus angustifolia* is the most commonly present deciduous tree species, although *Populus tremuloides* may persist as a seral species on well-drained sites of this alliance. There is often an abundant tall-shrub layer, with cover ranging from 20-60%, dominated by one or several cold-deciduous species. The most common species include *Alnus incana, Betula occidentalis, Cornus sericea, Rosa woodsii*, and willow species, including *Salix exigua, Salix drummondiana, Salix monticola*, and *Salix bebbiana*. Other shrubs that may be present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera involucrata*, and *Acer glabrum*. Due to favorable soil moisture, the herbaceous layer is usually a luxuriant mixture of forbs and graminoids, including *Equisetum arvense, Calamagrostis canadensis, Carex siccata (= Carex foenea), Heracleum sphondylium, Rudbeckia laciniata, Mertensia ciliata, Fragaria virginiana, Conioselinum scopulorum*, and *Maianthemum stellatum*. The herbaceous layer can have very high cover in some stands.

Dynamics: *Picea pungens* is a slow-growing, long-lived tree which regenerates from seed (Burns and Honkala 1990a). Seedlings are shallow-rooted and require perennially moist soils for establishment and optimal growth. *Picea pungens* is intermediate in shade tolerance, being somewhat more tolerant than *Pinus ponderosa* or *Pseudotsuga menziesii*, and less tolerant than *Abies lasiocarpa* or *Picea engelmannii*. It forms climax stands in the subhumid stands of the southern Rocky Mountains, but may occupy a seral position in more mesic northern stands (Burns and Honkala 1990a). In deep, narrow canyons with swift-moving streams and narrow floodplains and benches, *Picea pungens* appears to be a climax riparian species, and will remain on these sites until removed or damaged by a catastrophic flood (Kittel et al. 1999). It is common for these forests to be heavily disturbed by grazing or fire, as well as recreational uses, such as campgrounds, fishing access, home building, and other activities.

Similar Alliances:

- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)

- *Picea pungens - Populus tremuloides* Forest Alliance (A.423)
- *Picea pungens* Forest Alliance (A.165)
- *Picea pungens* Woodland Alliance (A.557)

Similar Alliance Comments: These woodlands are distinguished from the alliances above by the singular dominance of *Picea pungens* growing in open canopy woodlands generally on wetland sites.

ALLIANCE DISTRIBUTION

Range: These riparian woodlands have been reported from the central and southern Rocky Mountains and higher elevations of the Colorado Plateau in Arizona, Colorado, New Mexico, Utah and Wyoming.
Nations: US
Subnations: AZ, CO, NM, UT, WY
TNC Ecoregions: 9:C, 10:C, 11:C, 19:C, 20:C
USFS Ecoregions: 331J:CC, 341B:CC, M313A:CC, M313B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M341:C
Federal Lands: NPS (Capitol Reef, Curecanti, Florissant Fossil Beds, Grand Teton, Rocky Mountain); USFS (Rio Grande, Routt, San Juan)

ALLIANCE SOURCES

Author(s): M.S. Reid
References: Alexander et al. 1987, Baker 1986, Baker 1989b, Burns and Honkala 1990a, Cooper and Cottrell 1990, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Eyre 1980, Fitzhugh et al. 1987, Hess and Wasser 1982, Johnston 1984, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Komarkova et al. 1988a, Larson and Moir 1987, Moir and Ludwig 1979, Padgett et al. 1988a, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Youngblood and Mauk 1985

[CEGL000894] *Picea pungens / Alnus incana* Woodland

Translated Name: **Blue Spruce / Speckled Alder Woodland**
Common Name: **Colorado Blue Spruce / Thinleaf Alder**
Ecological System(s):
- Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): M.S. Reid

ELEMENT CONCEPT

Global Summary: This woodland occurs in montane riparian areas in Colorado. Stands occur in deep, shaded canyons and narrow valleys along relatively straight stream reaches. It generally forms small patches, but can be continuous for several river miles. *Picea pungens* dominates the overstory with 10-70% cover. There are typically many seedling and saplings as well as mature trees. *Abies lasiocarpa* may also be present with 0-25% cover. The thick shrub understory is confined to a narrow band lining the stream channel. Shrub species include 10-70% cover of *Alnus incana*, 0-40% cover of *Salix drummondiana*, 0-30% cover each of *Salix monticola* and *Acer glabrum*, and 0-10% cover each of *Cornus sericea* and *Lonicera involucrata*. The forb layer is species-rich with up to 40 species and dense, with a total of up to 50% cover. Forb species include *Actaea rubra, Conioselinum scopulorum, Oxypolis fendleri, Geranium richardsonii, Heracleum maximum (= Heracleum lanatum), Maianthemum stellatum, Mertensia ciliata, Rudbeckia laciniata*, and *Equisetum arvense*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The three stands that define this association occur on the valley floor at elevations of 6610 feet to 6700 feet. One stand is on the flood plain of the Snake River and one occurs in the Buffalo Creek Channel. Soil data are available for two stands; the well-drained sandy loam and moderately well-drained sandy clay soils are primarily covered by litter and duff; mosses and wood are well represented, bare soil and lichen are common, and traces of fungi, gravel, and rocks greater than 10cm may occur in one or both stands. Adjacent vegetation includes a continuation of this association with scattered *Populus* sp. One stand has an herbaceous stratum composed almost entirely of non-native species.

Global Environment: This type occurs along moderate-sized, gravel-bed rivers and streams, from 6400 to 8800 feet elevation; occasional stands can be found up to 9300 feet. Valleys where found are typically narrow, rocky canyons, with northerly flowing streams. Soils are derived from coarse Quaternary alluvium and are poorly developed, shallow loamy sands over cobbles and gravel.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a forested community that occurs on mesic sites. *Picea pungens* dominates the stands with 20 to 80% cover in the tree canopy. *Populus angustifolia* (1 and 3% cover) occurs in two stands.

Seedlings of *P. pungens* and *Pinus contorta* may occur in trace amounts. The only shrub that occurs in all stands is *Alnus incana* (3% cover) in either the tall or short shrub stratum. *Juniperus communis, Dasiphora floribunda, Mahonia repens,* and *Elaeagnus commutata* each occur in two stands in either the short or dwarf shrub strata. Graminoids that occur in two stands include *Bromus ciliatus, Elymus glaucus, Phleum pratense, Carex rossii,* and *Poa pratensis.* Forbs are more diverse than graminoids, but they do not occur in the high quantities that the graminoids do. Forbs occurring in two stands are numerous with *Equisetum* spp. occurring in every sampled stand. Forbs that contribute more than 3% cover include *Fragaria virginiana, Galium boreale,* and *Osmorhiza berteroi.*

Global Vegetation: This association is characterized by a somewhat open canopy (averaging 20-30% cover) of the evergreen needle-leaved tree *Picea pungens*. Other trees occur infrequently, but may include *Pseudotsuga menziesii* or *Populus angustifolia*. The understory is dominated by a layer of the tall, broad-leaved deciduous shrub *Alnus incana*, varying in abundance from 15-70% cover. Other shrubs that may be present are also deciduous and include *Amelanchier utahensis, Cornus sericea, Lonicera involucrata,* and *Rosa woodsii*. The herbaceous layer is well-developed and diverse in most stands, and is dominated by the perennial forbs *Equisetum arvense* and *Maianthemum stellatum (= Smilacina stellata),* each with 5-25% cover. Common perennial graminoids include *Bromus ciliatus* and *Calamagrostis canadensis*. Some sedge species may be locally abundant, such as *Carex geyeri* and *Carex pellita (= Carex lanuginosa).*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea pungens	Tree canopy	Needle-leaved tree	X	X	.
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	.	X	.
Alnus incana	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Juniperus communis	Short shrub/sapling	Needle-leaved shrub	.	X	.
Elaeagnus commutata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Mahonia repens	Herb (field)	Dwarf-shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Actaea rubra	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Taraxacum officinale	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	X	.
Carex rossii	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Astragalus sp.	characteristic fern
Equisetum sp.	characteristic fern
Viola sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea pungens	Tree canopy	Needle-leaved tree	X	X	.
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous tree	X	X	.
Cornus sericea	Tall shrub/sapling	Broad-leaved deciduous tree	X	.	.
Lonicera involucrata var. *involucrata*	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Rosa woodsii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Maianthemum stellatum	Herb (field)	Forb	X	.	.
Osmorhiza depauperata	Herb (field)	Forb	X	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	.	.
Poa pratensis	Herb (field)	Graminoid	.	.	X
Equisetum arvense	Herb (field)	Fern	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic

Cirsium vulgare	-	P	exotic
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	increased coverage of this exotic species due to livestock grazing.
Taraxacum officinale	-	P	increased coverage of this exotic species due to livestock grazing.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (14-Nov-1997). This riparian plant association is somewhat widespread on the western slope of Colorado, and may also occur in Wyoming and New Mexico. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan National Forests. This association occurs along narrow to moderately wide floodplains and stream benches in narrow canyons subject to cold air drainage and limited sunlight, typically in small patches and scattered locations. Recent inventory efforts by the Colorado Natural Heritage Program have found this association to be more common in Colorado than previously thought. While many stands have been negatively impacted by livestock grazing, and dams or hydrologic alterations are threats, the association does not appear to be rare or severely threatened. Therefore the global rank has been lowered to G3.

RELATED CONCEPTS

Global Similar Associations:
- *Picea pungens / Cornus sericea* Woodland (CEGL000388)

Global Related Concepts:
- *Picea pungens/Alnus incana* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.b. (Driscoll et al. 1984) B
- UNESCO FORMATION CODE: II.A.2b (UNESCO 1973) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs north of Schwabachers Landing, one occurs west of Triangle X Ranch, and one occurs in the Buffalo Creek Channel.

Global Range: Reported from scattered locations from northwestern Wyoming to northern New Mexico, although only Colorado actually has documented occurrences. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan national forests.
Nations: US
States/Provinces: CO:S3, NM?, WY
TNC Ecoregions: 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331G:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Curecanti, Grand Teton, Rocky Mountain); USFS (Rio Grande, Routt, San Juan)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A096, GT-03B078
Accuracy Assessment Points: 04R100
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): M.S. Reid

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1986	.	X	.	X	X	.	.	.	.
Baker 1989a	.	.	.	X	X	.	.	.	.
Baker 1989b	.	X	.	X	X	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	X	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
UNESCO 1973	.	.	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000389] *Picea pungens / Equisetum arvense* Woodland

Translated Name: **Blue Spruce / Field Horsetail Woodland**
Common Name: **Blue Spruce / Field Horsetail**
Ecological System(s):
- Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): J. Thompson and J. Stevens

ELEMENT CONCEPT

Global Summary: This association is restricted to narrow canyons and cool ravines on stream benches and streambanks in Colorado, Utah, and Wyoming. Stands occur at elevations of 2135-2745 m (7000-9000 feet) and are characterized by dominance of *Picea pungens* with a thick understory of *Equisetum arvense* and few shrubs. Other tree species possibly present include *Pseudotsuga menziesii*, *Pinus contorta*, and *Picea engelmannii*. Shrub cover is minor, yet diverse and may include *Betula nana*, *Salix geyeriana*, *Salix monticola*, and *Rosa woodsii*. The herbaceous undergrowth typically consists of few species including *Equisetum arvense*, *Carex aquatilis*, and *Juncus balticus var. montanus*. Frequent flooding appears important to maintaining the species in the herbaceous layer.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs on the valley floor or in channels on the valley floor. One stand occurs on an intermittently flooded island in the Snake River. The elevations for these stands range from 1963 to 2073 m (6440-6800 feet). The loam-based soils are well- to moderately well-drained. The unvegetated ground cover is comprised primarily of litter and duff (80-90% cover) and wood (5-20% cover). Adjacent communities often include *~Artemisia tridentata ssp. vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533)$$. On the island *Populus angustifolia* and *Alnus incana* are present.
Global Environment: This association occurs in cool, narrow canyons or north-facing aspects on poorly drained flats, stream terraces, gentle toeslopes, or on seeps. It occurs at elevations ranging from 878 to 2805 m (2880-9200 feet). Soils are continually saturated or moderately well-drained. The water table is within 50 cm of the surface. Textures are highly variable and range from loamy skeletal, sandy skeletal, fine loamy to silt loam and clay loam.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane spruce woodland occurring on mesic sites. The dominant tree canopy species is *Picea pungens*, contributing 60 to 80% cover. *Picea engelmannii* (20% cover) and *Abies lasiocarpa* (1% cover) each occur in one stand. *Picea pungens* occurs in the tree subcanopy, and seedlings of *Picea pungens* are present. The shrub layer is not well-developed, and there are no dominant shrub species. Shrubs that occur in two of the four stands include *Dasiphora fruticosa ssp. floribunda*, *Lonicera involucrata*, and *Shepherdia canadensis* (1% cover each). The herbaceous layer is dominated by *Equisetum arvense* (1-20% cover in three stands) or *Equisetum hyemale* (1-20% cover in two stands). Species found in each stand include *Carex* spp. (1-10% cover), *Fragaria virginiana* (1-3% cover), and *Maianthemum stellatum* (1% cover). Other high-constancy forbs include Asteraceae sp., *Galium boreale*, and *Orthilia secunda*.
Global Vegetation: These riparian stands are dominated by an overstory canopy of *Picea pungens*. Sometimes *Picea engelmannii* also occurs, as well as a few scattered *Abies lasiocarpa* individuals. *Populus tremuloides* and *Pseudotsuga menziesii* may also be present. The shrub layer is sparse, with such shrubs as *Alnus incana*, *Betula occidentalis*, *Betula nana (= Betula glandulosa)*, *Lonicera involucrata*, *Amelanchier alnifolia*, *Symphoricarpos oreophilus*, *Salix monticola*, and *Salix geyeriana*. The herbaceous layer can be monotypic with *Equisetum arvense* (sometimes *Equisetum hyemale*) the sole dominant. Other herbaceous species that may be

present include *Carex aquatilis, Carex disperma, Juncus balticus, Elymus glaucus, Glyceria striata (= Glyceria elata), Geranium richardsonii, Senecio triangularis, Galium boreale, Orthilia secunda*, and *Maianthemum stellatum (= Smilacina stellata).*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea pungens	Tree canopy	Needle-leaved tree	X	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Orthilia secunda	Herb (field)	Forb	.	X	.
Equisetum arvense	Herb (field)	Fern	X	X	.
Equisetum hyemale	Herb (field)	Fern	.	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	characteristic graminoids
Asteraceae sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	.	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	.	X	.
Picea pungens	Tree canopy	Needle-leaved tree	X	X	X
Equisetum arvense	Herb (field)	Fern	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium hybridum	-	P	exotic
Trifolium pratense	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (29-Dec-1999). This minor riparian association is known from Colorado, Utah, and Wyoming. Less than 100 occurrences are estimated to exist. Threats are imposed by overuse from recreation and livestock, and alteration of flood regimes from dams and diversions. Soils are often wet and easily compacted by livestock, and frequent flooding appears important to maintain the dominance of *Equisetum arvense*, at least in stands in Colorado. The question mark in the rank indicates the uncertainty of how many occurrences exist in Utah. Classification clarification of similar stands in Utah and Wyoming is needed to know the extent of this type.

RELATED CONCEPTS

Global Similar Associations:
- *Picea engelmannii / Equisetum arvense* Forest (CEGL005927)
- *Picea pungens / Betula occidentalis* Woodland (CEGL002637)

Global Related Concepts:
- *Picea / Equisetum arvense* Community Type (Youngblood et al. 1985a) B
- *Picea pungens / Equisetum arvense* (Kittel et al. 1999a) =
- *Picea pungens / Equisetum arvense* Habitat Type (Youngblood and Mauk 1985) =
- *Picea pungens/Equisetum arvense* (Bourgeron and Engelking 1994) =
- Conifer / *Equisetum arvense* Community Type (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association slightly differs from the Youngblood et al. (1985a) description in that the undergrowth in Grand Teton National Park is not as dense.

Global Classification Comments: This association is known from Colorado and Utah, and western Wyoming as part of the Conifer/*Equisetum arvense* and the *Picea / Equisetum arvense* community types (Padgett et al. 1989, Youngblood et al. 1985a, respectively). These closely related forest communities have tree canopies dominated by either *Picea engelmannii* or *Picea pungens*, or codominated by both species. Hansen et al. (1995) also reported a *Picea / Equisetum arvense* community type, but in Montana these are either *Picea engelmannii* or *Picea glauca* or hybrids of the two.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs primarily east and south of Cow Lake with one stand also occurring west of Moose.
Global Range: This minor association is known from Colorado and Utah, and likely occurs in southwestern Wyoming and southeastern Idaho.
Nations: US
States/Provinces: CO:S2?, UT:S3?, WY
TNC Ecoregions: 9:C, 10:C, 11:C, 19:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331E:CC, M331H:CC, M331I:CC, M341:C
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C089, GT-03C097, GT-0201092, GT-0202109
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): J. Thompson and J. Stevens, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	.	.	.	.	.	.	.	.
Kittel et al. 1996	.	X	.	X	X	.	.	.	.
Kittel et al. 1999a	.	X	X	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mauk 1985	.	X	X	X	X	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	X	.	.	.	.

[PARK SPECIAL GRTE-064] *Picea pungens / Actaea rubra* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: Two of the stands defining this association occur on the valley floor at elevations of 6451 feet and 6486 feet and one occurs in the Snake River Channel at an elevation of 6600 feet. For the two stands occurring on the valley floor the moderately well-drained loam or sandy loam soils are covered primarily by litter and duff and wood. Also contributing to the unvegetated ground cover are mosses (5% and 10% cover) and rocks greater than 10 cm, gravels, lichens, and fungi, which occur in trace amounts. Scat contributes 5% ground cover to one stand. Adjacent vegetation includes a continuation of

this association or open areas dominated by various graminoids or shrubs. The stand in the channel has heavy fuel loading, with some trees felled by beavers.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a forested community occurring on mesic sites. *Picea pungens* contributes 30 to 50% cover in the tree canopy. *Populus angustifolia* (3 and 10% cover) occurs in two stands and *Picea engelmannii* contributes 30% cover in one stand. Subcanopy species include *Picea pungens* (3 to 30% cover) in all stands, *P. engelmannii*, and *P. contorta*, with the latter two each contributing 10% cover in the same stand. Seedlings of *A. lasiocarpa* occur in two stands. Shrubs that occur in two stands include *Amelanchier alnifolia, Symphoricarpos albus*, and *Mahonia repens.* Herbaceous species are diverse, but few occur in more than trace amounts. Graminoids that occur in two stands include *Bromus vulgaris* (3 and 20% cover), *Carex rossii* (1 and 10% cover), and *Phleum pratense* (1% cover). *Actaea rubra* is the dominant forb with 10 to 40% cover. Other forbs occurring in all stands include *Osmorhiza berteroi* and *Rudbeckia occidentalis.* Numerous other forbs occur in two of the sampled stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Picea pungens*
FORB	*Actaea rubra, Osmorhiza berteroi, Rudbeckia occidentalis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Picea engelmannii, Picea pungens, Populus angustifolia, Amelanchier alnifolia, Mahonia repens, Symphoricarpos albus, Bromus vulgaris, Carex rossii, Phleum pratense, Actaea rubra, Aconitum columbianum, Campanula rotundifolia, Chamerion angustifolia, Disporum trachycarpum, Hieracium sp., *Maianthemum stellatum, Osmorhiza berteroi, Rudbeckia occidentalis, Streptopus amplexifolius, Thalictrum* sp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Cirsium arvense, Taraxacum officinale*
Rare Species: *Viola orbiculata*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is type is similar to Padgett et al's Conifer/*Actea rubra* community type.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Two of the sampled stands occur southeast of the Moose Entrance Station and one occurs in the Snake River Channel north of Bar BC Ranch.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B080, GT-03B079
Accuracy Assessment Points: 04R082
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-064
Local Author: Mark Fain
Date: 20 April 2004
Local Editor: Klara Varga
Date: 4 May 2004
Re-write: Mark Fain
Date: 1 November 2004
Re-edit: kelly McCloskey
Date: 22 December 2004

Global Author:

REFERENCES: Padgett et al. 1989

II.B.2.N.b. Temporarily flooded cold-deciduous woodland

A.641 *Populus angustifolia* Temporarily Flooded Woodland Alliance

Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ALLIANCE CONCEPT

Summary: This riparian alliance occurs in the lower to mid-montane floodplains and streams throughout much of the western U.S. Sites include narrow benches along narrow stream channels and on large floodplains along broad, meandering rivers. Stands are usually found between 0.5-2 m above the stream channel. The alluvial soils are highly permeable with large amounts of coarse fragments in the subsurface horizons. Vegetation within this alliance is characterized by a typically open tree canopy and is dominated by *Populus angustifolia* with 20-70% cover. Other trees can include *Acer negundo, Juniperus scopulorum, Picea pungens, Pinus ponderosa*, and *Picea engelmannii* in the Rocky Mountains. The shrub layer can be very dense and diverse with 10-80% cover of *Cornus sericea, Alnus incana, Amelanchier utahensis, Rosa woodsii, Acer glabrum, Quercus gambelii, Salix* spp., *Crataegus rivularis*, or *Lonicera involucrata*. *Juniperus deppeana, Brickellia californica*, and *Alnus oblongifolia* have been reported from stands in New Mexico and Arizona, as has significant cover of woody vines such as *Vitis arizonica, Parthenocissus quinquefolia (= Parthenocissus inserta), Clematis ligusticifolia*, and *Humulus lupulus var. lupuloides (= Humulus americanus)*. The forb layer is moderately dense to absent and includes species such as *Maianthemum stellatum, Heracleum maximum (= Heracleum lanatum), Achillea millefolium*, and *Osmorhiza depauperata*. Graminoid cover is insignificant in New Mexico and Arizona. Diagnostic of this alliance is the dominance of *Populus angustifolia* in the tree canopy in woodlands that are briefly flooded during the growing season.
Environment: Vegetation types in this alliance occur in narrow to wide valleys, 10-150 m, having variable gradients (1-16%) and moderately steep stream channels (2-5% gradient). Elevation ranges from below 1650 m in Wyoming to 2600 m in Colorado. Stands occur on narrow benches along narrow stream channels and on large floodplains along broad, meandering rivers. This alliance usually occurs between 0.5-2 m above the stream channel. Water tables usually fluctuate enough for distinct mottles to form. Available water capacity appears low in many stands.

Soils are highly permeable with large amounts of coarse fragments in the subsurface horizons. The soil textures are fine sandy loams, clay loams, silty clay loams, and silty clay. Soils are frequently reworked by floods and beavers. Peat deposits, if present, are thin.

Kittel et al. (1994, 1995, 1996) reported *Pinus edulis - Juniperus osteosperma* woodlands, *Pinus ponderosa - Quercus gambelii* forests, *Quercus gambelii* scrub, and *Artemisia tridentata* and *Chrysothamnus* spp. shrublands as occurring on adjacent hillslopes.
Vegetation: Associations within this alliance are defined as cold-deciduous, temporarily flooded woodlands. The tree canopy is typically open and dominated by *Populus angustifolia* with 20-70% cover. Other trees can include *Acer negundo, Juniperus scopulorum, Picea pungens, Pinus ponderosa*, and *Picea engelmannii* in the Rocky Mountains. The shrub layer is can be very dense and diverse with 10-80% cover of *Cornus sericea, Alnus incana, Amelanchier utahensis, Rosa woodsii, Acer glabrum, Quercus gambelii, Salix* species, *Crataegus rivularis*, or *Lonicera involucrata*. The shrub layer in stands in Arizona and New Mexico also consist of *Juniperus deppeana, Brickellia californica*, and *Alnus oblongifolia*. The forb layer includes 0-50% cover of *Maianthemum stellatum, Heracleum maximum (= Heracleum lanatum), Achillea millefolium*, and *Osmorhiza depauperata*. Graminoid cover is insignificant. In New Mexico and Arizona, a significant vine component is present, with cover of 25-60%, consisting mainly of *Vitis arizonica, Parthenocissus quinquefolia (= Parthenocissus inserta), Clematis ligusticifolia*, and *Humulus lupulus var. lupuloides (= Humulus americanus)*.
Dynamics: Cottonwood woodlands grow within an alluvial environment that is continually changing due to the ebb and flow of the river. Riparian vegetation is constantly being 're-set' by flooding disturbance. Cottonwood communities are early, mid or late seral, depending on the age class of the trees and the associated species of the stand. Mature cottonwood stands do not regenerate in place, but regenerate by 'moving' up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is well documented. Periodic flooding events can leave sandbars of bare, mineral substrate. Cottonwood seedlings germinate and become established on newly-deposited, moist sandbars. In the absence of large floods in subsequent years, seedlings begin to trap sediment. In time, the sediment accumulates and the sandbar rises. The young forest community is then above the annual flood zone of the river channel.

In this newly elevated position, with an absence of excessive browsing, fire, and agricultural conversion, this cottonwood community can grow into a mature riparian forest. At the same time, the river channel continually erodes streambanks and creates fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (TNC 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example a high terrace, the cottonwoods will be replaced by upland shrub or tree species from adjacent areas.
Similar Alliances:
- *Juniperus deppeana* Woodland Alliance (A.534)
- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)

Similar Alliance Comments: The ~*Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)$$ differs in vegetation structure. The forest alliances are distinguished from the woodlands mainly due to overlapping crowns in the canopy, generally forming 60-100% cover.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread in the lower to mid-montane floodplains and streams of the Rocky Mountains, Great Plains, Great Basin, Colorado Plateau and the American Southwest.
Nations: US
Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WY
TNC Ecoregions: 6:C, 8:?, 9:C, 10:C, 11:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:P, 24:P, 25:C, 26:C, 27:C
USFS Ecoregions: 311:C, 313E:CC, 321A:CC, 322A:CC, 331D:CC, 331G:C?, 331I:CC, 331J:CC, 341B:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342D:CC, 342F:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M334A:CC, M341A:CC, M341B:CC
Federal Lands: NPS (Capitol Reef, Curecanti, Dinosaur, Grand Teton, Rocky Mountain); USFS (Bighorn, Black Hills, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Baker 1986, Baker 1989b, Bassett et al. 1987, Beidleman 1954, Boles and Dick-Peddie 1983, Cooper and Cottrell 1990, DeLeuw, Cather & Company 1977, Durkin et al. 1994b, Durkin et al. 1995a, Eyre 1980, Freeman and Dick-Peddie 1970, Girard et al. 1997, Hansen et al. 1991, Hansen et al. 1995, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Johnston 1987, Keammerer 1974a, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Komarkova 1986, Laurenzi et al. 1983, Marriott and Jones 1989, Muldavin et al. 1993a, Muldavin et al. 1993b, Olson and Gerhart 1982, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1942, Richard et al. 1996, Smith 1994b, Woodbury et al. 1961, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL002537] *Populus angustifolia / Artemisia tridentata* var. *vaseyana / Eriogonum umbellatum* Dry Outwash Woodland

Translated Name: **Narrowleaf Cottonwood / Mountain Big Sagebrush / Sulphurflower Wild Buckwheat Dry Outwash Woodland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): G. Kittel

ELEMENT CONCEPT

Global Summary: This association is documented only from Grand Teton National Park, Wyoming, on the Snake River floodplain and along Pilgrim Creek. The riparian woodland occurs on the valley floor at elevations of 1970 and 2100 m (6455-6880 feet). The soils are well-drained sandy loams. It is a phreatophytic woodland with an overstory canopy of *Populus angustifolia* tapping into the alluvial water table, while surface is well-drained sandy loam with coarse alluvial cobbles. Consequently, the understory canopy is a mix of mesic riparian and upland species. The shrub layer is composed of *Artemisia tridentata, Amelanchier* spp., *Mahonia repens*, and *Symphoricarpos* spp. The herbaceous undergrowth is dominated by forbs, but some graminoid genera occur, including *Carex* and *Elymus*. *Eriogonum umbellatum* is the dominant forb. Other forbs present include *Achillea millefolium, Arabis* spp., *Collomia linearis, Lomatium ambiguum, Packera streptanthifolia,* and *Sedum lanceolatum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor at elevations from 6455 to 6900 feet. Where data are available the soils are well-drained sandy loams, loamy sands, or clay loams. The unvegetated and non-vascular ground surface is composed of litter and duff (20 to 80% cover), mosses (5 to 40% cover), gravel (1 to 30% cover), wood greater than 1 cm (5 to 20% cover), rocks greater than 10 cm (1 to 10% cover), and bare soil (1 to 10% cover). Most stands have traces of sand and lichens, although sand contributes 40% ground cover for one stand. Adjacent vegetation may include *Pinus contorta, Artemisia tridentata,* and/or *Picea pungens* intermixed with *Populus angustifolia*.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a deciduous woodland community that occurs on subxeric sites. *Populus angustifolia* (12 to 30% cover) is the dominant tree species occurring in the tree canopy, subcanopy, or short shrub strata. *Artemisia tridentata* ssp. *vaseyana* (1 to 30% cover) is the dominant shrub. Other high constancy shrubs include *Shepherdia canadensis* and *Amelanchier alnifolia.* The herbaceous layer may be diverse and contribute up to 60% cover. The highest constancy graminoids include *Poa pratensis* and *Koeleria macrantha.* *Eriogonum umbellatum* is the only forb to occur in all stands contributing 1 to 40% cover. Other forbs present in the majority of stands include *Achillea millefolium* and *Arabis* spp. A variety of forbs and graminoids are present in less than half the stands, but may be locally abundant.

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	X	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Collomia linearis	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Arabis spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Carduus nutans	-	P	exotic
Cerastium arvense	-	P	exotic
Cirsium arvense	-	P	exotic
Medicago lupulina	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Thlaspi arvense	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (30-Mar-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur west of the GTNP Headquarters in Moose, near of Pilgrim Creek, near Ditch Creek, near Spread Creek, south of Wolff Ridge, and near the Gros Venture River.

Global Range: This association is documented only from Grand Teton National Park, Wyoming.
Nations: US
States/Provinces: WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments:
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A002, GT-0201098, GT-03B115, GT-03C047, GT-03C060, GT-03C094
Accuracy Assessment Points: 04K080, 04K082, 04X487, 04X023, 04X422
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, mod. K. Varga, M. Fain and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL005963] *Populus angustifolia / Poa pratensis* Woodland

Translated Name: **Narrowleaf Cottonwood / Kentucky Bluegrass Woodland**
Common Name:

Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): E. Muldavin

ELEMENT CONCEPT

Global Summary: This deciduous riparian forest is widespread throughout the Rocky Mountains, from New Mexico north to Montana, and west to Utah and Idaho. The community can be found in mountain valleys at mid to upper elevations ranging from 945 to 2450 m (3100-8040 feet). Stands occur on flat, elevated stream terraces in wide and narrow valley bottoms. Sites are normally elevated stream terraces or recently aggraded alluvial bars situated well above stream bankfull levels. Slope gradients are gentle, between 0 and 6%. Soils are well-drained, often skeletal sands, loams, or fine clay over coarse alluvium. The middle-aged to mature stands of *Populus angustifolia* have open to closed canopies (20-90%). The grassy underlayer is dominated by *Poa pratensis* which contributes up to 10-80% cover. Other trees that may be present include *Juniperus scopulorum, Juniperus monosperma, Juniperus deppeana* in New Mexico, *Populus X acuminata, Populus fremontii* or *Fraxinus velutina* in southeastern Idaho, *Picea engelmannii* in Utah, and *Salix amygdaloides* in Wyoming. In mature, shaded stands, cottonwood reproduction is limited to root sprouts. Shrubs are absent or present only as scattered individuals. These can include *Rosa woodsii, Cornus sericea ssp. sericea, Salix irrorata, Salix exigua, Salix lutea, Symphoricarpos* spp., *Lonicera involucrata, Ribes* spp., *Rhus trilobata, Ericameria nauseosa (= Chrysothamnus nauseosus),* and the vine *Clematis ligusticifolia*. Herbaceous diversity is moderately high but variable.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on historic floodplains on the valley floor between 1935 to 2118 m (6350-6950 feet). One stand is situated in a palustrine area that has saturated soil for extended periods during the growing season. Soil and unvegetated ground surface data are available for three stands; the soils are moderately well-drained clay loams or loamy sands. Litter and duff dominate the unvegetated ground surface for this stand, covering 80 to 90%. The remainder of the surface is codominated by rocks greater than 10 cm (1 to 10% cover), gravel (1 to 5% cover), wood (5 to 10% cover), and bare soil (1 to 5% cover). Mosses and lichens may be present in trace quantities. Sandy soils are associated with five other stands. Ungulate disturbance is evident in all of the stands; severe browsing is the most prominent sign. In the vicinity of three stands beavers have either chewed or felled large *Populus angustifolia* trees. Most of the plots have many weedy species within them. Most of the sampled stands are located in continuous *Populus angustifolia* woodlands in which variable understories are evident. One of the stands is situated in a woodland that fronts an *Artemisia tridentata ssp. vaseyana* - *Artemisia arbuscula* - *Purshia tridentata* shrubland, and another is bordered by ~*Alnus incana* / Mesic Forbs Shrubland (CEGL001147)$$. *Picea pungens* associations border at least three stands.

Global Environment: This deciduous riparian forest is widespread throughout the Rocky Mountains, from New Mexico north to Montana, and west to Utah and Idaho. The community can be found in mountain valleys at mid to upper elevations ranging from 945 to 2450 m (3100-8040 feet). Stands occur on flat, elevated stream terraces in wide and narrow valley bottoms. Sites are normally elevated stream terraces or recently aggraded alluvial bars situated well above stream bankfull levels. Slope gradients are gentle, between 0 and 6%. Terraces may border the channel, or stands may be more than 50 m from the channel, but are elevated several meters above the stream. Consequently, the community is only periodically flooded (10- to 25-year recurrence interval). On the older elevated terraces soils show some development (Inceptisols), with some beginning to develop a rich organic layer from decomposition and leaching of leaves and branches (Mollis Epipedons). On recently aggraded bars, soils lack development (Entisols). Soils are well-drained, often skeletal sands, loams, or fine clay over coarse alluvium. Mottling is rarely present, and water tables are only rarely observed within 1 m (3.3 feet) of the ground surface. These soils are located closer to the active channel and therefore can be wet or moist well within rooting depth. Generally, all soils are well-drained sands with river gravels and cobbles mixed within the matrix.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane cottonwood community that occurs on subxeric sites. The tree strata are dominated solely by *Populus angustifolia* with 1 to 30% canopy cover in either the canopy or subcanopy. In stands where *Populus angustifolia* has low canopy or subcanopy cover, the regeneration cover is 20%. All stands have at least one stratum with 12% cover of *Populus angustifolia*. The shrub layer is conspicuous (averaging 3% canopy cover) but generally does not form a definite stratum. The highest constancy species include *Dasiphora fruticosa ssp. floribunda* and *Shepherdia canadensis*, though no shrub species has 50% constancy. The majority of the stands have herbaceous ground cover of 30% or less, although cover may be as high as 90%, with graminoids dominating. The most dominant graminoid is *Poa pratensis*, composing 3 to 60% canopy cover. The only other high-constancy graminoid is *Phleum pratense* (trace to 3% cover). No forb species is present throughout even one-third of the stands. *Pseudotsuga menziesii* seedlings are colonizing one stand; they are present in the dwarf-shrub layer at 1% cover.

Global Vegetation: The middle-aged to mature stands of *Populus angustifolia* have moderately open to closed canopies (20-90%). The grassy underlayer is dominated by *Poa pratensis* which contributes up to 10-80% cover. Other trees that may be present include *Juniperus scopulorum, Juniperus monosperma, Juniperus deppeana* in New Mexico, *Populus X acuminata, Populus fremontii*, or *Fraxinus velutina* in southeastern Idaho, *Picea engelmannii* in Utah, and *Salix amygdaloides* in Wyoming. In mature, shaded stands, cottonwood reproduction is limited to root sprouts. Shrubs are absent or present only as scattered individuals. These can include *Rosa woodsii, Cornus sericea ssp. sericea, Salix irrorata, Salix exigua, Salix lutea, Symphoricarpos* spp., *Lonicera involucrata, Ribes* spp.,

Rhus trilobata, Ericameria nauseosa (= Chrysothamnus nauseosus), and the vine *Clematis ligusticifolia*. Herbaceous diversity is moderately high but variable. Common graminoids that occur with *Poa pratensis* include *Elymus lanceolatus, Pascopyrum smithii (= Elymus smithii), Hordeum jubatum, Hesperostipa comata, Phleum pratense, Agrostis stolonifera, Carex stipata, Carex praegracilis*, and *Alopecurus aequalis*. Forbs are also highly variable and are generally less abundant than graminoids. Forb species include *Epilobium ciliatum, Equisetum arvense, Equisetum laevigatum, Heracleum maximum, Veronica anagallis-aquatica, Maianthemum stellatum (= Smilicina stellata), Cynoglossum officinale, Glycyrrhiza lepidota, Chenopodium* spp., and *Rudbeckia laciniata*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	X	X	.
Shepherdia canadensis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	X	X	X
Poa pratensis	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Agrostis stolonifera	-	P	exotic
Bromus inermis	-	P	exotic
Bromus tectorum	-	P	exotic
Carduus nutans	-	P	exotic
Centaurea biebersteinii	-	P	exotic
Cirsium arvense	-	P	exotic
Cirsium vulgare	-	P	exotic
Cynoglossum officinale	-	P	exotic
Linaria vulgaris	-	P	exotic
Medicago lupulina	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (modified/managed) (19-Jul-2004). This type has received a global rank of GM (modified) because of the dominance of the exotic *Poa pratensis* in the undergrowth along with the incursion of a number other exotic species (21 herbaceous exotic have been recorded for the type).

RELATED CONCEPTS

Global Similar Associations:

- *Picea pungens / Poa pratensis* Woodland (CEGL005958)

Global Related Concepts:

- *Populus angustifolia / Poa pratensis* Community (Jones and Walford 1995) =
- *Populus angustifolia / Poa pratensis* Community Type (Muldavin et al. 2000a) =
- *Populus angustifolia / Poa pratensis* Community Type (Youngblood et al. 1985a) =
- *Populus angustifolia / Poa pratensis* Community Type (Padgett et al. 1989) =
- *Populus angustifolia* / Herbaceous Community Types (Hall and Hansen 1997) B
- *Populus angustifolia* / Herbaceous Community Types (Hansen et al. 1995) B
- Unclassified: *Populus angustifolia* / mesic graminoid (Kittel et al. 1999a) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The Youngblood et al. (1985a) description of this community type differs from Grand Teton National Park's association in that all of Grand Teton stands are situated above 1920 m (6300 feet); Youngblood et al. mention that this community type is typically located below 1920 m (6300 feet).
Global Classification Comments: This is thought to be a grazing-induced vegetation type. It has been observed in Colorado but not described (unclassified plot data, Kittel et al. 1999a).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs on the floodplains of the Gros Ventre and Snake rivers, on the southern tip of Burnt Ridge, near Moose Post office off the Murie Road, Cottonwood Creek north of Fabian Ranch, and south of Wolff Ridge.
Global Range: This association is widespread in mountainous regions of the Rocky Mountains and is documented in Montana, Idaho, Utah, Wyoming, Colorado, and New Mexico.
Nations: US
States/Provinces: CO, ID, MT, NM, UT, WY
TNC Ecoregions: 8:?, 9:C, 18:C, 20:C, 21:C
TNC Ecoregion Comments: ECO18:C, ECO9:C, ECO8:? added (GK 7-05).
USFS Ecoregions: M313A:CC, M331F:CC, M331G:CC, M331I:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Plots: GT-03B113, GT-03A099, GT-03A123. **Accuracy Assessment Points:** 04K011, 04M023, 04R019, 04R036, 04R037, 04R039, 04R040, 04R069, 04R076, 04R085, 04R089, 04R209. **Other plots within park boundaries, from other projects:** None. **Other plots outside park boundaries but within 2 miles:** None.

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga, M. Fain and K. McCloskey
Global Description Author(s): E. Muldavin et al., mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Hall and Hansen 1997	.	.	X	.	.	.	.	.	.
Hansen et al. 1990	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	.	X	.	.	.	.	.	.
Jones and Walford 1995	.	X	X	X	.	.	.	.	.
Kittel et al. 1999a	.	X	X	.	.	.	.	.	.
Muldavin 1991	.	X	.	.	.	.	.	.	.
Muldavin et al. 2000a	.	X	X	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	.	.	.	.	.	.

[CEGL002648] *Populus angustifolia / Symphoricarpos (albus, occidentalis, oreophilus)* Woodland

Translated Name: **Narrowleaf Cottonwood / (Common Snowberry, Western Snowberry, Mountain Snowberry) Woodland**
Common Name:
Ecological System(s):
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.821)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This deciduous forest occurs on narrow montane valley floodplains, on upper terraces, outer edges of floodplains, on alluvial bars of major rivers, as well as around lakes and ponds. It occurs between 945 and 2550 m (3100-8350 feet) elevation. Soils are shallow to deep, fine-textured sandy loams and clay loams over coarser materials. Few coarse fragments occur in the upper soil layers. This deciduous forest is dominated by an open to nearly closed canopy of mature *Populus angustifolia*. Other trees present may include *Juniperus scopulorum, Populus balsamifera, Populus tremuloides, Picea pungens*, or *Pinus contorta*. The shrub layer in mesic stands is dominated by one of several species of *Symphoricarpos*: *Symphoricarpos albus, Symphoricarpos rotundifolius, Symphoricarpos occidentalis*, or *Symphoricarpos oreophilus*. Other shrub species that may be scattered but never as abundant as *Symphoricarpos* include *Prunus virginiana, Quercus gambelii, Cornus sericea, Ribes lacustre, Ribes cereum, Alnus incana, Betula*

occidentalis, and *Salix bebbiana*. Graminoids and forbs present include *Agrostis stolonifera, Bromus inermis, Poa pratensis, Phleum pratense, Elymus* spp., *Balsamorhiza sagittata, Eriogonum umbellatum, Cirsium arvense, Glycyrrhiza lepidota, Melilotus officinalis, Maianthemum stellatum (= Smilacina stellata), Solidago canadensis*, and *Achillea millefolium*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The sampled stands of this association occur on the valley floor or flat terrain in channels at elevations of 1971 to 2103 m (6466-6900 feet). Soil data are available for two stands; soil textures include loams containing 30% gravel and clay loams that are gravel-free. One stand has an abundance of downed woody material greater than 7.6 cm (3 inches) in diameter. One stand is situated on an island in the Snake River that is about 250 square meters. One stand is bordered on three sides by either a *Pinus contorta* stand, a *Picea pungens* stand, or a *Populus angustifolia / Artemisia tridentata ssp. vaseyana* stand.

Global Environment: This deciduous forest occurs on narrow montane valley floodplains, on upper terraces, outer edges of floodplains, on alluvial bars of major rivers, as well as around lakes and ponds. It occurs between 945 and 2550 m (3100-8350 feet) elevation. Soils are shallow to deep, fine-textured sandy loams and clay loams over coarser materials. Few coarse fragments occur in the upper soil layers. *Populus angustifolia* occupies elevations above broad-leaved cottonwoods in Colorado and Wyoming, and between the range of black cottonwood (*Populus balsamifera ssp. trichocarpa*, which is higher) and plains cottonwood (*Populus deltoides*, at lower elevations) in Montana and Idaho.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a deciduous forest community that occurs adjacent to drainages. The tree canopy stratum is dominated almost exclusively by *Populus angustifolia* (7 to 50% cover). *Populus balsamifera, Populus tremuloides, Picea pungens*, or *Pinus contorta* may occur as incidental species in either the tree canopy or subcanopy. A variety of shrubs may be present in all of the shrub strata. Species present in the majority of the stands include *Symphoricarpos oreophilus* (7 to 20% cover), *Mahonia repens* (1 to 12% cover), and *Juniperus communis* (trace to 1% cover). Graminoids and forbs present in at least half the sampled stands include *Poa pratensis, Elymus* spp., *Balsamorhiza sagittata, Eriogonum umbellatum*, and *Achillea millefolium*. A variety of other forbs are present in just one or two stands.

Global Vegetation: This deciduous forest is dominated by an open to nearly closed canopy of mature *Populus angustifolia*. Other trees present may include *Juniperus scopulorum, Populus balsamifera, Populus tremuloides, Picea pungens*, or *Pinus contorta*. The shrub layer in mesic stands is dominated by one of several species of *Symphoricarpos*: *Symphoricarpos albus, Symphoricarpos rotundifolius, Symphoricarpos occidentalis*, or *Symphoricarpos oreophilus*. Other shrub species that may be scattered but never as abundant as *Symphoricarpos* include *Prunus virginiana, Quercus gambelii, Cornus sericea, Ribes lacustre, Ribes cereum, Alnus incana, Betula occidentalis*, and *Salix bebbiana*. Graminoids and forbs present include *Agrostis stolonifera, Bromus inermis, Poa pratensis, Phleum pratense, Elymus* spp., *Balsamorhiza sagittata, Eriogonum umbellatum, Cirsium arvense, Glycyrrhiza lepidota, Melilotus officinalis, Maianthemum stellatum (= Smilacina stellata), Solidago canadensis*, and *Achillea millefolium*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	X	X	.
Juniperus communis	Short shrub/sapling	Needle-leaved shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Elymus spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus angustifolia	Tree canopy	Broad-leaved deciduous tree	X	X	X
Symphoricarpos albus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos occidentalis	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Dactylis glomerata	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2Q (7-Apr-1998).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Populus angustifolia / Symphoricarpos albus* (Kittel et al. 1999a) =
- *Populus angustifolia / Symphoricarpos occidentalis* Community Type (Hall and Hansen 1997) =
- *Populus angustifolia / Symphoricarpos occidentalis* Community Type (Hansen et al. 1995) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Global Classification Comments: We include stands dominated by *Populus angustifolia* and any species of *Symphoricarpos*, because they all occupy a similar ecological niche within the riparian zone, that is, the higher, older terraces. *Symphoricarpos* species are wide-ranging across the West and even into the Midwest, while the cottonwood dominating the overstory is the better indicator for the geographic distribution for the association.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands of this association occur north of Moose on the west side of the Snake River, adjacent to Ditch Creek east of Blacktail Butte, near Pilgrim Creek Road, and off the Moose/Wilson Road.
Global Range: This plant association is found in Front Range canyons of Colorado.
Nations: US
States/Provinces: CO:S2, ID, MT, WY
TNC Ecoregions: 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 & M331A added for Teton (mjr 3-05).
USFS Ecoregions: M331A:CC, M331D:CC, M331E:CC, M331I:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Plots: GT-0201085, GT-0202101. **Accuracy Assessment Points:** 04M028, 04X420, 04X812. **Other plots within park boundaries, from other projects:** None. **Other plots outside park boundaries but within 2 miles:** None.

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga and M. Fain
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Hall and Hansen 1997	.	.	X	.	.	.	.	.	.
Hansen et al. 1995	.	.	X	.	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-056] *Populus angustifolia / Shepherdia canadensis* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on level terrain adjacent to rivers at elevations from 6500 to 6900 feet. Soil data are available for two stands; the stands' very deep Tetonville soils are somewhat poorly-drained sandy loams. These are soils of flood plains that formed in alluvium. Other stands contain sandy soils with large amounts of litter and duff and one stand has a large percentage of bare ground with small rocks scattered. No additional environmental data are available. Adjacent to one stand is a *Pinus contorta* forest, which encroaches into the stand. Ungulate use is evident in half the stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous woodland community that occurs on flood plains. The tree canopy is dominated by *Populus angustifolia* (7 to 40% cover). *Pinus contorta* occurs in over half the stands with trace to 7% cover. Other tree species that may occur include *Picea pungens*, *Pseudotsuga menziesii*, *Populus tremuloides*, and *Abies lasiocarpa*. *Shepherdia canadensis* is the most constant shrub with 3 to 30% cover in the short shrub stratum. Numerous other shrubs may occur, but none are present in over half the sampled stands. The herbaceous layer is diverse, but few species occur in more than half the stands. The total herbaceous cover for most stands ranges from 12 to 20%. The most constant graminoids include *Phleum pratense*, *Poa pratensis*, and *Bromus* spp. The only forbs present in half the stands are *Eriogonum umbellatum* and *Lupinus* spp.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Populus angustifolia*
SHORT SHRUB	*Shepherdia canadensis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Pinus contorta, Populus angustifolia, Shepherdia canadensis, Bromus spp., *Phleum pratense, Poa pratensis, Eriogonum umbellatum, Lupinus* spp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Agrostis stolonifera, Bromus inermis, Phleum pratense, Poa compressa, Poa pratensis, Centaurea biebersteinii, Medicago lupulina, Medicago sativa, Taraxacum officinale, Tragopogon dubius, Trifolium hybridum*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus angustifolia – Picea pungens / Shepherdia canadensis* association, but is differentiated by the absence of *Picea pungens* as a co-dominant tree species.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One of the sampled stands occurs on the Gros Ventre River south of Blacktail Butte, one stand occurs on the Snake River north of Blacktail Butte, two occur in the Snake River channel east of Potholes, one occurs in Spread Creek channel west of highway, one occurs south of Pacific Creek, one occurs in the Pilgrim Creek channel east of highway, and one occurs between the Moose visitor center and the Snake River.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202102, GT-0202111
Accuracy Assessment Points: 04R204, 04R208, 04K081, 04X417, 04X500, 04X817
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-056
Local Author: Rob Massatti
Date: 21 April 2004
Local Editor: Klara Varga
Date: 3 May 2004
Re-write: Mark Fain
Date: 29 October 2004
Re-edit: kelly McCloskey
Date: 22 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-055] *Populus angustifolia – Picea pungens / Shepherdia canadensis* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for association occurs on terraces or channels on the valley floor at elevations ranging from 6500 to 6900 feet. Where data are available the soils are well-drained sandy loams. Unvegetated and non-vascular ground surface data for one stand indicate that litter and duff is dominant, covering 90% of the ground. The remaining surface is covered by wood (10% cover), mosses (5% cover), and a trace of gravel, rocks greater than 10cm, fungi, and lichen. Wildlife use is evident in the form of beaver-felled cottonwoods and bison wallows and/or feces. Adjacent vegetation may

include graminoid meadows, *Dasiphora floribunda / Deschampsia caespitosa* association, *Salix* spp., and denser patches of *Picea pungens*.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a forest community that occurs in subxeric areas. The tree canopy layer is dominated by *Populus angustifolia* (3 to 30% cover) and *Picea pungens* (3 to 30% cover). The tree canopy layer covers 7 to 60% of the ground. *Populus angustifolia* and *Picea pungens* seedlings may be present. The shrub layer may or may not be well developed for all sampled stands; *Shepherdia canadensis* is the only species present in all of the stands (3 to 20% cover). Other high constancy shrub species are *Juniperus communis* and *Mahonia repens*. The herbaceous layer is generally dominated by graminoids, the most common being *Poa pratensis* (trace to 30% cover) and Phleum pratense (1 to 3% cover). No forb species occur in over half the stands with *Osmorhiza berteroi* and *Achillea millefolium* being the most constant.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Populus angustifolia, Picea pungens*
SHORT SHRUB	*Shepherdia canadensis*
GRAMINOID	*Poa pratensis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Picea pungens, Populus angustifolia, Juniperus communis, Mahonia repens, Shepherdia canadensis, Phleum pratense, Poa pratensis

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Agrostis stolonifera, Bromus inermis, Phleum pratense, Poa pratensis, Carduus nutans, Medicago lupulina, Taraxacum laevigatum, Taraxacum officinale, Tragopogon dubius, Trifolium pratense*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus angustifolia / Shepherdia canadensis* association, but is differentiated by the presence of *Picea pungens* as a co-dominant tree species. It is also similar to the *Picea pungens / Shepherdia canadensis* association, but is differentiated by the presence of *Populus angustifolia* as a co-dominant tree species.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association can be found along the Snake River, near Colter Bay, near the Moose Visitor Center, and across the river from Bar B C Ranch.

Global Range:

Nations:

States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A075, GT-0203006
Accuracy Assessment Points: 04J234, 04K083, 04R044, 04R073, 04R084, 04R202, 04R203, 04X057, 04X473
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-055
Local Author: Rob Massatti
Date: 24 March 2004
Local Editor: Klara Varga
Date: 25 March 2004
Re-write: Mark Fain
Date: 10 November 2004
Re-edit: kelly McCloskey
Date: 22 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-080] *Populus angustifolia - Picea pungens / Poa pratensis* Forest

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor in flat terrain of channels or terraces at elevations of 6400 to 6900 feet. Two stands contain patches of bare soil that may be contributed to heavy ungulate grazing. All other stands show evidence of some browsing. Adjacent vegetation may include an unclassified *Populus angustifolia-Picea pungens / Juniperus communis* community type and/or *Alnus, Salix,* or *Populus angustifolia* regeneration stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane forested community that occurs on mesic sites. The tree layer is almost exclusively *Picea pungens* (7 to 30% cover) and *Populus angustifolia* (7 to 30% cover) with *Pinus contorta* and *Populus tremuloides* occurring as incidental species in one stand each. Seedlings of *Picea pungens* and *Populus angustifolia* may occur within the shrub layer. The shrub layer is not very well developed for any stand. *Shepherdia canadensis* (trace to 3% cover) and *Rosa* spp. (trace to 3% cover) are the only species that occur in more than half the stands. The herbaceous layer is diverse and dominated by non-native grasses. *Poa pratensis* dominates with 3 to 20% cover in all stands and *Phleum pratense* is the only other species that occurs in over half the stands. No forb species contributes more than 3% cover or occurs in half the stands. *Equisetum* spp. occurs in three of five stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TREE CANOPY	*Picea pungens, Populus angustifolia*
GRAMINOID	*Poa pratensis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Picea pungens, Populus angustifolia, Rosa spp., *Shepherdia canadensis,Phleum pretense, Poa pratensis, Equisetum* spp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Agrostis stolonifera, Phleum pretense, Poa pratensis, Carduus nutans, Chenopodium album, Silene latifolia, Tragopogon dubius*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Populus angustifolia / Poa pratensis* association, but is differentiated by the co-dominance of *Picea engelmannii* in the tree layer. This association is also similar to the *Populus angustifolia-Picea pungens / Shepherdia canadensis* association, but *S. canadensis* is not present in large enough amounts with the stands sampled for this association to be a stratum; although, with less browsing/grazing these stands may have at one time been the *Populus angustifolia-Picea pungens / Shepherdia canadensis* association.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the Spread Creek area, southeast of Pacific Creek, near Blacktail Ponds, and near the Murie Ranch.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0203007
Accuracy Assessment Points: 04K068, 04R043, 04X411, 04X493
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-080

Local Author: Mark Fain
Date: 09 November 2004
Local Editor: Klara Varga
Date: 13 December 2004

Global Author:

REFERENCES: None

III. Shrubland

III.A.2.N.c. Sclerophyllous temperate broad-leaved evergreen shrubland

A.787 *Ceanothus velutinus* Shrubland Alliance

Tobacco-brush Shrubland Alliance

ALLIANCE CONCEPT

Summary: This is a limited alliance found in the northwestern Great Plains. It is dominated by dense colonies of *Ceanothus velutinus*. Stands are not extensive. Stands of this alliance occur on dry hillsides, often with thin soil.
Environment: Stands of this alliance occur on dry hillsides, often with thin soil.
Vegetation: This is a limited alliance found in the northwestern Great Plains. It is dominated by dense colonies of *Ceanothus velutinus*. Stands are not extensive.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in western South Dakota, Wyoming, Colorado and California.
Nations: US
Subnations: CA, CO, SD, WY
TNC Ecoregions: 9:C, 12:C, 20:C, 25:C
USFS Ecoregions: 331:P, M261E:CC, M331D:CC, M331E:CC, M334A:CC
Federal Lands: NPS (Curecanti, Dinosaur, Grand Teton, Yosemite)

ALLIANCE SOURCES

Author(s): Midwestern Ecology Group
References: Faber-Langendoen et al. 1996

[CEGL002167] *Ceanothus velutinus* Shrubland

Translated Name: **Tobacco-brush Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Lodgepole Pine Forest (CES306.820)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): D. Ode, mod. D. Faber-Langendoen

ELEMENT CONCEPT

Global Summary: This shrubland is known to occur at elevations ranging from 2088-2700 m (6850-8860 feet) on moderate to steep slopes (14-73%). Patches can be small, in a mosaic or post-burn vegetation, or cover entire hillsides. Soils are well-drained and are silty, loamy sandy, or clay loams. The vegetation is dominated by a tall layer of shrubs 1-2 m tall. *Ceanothus velutinus* is the major dominant. Stands can be a uniform layer of pure *Ceanothus velutinus*, or quite diverse. Tree seedlings and saplings may be mixed in the upper canopy layer with *Ceanothus*, including *Populus tremuloides* and *Pseudotsuga menziesii*. Other shrubs may also be present, including *Amelanchier* sp., *Artemisia tridentata ssp. vaseyana, Symphoricarpos rotundifolius, Symphoricarpos oreophilus, Ceanothus* spp., *Prunus virginiana, Mahonia repens*, and *Rosa* spp. The herbaceous layer ranges from low cover (10%) to up to 60%. Graminoids include *Carex geyeri, Elymus trachycaulus, Achnatherum* spp., and *Hesperostipa comata*. Forbs include *Arabis drummondii, Heterotheca villosa, Solidago* sp., *Campanula rotundifolia, Agastache urticifolia, Balsamorhiza sagittata, Eriogonum umbellatum, Geranium viscosissimum, Iliamna rivularis*, and *Thalictrum* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: This association occurs primarily on southeast-facing slopes at elevations ranging from 6700 to 8200 feet. The slopes vary from 13 to 73%. Where soil data are available the well drained soils vary in texture, ranging from loamy sands to clay loams. The unvegetated ground cover is generally composed of up to 10% gravel, 60% litter and duff and up to 20% bare soil. One stand burned in 1974 due to a natural wildfire and has 10% litter and duff and 70% bare soil; charred remains of *Pseudotsuga menziesii* (diameter 10 to 25 inches) make up 5% of the ground cover. Almost all stands have been affected by fire or occur in avalanche paths. Adjacent vegetation may include *Artemisia tridentata* ssp. *spiciformis* shrublands, *Acer Glabrum* avalanche chutes, *Populus tremuloides* avalanche chutes, *Pinus contorta* forests, mixed coniferous forests, and/or Sedge dominated meadows.

Global Environment: This shrubland is known to occur at elevations ranging from 2088-2700 m (6850-8860 feet) on moderate to steep slopes (14-73%). Patches can be small, in a mosaic or post-burn vegetation, or cover entire hillsides. Soils are well-drained and are silty to loamy sandy, to clay loams.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. Common tree species, usually occurring as regeneration after fire include *Pinus contorta, Pseudotsuga menziesii, Abies lasiocarpa,* and *Populus tremuloides*. The shrub canopy is usually dominated by *Ceanothus velutinus* (12 to 80% canopy cover) but in one stand the canopy is dominated by *Spiraea betulifolia.* A number of other shrub species can co-occur within the canopy (up to 12% cover); the common or high constancy species include *Symphoricarpos* spp., *Amelanchier alnifolia, Prunus virginiana, Mahonia repens,* and *Artemisia tridentata.* Herbaceous cover generally ranges from 12 to 60% and is dominated by *Carex geyeri*. Other common or high constancy herbaceous species include *Calamagrostis rubescens, Melica* spp., *Elymus* spp., *Bromus* spp., *Agastache urticifolia, Balsamorhiza sagittata, Eriogonum umbellatum,* and *Chamerion angustifolium.*

Global Vegetation: The vegetation is dominated by a tall layer of shrubs 1-2 m tall. *Ceanothus velutinus* is the major dominant. Stands can be a uniform layer of pure *Ceanothus velutinus*, or stands can be quite diverse. Tree seedlings and saplings may be mixed in the upper canopy layer with *Ceanothus*, including *Populus tremuloides* and *Pseudotsuga menziesii*. Other shrubs may also be present, including *Rosa* spp., *Amelanchier* sp., *Artemisia tridentata ssp. vaseyana, Mahonia repens, Symphoricarpos rotundifolius, Symphoricarpos oreophilus, Ceanothus* spp., and *Prunus virginiana*. The herbaceous layer ranges from low cover (10%) to up to 60%. Graminoids include *Carex geyeri, Elymus trachycaulus, Achnatherum* spp., and *Hesperostipa comata*. Forbs include *Arabis drummondii, Heterotheca villosa, Solidago* sp., *Campanula rotundifolia, Agastache urticifolia, Balsamorhiza sagittata, Eriogonum umbellatum, Geranium viscosissimum, Iliamna rivularis*, and *Thalictrum* sp.
Global Dynamics: This type is apparently a seral community, as it resprouts following fire or avalanche disturbances.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tridentata	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Agastache urticifolia	Herb (field)	Forb	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Bromus spp.	characteristic graminoids
Elymus spp.	characteristic graminoids
Melica spp.	characteristic graminoids
Symphoricarpos spp.	characteristic short shrubs
Thalictrum sp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos rotundifolius	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tridentata	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Ceanothus velutinus	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	X
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic
Cynoglossum officinale	-	P	exotic
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (3-Oct-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Ceanothus velutinus* Forest (CEGL000581)--found in Colorado, where it is ranked S2S3.

Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments: *Ceanothus velutinus* is known to resprout after disturbance, and its seeds require the intense heat of fire to germinate. Most stands of *Ceanothus velutinus* in the park occur in areas frequently disturbed by avalanche or burned within the last couple of decades.
Global Classification Comments: The alliance and association concepts are tentative and need review. The information on this type is based on observations by D. Ode (pers. comm. 1999) at three sites in the Black Hills: (1) on the northwest-facing top slope of Terry Peak, present since at least the 1960s; (2) on north-facing slopes of Mt. Theodore Roosevelt located just north of Deadwood; and (3) in a powerline corridor near Spearfish Peak above Spearfish Canyon. The biggest stands might be in the Bear Lodge, but the largest seen is 2-3 acres on Terry Peak, surrounded by aspen; it generally does not occur under the aspen. Thilenius (1971) reports *Ceanothus velutinus* in his aspen type, the *Populus tremuloides / Spiraea betulifolia / Lathyrus ochroleucus* type, as having a constancy of 25%, compared with much higher constancies (>85%) for *Spiraea betulifolia* and *Symphoricarpos albus* (H. Marriott pers. comm. 1999). Thilenius (1971) also describes a *Ceanothus velutinus* shrubland type on old forest burns in the Igneous Cone area of the northern Hills (this refers to the zone of Tertiary igneous features (knobs, buttes, etc.). It also occurs under the *Pinus ponderosa* canopy on unburned sites in the region. It is difficult to know from his report how significant these stands are and whether they constitute an association, as he also recognizes *Pinus flexilis* and *Pinus contorta* pine types for the Black Hills, both of which are really only minor (though unusual) species populations in other *Pinus ponderosa* types.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on the east slope of the Teton Mountains, on the west shore of Jackson Lake, and near Taggart Lake.

Global Range: This shrubland is found in the Black Hills of South Dakota and Wyoming, western Wyoming, and northern and southern Colorado.
Nations: US
States/Provinces: CO, SD:S1, WY
TNC Ecoregions: 9:C, 20:C, 25:C
TNC Ecoregion Comments: ECO20 added for CURE (mjr 6-05).
USFS Ecoregions: 331:P, M331D:CC, M331E:CC, M334A:CC
Federal Lands: NPS (Curecanti, Dinosaur, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A108, GT-03B009, GT-03C032, GT-03D001
Accuracy Assessment Points: 04J057, 04J060, 04J074, 04J115, 04J117, 04J118, 04J122, 04J123, 04J144, 04J145 04J155, 04K004, 04K006, 04K035, 04K039, 04K041, 04K043, 04M011, 04M021, 04R016, 04R024
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): D. Ode, mod. D. Faber-Langendoen and G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Marriott pers. comm.	.	.	.	X	.	.	.	.	.

Midwestern Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Ode pers. comm.	.	.	.	X	.	.	.	.	.
Thilenius 1971	.	.	.	X	.	.	.	.	.

III.A.3.N.a. Needle-leaved evergreen shrubland

A.811 *Abies lasiocarpa - Picea engelmannii - Pinus flexilis* Krummholz Shrubland Alliance

Subalpine Fir - Engelmann Spruce - Limber Pine Krummholz Shrubland Alliance

ALLIANCE CONCEPT

Summary: These dwarf-tree shrublands are a matrix type in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana. Climate is cold, temperate often with heavy winter snow, short cool summers, and windswept most of the year. Sites are nearly level to steeply sloping, often on more mesic north aspects. Soils are shallow, lithic gravelly or sandy loams typically derived from granite or schist. Rock outcrop is common. Stands are a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall), alpine meadow or fellfields. The woody canopy is dominated by stunted *Abies lasiocarpa* often with *Picea engelmannii* codominating. Other woody species include shrubs and dwarf-shrubs, such as *Phyllodoce glanduliflora, Kalmia polifolia, Ribes montigenum, Salix brachycarpa, Salix glauca, Salix planifolia, Vaccinium membranaceum*, and *Vaccinium scoparium*, that may be present to codominant. The herbaceous layer is sparse under dense shrub canopy, or may be dense where the shrub canopy is open or absent. It is often dominated by mesic or xeric alpine forb and graminoid species, but may include subalpine species especially in protected areas. Characteristic species may include the forbs *Antennaria* spp., *Artemisia scopulorum, Geum rossii, Polemonium pulcherrimum ssp. delicatum, Potentilla diversifolia, Sedum lanceolatum, Sibbaldia procumbens, Thalictrum occidentale, Trifolium dasyphyllum*; and the graminoids *Calamagrostis purpurascens, Carex* spp., *Festuca brachyphylla, Kobresia myosuroides, Poa* spp., and *Trisetum spicatum*. Adjacent vegetation includes subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii* or *Pinus contorta* at lower elevations, or alpine meadows and fellfields at higher elevations.

Environment: These dwarf-tree shrublands are a matrix type in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana. Climate is cold, temperate often with heavy winter snow, short cool summers, and windswept most of the year. Sites are nearly level to steeply sloping, often on more mesic north aspects. Soils are shallow, lithic gravelly or sandy loams typically derived from granite or schist. Rock outcrop is common. Adjacent vegetation includes subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii* or *Pinus contorta* at lower elevations, or alpine meadows and fellfields at higher elevations.

Vegetation: Shrublands included in this alliance occur near treeline in the upper subalpine zone of the Rocky Mountains. Stands are a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall), alpine meadow or fellfields. The woody canopy is dominated by stunted *Abies lasiocarpa* often with *Picea engelmannii* codominating. Other woody species include shrubs and dwarf-shrubs such as *Phyllodoce glanduliflora, Kalmia polifolia, Ribes montigenum, Salix brachycarpa, Salix glauca, Salix planifolia, Vaccinium membranaceum*, and *Vaccinium scoparium*, that may be present to codominant. The herbaceous layer is sparse under dense shrub canopy, or may be dense where the shrub canopy is open or absent. It is often dominated by mesic or xeric alpine forb and graminoid species, but may include subalpine species especially in protected areas. Characteristic species may include the forbs *Antennaria* spp., *Artemisia scopulorum, Geum rossii, Polemonium pulcherrimum ssp. delicatum, Potentilla diversifolia, Sedum lanceolatum, Sibbaldia procumbens, Thalictrum occidentale, Trifolium dasyphyllum*, and the graminoids *Calamagrostis purpurascens, Carex* spp., *Festuca brachyphylla, Kobresia myosuroides, Poa* spp., and *Trisetum spicatum*.

Dynamics: In the harsh windswept environment where these shrublands occur, trees are stunted and flagged from wind damage. The stands or patches often originate when *Picea engelmannii* or *Pinus albicaulis* colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* then can colonize in the shelter of the *Picea engelmannii*, and may form a dense canopy by branch layering (Habeck 1969, Zwinger and Willard 1996). Sexual reproduction and the role of disturbances from frost heaving and small mammal burrows that expose mineral soil need further investigation (Habeck and Choate 1963).

Similar Alliances:

Similar Alliance Comments: This alliance is one of nine alliances that are dominated or codominated by *Abies lasiocarpa*. This alliance contains stands that are not forests or woodlands, but are dominated by dwarfed trees that form an upper treeline shrubland mosaic.

ALLIANCE DISTRIBUTION

Range: These shrublands occur near treeline in the Rocky Mountains. Stands have only been described from Colorado, Wyoming, Montana, and Alberta, Canada, but likely occur in similar habitat in adjacent states.

Nations: CA, US

Subnations: AB, CO, MT, UT?, WY

TNC Ecoregions: 7:C, 8:C, 9:C, 20:C

USFS Ecoregions: M331A:CC, M331D:CC, M331F:CP, M331G:CP, M331H:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Gunnison, White River NF)

ALLIANCE SOURCES

Author(s): K.A. Schulz
References: Habeck 1969, Habeck and Choate 1963, Hess 1981, Hess and Wasser 1982, Komarkova 1986, Peet 1975, Peet 1981, Wasser and Hess 1982, Zwinger and Willard 1996

[CEGL000985] *Abies lasiocarpa - Picea engelmannii* Krummholz Shrubland

Translated Name: **Subalpine Fir - Engelmann Spruce Krummholz Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Subalpine Dry Parkland (CES306.807)
- Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: These dwarf-tree shrublands occur in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana and Canada. Climate is cold, temperate, often with heavy winter snow, and short cool summers. Sites are nearly level to steeply sloping. Stands are often extensive on more mesic north aspects. Sites are windswept most of the year by prevailing westerly winds. Winter winds are especially intense, desiccate and kill needles and stems, and deform branches that are above the snowpack. Soils are shallow, lithic, gravelly or sandy loams, and rock outcrops are common. Stands form a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall, with occasional taller wind-flagged individuals) in alpine meadows or fell-fields. The woody canopy is dominated by stunted *Abies lasiocarpa* and *Picea engelmannii*. *Pinus albicaulis, Pinus flexilis,* or *Pinus aristata* may be present to codominant. Occasional *Pinus contorta* or *Larix lyallii* may be present in some stands. *Picea engelmannii* is more prominent on more xeric sites in more southern latitudes, and *Abies lasiocarpa* is more prominent on mesic sites and in the north. Other woody species may be present, including shrubs and dwarf-shrubs such as *Phyllodoce glanduliflora, Kalmia polifolia, Ribes montigenum, Vaccinium membranaceum,* and *Vaccinium scoparium*. The herbaceous layer is sparse under dense shrub canopies, or may be dense turf where the shrub canopy is open and where soil is not limiting. It is often dominated by mesic or xeric alpine forb and graminoid species but may include subalpine species especially in protected areas.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a variety of slopes, interfluves, or terraces with aspects of any direction. Elevations for the sampled stands range from 9300 to 10600 feet. Soil data is available for only one plot; the very deep and well-drained Leighcan soils formed in colluvium and glacial till. The soils are very stony sandy loams. The majority of the stands have large amounts of gravel, cobble, and/or bedrock as unvegetated ground cover. All stands have short growing seasons and are heavily affected by snow and wind causing Krummholz growth formations.

Global Environment: These dwarf-tree shrublands occur in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana and Canada. Climate is cold, temperate, often with heavy winter snow, and short cool summers. Sites are nearly level to steeply sloping. Stands are often extensive on more mesic north aspects. Sites are windswept most of the year by prevailing westerly winds. Winter winds are especially intense, desiccate and kill needles and stems, and deform branches that are exposed above the snowpack. Soils typically are shallow, lithic, gravelly or sandy loams typically derived from granite or schist. Soils formed in colluvium and glacial till can be deep and well-drained. Rock outcrop is common.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an alpine shrubland community that occurs in mesic areas. *Abies lasiocarpa* (1 to 70% cover) is the dominant conifer with *Pinus albicaulis* (trace to 30% cover) and *Picea engelmannii* (trace to 30% cover) as co-dominants growing either as short trees or seedlings. Short or dwarf shrubs may be present, though no species grows in more than 25% of the stands. The most constant shrubs include *Ribes montigenum* and *Salix* spp. Some of the stands have a diverse herbaceous understory, but only three species occur in more than trace amounts in at least 25% of the stands; these are *Poa alpina, Juncus parryi,* and *Pedicularis contorta.*
Global Vegetation: Stands form a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall, with occasional taller wind-flagged individuals) in alpine meadows and turf or fell-fields. The woody canopy is dominated or codominated by stunted *Abies lasiocarpa* and *Picea engelmannii*. Occasional *Pinus albicaulis, Pinus flexilis, Pinus aristata, Pinus contorta,* or *Larix lyallii* may be present to codominant. *Picea engelmannii* is more prominent on more xeric sites and in more southern latitudes,

and *Abies lasiocarpa* is more prominent on more mesic sites and in the north. Other woody species, including shrubs and dwarf-shrubs such as *Phyllodoce glanduliflora, Kalmia polifolia, Ribes montigenum, Vaccinium membranaceum*, and *Vaccinium scoparium*, may be present. The herbaceous layer is sparse under dense shrub canopy, or may be dense turf where the shrub canopy is open and where soil is not limiting. It is often dominated by mesic or xeric alpine forb and graminoid species but may include subalpine species especially in protected areas. Common species may include the forbs *Antennaria* spp., *Arenaria fendleri, Arnica* spp., *Artemisia scopulorum, Astragalus kentrophyta, Erigeron peregrinus, Erigeron rydbergii, Draba oligosperma, Geum rossii, Minuartia obtusiloba, Phlox pulvinata, Polemonium pulcherrimum, Orthilia secunda, Potentilla diversifolia, Sedum lanceolatum, Sibbaldia procumbens, Silene acaulis, Smelowskia calycina, Streptopus amplexifolius, Thalictrum occidentale, Trifolium dasyphyllum, Valeriana sitchensis, Veratrum viride*, and the graminoids *Calamagrostis purpurascens, Carex elynoides, Carex rupestris var. drummondiana, Carex heteroneura, Festuca brachyphylla, Kobresia myosuroides, Luzula glabrata, Luzula spicata, Phleum alpinum, Poa alpina*, and *Trisetum spicatum*.

Global Dynamics: In the harsh wind-swept environment where these shrublands occur, trees are stunted and flagged from wind damage. The stands or patches often originate when *Picea engelmannii* or *Pinus albicaulis* colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* then can colonize in the shelter of the *Picea engelmannii* and may form a dense canopy by branch layering (Habeck 1969, Zwinger and Willard 1996). Sexual reproduction and the role of disturbances from frost heaving and small mammal burrows that expose mineral soil need further investigation (Habeck and Choate 1963).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Short shrub/sapling	Needle-leaved shrub	X	X	.
Picea engelmannii	Short shrub/sapling	Needle-leaved shrub	X	X	.
Pinus albicaulis	Short shrub/sapling	Needle-leaved shrub	X	X	.
Aquilegia flavescens	Herb (field)	Forb	.	X	.
Pedicularis contorta	Herb (field)	Forb	.	.	.
Polygonum bistortoides	Herb (field)	Forb	X	X	.
Valeriana edulis	Herb (field)	Forb	.	X	.
Poa alpina	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree canopy	Needle-leaved tree	X	X	.
Picea engelmannii	Tree canopy	Needle-leaved tree	X	.	.
Erigeron peregrinus	Herb (field)	Forb	X	.	.
Geum rossii	Herb (field)	Forb	X	.	.
Orthilia secunda	Herb (field)	Forb	X	.	.
Polemonium pulcherrimum	Herb (field)	Forb	X	.	.
Streptopus amplexifolius	Herb (field)	Forb	X	.	.
Thalictrum occidentale	Herb (field)	Forb	X	.	.
Calamagrostis purpurascens	Herb (field)	Graminoid	X	.	.
Festuca brachyphylla	Herb (field)	Graminoid	X	.	.
Kobresia myosuroides	Herb (field)	Graminoid	X	.	.
Luzula glabrata var. *hitchcockii*	Herb (field)	Graminoid	X	X	.
Trisetum spicatum	Herb (field)	Graminoid	X	.	.

Higher Taxon Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Abies lasiocarpa - Picea engelmannii* Ribbon Forest (CEGL000328)
- *Abies lasiocarpa - Picea engelmannii* Tree Island Forest (CEGL000329)

Global Related Concepts:

- *Abies lasiocarpa* (Krummholz) (Bourgeron and Engelking 1994) =
- Cushion Krummholz (Wardle 1968) =

- DRISCOLL FORMATION CODE:III.A.2.a. (Driscoll et al. 1984) B
- Krummholz Community (Hartman and Rottman 1988) =
- Mesic Krummholz (G1) (Peet 1981) I
- S22: *Abies lasiocarpa / Arnica cordifolia* Vegetation Type (Achuff et al. 2002a) I Xeric Krummholz (G2) (Peet 1981) F

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association has only been described from Colorado, northwestern Montana and Alberta, but occurs elsewhere in the Rocky Mountains. Differences is understory composition in southern Rocky Mountain stands and northern Rocky Mountain stands may justify creating new associations. More survey and classification work are needed.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands are located near Lake Solitude, near the top of Avalanche Canyon, the south end of Cascade Canyon, Open Canyon, SW of Marion Lake, Upper Granite Canyon, on the southern slope of Mt. Woodring, NW of Holly Lake, and in Paintbrush Canyon.

Global Range: These shrublands occur near upper treeline in the Rocky Mountains. Stands have only been described from Colorado, Montana and Alberta, but likely occur in similar habitats in adjacent states.
Nations: CA, US
States/Provinces: AB, CO, MT:S4, UT?, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 20:C
TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO9:C, ECO20:C added (MSR 3-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331F:CP, M331G:CP, M331H:CP, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202073
Accuracy Assessment Points: 04R302, 04R301, 04R300, 04R298, 04R297, 04K113, 04K112, 04K110, 04K108, 04K107, 04K106, 04K105, 04K103, 04X308, 04R257, 04R253, 04R250, 04R246, 04R245, 04J177
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Habeck and Choate 1963	.	X	.	X	.	.	.	.	.
Hartman and Rottman 1988	.	X	X	.	.	.	.	.	.
Knight 1994	.	.	.	X	.	.	.	.	.
Komarkova 1986	.	.	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Peet 1975	.	.	.	X	.	.	.	.	.
Peet 1981	.	.	X	X	.	.	.	.	.
Wardle 1968	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Zwinger and Willard 1996	.	.	.	X	.	.	.	.	.

III.A.4.N.a. Lowland microphyllous evergreen shrubland

A.2557 *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrubland Alliance

(Bolander Silver Sagebrush, Mountain Silver Sagebrush) Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance occurs throughout the northern half of the Intermountain West in relatively moist environments, including alkaline or saline playa lakes. Stands are characterized by an open to closed, medium-tall shrub canopy of *Artemisia cana ssp. viscidula* or *Artemisia cana ssp. bolanderi*. The shrub layer ranges from 0.5-1.5 m tall, and shrub canopy cover ranges from 10-60%. In most stands, *Artemisia cana ssp. viscidula* or *Artemisia cana ssp. bolanderi* is the only dominant shrub, although other shrubs can be present. Herbaceous cover can be abundant to very sparse, but perennial graminoids generally total less than 20% cover. Species include *Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Poa secunda (= Poa nevadensis), Poa cusickii, Muhlenbergia richardsonis, Leymus cinereus, Eleocharis palustris*, and *Danthonia intermedia*.

Environment: Plant associations in this alliance occur throughout the northern half of the Intermountain West, usually at middle elevations (1000-2500 (occasionally to 3000) m). Soils range from those with a seasonally high water table along low-gradient streams, in broad valleys, in and around playas (internally drained basins with seasonal flooding), to shallow or moderately deep fine-textured alluvium or loess soils typically overlaying flow-basalt bedrock, to cold, deep soils in moist subalpine meadows. The alliance may represent the driest extreme of wetland and riparian vegetation. High-elevation stands of the alliance are associated with upland habitats and occur on more favorable soils. These shrublands can occur in perennially moist, semi-alkaline, playa lakebeds above 1065 m. In the northern Great Basin (Oregon) stands are found in playas on sites that are flooded for several months during the winter and early spring but which rapidly dry up as the weather warms. Precipitation varies across the range, from less than 25 cm in semi-arid basins of the western Great Basin, to over 90 cm in moister meadow habitats of the Sierra Nevada and northern Rocky Mountains. Adjacent vegetation varies from *Pinus contorta* forests in the mountains, to *Artemisia tridentata* shrublands in semi-arid basins and plains, to *Salix* spp. shrublands on terraces above riparian habitats.

Vegetation: Stands of the alliance are characterized by an open to closed, medium-tall shrub canopy of *Artemisia cana ssp. viscidula* or *Artemisia cana ssp. bolanderi*. The shrub layer ranges from 0.5-1.5 m tall and shrub canopy cover ranges from 10-60%. In most stands, *Artemisia cana ssp. viscidula* or *Artemisia cana ssp. bolanderi* is the only dominant shrub, although other shrubs can be present. Herbaceous cover can be abundant to very sparse, but perennial graminoids generally total less than 20% cover. *Artemisia tridentata* is the most consistent associate shrub species across the range of this alliance, and at higher elevations *Artemisia tridentata ssp. vaseyana* is occasionally present. Other shrubs may be common, including *Symphoricarpos occidentalis, Symphoricarpos oreophilus, Artemisia frigida, Rosa woodsii, Gutierrezia sarothrae*, or *Purshia tridentata*. In alkaline habitats *Sarcobatus vermiculatus, Atriplex canescens*, or *Ericameria nauseosa (= Chrysothamnus nauseosus)* may be present. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed stands. Graminoids that can be abundant include *Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Poa secunda (= Poa nevadensis), Poa cusickii, Muhlenbergia richardsonis, Leymus cinereus, Eleocharis palustris*, and *Danthonia intermedia*. Common exotic grass species include *Poa pratensis* and *Agrostis stolonifera*. Forbs can be important, including *Achillea millefolium, Potentilla gracilis, Conyza canadensis, Hymenoxys hoopesii (= Helenium hoopesii), Fragaria virginiana, Artemisia ludoviciana, Linum perenne, Trifolium* spp., *Arnica* spp., *Epilobium brachycarpum, Gnaphalium palustre, Perideridia gairdneri ssp. borealis (= Perideridia montana), Navarretia intertexta, Madia gracilis, Astragalus* spp., *Orthocarpus* ssp., and *Rorippa* spp.

Dynamics: *Artemisia cana ssp. viscidula* and *Artemisia cana ssp. bolanderi* both resprout vigorously after fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). These highly productive sites often attract heavy livestock use. Livestock grazing may shift the understory composition to increased abundance of early seral species such as *Achillea millefolium, Iris missouriensis, Potentilla gracilis*, or *Taraxacum officinale* and result in reduced abundance of native bunch grass species such as *Poa secunda, Poa cusickii*, or *Festuca idahoensis*. Comparisons of grazed and protected (ungrazed) floodplain sites showed a tendency for *Artemisia cana* to occur more commonly in grazed than ungrazed sites with similar groundwater hydrology.

Similar Alliances:

- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrub Herbaceous Alliance (A.1531)
- *Artemisia cana* Shrubland Alliance (A.827)
- *Artemisia cana* Temporarily Flooded Shrubland Alliance (A.843)

Similar Alliance Comments: Vegetation in this alliance is distinguished from the ~*Artemisia cana (ssp. bolanderi, ssp. viscidula*) Shrub Herbaceous Alliance (A.1531)$$ by the lesser importance of graminoid cover (generally <20%) and significant cover of shrubs (generally >40%). Nearly all *Artemisia cana* communities are azonal (*sensu* Daubenmire 1970) and are associated with sites of above normal soil moisture.

ALLIANCE DISTRIBUTION

Range: This alliance is found west of the Continental Divide from the Rocky Mountains across the Great Basin to the Sierra Nevada and Cascade Range. Associations dominated by *Artemisia cana ssp. viscidula* occur mostly along streams or in areas with heavy snowpack. Associations dominated by *Artemisia cana ssp. bolanderi* occur mainly in the Sierra Nevada and Cascade Range, commonly in internally drained basins with poor drainage and/or alkaline conditions.

Nations: US

Subnations: CA, CO, ID, MT, NV?, OR, UT, WY

TNC Ecoregions: 6:C, 8:C, 9:C, 10:P, 11:C, 12:C, 20:C

USFS Ecoregions: 313A:PP, 341A:PP, 341B:PP, 342B:CC, 342C:CC, 342E:CP, 342F:CP, 342G:CP, M261E:CC, M331A:CC, M331D:CC, M331E:CP, M331I:CP, M331J:CP, M332A:CC, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M341C:CP
Federal Lands: BLM (Foster Flat RNA); NPS (Grand Teton, Yosemite); USFS (Arapaho-Roosevelt, Gunnison, Routt)

Alliance Sources

Author(s): S. Rust, D. Tart, D. Sarr, J. Tuhy, M.S. Reid, R.J. Rondeau
References: Bramble-Brodahl 1978, Chappell et al. 1997, Cunningham 1971, Daubenmire 1970, Faber-Langendoen et al. 1996, Francis 1983, Hansen et al. 1995, Hess 1981, Hironaka et al. 1983, Jankovsky-Jones et al. 2001, Johnston 1987, Kartesz 1999, Manning and Padgett 1995, Mueggler and Stewart 1980, Mutz and Graham 1982, Mutz and Queiroz 1983, ORNHP unpubl. data, Padgett et al. 1988b, Padgett et al. 1989, Reid et al. 1994, Sarr 1995, Schlatterer 1972, Shiflet 1994, Soil Conservation Service 1978, Tiedemann et al. 1987, Tuhy 1981, Tuhy and Jensen 1982, Turner 1969, USFS 1992, Youngblood et al. 1985a

[CEGL002988] *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) / *Poa pratensis* Semi-natural Shrubland

Translated Name: **(Bolander Silver Sagebrush, Mountain Silver Sagebrush) / Kentucky Bluegrass Semi-natural Shrubland**
Common Name:
Ecological System(s):
- Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe (CES304.084)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

Element Concept

Global Summary: This association occurs in high mountain valleys, on broad flat, gently sloping to undulating alluvial outwash fans, first or second stream terraces, toeslopes or seeps. Elevation ranges from 1445 to 2560 m (4753-8400 feet). It generally occurs as narrow stringers along stream courses, or in meadows where the water table is near the surface seasonally. Soils are deep and finely textured, alluvial, often with mottling, indicating a fluctuating water table at depths of 60-100 cm below the soil surface. *Artemisia cana* is the major short-shrub component (10-40% canopy cover); other sagebrush species may also be present in lower abundance such as *Artemisia tridentata* or *Artemisia tridentata ssp. vaseyana*. Other shrubs include *Dasiphora fruticosa* and *Betula nana (= Betula glandulosa)*. The herbaceous cover is sparse to thick and is generally dominated by *Poa pratensis*. Other herbaceous species present include *Carex simulata, Juncus balticus, Stipa* spp., *Achillea millefolium, Potentilla gracilis, Trifolium* spp., *Taraxacum officinale*, and *Geranium viscosissimum*. This association is considered a grazing-induced version of *Artemisia cana / Festuca idahoensis* in Idaho, Utah, western Wyoming and Montana, or *Artemisia cana / Deschampsia caespitosa* in northeastern Oregon. It can also be a grazing-induced type of *Artemisia cana / Pascopyrum smithii* and *Artemisia cana / Elymus trachycaulus*, also in Montana. Depending on the degree of disturbance, one may find traces of these native graminoid species in the undergrowth.

Environmental Description

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on the valley floor and the adjacent toeslopes at elevations ranging from 2050 to 2120 m (6725-6950 feet). The soils range between clays and silty clay loams and are moderately to well-drained. Approximately 90% of the ground surface is covered by litter and duff. This association generally occurs on mesic sites and is often found near various *Salix* spp. associations.
Global Environment: This association occurs in high mountain valleys, on broad flat, gently sloping to undulating alluvial outwash fans, first or second stream terraces, toeslopes or seeps. Elevation ranges from 1445 to 2560 m (4753-8400 feet). It generally occurs as narrow stringers along stream courses, or in meadows where the water table is near the surface seasonally. Soils are deep and finely textured, alluvial, and often with mottling indicating a fluctuating water table at depths of 60-100 cm below the soil surface.

Vegetation Description

Grand Teton National Park Vegetation: This association is a montane shrubland that occurs in mesic areas of riparian corridors. *Artemisia cana* is the major short-shrub component (20-30% canopy cover), but *Dasiphora fruticosa ssp. floribunda* can codominate (0-20% canopy cover). Herbaceous cover ranges from 30 to 80% and is dominated by *Poa pratensis* (10-50% canopy cover), *Juncus balticus* (up to 10% canopy cover), *Achillea millefolium, Potentilla gracilis*, and *Geranium viscosissimum*.
Global Vegetation: This association is a montane shrubland that occurs in mesic areas of riparian corridors, or along upper terraces of valley floors. *Artemisia cana* is the major short-shrub component (10-40% canopy cover), other sagebrush species may also be present in lower abundance such as *Artemisia tridentata* or *Artemisia tridentata ssp. vaseyana*. Other shrubs include *Dasiphora fruticosa* and *Betula nana (= Betula glandulosa)*. Herbaceous cover is sparse to thick and is generally dominated by *Poa pratensis*. Other herbaceous species present include *Carex simulata, Juncus balticus, Stipa* spp., *Achillea millefolium, Potentilla gracilis, Trifolium* spp., *Taraxacum officinale*, and *Geranium viscosissimum*.
Global Dynamics: This association is considered a grazing-induced version of *Artemisia cana / Festuca idahoensis* in Idaho, Utah, western Wyoming and Montana, or *Artemisia cana / Deschampsia caespitosa* in northeastern Oregon. It is also a grazing-induced type of *Artemisia cana / Pascopyrum smithii* and *Artemisia cana / Elymus trachycaulus*, also in Montana. Depending on the degree of disturbance, one may find traces of these native graminoid species in the undergrowth.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia cana	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	X	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Potentilla gracilis	Herb (field)	Forb	X	X	.
Juncus balticus	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia cana	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	X	.	.
Geranium viscosissimum	Herb (field)	Forb	X	.	.
Potentilla gracilis	Herb (field)	Forb	X	X	.
Juncus balticus	Herb (field)	Graminoid	X	.	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Cirsium arvense	-	P	exotic
Lactuca serriola	-	P	exotic
Phleum pratense	-	P	exotic
Rumex crispus	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Artemisia cana ssp. *bolanderi*	G5T3?	P	
Artemisia cana ssp. *viscidula*	-	P	

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (15-Apr-2002).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Artemisia cana / Festuca idahoensis* Community Type (Tuhy and Jensen 1982) B
- *Artemisia cana / Festuca idahoensis* Community Type (Hansen et al. 1995) B
- *Artemisia cana / Poa pratensis* Community Type (Youngblood et al. 1985a) =
- *Artemisia cana / Poa pratensis* Community Type (Padgett et al. 1989) =
- *Artemisia cana / Poa pratensis* Plant Association (Cooper et al. 1999) =
- *Artemisia cana ssp. viscidula / Festuca idahoensis* Habitat Type (Hironaka et al. 1983) B
- Silver sagebrush / Kentucky bluegrass Plant Association (Crowe and Clausnitzer 1997) =

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: This association may be dominated by *Artemisia cana ssp. bolanderi* or *Artemisia cana ssp. viscidula*. Most of the authors cited refer only to the species, *Artemisia cana*. The only known reference to *Artemisia cana ssp. bolanderi* is from another type, *Artemisia cana ssp. bolanderi / Muhlenbergia richardsonis* Habitat Type (Hironaka et al. 1983), which mentions *Poa nevadensis (= Poa secunda)* as a common understory component, but makes no reference to *Poa pratensis*. Svalberg et al. (1997) and Tart (1997) are cited for this type but were unavailable for analysis.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association seems localized to riparian corridors along the Two Ocean Lake drainage, Oxbow Bend, Lava Creek and its associated drainages, and Buffalo Fork River.
Global Range: This association is known from northeastern Oregon, Idaho, western Wyoming, southwestern Montana, Utah, and possibly Colorado.
Nations: US

States/Provinces: CO?, ID, MT, OR, UT, WY
TNC Ecoregions: 6:C, 9:C
TNC Ecoregion Comments: ECO6 added (mjr 8-05). ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342C:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202097, GT-0202098, GT-03B023, GT-03C014, GT-03C093
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Cooper et al. 1999	.	X	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Svalberg et al. 1997	.	X	.	X	.	.	.	.	.
Tart 1995	.	X	.	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

A.831 *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance

Mountain Big Sagebrush Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance is widespread in mountainous areas across the western U.S. The alliance forms large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above the lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil. The vegetation included in this alliance is characterized by a moderate to dense shrub layer in which *Artemisia tridentata ssp. vaseyana* is either dominant or contributes >40% to the total sagebrush shrub cover. Other shrub species present may include *Artemisia rigida, Artemisia arbuscula, Chrysothamnus* spp., *Symphoricarpos oreophilus, Purshia tridentata, Ribes cereum, Rosa woodsii, Ceanothus velutinus*, and *Amelanchier alnifolia*. Perennial graminoids typically dominate the herbaceous layer, but their total cover is generally <20%. Total herbaceous cover can be higher, depending on the density of the shrub layer and environmental factors. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Columbia Basin to the northern Rockies, although they may not be the most abundant species in individual stands. Other locally important species may include *Leymus cinereus, Leucopoa kingii (= Festuca kingii), Festuca thurberi, Festuca viridula, Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis), Poa fendleriana, Poa secunda*, and *Bouteloua gracilis*. The forb layer is variable and can be very diverse. Species of *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum* are characteristic. Other common forbs include *Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea*, and *Eriogonum umbellatum*. Diagnostic of this shrubland alliance is the *Artemisia tridentata ssp. vaseyana* dominating the shrub layer or with >40% relative cover, and total perennial graminoid cover typically less than 20%.
Environment: *Artemisia tridentata ssp. vaseyana*-dominated shrublands occupy the coolest and moistest climate zone of the *Artemisia tridentata* shrubland and shrub herbaceous alliances. This alliance forms large, continuous stands on mid-elevation mountain slopes and foothills, and often extends above lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25-60 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this alliance is large, from about 1060 m in eastern Oregon and Washington, to well over 3000 m in the mountains of northern Nevada, Idaho, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony

flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be mainly on south- or west-facing slopes. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; they often have a substantial volume of coarse fragments. The soils are derived from a variety of parent materials (although sandstones, limestones, and crystalline rocks are common). In some cases, soils supporting stands of this alliance are unstable and prone to mass movement (Bramble-Brodahl 1978, Hironaka et al. 1983). In subalpine environments, these shrublands are found on deeper soils than *Artemisia arbuscula* subalpine shrublands.

Adjacent vegetation is highly variable. In the Great Basin and Rocky Mountains, adjacent communities typically include *Pinus ponderosa* forests, *Pinus - Juniperus* or *Cercocarpus ledifolius* woodlands, *Populus tremuloides* forests, *Artemisia arbuscula, Artemisia rigida, Artemisia tridentata ssp. wyomingensis*, and *Artemisia tridentata ssp. tridentata* shrublands, *Quercus gambelii* shrublands, and herbaceous meadows. In the Blue Mountains, eastern Cascade Range, and in the Okanogan Highlands these shrublands are found in a matrix with *Juniperus occidentalis, Pinus ponderosa, Pinus albicaulis*, and *Abies lasiocarpa* forests and woodlands.

Vegetation: The plant associations in this alliance are characterized by a somewhat sparse to moderately dense (25-70% cover) shrub layer of *Artemisia tridentata ssp. vaseyana*, a microphyllous evergreen shrub. A variety of other shrubs are often found in some stands, however, *Artemisia tridentata ssp. vaseyana* contributes at least 40% of the total sagebrush shrub cover. Other shrubs can include *Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa (= Chrysothamnus nauseosus), Chrysothamnus viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Ribes cereum, Rosa woodsii, Ceanothus velutinus, Amelanchier utahensis*, and *Amelanchier alnifolia*. The herbaceous layer is typically dominated by bunch grasses which occupy patches in the shrub matrix, and the forb layer can be very diverse. Perennial graminoid cover generally totals <20%. The most widespread species are *Pseudoroegneria spicata* and *Festuca idahoensis*, which occur from the Columbia Basin to the northern Rockies, although they may not be the most abundant species in individual stands. Other locally important species include *Leymus cinereus, Leucopoa kingii (= Festuca kingii), Festuca thurberi, Festuca viridula, Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis), Poa fendleriana*, or *Poa secunda*. *Bouteloua gracilis* is important in stands in the eastern extension of the range. Forbs are highly variable across the range, but may be diverse in some stands. Species of *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum* are characteristic. Other common forbs include *Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea*, and *Eriogonum umbellatum*. Trees are uncommon in stands of this alliance, but *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Juniperus scopulorum, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata*. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes, and grazing history on *Artemisia tridentata* shrublands and shrub herbaceous vegetation.

Artemisia tridentata ssp. vaseyana shrublands may represent either drier or more disturbed examples of the *Artemisia tridentata ssp. vaseyana* shrubland complex. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded 'steppe' (e.g., shrub herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* at lower elevations) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency, every 2-5 years, perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunch grasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* become the theoretical dominants.

Similar Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)

Similar Alliance Comments: This alliance (A.831) contains stands in which *Artemisia tridentata ssp. vaseyana* is dominant or contributes >40% of the total sagebrush cover and with perennial graminoids generally having less than 20% total cover. Some stands in the ~*Artemisia tridentata* Shrubland Alliance (A.829)$$ may be very similar.

ALLIANCE DISTRIBUTION

Range: This shrubland alliance occurs in mountainous regions from eastern California, Oregon, and Washington, across the Great Basin in Nevada, the northern Rocky Mountain foothills of Idaho, and in Colorado, Wyoming, and Montana. It has not been reported from Utah, Arizona, or New Mexico, but it is very likely to occur in these states at high elevations. In addition, the alliance probably extends north into Alberta, Canada.
Nations: CA?, US
Subnations: CA, CO, ID, MT, NV, OR, UT, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 11:C, 12:C, 17:C, 19:C, 20:C, 26:C
USFS Ecoregions: 313A:CC, 322A:CC, 331D:CC, 331G:CC, 341B:C?, 341D:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342I:CP, M242C:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:C?, M331G:CC, M331H:C?, M331I:CC, M332A:CC, M332B:CC, M332C:CP, M332D:CP, M332E:CC, M332F:CC, M332G:CC, M341A:CC
Federal Lands: NPS (Black Canyon of the Gunnison, Craters of the Moon, Curecanti, Dinosaur, Grand Teton, Rocky Mountain, Yosemite, Zion); USFS (Bighorn, Bridger-Teton, Deschutes, Medicine Bow, Shoshone)

ALLIANCE SOURCES

Author(s): D. Sarr, mod. M.S. Reid
References: Baker 1983c, Baker and Kennedy 1985, Boyce 1977, Bramble-Brodahl 1978, Caicco and Wellner 1983a, Chappell et al. 1997, Cooper et al. 1999, Current 1984, Francis 1983, Giese 1975, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Jensen et al. 1988a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Komarkova 1986, Kuchler 1964, Lewis 1971, Lewis 1975a, McArthur and Welch 1986, Mooney 1985, Nelson and Jensen 1987, ORNHP unpubl. data, Rzedowski 1981, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Smith 1966, Tart 1996, Terwilliger and Smith 1978, Terwilliger and Tiedemann 1978, Tiedemann et al. 1987, Tueller and Eckert 1987, West 1983c, Winward 1970

[CEGL001035] *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Bromus carinatus* Shrubland

Translated Name: **Mountain Big Sagebrush - Mountain Snowberry / California Brome Shrubland**
Common Name: **Mountain Big Sagebrush - Mountain Snowberry / California Brome**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This sagebrush shrubland is described from the mountains of northeastern Nevada and eastern Idaho. It occurs on moderate to steep slopes (15-45%), on deep soils (110-162 cm), at elevations ranging from 1768 to 2499 m (5800-8200 feet). It is one of the most productive sagebrush types in northeastern Nevada, occupying higher elevations than those of other sagebrush types in the area. *Artemisia tridentata ssp. vaseyana* is the dominant sagebrush. *Symphoricarpos oreophilus* is conspicuously present, usually with a canopy cover greater than 3%. *Amelanchier alnifolia* may also be present (0-5%) and can replace *Symphoricarpos oreophilus* on some sites. Other shrubs include *Prunus virginiana, Purshia tridentata, Ribes* spp., and *Rosa woodsii*. *Bromus carinatus* is the dominant grass. *Festuca idahoensis, Elymus trachycaulus (= Agropyron trachycaulum)*, and *Leymus cinereus (= Elymus cinereus)* are conspicuously present and may replace *Bromus carinatus* in dominance on some sites. Forb species occur with the same abundance as grasses on most sites. Common forb species include *Balsamorhiza sagittata, Helianthella uniflora (= Helianthus uniflorus), Lupinus caudatus*, and *Eurybia conspicua*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: This association occurs on mostly southeast-facing slopes with gradients of 18 to 30%. The elevations for these stands range from 6900 to 7541 feet. Unvegetated ground surface data are available for two stands; litter and duff (30 to 60% ground cover) is dominant at one plot and basal vegetation (30 to 40% ground cover) is dominant at the other plot. Also, bare soil (30% ground cover), wood (3% ground cover), and small rocks (2% ground cover) comprise the ground cover. Adjacent vegetation may include mixed coniferous forests and/or *Populus tremuloides* forests. Two stands contain down *Populus tremuloides*.

Global Environment: This sagebrush shrubland is described from mountains of northeastern Nevada and eastern Idaho. It occurs on moderate to steep slopes (15-45%), on deep soils (110-162 cm), at elevations ranging from 1768 to 2499 m (5800-8200 feet). It is one of the most productive sagebrush types in northeastern Nevada, occupying higher elevations than that of other sagebrush types in the area.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane sagebrush shrubland that occurs on subxeric sites. The short shrub layer is dominated by *Artemisia tridentata* ssp. *vaseyana* (7 to 12% canopy cover) and *Symphoricarpos*

oreophilus (3 to 12% canopy cover). *Populus tremuloides* seedlings occur in over half of the stands. The herbaceous layer is generally not diverse, though many species may contribute significant cover; *Poa pratensis, Carex ciliatus, Carex hoodii, Eriogonum umbellatum, Balsamorhiza sagittata, Achillea millefolium,* and *Helianthella uniflora* occur in at least half the stands.

Global Vegetation: *Artemisia tridentata ssp. vaseyana* is the dominant sagebrush. *Symphoricarpos oreophilus* is conspicuously present, usually with a canopy cover greater than 3%. *Amelanchier alnifolia* may also be present (0-5%) and can replace *Symphoricarpos oreophilus* on some sites. Other shrubs include *Prunus virginiana, Purshia tridentata, Ribes* spp., and *Rosa woodsii*. *Bromus carinatus* is the dominant grass. *Festuca idahoensis, Elymus trachycaulus (= Agropyron trachycaulum),* and *Leymus cinereus (= Elymus cinereus)* are conspicuously present and may replace *Bromus carinatus* in dominance on some sites. Forb species occur with the same abundance as grasses on most sites. Common forb species include *Balsamorhiza sagittata, Helianthella uniflora (= Helianthus uniflorus), Lupinus caudatus,* and *Eurybia conspicua*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Achillea millefolium	Herb (field)	Forb	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	X	.
Carex hoodii	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eurybia conspicua	Herb (field)	Forb	X	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4Q (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Bromus carinatus* Habitat Type (Jensen et al. 1988a) =
- *Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Bromus carinatus* Habitat Type (Jensen et al. 1988b) =
- *Artemisia tridentata ssp. vaseyana-Symphoricarpos oreophilus/Bromus carinatus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: *Bromus carinatus* was not identified in three plots.

Global Classification Comments:
GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana / Bromus carinatus* association, but differs because *Symphoricarpos oreophilus* contributes at least 5% total shrub cover in the sampled stands.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Two sampled stands for this association occur in Bridger-Teton National Forest on the western slope of Shadow Mountain, one occurs west of the sewage ponds near Signal Mt., and one occurs east of Elk Ranch Reservoir.

Global Range: This association occurs in mountains of eastern Idaho, northern Nevada, Oregon, Wyoming, and possibly Utah.
Nations: US
States/Provinces: ID:S3?, NV:S4, OR:S3, UT?, WY
TNC Ecoregions: 6:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331D:CC
Federal Lands: NPS (Grand Teton?); USFS (Bridger-Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R321, 04X400
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507016, BT-9507044

Grand Teton National Park Description Author(s): B. Villalobos, M. Fain, and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Jensen et al. 1988a	.	X	X	X	.	.	.	.	.
Jensen et al. 1988b	.	X	X	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-088] *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilis / Carex geyeri* Shrubland

TRANSLATED ASSOCIATION NAME

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur primarily on the lower eastern slopes of the Teton Range except one stand that occurs on the valley floor north of Jenny Lake. The elevation range for these sites is 6821 to 7293 feet. The three stands on the slopes have southeast to southwest aspects with slopes between 20 and 24%. The soil is either well drained loam or sandy loam or moderately well drained loamy sand. The unvegetated and nonvascular ground cover is primarily litter and duff (20 to 70%). Adjacent vegetation includes *Pinus contorta* ssp. *latifolia*, *Pseudotsuga menziesii* var. *glauca*, *Picea engelmannii*, *Abies lasiocarpa*, and *Populus tremuloides.*

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. *Artemisia tridentata* ssp. *vaseyana* is the dominant species in the shrub stratum contributing 20 to 50% canopy cover. *Symphoricarpos oreophilus* contributes 3 to 20% canopy cover. The graminoid stratum is dominated by *Carex geyeri* (1 to 50%). *Melica spectabilis*, *Koeleria macrantha*, and *Poa pratensis* are common in this association, but contribute only 1% canopy cover with each occurring in only two of the three plots. *Eriogonum umbellatum* is the dominant forb contributing 3 to 10% canopy cover. *Geranium viscosissimum* is present in each plot, contributing 1 to 3% canopy cover.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Artemisia tridentata ssp. vaseyana, Symphoricarpos oreophilus*
GRAMINOID	*Carex geyeri, Melica spectabilis, Koeleria macrantha, Poa pratensis*
FORB	*Eriogonum umbellatum, Geranium viscosissimum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Artemisia tridentata ssp. *vaseyana, Symphoricarpos oreophilus, Carex geyeri, Koeleria macrantha, Melica spectabilis, Poa pratensis, Eriogonum umbellatum, Geranium viscosissimum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Phleum pratense, Poa pratensis, Tragopogon dubius*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: The GTNP sites differ from Hironaka (1983) definitions. *Linanthus nuttallii* and *Balsamorhiza sagittata* are prominent forbs in the Hironaka classification. *L. nuttallii* is absent in the GTNP stands and *B. sagittata* occurs in only two of the stands with 1% canopy cover.

GRAND TETON NATIONAL PARK Other Comments: One stand on the slope is periodically disturbed by rockslide. This plot contains 50% canopy cover of *Carex geyeri*. The other plots contain only 1% *C. geyeri*. This association is similar to the *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* association, but is differentiated by the presence of *Symphoricarpos oreophilus* as a co-dominant species with *Artemisia tridentata* ssp. *vaseyana.*

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on the lower elevation, eastern slopes of the Teton Range between Phelps Lake and Jenny Lake.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B054, GT-03A017, GT-03A093
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** NEW-GRTE-088
Local Author: Mark Fain
Date: 8 March 2004
Local Editor: Klara Varga
Date: 9 March 2004
Re-write: Mark Fain
Date: 10 November 2004
Re-edit: kelly McCloskey
Date: 21 December 2004

Global Author:

REFERENCES: Hironaka, et al. 1983

[CEGL001036] *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* Shrubland

Translated Name: **Mountain Big Sagebrush - Mountain Snowberry / Idaho Fescue Shrubland**
Common Name: **Mountain Big Sagebrush - Mountain Snowberry / Idaho Fescue**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This sagebrush shrubland occurs on all exposures except southerly sites. It appears to be limited to above 1830 m (6000 feet) elevation, ranging from 1935 to 2290 m (6350-7500 feet). Slopes range from 0-30%. Soils are derived from acidic igneous and basaltic parent materials. Textures range from gravelly loam to gravelly clay loam to finer silt loams with fewer fragments. *Artemisia tridentata ssp. vaseyana* is the dominant shrub species, ranging from 3 to 40% canopy cover. *Symphoricarpos oreophilus* is often present and occasionally replaced by *Prunus virginiana* or *Ribes cereum*. Other shrubs that may be present include *Purshia tridentata* and *Amelanchier alnifolia*. Herbaceous cover ranges from 20 to 70% and is dominated by *Festuca idahoensis*. Other common or high-constancy species include *Poa pratensis, Melica bulbosa, Koeleria macrantha, Lupinus sericeus, Geranium viscosissimum, Eriogonum umbellatum, Balsamorhiza sagittata*, and *Helianthella uniflora*. Presence of *Achnatherum nelsonii ssp. dorei (= Stipa columbiana)* or *Achnatherum lettermanii (= Stipa lettermanii)* are indications of past disturbance.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur from the terraces above the Snake River (6350 feet) to the footslopes of the Teton and the Gros Ventre Mountains (7500 feet). The stands occupy sites with slopes from 0 to 30%. Sampled soil textures range from sandy clays to silty loams. The unvegetated and non-vascular ground surface is composed consistently of 40 to 70% litter and duff and up to 13% gravel. Mosses and lichens are present only in trace amounts. Bare soil composes up to 20% of the ground cover. Adjacent to one stand is a *Populus tremuloides* association.

Global Environment: This sagebrush shrubland occurs on all exposures except southerly sites. It appears to be limited to above 1830 m (6000 feet) elevation, ranging from 1935 to 2590 m (6350-8500 feet). Slopes range from 0-30%. Soils are derived from acidic igneous and basaltic parent materials. Textures range from gravelly loam to gravelly clay loam to finer silt loams with fewer fragments.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub species, ranging from 10 to 40% canopy cover. *Symphoricarpos oreophilus* always has a canopy cover equal to or less than *Artemisia tridentata* ssp. *vaseyana*, ranging from 3 to 20%. The only other shrubs that occur in at least half the sampled stands are *Purshia tridentata* and *Amelanchier alnifolia*. Herbaceous cover is dominated by *Festuca idahoensis* (3 to 12% cover). Other high constancy species include *Poa pratensis, Pseudoroegneria spicata, Lupinus sericeus, Eriogonum umbellatum, Balsamorhiza sagittata,* and *Helianthella uniflora.*

Global Vegetation: *Artemisia tridentata ssp. vaseyana* is the dominant shrub species, ranging from 3 to 40% canopy cover. *Symphoricarpos oreophilus* is often present and occasionally replaced by *Prunus virginiana* or *Ribes cereum*. Other shrubs that may

be present include *Purshia tridentata* and *Amelanchier alnifolia*. Herbaceous cover ranges from 20 to 70% and is dominated by *Festuca idahoensis*. Other common or high-constancy species include *Poa pratensis, Melica bulbosa, Koeleria macrantha, Lupinus sericeus, Geranium viscosissimum, Eriogonum umbellatum, Balsamorhiza sagittata*, and *Helianthella uniflora*. Presence of *Achnatherum nelsonii ssp. dorei (= Stipa columbiana)* or *Achnatherum lettermanii (= Stipa lettermanii)* are indications of past disturbance.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb		X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Lupinus sericeus	Herb (field)	Forb	.	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Sonchus oleraceus	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

Global Related Concepts:

- *Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* (Tueller and Eckert 1987) =
- *Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* Habitat Type (Hironaka et al. 1983) =
- *Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* Plant Association (Cooper et al. 1999) =
- *Artemisia tridentata ssp. vaseyana-Symphoricarpos oreophilus/Festuca idahoensis* (Bourgeron and Engelking 1994) =
- *Symphoricarpos oreophilus - Artemisia tridentata ssp. vaseyana / Festuca idahoensis* (Tueller and Eckert 1987) =
- DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Grand Teton National Park's stands depart from Hironaka et al. (1983) in that *Melica bulbosa* and *Koeleria macrantha* are not necessarily conspicuously present along with *Festuca idahoensis*.

Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Purshia tridentata / Festuca idahoensis* and the *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* association, but is differentiated by the presence of *Symphoricarpos oreophilus* as a dominant species. If *Purshia tridentata* is co-dominant with

Symphoricarpos oreophilus then the stand was put into the *Artemisia tridentata* ssp. *vaseyana – Purshia tridentata / Festuca idahoensis* association.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Five of the sampled stands occur in Bridger-Teton National Forest. The sampled stands within the park occur north of the Granite Canyon parking lot, on the footslope of Uhl Hill, and southwest of Teton Science School.

Global Range: This association is known from northern Nevada, eastern Idaho, southeastern Montana, eastern Oregon, and western Wyoming.
Nations: US
States/Provinces: ID:S4, MT, NV, OR:S3, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 20:?
TNC Ecoregion Comments: ECO8 & ECO20 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331D:CC, M331G:C?, M332A:CC, M332E:CC, M332F:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The range consideration for this association may be skewed because three-quarters of the sampled plots were within the Bridger-Teton National Forest at elevations above 2100 m (6892 feet).

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C040
Accuracy Assessment Points: 04S017, 04X017
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407050, BT-9407076, BT-9507010, BT-9507015, BT-9902041

Grand Teton National Park Description Author(s): R. Massatti, K. Varga, M. Fain, and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Caicco and Wellner 1983a	.	X	.	X	.	.	.	.	.
Cooper et al. 1999	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Tueller and Eckert 1987	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001039] *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Hesperostipa comata* Shrubland

Translated Name: **Mountain Big Sagebrush - Mountain Snowberry / Needle-and-Thread Shrubland**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This sagebrush shrubland is known only from Grand Teton National Park but is expected to occur in the surrounding area in southeastern Idaho and elsewhere in Wyoming. One stand occurs on the valley floor, with a 4% slope at an elevation of 2060 m (6749 feet), on a dry southeastern aspect. The soil is a loam with gravel and cobble. The shrub layer is dominated by *Artemisia tridentata ssp. vaseyana* and *Symphoricarpos oreophilus*. Graminoids include *Hesperostipa comata* and *Poa pratensis*. The most abundant forb is *Balsamorhiza sagittata*. Other forbs present include *Eriogonum umbellatum, Lupinus sericeus, Geranium viscosissimum, Lithospermum ruderale*, and *Helianthella uniflora*. Similar vegetation types have been described in the literature with an *Artemisia tridentata* canopy and an undergrowth of *Hesperostipa comata (= Stipa comata)*. However, these do not refer to *Artemisia tridentata ssp. vaseyana*, nor do they mention any *Symphoricarpos* spp. as present.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor, a step in slope, or south-facing slopes above the valley floor with gradients of 4 to 35%. The elevations for these stands range from 6500 to 7000 feet. Soil data is available for one stand; the soil is a loam with gravel and cobble. There is evidence of fire from scars that are located below one plot at the bottom of the slope. Adjacent to one stand are an *Artemisia tridentata* ssp. *vaseyana* without *Symphoricarpos oreophilus* community and a *Pinus contorta* community. Animal use was noted in three of the stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a sagebrush shrubland that occurs on subxeric sites. The short shrub layer is dominated by *Artemisia tridentata* ssp. *vaseyana* (7 to 30% canopy cover) and *Symphoricarpos oreophilus* (1 to 12% canopy cover). *Mahonia repens* is present in more than half of the stands. Graminoids that occur in all stands include *Hesperostipa comata* (3 to 20% canopy cover) and *Poa pratensis* (3 to 7% canopy cover). *Eriogonum umbellatum* (1 to 10% cover) is the only forb to occur in all stands. Other species to occur in at least half of the stands include *Bromus* spp., *Balsamorhiza sagittata, Lithospermum ruderale*, and *Helianthella uniflora.*

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Lithospermum ruderale	Herb (field)	Forb	.	X	.
Lupinus sericeus	Herb (field)	Forb	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.
Hesperostipa comata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Bromus spp.	

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:

- *Artemisia tridentata* ssp. *vaseyana / Hesperostipa comata* Shrubland (CEGL002931)--(Hironaka et al. 1983) has scattered *Symphoricarpos oreophilus* at the upper elevation range.

Global Related Concepts:

- *Artemisia tridentata ssp. vaseyana-Symphoricarpos oreophilus/Stipa comata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. v*aseyana / Hesperostipa comata* association, but is differentiated by the presence of *Symphoricarpos oreophilus* as a co-dominant species with *Artemisia tridentata* ssp. v*aseyana* in the shrub layer.

Global Classification Comments: There appears to be no literature reference for this association. Tueller and Eckert (1987) have no mention of any *Stipa* spp. including *Stipa comata (= Hesperostipa comata)* understory. Tueller and Blackburn (1974) discuss *Artemisia tridentata* and *Stipa comata* ecological relationships, with no *Symphoricarpos* mentioned. Blackburn et al. (1968c) (Duckwater Watershed) and Blackburn (1967) discuss an *Artemisia tridentata / Stipa comata* association, but the subspecies for the sagebrush is not identified, and there is no mention of *Symphoricarpos* spp.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur south of Cow Lake near the River Road, behind the Moose Post Office, south of RKO road, near the Moran Junction, and near McAllister's Ranch.

Global Range: This sagebrush shrubland is currently known only from Grand Teton National Park but is expected to occur in the surrounding area in southeastern Idaho and elsewhere in Wyoming.
Nations: US
States/Provinces: NV:S3?, WY
TNC Ecoregions: 6:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201022
Accuracy Assessment Points: 04X016, 04X059, 04X079, 04X808
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): B. Villalobos, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Tueller and Eckert 1987	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001038] *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Pseudoroegneria spicata* Shrubland

Translated Name: **Mountain Big Sagebrush - Mountain Snowberry / Bluebunch Wheatgrass Shrubland**
Common Name: **Mountain Big Sagebrush - Mountain Snowberry / Bluebunch Wheatgrass**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This low sagebrush association occurs from 1830 to 2750 m (6000-9000 feet) elevation, on slopes from 10-42%, often on northern aspects, in concave snowpockets in northern Nevada, and generally on southern exposures in eastern Idaho. Soils are deep Mollisols (average 117 cm), of fine loam texture with gravel fragment up to 30%. This low-stature shrubland is dominated by a combination of *Artemisia tridentata ssp. vaseyana* and *Symphoricarpos oreophilus*, sometimes one more dominant than the other, but both always present with at least 10% cover. Other shrubs that may be present include *Chrysothamnus viscidiflorus, Ribes* spp., and *Purshia tridentata*. The understory is sparsely to occasionally thickly dominated by grasses. *Pseudoroegneria spicata* is always present and usually the most abundant grass with 2-10% cover. Other grasses commonly present include *Festuca idahoensis, Poa fendleriana, Achnatherum nelsonii ssp. dorei (= Stipa columbiana), Achnatherum lettermanii (= Stipa lettermanii), Bromus*

tectorum, and *Melica bulbosa*. Common forbs include *Lupinus caudatus, Achillea millefolium, Balsamorhiza sagittata, Collinsia parviflora*, and *Helianthella uniflora*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes near the valley floor. One stand is on a northeast facing slope while the other three are on southwest facing slopes. The elevation ranges between 6900 and 7688 feet. The clay loam soil of the northeast facing plot is moderately well drained and soil data is unavailable for the southwest facing plots. 40 to 90% of the ground surface is litter and duff for all plots. Adjacent vegetation includes *Picea pungens* and *Populus tremuloides* for the northwest facing plot.

Global Environment: This low sagebrush association occurs from 1830 to 2750 m (6000-9000 feet) elevation, on slopes from 10-42%, often on northern aspects, in concave snowpockets in northern Nevada, and generally on southern exposures in eastern Idaho. Soils are deep Mollisols (average 117 cm), of fine loam texture with gravel fragment up to 30%.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane short shrub land that occurs on subxeric sites. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub species comprising 3 to 40% canopy cover and *Symphoricarpos oreophilus* comprises 3 to 20% canopy cover. The herbaceous layer is diverse and dominated by *Pseudoroegneria spicata* with 1 to 10% cover in all stands. Graminoids that occur in half the stands include *Poa pratensis* and *Koeleria macrantha.* Forbs that occur in at least half the stands include *Eriogonum umbellatum, Balsamorhiza sagittata, Achillea millefolium,* and *Helianthella uniflora.*

Global Vegetation: This low-stature shrubland is dominated by a combination of *Artemisia tridentata ssp. vaseyana* and *Symphoricarpos oreophilus*, sometimes one more dominant than the other, but both always present with at least 10% cover. Other shrubs that may be present include *Chrysothamnus viscidiflorus, Ribes* spp., and *Purshia tridentata*. The understory is sparsely to occasionally thickly dominated by grasses. *Pseudoroegneria spicata* is always present and usually the most abundant grass with 2-10% cover. Other grasses commonly present include *Festuca idahoensis, Poa fendleriana, Achnatherum nelsonii ssp. dorei (= Stipa columbiana), Achnatherum lettermanii (= Stipa lettermanii), Bromus tectorum*, and *Melica bulbosa*. Common forbs include *Lupinus caudatus, Achillea millefolium, Balsamorhiza sagittata, Collinsia parviflora*, and *Helianthella uniflora*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Lupinus caudatus	Herb (field)	Forb	X	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Hordeum jubatum	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius			

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Artemisia tridentata ssp. vaseyana / Symphoricarpos oreophilus / Agropyron spicatum* Habitat Type (Jensen et al. 1988a) =
- *Artemisia tridentata ssp. vaseyana-Symphoricarpos oreophilus/Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- *Artemisia tridentata vaseyana - Symphoricarpos oreophilus / Agropyron spicatum* (Tueller and Eckert 1987) =
- *Artemisia vaseyana / Symphoricarpos oreophilus / Agropyron spicatum* Habitat Type (Hironaka et al. 1983) =
- *Symphoricarpos oreophilus - Artemisia tridentata vaseyana / Agropyron spicatum* (Tueller and Eckert 1987) = DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Other Comments: All plots lie in areas of disturbance. The three south-facing plots lie in or near Lost Creek Ranch, and the north-facing plot lies in an area previously disturbed by heavy grazing.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur north of the Elk Ranch Reservoir on a northeast facing slope, at the north end of Blacktail Butte, and three plots are located south of Hedrick Pond on southwest facing slopes.

Global Range: This association is known from northern Nevada, Idaho, and Wyoming and may also occur in Utah.
Nations: US
States/Provinces: ID:S3, NV:S5, UT?, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 11:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C067
Accuracy Assessment Points: 04R004
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407001, BT-9407055, BT-9407044
GRAND TETON NATIONAL PARK Inventory Notes:

Grand Teton National Park Description Author(s): M. Fain, K. Varga, and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
Jensen et al. 1988a	.	X	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Tueller and Eckert 1987	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-048] *Artemisia tridentata* ssp. *vaseyana - Pursha tridentata / Festuca idahoensis* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association were sampled on terraces or the valley floor at elevations between 6500 and 6800 feet. Soil data is available for four plots; the soils include well-drained loam, sandy clay loam, silt loam, and clay loam. Two stands have unvegetated and nonvascular ground cover comprised of 40 and 60% litter and duff, 20% gravel, 10% bare soil, 5% cobbles, up to 5% wood, and up to 30% mosses and liverworts. Unidentified conifers occur adjacent to one site. Half of the plots may have some disturbance due to proximity of roads or old roads running through them.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane, shrub steppe. Two species co-dominate the shrub layer. *Artemisia tridentata* ssp. *vaseyana* has 10 to 40% cover and *Purshia tridentata* has 3 to 20% cover. The herbaceous layer is diverse, but few species occur in more than trace amounts. The highest constancy and cover species include *Festuca idahoensis* (1 to 50% cover), *Poa pratensis* (1 and 10% cover), *Koeleria macrantha* (trace to 10% cover), *Poa secunda* (1 to 3% cover), *Eriogonum umbellatum* (trace to 20% cover), *Balsamorhiza sagittata* (trace to 3% cover), and *Phlox longifolia* (trace to 1% cover).
Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Artemisia tridentata* ssp. *vaseyana, Purshia tridentata*
GRAMINOID	*Festuca idahoensis*
FORB	*Eriogonum umbellatum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Artemisia tridentata ssp. *vaseyana, Purshia tridentata, Festuca idahoensis, Koeleria macrantha, Poa pratensis, Poa secunda, Eriogonum umbellatum, Balsamorhiza sagittata, Phlox longifolia*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Phleum pratense, Poa pratensis, Taraxacum officinale, Tragopogon dubius*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Festuca idahoensis* and the *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* association, but is differentiated by the presence of *Purshia tridentata* as a dominant species. If *Purshia tridentata* is co-dominant with *Symphoricarpos oreophilus* then the stand was put into the *Artemisia tridentata* ssp. *vaseyana – Purshia tridentata / Festuca idahoensis* association.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near Moose, near the Teton Science School, near Baseline Flat, near the Granite Canyon trailhead, and east of Tracy Lake in the Bridger-Teton National Forest.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C003, GT-0201100, GT-0202002, GT-03B121
Accuracy Assessment Points: 04K015, 04M018, 04X022, 04J235, 04X046
Other plots within park boundaries, from other projects: GT-tm5c
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-048
Local Author: Mark Fain **Date:** 5 March 2004
Local Editor: Klara Varga **Date:** 25 March 2004
Re-write: Mark Fain **Date:** 21 October 2004
Re-edit: kelly McCloskey **Date:** 21 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-047] *Artemisia tridentata* ssp. *vaseyana - Pursha tridentata / Balsamorhiza sagittata* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: Three sampled stands of association occurs on the valley floor and four are located on east to southwest facing slopes with gradients between 15% and 35%. Elevations for the stands range from 6710 feet to 7859 feet. The soils range from well-drained sandy loam to moderately well-drained sandy clay loam. The ground surface can be comprised of up to 80% litter and duff, 40% gravel, and 40% bare soil. One plot has a relatively high percent of moss (10%) and lichen (20%); these components are almost absent in all other sites. There is an agricultural field to the south of one stand.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane short shrubland. *Artemisia tridentata* ssp. *vaseyana* (1% to 50% canopy cover) in the short shrub stratum and *Purshia tridentata* (3% to 40% canopy cover) in either the short or dwarf shrub strata are co-dominant in the shrub layer. *Amelanchier alnifolia* contributes 1% to 3% cover to the short or tall shrub strata in six of seven stands. No graminoids occur in half of the stands; graminoids with high cover in individual stands include *Achnatherum nelsonii* (40% cover) and *Poa cusickii* (30% cover). The dominant forb is *Balsamorhiza sagittata* (1% to 20% canopy cover). *Eriogonum umbellatum* (4 stands, 1% to 10% cover) is the only other forb to occur in more than half of the stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Artemisia tridentata* ssp. *vaseyana, Purshia tridentata*
FORB	*Balsamorhiza sagittata*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Amelanchier alnifolia, Artemisia tridentata ssp. *vaseyana, Purshia tridentata, Balsamorhiza sagittata, Eriogonum umbellatum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis, Carduus nutans, Taraxacum officinale, Taraxacum laevigatum, Tragopogon dubius*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a newly described type to the literature. The lack of a dominant graminoid species is unusual, and may have to do with recent (100 year) changes to the fire and grazing/browsing regime due to homesteaders, ranching, and fire suppression.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association is fairly common with all stands occurring near the eastern border of the park.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-03A001, GT-03A005
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: GT-tm5b
Other plots outside park boundaries, but within 2 miles: BT-9407018, BT-9407047, BT-99507004, BT-9507013

GRAND TETON NATIONAL PARK Inventory Notes:
Classification Confidence: **Identifier:** New-GRTE-047
Local Author: Mark Fain **Date:** 4 March 2004
Local Editor: Klara Varga **Date: 19** March 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-081] *Artemisia tridentata* ssp. *vaseyana - Pursha tridentata / Bromus inermis - Poa pratensis* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevations between 6400 and 6500 feet. Half the stands have a significant amount of bare rocky ground and one stand has a significant amount of litter and duff as unvegetated ground cover. Almost all of the stands sampled for this association occur near anthropogenic disturbances including homesteads, roads, irrigation ditches, etc. which may be causing many non-native species to occur in this association. Two stands are bordered by *Populus angustifolia*, *Populus tremuloides*, and/or *Pinus contorta* woodlands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on sub-xeric sites. The shrub layer is co-dominated by *Artemisia tridentata* ssp. *vaseyana* (3 to 30% cover) and *Purshia tridentata* (3 to 12 % cover). *Symphoricarpos oreophilus* may occur with trace to 1% cover in some stands. The herbaceous layer contributes 12 to 30% cover in all sampled stands and is dominated by non-native graminoids. *Poa pratensis* (3 to 20% cover) co-dominates with *Bromus inermis* (7 to 20% cover), although neither species occurs in every stand. Other high constancy and moderate cover graminoids include *Poa secunda* and *Carex* spp. *Bromus inermis, Poa compressa,* and *Phleum pratense* occur in only one-third of the stands, but they typically contribute a high amount of cover when they do occur. No forb contributes more than 7% cover and the only constant forbs are *Eriogonum umbellatum* and *Balsamorhiza sagittata.*

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Artemisia tridentata* ssp. *vaseyana, Purshia tridentata*
GRAMINOID	*Poa pratensis, Bromus inermis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Artemisia tridentata ssp. *vaseyana, Purshia tridentata, Bromus inermis, Carex* spp., *Poa pratensis, Poa secunda, Balsamorhiza sagittata, Eriogonum umbellatum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Phleum pratense, Poa compressa, Poa pratensis, Linaria vulgaris*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana / Bromus inermis* association, but is differentiated due to the presence of *Purshia tridentata* as a co-dominant species in the shrub layer and *Poa pratensis* may be dominant or co-dominant with *Bromus inermis* in the herbaceous layer of the sampled stands for this association. If *P. pratensis* is dominant, then *B. inermis* may or may not be present.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur west of Blacktail Butte, between the Moose/Wilson Road and the main inside road, near the Barker/Ewing cabins, and near the airport.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04K120, 04K121, 04M025, 04X005, 04X006, 04X810
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-081
Local Author: Mark Fain
Date: 08 November 2004
Local Editor: Klara Varga
Date: 15 December 2004

Global Author:

REFERENCES: None

[CEGL001021] *Artemisia tridentata* ssp. *vaseyana / Bromus carinatus* Shrubland

Translated Name: **Mountain Big Sagebrush / California Brome Shrubland**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is documented only from Grand Teton National Park, Wyoming. It occurs on an upland toeslope at an elevation of 2232 m (7319 feet) with a gradient of 22% on a southern aspect. The soil is a well-drained sandy loam. The low-shrub canopy is dominated by *Artemisia tridentata ssp. vaseyana*, and *Symphoricarpos oreophilus* occurs in small amounts. Graminoids are common and are dominated by *Elymus trachycaulus, Bromus carinatus*, and *Melica spectabilis*. Forbs are dominated by *Eriogonum umbellatum, Symphyotrichum ascendens*, and *Antennaria microphylla*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: Two of the sampled stands for this association occur on the valley floor at elevations from 6400 to 6500 feet, the third occurs on an upland toeslope at an elevation of 7319 feet with a gradient of 22% on a southern aspect. Soil data is available for one stand; the soil is a well drained sandy loam. The unvegetated ground surface for this stand is comprised of litter and duff (70% ground cover), bare soil (10% ground cover), and small rocks (10% ground cover). The surrounding vegetation may include *Abies lasiocarpa, Picea engelmannii*, and *Pinus contorta.* All stands sampled are located near trails and/or roads.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane sagebrush shrubland that occurs on subxeric sites. The short shrub layer is dominated by *Artemisia tridentata* ssp. *vaseyana* (20 to 40% canopy cover). Constant graminoids include *Bromus carinatus, Poa pratensis*, and *Koeleria macrantha*. Forbs are more diverse than graminoids in the herbaceous layer, with *Eriogonum umbellatum, Balsamorhiza sagittata*, and *Lupinus* sp. occurring in more than half the stands.

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Bromus carinatus	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note
Lupinus sp	

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Artemisia tridentata ssp. vaseyana/Bromus carinatus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Hironaka et al. (1983) description well (Hironaka refers only to *Artemisia vaseyana "spiciformis" / Bromus carinatus* type, not ssp. *vaseyana*).
Grand Teton National Park Other Comments:
Global Classification Comments: Hironaka et al.'s (1983) *Artemisia vaseyana "spiciformis" / Bromus carinatus* is represented in the NVC by ~*Artemisia tridentata ssp. spiciformis / Bromus carinatus* Shrubland (CEGL002989)$$, as the sagebrush has been elevated to subspecies *Artemisia tridentata ssp. spiciformis*, so this reference does not apply to stands of *Artemisia tridentata ssp vaseyana*. Lewis (1971) refers to *Artemisia tridentata ssp. vaseyana / Bromus marginatus / Festuca idahoensis*. Jensen et al. (1988) have an *Artemisia tridentata ssp. vaseyana / Symphoricarpos oreophilus / Bromus carinatus* type, where the *Symphoricarpos* is present in 90% of plots with just under 10% cover on average. Mooney (1985) describes an *Artemisia tridentata ssp vaseyana / Elymus cinereus / Bromus carinatus* type , with only 1-5% *Bromus carinatus* and 25-50% *Leymus cinereus (= Elymus cinereus)*.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near Owl Creek, north of the Barker/Ewing Cabins, and south of the String Lake turnoff.

Global Range: This association is documented only from Grand Teton National Park, Wyoming.
Nations: US
States/Provinces: CA?, ID:S3, NV:S4, UT?, WY
TNC Ecoregions: 6:C, 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 342B:CC, 342C:CC, M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C074
Accuracy Assessment Points: 04J084, 04M024
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): B. Villalobos, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	.	X	.	.	.	.	.
Jensen et al. 1988a	.	X	.	.	.	.	.	.	.
Jensen et al. 1988b	.	X	.	.	.	.	.	.	.
Lewis 1971	.	X	.	X	.	.	.	.	.
Mooney 1985	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL002931] *Artemisia tridentata* ssp. *vaseyana / Hesperostipa comata* Shrubland

Translated Name: **Mountain Big Sagebrush / Needle-and-Thread Shrubland**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association occurs on moderate slopes between 1372 to 2100 m (4500-6900 feet) elevation. Soils range from clay loam to sandy loams. *Artemisia tridentata ssp. vaseyana* is the dominant shrub. *Purshia tridentata, Symphoricarpos oreophilus, Ericameria* sp., *Artemisia tripartita*, and *Amelanchier alnifolia* may be present at upper elevations, and at lower altitudes *Chrysothamnus viscidiflorus* and *Tetradymia canescens* can be common. *Hesperostipa comata (= Stipa comata)* is the principal understory species. *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum)*, and *Koeleria macrantha* may be present in small amounts. Other herbaceous species that may be present include *Carex rossii, Achnatherum lettermanii, Achnatherum nelsonii, Pseudoroegneria spicata, Poa pratensis, Antennaria microphylla*, and *Eriogonum umbellatum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on the valley floor, terraces, and on slopes that are less than 23%. The elevations of the sites range from 6400 to 7100 feet. Where data are available, soil textures are generally loams or clay loams but can contain coarser particles. Gravel cover ranges from 0% to 40% of the ground cover; the soils are well drained. Litter and duff compose up to 50% of the ground cover. Moss can be a major component of the ground cover, occupying up to 30%; decreasing moss cover is correlated with increasing bare ground. Almost all other stands that did not have detailed soil data were noted as having a significant amount of bare ground covered with either mosses or rocks. More than half of the plots sampled were disturbed either by heavy wildlife use or by anthropogenic disturbances such as horse use, livestock grazing, and roads. Adjacent vegetation may include *Dasiphora floribunda* shrublands, *Artemisia arbuscula* shrublands, *Salix* spp. riparian zones, *Populus tremuloides* forests, and *Pinus contorta* forests.

Global Environment: This association occurs on moderate slopes between 1372 to 2164 m (4500-7100 feet) elevation. Soils range from clay loam to sandy loams.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrub steppe that occurs on subxeric sites. *Artemisia tridentata* ssp. *vaseyana* is the dominant species in the shrub layer contributing 7 to 50% of the canopy cover. Numerous other shrub species occur as a minor component to the shrub layer, but none occur in the majority of the stands. Herbaceous cover ranges from 12 to 50% and is dominated by *Hesperostipa comata* (3 to 40% canopy cover). Other species that occur in the majority of the sampled stands include *Koeleria macrantha, Poa pratensis*, and *Eriogonum umbellatum.*

Global Vegetation: *Artemisia tridentata ssp. vaseyana* is the dominant shrub. *Purshia tridentata, Symphoricarpos oreophilus, Ericameria* sp., *Artemisia tripartita*, and *Amelanchier alnifolia* may be present at upper elevations, and at lower altitudes *Chrysothamnus viscidiflorus, Cercocarpus montanus*, and *Tetradymia canescens* can be common. *Hesperostipa comata (= Stipa comata)* is the principal understory species. *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum)*, and *Koeleria macrantha* may be present in small amounts. Other herbaceous species that may be present include *Bouteloua gracilis, Poa fendleriana, Muhlenbergia* spp., *Carex rossii, Achnatherum lettermanii, Achnatherum nelsonii, Pseudoroegneria spicata, Poa pratensis, Antennaria microphylla*, and *Eriogonum umbellatum*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Hesperostipa comata	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Purshia tridentata	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Antennaria microphylla	Herb (field)	Forb	X	.	.
Eriogonum umbellatum	Herb (field)	Forb	X	.	.
Stipa comata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Carduus nutans	-	P	exotic

Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Rumex crispus ssp. *crispus*	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Thlaspi arvense	-	P	exotic
Tragopogon dubius	-	P	exotic
Orobanche corymbosa	-	P	rare (state)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (14-Aug-2001).

RELATED CONCEPTS

Global Similar Associations:
- *Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus / Hesperostipa comata* Shrubland (CEGL001039)

Global Related Concepts:
- *Artemisia tridentata ssp. vaseyana / Stipa comata* - *Geum triflorum* (Bramble-Brodahl 1978) =
- *Artemisia vaseyana / Stipa comata* Habitat Type (Hironaka et al. 1983) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Grand Teton National Park's stands generally fit the Hironaka et al. (1983) description because *Pseudoroegneria spicata, Festuca idahoensis*, and *Koeleria macrantha* are present on scattered microsites, and because *Symphoricarpos oreophilus, Purshia tridentata*, and *Chrysothamnus viscidiflorus* occur in this elevational range (1980-2100 m) in low densities. Hironaka's description departs slightly when he refers to this association as being restricted to sandy soils. Grand Teton National Park's stands occur over a range of soils but primarily on fine-particled loams and clay loams.
Global Classification Comments: The Global description is based on Hironaka et al. (1983) and Grand Teton National Park and Zion National Park local descriptions. Of all the references for this association, only Hironaka et al. (1983) clearly reference an *Artemisia tridentata ssp. vaseyana / Stipa comata* vegetation type. All the others (Blackburn 1967, Blackburn et al. 1968c, 1971, Tueller et al. 1966, 1974, McLean 1970, Poulton 1955, DeVelice and Lesica 1993) do not provide information as to the subspecies of *Artemisia tridentata*. Further clarification of which published materials relate to this association is needed. Based on habitat information and photos available for the study areas in Nevada, these could reference *Artemisia tridentata ssp. tridentata / Stipa comata* vegetation types.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Hesperostipa comata* association, but is differentiated due to the lack of *S. oreophilus* as a major component of the shrub layer.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs on both the east and west sides of the Snake River, with all but one sampled stand occurring south of Jackson Lake.

Global Range: This association is known from southern Utah to southern Idaho and western Wyoming. It is likely to occur in northern Nevada.
Nations: US
States/Provinces: CO, ID, MT, NV, UT, WY
TNC Ecoregions: 4:P, 6:P, 8:C, 9:C, 11:P, 19:P, 20:P
TNC Ecoregion Comments: ECO4 & ECO8 added (mjr 8-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 313A:CC, 342B:CP, 342C:CC, 342D:CC, 342I:CP, M261G:CP, M331D:CC, M331E:CC, M331G:CC, M332E:CC
Federal Lands: NPS (Black Canyon of the Gunnison, Curecanti, Dinosaur, Grand Teton, Zion)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201019, GT-0201021, GT-0201023, GT-0202019, GT-0202022, GT-03A100, GT-03C096
Accuracy Assessment Points: 04R017, 04R020, 04R032, 04R048, 04R049, 04R050, 04R055, 04R056, 04R075, 04R079, 04R088, 04R101, 04R187, 04R205, 04R207, 04R210, 04R211, 04X407, 04X409, 04X807

Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Blackburn 1967	.	X	.	X	.	.	.	.	.
Blackburn et al. 1968c	.	X	.	X	.	.	.	.	.
Blackburn et al. 1971	.	X	.	X	.	.	.	.	.
Bramble-Brodahl 1978	.	.	X	.	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cogan et al. 2004	.	X	.	.	.	.	.	.	.
DeVelice and Lesica 1993	.	X	.	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
McLean 1970	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Poulton 1955	.	X	.	X	.	.	.	.	.
Tueller and Blackburn 1974	.	X	.	X	.	.	.	.	.
Tueller et al. 1966	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL002528] *Artemisia tridentata* ssp. *vaseyana / Poa pratensis* Sagebrush Shrubland

Translated Name: **Mountain Big Sagebrush / Kentucky Bluegrass Sagebrush Shrubland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This sagebrush shrubland is documented by four quantitative plots from Grand Teton National Park. It has been observed throughout the range of *Artemisia tridentata ssp. vaseyana* shrublands, and stands dominated by *Poa pratensis* in the undergrowth have likely been identified by the local potential dominant native graminoid (such as *Festuca idahoensis*, *Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Grand Teton National Park, no native graminoids were present, so the potential native graminoid counterpoint to *Poa pratensis* is unknown.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: This association occurs primarily on the valley floor with a few occurrences on moderate slopes with various aspects. The elevation ranges for these sites is approximately 6400 to 6800 feet, with two sampled stands occurring above 7000 feet. Soil types range from sandy loam to clay loam, sometimes with gravel present. Many stands have bare, rocky soil. Most stands occur near a large variety of man-made disturbances, which correlates with the non-native species found in many plots. Adjacent vegetation may include a *Picea pungens* riparian corridor, *Artemisia arbuscula* shrublands, *Salix* spp. shrublands, and non-native grasslands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane, short shrub steppe. *Artemisia tridentata* ssp. *vaseyana* dominates the shrub layer with 12 to 50% canopy cover. The composition of the herbaceous layer varies considerably, both in species richness and in species composition. The unifying characteristic is that *Poa pratensis* dominates with 1 to 50% canopy cover. The only other high constancy graminoid is *Festuca idahoensis*. The most constant forbs are *Eriogonum umbellatum* and *Achillea millefolium*, although the total species list for this type includes many more species.

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.

Achillea millefolium	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (29-Mar-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This vegetation type is probably a very disturbed version of ~*Artemisia tridentata ssp. vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533)$$ in which *Poa pratensis* has replaced *Festuca idahoensis* as the dominant graminoid, following the settlement of the Jackson Hole valley.
Grand Teton National Park Other Comments:
Global Classification Comments: This type has not been described in the literature by name but seems highly likely to occur throughout the range of the dominant sagebrush.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs over a wide range within the non-forested, lower elevations of Grand Teton National Park.

Global Range: This type has been documented in western Wyoming but is expected to occur throughout the range of the dominant sagebrush.
Nations: US
States/Provinces: WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments:
USFS Ecoregions: M331A:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202001, GT-0201020, GT-0202027
Accuracy Assessment Points: 04J008, 04J217, 04K013, 04K022, 04M029, 04R007, 04R310, 04R315, 04R317, 04R330, 04X004, 04X021, 04X081, 04X479, 04X480, 04X491, 04X802
Other plots within park boundaries, from other projects: GT-tm6e, GT-tm5a, GT-tm3a, GT-GRTEsrm_TrailRanc
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain, mod. K. Varga and K. McCloskey

Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001030] *Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata* Shrubland

Translated Name: **Mountain Big Sagebrush / Bluebunch Wheatgrass Shrubland**
Common Name: **Mountain Big Sagebrush / Bluebunch Wheatgrass**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a common, abundant, and widespread sagebrush community in the western U.S. It occurs from 1829 to 3048 m (6000-10,000 feet) elevation, on 10-59% slopes, usually on the upper part of the slope, or on ridgetops, from northeast- to south-facing aspects. Soils are generally deep Mollisols (average depth from one study was 104 cm). This association is dominated by *Artemisia tridentata ssp. vaseyana,* with a conspicuous herbaceous undergrowth often dominated by *Pseudoroegneria spicata*. Other shrubs are usually present, but no one species consistently so, all generally with low cover (<10%). Shrub species include *Chrysothamnus* spp., *Tetradymia canescens, Purshia tridentata,* and *Amelanchier alnifolia*. Note that stands usually lack *Symphoricarpos oreophilus*. The herbaceous undergrowth is dominated by grasses, *Pseudoroegneria spicata* usually having the highest cover. In disturbed stands, *Bromus tectorum* can be more abundant. Other grass species include *Poa fendleriana, Poa secunda (= Poa sandbergii), Bouteloua gracilis, Elymus lanceolatus (= Agropyron dasystachyum), Koeleria macrantha, Hesperostipa comata (= Stipa comata),* and *Elymus elymoides (= Sitanion hystrix). Festuca idahoensis* is usually not present, but if so then in very low amounts. Common forbs include *Eriogonum umbellatum, Lupinus sericeus, Lupinus caudatus, Comandra umbellata, Balsamorhiza sagittata, Lithospermum ruderale,* and *Achillea millefolium*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on or near the valley floor. Two stands occur on shallow slopes. The elevations for these stands range from 6604 to 7400 feet. Where data are available the sandy clay loam soils generally have a high percentage of gravel or cobble. The unvegetated and nonvasucular ground cover for one stand is primarily comprised of litter and duff (40%), bare ground (10%), and gravel (40%). Three other stands are noted as having bare soil with large and small rocks evident. Fire has affected one stand. Adjacent vegetation may include *Pinus contorta* forests, and *Artemisia tridentata* ssp. *vaseyana* shrublands with various other understories.

Global Environment: This is a common, abundant, and widespread sagebrush community in the western U.S. It occurs from 1829 to 3048 m (6000-10,000 feet) elevation, on 10-59% slopes, usually on the upper part of the slope, and on ridgetops, from northeast- to south-facing aspects. Soils are generally deep Mollisols (average depth from one study was 104 cm). Soil textures range from loams to gravely clays.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. The dominant short shrub species is *Artemisia tridentata* ssp. *vaseyana* contributing 10 to 30% cover. The herbaceous layer is dominated by *Pseudoroegneria spicata,* contributing trace to 12 % cover. Other high constancy graminoids include *Koeleria macrantha* and *Melica spectabilis*. The only forb that occurs in more than half the stands is *Eriogonum umbellatum* (3 to 30% cover).

Global Vegetation: This association is dominated by *Artemisia tridentata ssp. vaseyana*, with a conspicuous herbaceous undergrowth often dominated by *Pseudoroegneria spicata*. Other shrubs are usually present, but no one species consistently so, all generally with low cover (<10%). Shrub species include *Chrysothamnus* spp., *Tetradymia canescens, Purshia tridentata,* and *Amelanchier alnifolia*. Note that stands usually lack *Symphoricarpos oreophilus*. The herbaceous undergrowth is dominated by grasses, *Pseudoroegneria spicata* usually having the highest cover. In disturbed stands, *Bromus tectorum* can be more abundant. Other grass species include *Poa fendleriana, Poa secunda (= Poa sandbergii), Bouteloua gracilis, Elymus lanceolatus (= Agropyron dasystachyum), Koeleria macrantha, Hesperostipa comata (= Stipa comata),* and *Elymus elymoides (= Sitanion hystrix). Festuca idahoensis* is usually not present, but if so then in very low amounts. Common forbs include *Eriogonum umbellatum, Lupinus sericeus, Lupinus caudatus, Comandra umbellata, Balsamorhiza sagittata, Lithospermum ruderale,* and *Achillea millefolium*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Melica spectabilis	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Purshia tridentata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Capsella bursa-pastoris	-	P	exotic
Cirsium arvense	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii* Shrubland (CEGL001025)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535)

Global Related Concepts:

- *Artemisia tridentata ssp. vaseyana / Agropyron spicatum - Poa fendleriana* association (Mooney 1985) =
- *Artemisia tridentata ssp. vaseyana / Agropyron spicatum* Community Type (Jensen et al. 1988a) =
- *Artemisia tridentata ssp. vaseyana / Agropyron spicatum* Community Type (Jensen et al. 1988b) =
- *Artemisia tridentata ssp. vaseyana / Agropyron spicatum* Plant Association (Baker and Kennedy 1985) =
- *Artemisia tridentata ssp. vaseyana / Agropyron spicatum* association (Mooney 1985) =
- *Artemisia tridentata ssp. vaseyana/Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- *Artemisia vaseyana / Agropyron spicatum* Habitat Type (Hironaka et al. 1983) =
- Big sagebrush community (Lewis 1971) B
- DRISCOLL FORMATION CODE:III.A.2.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association differs from Hironaka et al.'s (1983) *Artemisia vaseyana / Agropyron spicatum* Habitat Type. Hironaka writes that *Bromus tectorum* is present in almost all stands and that *Chrysothamnus viscidiflorus* and *Ericameria nauseosa* are usually present. None of these three species occur in any stand in the Grand Teton National Park occurrences.

Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. vaseyana – *Symphoricarpos oreophilus / Pseudoroegneria spicata* association, but is differentiated by the absence of *Symphoricarpos oreophilus* as a dominant species.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Within the park boundaries these sites occur in Baseline Flat east of Taggart Lake, Triangle X Ranch, Blacktail Butte, near Lost Creek Ranch, at the String Lake turnoff, and near Burnt Ridge. One sampled stand occurs outside the park boundary on the western slope of Shadow Mountain.

Global Range: This common association is known from Nevada, Oregon, Idaho, Montana, Wyoming, and Colorado.
Nations: US
States/Provinces: CO:S2, ID:S4, MT, NV:S4, OR:S3, UT?, WY:S2
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 11:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 331D:CC, 331G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CP, M332D:CP, M332E:CC, M332G:CC
Federal Lands: NPS (Dinosaur, Grand Teton); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201002, GT-0201010
Accuracy Assessment Points: 04J083, 04R034, 04R184, 04R266, 04X615
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407075

Grand Teton National Park Description Author(s): M. Fain, K. Varga, and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker and Kennedy 1985	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Bramble-Brodahl 1978	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cooper et al. 1999	.	X	.	X	.	.	.	.	.
Current 1984	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Eddleman and Jaindl 1994	.	.	.	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
Jensen et al. 1988a	.	X	X	X	.	.	.	.	.
Jensen et al. 1988b	.	X	X	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Lewis 1971	.	X	X	.	.	.	.	.	.
Lewis 1975a	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mooney 1985	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Smith 1966	.	X	.	X	.	.	.	.	.
Terwilliger and Smith 1978	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001532] *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevations of 6500 to 6900 feet. Unvegetated ground cover for all stands includes bare ground cover with a large amount of small rocks. Two stands contain dead and downed trees. Two stands have horse trails through them. Adjacent vegetation may include *Pinus contorta* forests.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on mesic sites. *Artemisia tridentata* ssp. *vaseyana* (12 to 30% cover) is the dominant and typically the only species in the shrub layer. The herbaceous layer contributes 30 to 40% ground cover with graminoids being more diverse than forbs. *Carex geyeri* (7 to 30% cover) and *Eriogonum umbellatum* (7% cover) are the only species to occur in all stands. The other high constancy species are *Poa pratensis* and *Koeleria macrantha*, occurring in half the stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Artemisia tridentata* ssp. *vaseyana*
GRAMINOID	*Carex geyeri*
FORB	*Eriogonum umbellatum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Artemisia tridentata ssp. *vaseyana, Carex geyeri, Koeleria macrantha, Poa pratensis, Eriogonum umbellatum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This type may be closely related to the NVC type CEGL001532 *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Carex geyeri* association, but is differentiated by the absence of *Symphoricarpos oreophilus* as a co-dominant species with *Artemisia tridentata* ssp. *vaseyana*.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on Hermitage Point, across from the Moose Habitat Pullout, and near Pacific creek.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R121, 04R136, 04X074, 04X813
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-088
Local Author: Mark Fain
Date: 10 November 2004
Local Editor: kelly McCloskey
Date: 21 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-075] *Artemisia tridentata* ssp. *vaseyana / Bromus inermis* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevations between 6400 and 6800 feet. In one stand there is a lot of bare soil. Almost all of the stands sampled for this association occur near anthropogenic disturbances including homesteads, roads, horse trails, power lines, irrigation ditches, etc, which may be causing many non-native species to occur in this association. One stand is surrounded by a *Phleum pratense – Poa pratensis – Bromus inermis* association and another is bordered by a *Bromus inermis* hayfield.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane sagebrush shrubland that occurs on sub-xeric sites. *Artemisia tridentata* ssp. *vaseyana* (7 to 30% cover) is the dominant shrub species, and is typically the only shrub species to occur. The herbaceous layer is dominated primarily by non-native graminoids. *Bromus inermis* (3 to 20% cover) dominates all stands. Other high constancy species include *Poa pratensis* (averaging 6% cover), *Phleum pretense* (averaging 3% cover), and *Eriogonum umbellatum* (averaging 3% cover).

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***

SHORT SHRUB	*Artemisia tridentata* ssp. *vaseyana*
GRAMINOID	*Bromus inermis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Artemisia tridentata ssp. *vaseyana, Bromus inermis, Phleum pratense, Poa pratensis, Eriogonum umbellatum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus inermis, Phleum pratense, Poa bulbosa, Poa pratensis, Carduus nutans, Cirsium arvense, Thlaspi arvense, Cynoglossum officinale, Tragopogon* sp.

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Purshia tridentata / Bromus inermis – Poa pratensis* association, but is differentiated due to the lack of *P. tridentata* as a co-dominant species in the shrub layer.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur mainly in the Antelope Flats area. However there is also one occurring south of the airport and one north of Pilgrim Creek.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J009, 04K026, 04R021, 04R047, 04X426, 04X430, 04X481, 04X801, 04X819
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-075
Local Author: Mark Fain
Date: 08 November 2004
Local Editor: Klara Varga
Date: 15 December 2004

Global Author:

REFERENCES: None

III.B.2.N.a. Temperate cold-deciduous shrubland

A.913 *Amelanchier alnifolia* Shrubland Alliance

Saskatoon Serviceberry Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the western United States and south-central Canada. It occurs predominantly in the West and requires rangewide review for a complete description. In the Midwest, it is characterized by moderate cover (>25%) of shrubs, most of which are approximately 1 m tall. Mixedgrass prairie species occupy the spaces between the shrubs. Dominant shrubs include *Amelanchier alnifolia, Prunus virginiana*, and *Symphoricarpos occidentalis*. Typical herbaceous species include *Pascopyrum smithii, Hesperostipa comata (= Stipa comata)*, and other species characteristic of mixedgrass prairie.
Environment: These communities occur in middle elevations (1800-2500 m) of mountains in the Intermountain West. Precipitation ranges from 30-50 cm annually with a large proportion falling as winter snow. These shrublands occur on all aspects in mesic ranges but are generally best developed on north-facing slopes in xeric areas. Soils are variable, from shallow and skeletal near rock outcroppings, to moderately deep with abundant organic matter. Adjacent communities are typically *Quercus gambelii* shrublands, *Pinus ponderosa* forests, *Pinus edulis - Juniperus osteosperma* woodlands, or *Artemisia* shrublands.
Vegetation: This alliance is widely scattered from the northwestern Great Plains into interior regions of the West. In all locations, it is distinguished by dominance of *Amelanchier alnifolia* in the upper shrub layer. It is best described from the Rocky Mountain and Great Basin regions, where it forms a prominent component of montane shrublands. Such stands typically contain a tall-shrub layer of *Amelanchier alnifolia*, often with other shrubs of various sizes, including *Symphoricarpos oreophilus, Artemisia tridentata, Ribes aureum, Chrysothamnus viscidiflorus*, and *Rosa woodsii*. The understory is composed of primarily perennial bunch grasses, including *Festuca idahoensis, Pseudoroegneria spicata, Elymus elymoides, Poa secunda (= Poa sandbergii)*, and *Carex* spp.

In the northwestern Great Plains, the alliance is characterized by a moderate cover (>25%) of shrubs, most of which are approximately 1 m tall. Mixedgrass prairie species occupy the spaces between the shrubs. Dominant shrubs include *Amelanchier alnifolia, Prunus virginiana*, and *Symphoricarpos occidentalis*. Typical herbaceous species include *Pascopyrum smithii, Hesperostipa comata (= Stipa comata)*, and other species characteristic of mixedgrass prairie.
Dynamics: *Amelanchier utahensis* hybridizes with *Amelanchier alnifolia* and distinctions between the two species may be come blurred in areas where their ranges overlap. *Amelanchier* spp. are palatable to both livestock and native ungulates and compose a valuable element of the winter range in the Great Basin and Rocky Mountains.
Similar Alliances:
- *Amelanchier utahensis* Shrubland Alliance (A.916)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

Similar Alliance Comments: Vegetation types in this alliance and the alliances above are very similar in habitat and physiognomy. In addition, *Amelanchier alnifolia* and *Amelanchier utahensis* are taxonomically very similar species and can be difficult to distinguish. *Amelanchier utahensis* is distinguished from *Amelanchier alnifolia* by having pubescent adult leaves, but there may be intergrading where the species ranges overlap. In general, *Amelanchier alnifolia* communities occur in more northern and mesic habitats than *Amelanchier utahensis* communities.

ALLIANCE DISTRIBUTION

Range: Vegetation types in this alliance are found in North Dakota, Wyoming, Montana, Nevada, Colorado, and possibly California. The alliance is also found in Canada in southern Saskatchewan and Alberta.
Nations: CA, US
Subnations: AB, CA?, CO, MT, ND, NV, SK, UT, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 26:C, 34:C, 35:C
USFS Ecoregions: 251Aa:CCC, 331H:CC, 332:P, 342B:CC, 342F:CC, 342G:CC, M331D:CC, M331E:CC, M332C:CC, M333B:CP, M333C:CC
Federal Lands: NPS (Dinosaur, Glacier, Grand Teton); PC (Waterton Lakes)

ALLIANCE SOURCES

Author(s): D. Sarr
References: Blackburn et al. 1968a, Faber-Langendoen et al. 1996, Harvey 1980, Mozingo 1987

REFERENCES: None

[CEGL005886] *Populus tremuloides / Amelanchier alnifolia* Avalanche Chute Shrubland

Translated Name: **Quaking Aspen / Saskatoon Serviceberry Avalanche Chute Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)

Status: Standard **Circumscription Confidence:**
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is scattered infrequently on avalanche chutes and other steep slopes in Glacier National Park in Montana, Waterton Lakes National Park in Alberta, and Grand Teton National Park in Wyoming. This mesic, montane to lower subalpine association is present within avalanche chutes at a broad range of elevations, from 1130 to 2396 m (3720-7860 feet) on moderate to steep, south- and east-facing midslopes. Soils are rapidly to well-drained sandy loams, characterized as Orthic and Cumulic Regosols developed on fluvial and colluvial landforms. These are generally weakly developed, strongly acidic to neutral soils that are coarse-textured. Litter dominates the ground surface with 40-85% cover. Frequent avalanches maintain the shrubby structure of this deciduous shrubland. Tall shrubs are dominant and some stands have a more pronounced short-tree layer, ranging from 1-5 m in height. *Populus tremuloides* dominates both the tall-shrub and tree layer. *Pseudotsuga menziesii* may also be present, sometimes becoming emergent over other vegetation. *Picea engelmannii, Abies lasiocarpa*, and *Pinus ponderosa* trees are also sometimes scattered in the canopy. Total short-shrub cover is 20-70%, and common shrubs are *Amelanchier alnifolia, Acer glabrum, Spiraea betulifolia, Shepherdia canadensis, Sorbus scopulina, Prunus pensylvanica, Rubus parviflorus, Lonicera utahensis, Symphoricarpos albus, Mahonia repens, Paxistima myrsinites*, and *Arctostaphylos uva-ursi*. Total herbaceous cover ranges from 20-100% and high-constancy species include *Chamerion angustifolium, Eurybia conspicua (= Aster conspicuus), Carex geyeri, Elymus glaucus, Populus tremuloides* seedlings, *Thalictrum occidentale, Calamagrostis rubescens*, and *Calamagrostis canadensis*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on east to south-facing slopes with gradients of 24 to 70% at elevations ranging from 7051 to 8000 feet. Where data are available the soils are well-drained to moderately well-drained sandy loams. The unvegetated and nonvascular ground cover is comprised of litter and duff (70 to 80% cover), rocks greater than 10 cm (5 to 30% cover), wood (1 to 10% cover), and gravel (5% cover). Bare soil, mosses, and lichens are present in trace quantities. All stands are situated in areas frequently disturbed by avalanches. The adjacent vegetation may include *Pseudotsuga menziesii* and *Abies lasiocarpa*.

Global Environment: This mesic, montane to lower subalpine association is present within avalanche chutes at a broad range of elevations, from 1130 to 2396 m (3720-7860 feet) on moderate to steep, south- and east-facing midslopes. Soils are rapidly to well-drained sandy loams, characterized as Orthic and Cumulic Regosols developed on fluvial and colluvial landforms. These are generally weakly developed, strongly acidic to neutral soils that are coarse-textured. Litter dominates the ground surface with 40-85% cover. Frequent avalanches maintain the shrubby structure of this deciduous shrubland.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane shrubland that occurs on mesic sites. *Populus tremuloides* is the dominant tree species with 7 to 60% cover in either the tree canopy, subcanopy, or as seedlings in the short shrub stratum. The shrub layer is diverse and composes up to 50% canopy cover. High constancy shrubs include *Acer glabrum, Amelanchier alnifolia, Sorbus scopulina, Symphoricarpos oreophilus, Prunus virginiana*, and *Paxistima myrsinites*. The herbaceous layer is dominated by *Carex geyeri* (7 to 50% cover), occurring in almost every stand; no other graminoid occurs in half the stands. The only forbs that occur in the majority of the stands are *Helianthella uniflora* and *Chamerion angustifolium.* A variety of other forbs and graminoids are present in trace quantities.

Global Vegetation: Tall shrubs are dominant, and some stands have a more pronounced short-tree layer, ranging from 1-5 m in height. *Populus tremuloides* dominates both the tall-shrub and tree layer. *Pseudotsuga menziesii* may also be present, sometimes becoming emergent over other vegetation. *Picea engelmannii, Abies lasiocarpa*, and *Pinus ponderosa* trees are also sometimes scattered in the canopy. Total short-shrub cover is 20-70%, and common shrubs are *Amelanchier alnifolia, Acer glabrum, Spiraea betulifolia, Shepherdia canadensis, Sorbus scopulina, Prunus pensylvanica, Rubus parviflorus, Lonicera utahensis, Symphoricarpos albus, Mahonia repens, Paxistima myrsinites*, and *Arctostaphylos uva-ursi*. Total herbaceous cover ranges from 20-100%, and high-constancy species include *Chamerion angustifolium, Eurybia conspicua (= Aster conspicuus), Carex geyeri, Elymus glaucus, Populus tremuloides* seedlings, *Thalictrum occidentale, Calamagrostis rubescens*, and *Calamagrostis canadensis*.
Global Dynamics: Frequent avalanches maintain the shrubby structure of this deciduous shrubland.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tall shrub/sapling	Broad-leaved deciduous tree	X	X	.
Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.

Sorbus scopulina	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Tall shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	.	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Populus tremuloides	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Paxistima myrsinites	Tall shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	.	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (20-Jan-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Cascade Canyon, on the west side of String Lake, near the mouth of Paintbrush Canyon, on the slope above Bearpaw Lake, near the mouth of Leigh Canyon, and in Avalanche Canyon.

Global Range: This association has only been documented in Glacier National Park, Montana, Waterton Lakes National Park, Alberta, and Grand Teton National Park, Wyoming.
Nations: CA, US
States/Provinces: AB, MT, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M333B:CP, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B038, GT-03B081
Accuracy Assessment Points: 04J078, 04J079, 04J080, 04K034, 04K047, 04R109, 04R142, 04X343
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, and K. Varga

Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.915 *Acer glabrum* Shrubland Alliance

Rocky Mountain Maple Shrubland Alliance

ALLIANCE CONCEPT

Summary: These shrublands have been described from subalpine avalanche paths in the mountains of northwestern Montana, but are likely throughout the northern Rocky Mountains. Elevations in northwestern Montana are approximately 950-2200 m. Stands of the alliance are located in avalanche tracks and runout zones, on slopes ranging from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur. Sites are often mesic because avalanche paths are often in stream gullies. Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees and shrubs, dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites, Sorbus scopulina*, scattered *Alnus viridis ssp. sinuata, Alnus incana*, and on the edges of the avalanche tracks and runout zones, small, avalanche-damaged conifers such as *Picea engelmannii, Abies lasiocarpa*, and *Betula papyrifera*. The ground cover is moderately dense to dense and composed of graminoids, forbs in Asteraceae, *Castilleja* spp., *Erythronium grandiflorum, Myosotis asiatica (= Myosotis alpestris), Veratrum viride*, and *Xerophyllum tenax*. Mosses and ferns are often present.

Environment: These shrublands have been described from subalpine avalanche paths in mountains of Glacier National Park in northwestern Montana. Elevations in northwestern Montana are approximately 950-2200 m. Climate is temperate with extremely cold winters and cool summers. Mean annual precipitation ranges from 50-70 cm and occurs mostly as snow. Stands are located in avalanche tracks and runout zones. Slopes range from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur, such as southeast aspects where snow cornices develop because of prevailing northwesterly winds, and south- to southwest-facing slopes because of suncrust formation. Stands may be more common west of the Continental Divide where snowpack is heavier. Sites are often mesic because avalanche paths are often in stream gullies. Substrate is variable depending on parent materials, but is typically shallow and rocky.

Adjacent vegetation may include subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii* or *Pseudotsuga menziesii*, and subalpine meadows.

Vegetation: This vegetation occurs in avalanche paths in the northern Rocky Mountains. Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees/shrubs that is dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites, Sorbus scopulina*, scattered *Alnus viridis ssp. sinuata, Alnus incana*, and on the edges of the avalanche tracks and runout zones, small, avalanche-damaged conifers such as *Picea engelmannii, Abies lasiocarpa*, and *Betula papyrifera*. The groundcover is moderately dense to dense and composed of graminoids, forbs in Asteraceae, *Castilleja* spp., *Erythronium grandiflorum, Myosotis asiatica (= Myosotis alpestris), Veratrum viride* and *Xerophyllum tenax*. Mosses and ferns are often present.

Dynamics: Disturbance by avalanches prevents tall forests from growing on these sites. Flexible-stemmed deciduous trees and shrubs are more tolerant of this snow movement than the conifers. Where avalanches are frequent, stands develop that are dominated by dwarfed conifers (less than 4 m tall). Where avalanches occur annually or more often, only brushy deciduous trees and shrubs are present (Butler 1979).

Similar Alliances:

- *Abies lasiocarpa - Acer glabrum* Shrubland Alliance (A.1052)
- *Alnus (viridis* ssp. *sinuata, incana)* Temporarily Flooded Shrubland Alliance (A.965)

Similar Alliance Comments: The similar shrubland alliance also occurs in avalanche-disturbed areas, but is codominated by *Abies lasiocarpa*.

ALLIANCE DISTRIBUTION

Range: This shrubland alliance has been described from subalpine avalanche chutes in northwestern Montana and Wyoming and likely occurs elsewhere in the Rocky Mountains.

Nations: US

Subnations: MT, WY

TNC Ecoregions: 7:C, 8:C, 9:C

USFS Ecoregions: M331A:CC, M331D:CC, M332B:CC, M332C:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Butler 1979

[CEGL001061] *Acer glabrum* Avalanche Chute Shrubland

Translated Name: **Rocky Mountain Maple Avalanche Chute Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group, mod. G. Kittel

ELEMENT CONCEPT

Global Summary: This deciduous shrubland has been described from subalpine avalanche paths in the northern Rocky Mountains. Elevations range from 950 to 2306 m (3100-7600 feet). Stands are located in avalanche tracks and runout zones, on slopes ranging from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur. Soils are rapidly to well-drained loamy sands, sandy loams, or silt loams. They tend to be dark, weakly developed soils on colluvial and glacio-fluvial landforms with high gravel and rock content. Sites are often mesic because avalanche paths are often in stream gullies. Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees and shrubs, dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites, Sorbus scopulina, Alnus viridis ssp. sinuata, Alnus incana, Rubus parviflorus, Prunus virginiana, Symphoricarpos albus, Symphoricarpos oreophilus, Salix planifolia, Salix scouleriana*, and *Crataegus douglasii*. In addition to shrub species, several trees are usually present, these rarely attaining heights above that of the shrubs due to the frequent disturbance. Tree species are those from the surrounding forested slopes and include *Picea engelmannii, Abies lasiocarpa, Populus tremuloides, Populus balsamifera ssp. trichocarpa, Pseudotsuga menziesii*, and *Betula papyrifera*. The ground cover is moderately dense to dense and composed of many graminoids and forbs. *Chamerion angustifolium* and *Thalictrum occidentale* are common. Other species include *Lomatium dissectum, Heracleum maximum, Xerophyllum tenax, Carex geyeri, Castilleja* spp., *Agastache urticifolia, Eucephalus engelmannii, Erythronium grandiflorum, Myosotis asiatica (= Myosotis alpestris), Veratrum viride*, and *Xerophyllum tenax*. Mosses and ferns are often present.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes at elevations of 7500 to 8200 feet. Half of the slopes face south and half of the slopes face north with gradients between 30 and 66%. Two plots have soil data; the soils are well-drained loamy sand and moderately well-drained sandy loam. The unvegetated and nonvascular ground cover is comprised of litter and duff (40 and 50% cover), rocks greater than 10 cm (30 and 40% cover), gravel (10% cover), wood (1 and 10% cover), and bare soil (1 and 5% cover). Lichens occur in trace quantities at one stand. The adjacent vegetation for one stand includes *Pseudotsuga menziesii* and *Abies lasiocarpa* in an area recently burned. *Rubus parviflorus* occurs downslope of one stand. All stands are situated in areas frequently disturbed by avalanches.

Global Environment: These shrublands have been described from subalpine avalanche paths in the Rocky Mountains. Elevations range from 950-2306 m (3100-7600 feet). Climate is temperate with extremely cold winters and cool summers. Mean annual precipitation ranges from 50-70 cm and occurs mostly as snow. Stands are located in avalanche tracks and runout zones. Slopes range from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur, such as southeast aspects where snow cornices develop because of prevailing northwesterly winds, and south- to southwest-facing slopes because of suncrust formation. Sites are often mesic because avalanche paths are often in stream gullies. Soils are rapidly to well-drained loamy sands, sandy loams, or silt loams. They tend to be dark, weakly developed soils on colluvial and glacio-fluvial landforms with high gravel and rock content. Substrate is variable depending on parent materials but is typically shallow and rocky. Adjacent vegetation may include subalpine forests dominated by *Abies lasiocarpa, Picea engelmannii*, or *Pseudotsuga menziesii*, and subalpine meadows.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane shrubland that occurs on mesic sites. The tall shrub layer is dominated by *Acer glabrum* (7 to 40% cover). *Abies lasiocarpa* (trace and 10% cover) is present in every plot either as trees and/or seedlings. Present in at least half of the plots as either short or dwarf shrubs are *Sorbus scopulina* (3 to 12% cover), *Rubus parviflorus* (1 to 10% cover), *Paxistima myrsinites* (1 to 3% cover), and *Prunus virginiana* (1 to 7% cover). The herbaceous layer is not well developed and comprised predominantly of forbs. The only species to occur in half the plots are *Thalictrum occidentale* (1 to 3% cover), *Eucephalus engelmannii* (trace to 1% cover), and *Agastache urticifolia* (1 to 10% cover).

Global Vegetation: Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees and shrubs, dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites, Sorbus scopulina, Alnus viridis ssp. sinuata, Alnus incana, Rubus parviflorus, Prunus virginiana, Symphoricarpos albus, Symphoricarpos oreophilus, Salix planifolia, Salix scouleriana*, and *Crataegus douglasii*. In addition to shrub species, several trees are usually present, these rarely attaining heights above that of the shrubs due to the frequent disturbance. Tree species are those from the surrounding forested slopes and include *Picea engelmannii, Abies lasiocarpa, Populus tremuloides, Populus balsamifera ssp. trichocarpa, Pseudotsuga menziesii*, and *Betula papyrifera*. The ground cover is moderately dense to dense and composed of many graminoids and forbs. *Chamerion angustifolium*

and *Thalictrum occidentale* are common. Other species include *Lomatium dissectum, Heracleum maximum, Xerophyllum tenax, Carex geyeri, Castilleja* spp., *Agastache urticifolia, Eucephalus engelmannii, Erythronium grandiflorum, Myosotis asiatica (= Myosotis alpestris)*, and *Veratrum viride*. Mosses and ferns are often present.

Global Dynamics: Disturbance by avalanches prevents tall forests from growing on these sites. Flexible-stemmed deciduous trees and shrubs are more tolerant of this snow movement than conifers. Where avalanches are frequent, stands develop that are dominated by dwarfed conifers (less than 4 m tall). Where avalanches occur annually or more often, only brushy deciduous trees and shrubs are present.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tree subcanopy	Needle-leaved tree	.	X	.
Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Rubus parviflorus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Sorbus scopulina	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Agastache urticifolia	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	characteristic graminoids
Thalictrum spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tall shrub/sapling	Needle-leaved tree	.	X	.
Acer glabrum	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Rubus parviflorus	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix planifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Sorbus scopulina	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos albus	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Tall shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Erythronium grandiflorum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Lomatium dissectum	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Veratrum viride	Herb (field)	Forb	.	X	.
Xerophyllum tenax	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note
Alnus spp.	dominant tall shrubs

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Alnus viridis* ssp. *sinuata / Athyrium filix-femina - Cinna latifolia* Shrubland (CEGL001156)
- *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland (CEGL002633)

Global Related Concepts:

- *Acer glabrum* (Avalanche Chute) (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

Grand Teton National Park Other Comments:
Global Classification Comments: This association is the product of disturbance by avalanche.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Four sampled stands occur in Cascade Canyon, two occur in Avalanche Canyon, one occurs in Hanging Canyon, and one occurs in Death Canyon below the Cabin.

Global Range: This shrubland has been described from subalpine avalanche chutes in northwestern Montana and northwestern Wyoming.
Nations: US
States/Provinces: MT:S5, WY
TNC Ecoregions: 7:C, 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added for Glacier (GK 1-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332B:CC, M332C:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A040, GT-03C036
Accuracy Assessment Points: 04R103, 04R112, 04R115, 04R117, 04R141, 04X625
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Butler 1979	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.919 *Prunus virginiana* Shrubland Alliance

Choke Cherry Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance occurs in scattered locations at low to mid elevations of the western U.S. Sites typically occur along streams, rivers, lakes and ponds, and on terraces. It also is found in canyons or steep gullies and along arroyos. Elevations range from 716 m to about 1600 m in Montana, Wyoming and Colorado, and up to 2440 m in Nevada. In some places the alliance occurs on side slopes of hillsides, immediately below a seep or spring. Some examples of this alliance have been placed into an intermittently or temporarily flooded hydrologic regime. Soils are usually well-developed, older, and well-drained, formed in shallow to deep alluvial deposits. These soils have higher fertility and afford good rooting depth. Textures range from silt to sandy loams, often becoming skeletal at depth. *Prunus virginiana* can tolerate weakly saline soils, but is intolerant of poor drainage and prolonged flooding. This alliance is characterized by a tall, dense layer of shrubs, primarily of *Prunus virginiana*. In the absence of disturbance, this species can form dense, monotypic thickets. With grazing or browsing disturbance, stands become more open allowing other shrubs to become common, including *Symphoricarpos occidentalis, Rosa woodsii, Ribes aureum,* and, in Oregon, *Sambucus caerulea*. The woody vine *Toxicodendron rydbergii* is present in most stands, as are the forbs *Maianthemum stellatum* and *Galium triflorum*. The herbaceous layer is typically not abundant, although stands with an open shrub canopy will typically have a component of weedy forbs and graminoids. A few scattered *Juniperus scopulorum* also occur.
Environment: This alliance occurs in scattered locations at low to mid elevations of the western U.S. Sites where it has been found are typically along streams, rivers, lakes and ponds, and on terraces. It also is found in canyons or steep gullies and along arroyos. Elevations range from 716 m to about 1600 m in Montana, Wyoming and Colorado, up to 2440 m in Nevada. In some places it occurs on side slopes of hillsides, immediately below a seep or spring. Hansen et al. (1995) place their examples of this alliance into an Intermittently or Temporarily Flooded hydrologic regime.

Soils are usually well-developed, older, and well-drained, formed in shallow to deep alluvial deposits. These soils have higher fertility and afford good rooting depth (Hansen et al. 1995). Textures range from silt to sandy loams, often becoming skeletal at depth. *Prunus virginiana* can tolerate weakly saline soils, but is intolerant of poor drainage and prolonged flooding.
Vegetation: This alliance is characterized by a tall, dense layer of shrubs, primarily of *Prunus virginiana*. In the absence of disturbance, this species can form dense, monotypic thickets. With grazing or browsing disturbance, stands become more open allowing other shrubs to become common, including *Symphoricarpos occidentalis, Rosa woodsii, Ribes aureum*, and, in Oregon, *Sambucus caerulea*. The woody vine, *Toxicodendron rydbergii*, is present in most stands, as are the forbs *Maianthemum stellatum* and *Galium triflorum*. The herbaceous layer is typically not abundant, although stands with an open shrub canopy will typically have a component of weedy forbs and graminoids. A few scattered *Juniperus scopulorum* also occur.
Dynamics: In Nevada, these communities are considered 'marginal' riparian types and represent succession away from riparian conditions (Manning and Padgett 1995). In Montana, *Prunus virginiana* communities may be grazing-induced successional stages of the *Fraxinus pennsylvanica / Prunus virginiana* community type (Hansen et al. 1995). Both *Prunus virginiana* and *Symphoricarpos occidentalis* are tolerant of fire and will usually sprout after fires and grow into even denser stands. Dense stands of *Prunus virginiana* may preclude use by livestock, while open stands may provide adequate grazing opportunities. However, if grazed for the entire season the strongly rhizomatous *Rosa woodsii* and non-native grasses may become established (Manning and Padgett 1995, Hansen et al. 1988b).
Similar Alliances:
Similar Alliance Comments: *Prunus virginiana* occurs as an important tall shrub or short tree in several other alliances.

ALLIANCE DISTRIBUTION

Range: This alliance has been described from the northwestern Great Plains, including Colorado, Wyoming, and Montana. It also is found in low to mid-elevation foothill areas of Idaho, Nevada, Washington and Oregon.
Nations: CA?, US
Subnations: CO, ID, MT, NV, OR, SD, WA, WY
TNC Ecoregions: 6:C, 9:C, 10:C, 11:C, 20:C, 25:C, 26:C
USFS Ecoregions: 331D:CC, 331G:CC, 331H:CC, 342A:CC, 342F:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Badlands, Dinosaur, Florissant Fossil Beds, Grand Teton, Wind Cave)

ALLIANCE SOURCES

Author(s): M.S. Reid
References: Caicco and Wellner 1983n, Copeland 1980a, Evans 1989a, Hansen et al. 1988b, Hansen et al. 1995, Jones and Walford 1995, Kittel et al. 1996, Kittel et al. 1999a, Manning and Padgett 1995

[CEGL001108] *Prunus virginiana - (Prunus americana)* Shrubland

Translated Name: **Choke Cherry - (American Plum) Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland (CES306.994)
- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
- Western Great Plains Wooded Draw and Ravine (CES303.680)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): D. Faber-Langendoen

ELEMENT CONCEPT

Global Summary: This is a widespread small-patch shrubland that is known from the Columbia Plateau of eastern Washington and eastern Oregon, eastern Nevada, southeastern Idaho, throughout Wyoming, Montana, Colorado and western South Dakota. It occurs in the foothills and lower slopes of mountain ranges, along higher creeks, and in draws and ravines of high plateaus and the Great Plains. The elevational range is 716 to 2440 m (2350-8000 feet). This association grows at the interface between larger riparian areas and the adjacent upland and occurs as small dense thickets, narrow bands, or irregular patches. It often occupies draws, ephemeral creeks in steep narrow-bottomed canyons, and shallow ravines. It can occur on slopes below seeps and springs. Shrub cover ranges from 100% to more open stands of 30%. Shrub cover is generally greater in drainage bottoms and on lowermost slopes, and less on upper slopes. *Prunus virginiana* is usually the dominant shrub species, but *Prunus americana* may be solely present to codominant as well. Stands can be dominated by one species but are often a mix of three to six other shrub species, which can be as abundant and even more abundant than the *Prunus*. Other shrubs include *Rhus trilobata, Ribes aureum, Ribes lacustre, Ribes inerme, Salix exigua, Sambucus* spp., *Amorpha canescens, Symphoricarpos oreophilus, Symphoricarpos occidentalis, Juniperus scopulorum, Rosa woodsii*, and *Toxicodendron rydbergii*. In drainage bottoms, herbaceous cover is usually sparse, less than 10%. On slopes, the shrubs typically occur in some grassland type, and graminoid cover can be greater than 75%. Herbaceous species include *Bromus inermis,*

Maianthemum stellatum (= Smilacina stellata), Poa pratensis, Cirsium arvense, Muhlenbergia montana, Leymus cinereus, and *Bromus tectorum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur mainly on southeast facing slopes but can occur on level ground. The slopes vary from 15 to 78% and the elevations of the stands range from 6450 to 8700 feet. Where data are available the well-drained sandy loam soils are generally derived from local alluvium and colluvium and contain up to 5% gravel. Rocks greater than 10 cm can compose up to 20% of the unvegetated ground cover while bare soil and wood each generally compose less than 10%. The largest unvegetated ground cover component is litter and duff for the stands where soil data are available, occupying 50 to 60%. Other stands show a high amount of bare soil with large and small rocks dominating open spaces. Common disturbances may include snow/avalanche, erosion, game trails, and/or pocket gopher tunneling. Adjacent vegetation may include mixed coniferous forests with scattered *Populus tremuloides*, or *Populus angustifolia – P. tremuloides* riparian forests, *Populus balsamifera* stands, *Populus tremuloides* stands, *Salix* spp. stands, *Artemisia tridentata* shrublands, and/or *Pinus contorta* forests.

Global Environment: This is a widespread small-patch shrubland that is known from the Columbia Plateau of eastern Washington, eastern Oregon, eastern Nevada, southeastern Idaho, throughout Wyoming, Montana, Colorado and western South Dakota. It occurs in the foothills and lower slopes of mountains, along higher creeks, and in draws and ravines of plateaus and the Great Plains. The elevational range is 716 to 2440 m (2350-8000 feet). This association grows at the interface between larger riparian areas and the adjacent upland and occurs as small dense thickets, narrow bands, or irregular patches. It often occupies draws, ephemeral creeks in steep narrow-bottomed canyons, and shallow ravines. It can occur on slopes below seeps and springs. Stands can also occur as small pockets on higher terraces or as narrow bands along the high-water mark of steep banks and incised channels. It also grows at the base of cliffs adjacent to rivers. Slope varies from flat to very steep, with variable aspects, and can be associated with rock outcrops. Stands are typically very well-drained on rocky soils but occasionally have finer soils. Soil texture ranges from sandy loam to clay loam.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. The shrub layer is generally well developed and diverse. The short shrub canopy cover ranges from 40 to 70% and is dominated by *Prunus virginiana*, which ranges from 1 to 50%. While *Prunus virginiana* can grow tall enough to be called a tall shrub, it quite often was only a short shrub when the data was collected. Other shrubs that can co-dominate the shrub canopy include *Artemisia tridentata, Mahonia repens, Amelanchier alnifolia,* and *Symphoricarpos oreophilus*. The canopy cover of the herbaceous layer ranges from 12 to 50% and is generally dominated by forbs. No graminoid species occur in half the sampled stands, but they may contribute high cover to individual stands. Graminoid genera that occur in over half the stands include *Bromus, Carex,* and *Elymus.* High constancy forbs include *Agastache urticifolia, Eriogonum umbellatum,* and *Balsamorhiza sagittata.* Many other forbs may contribute significantly to canopy cover to a few individual stands.

Global Vegetation: Shrub cover ranges from 100% to more open stands of 30%. Shrub cover is generally greater in drainage bottoms and on lowermost slopes, and less on slopes. *Prunus virginiana* is usually the dominant shrub species, but *Prunus americana* may be solely present to codominant as well. Stands can be dominated by one species, but are often a mix of three to six other shrub species, which can be as abundant and even more abundant than the *Prunus*. Other shrubs include *Rhus trilobata, Ribes aureum, Ribes lacustre, Ribes inerme, Salix exigua, Sambucus* spp., *Amorpha canescens, Symphoricarpos oreophilus, Symphoricarpos occidentalis, Juniperus scopulorum, Rosa woodsii,* and *Toxicodendron pubescens*. In drainage bottom situations, herbaceous cover is usually sparse, less than 10%. On slopes, the shrubs typically occur in some grassland type, and graminoid cover can be greater than 75%. Herbaceous species include *Bromus inermis, Maianthemum stellatum (= Smilacina stellata), Poa pratensis, Muhlenbergia montana, Leymus cinereus, Cirsium arvense*, and *Bromus tectorum*.

Global Dynamics: Some stands on slopes are the result of recent fire that killed the overlying canopy, converting ~*Pinus ponderosa / Prunus virginiana* Forest (CEGL000192)$$ to this *Prunus virginiana* shrubland type.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tridentata	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Mahonia repens	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Agastache urticifolia	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Grand Teton National Park Higher Taxa					
Arabis spp.	characteristic forbs				

Bromus spp.	characteristic graminoids
Elymus spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Ribes aureum	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus americana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Rhus trilobata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ribes cereum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos occidentalis	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Carduus nutans	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Pascopyrum smithii	-	P	
Poa pratensis	-	P	
Prunus americana	-	P	
Symphoricarpos occidentalis	-	P	

CONSERVATION STATUS RANK

Global Rank & Reasons: G4Q (1-Feb-1996). This type is widespread, but it represents a broadly defined dominance type, with little information on the associated species or habitats that might help define the type more precisely. If, e.g. a Great Plains type was separated out from the other types, such a type could be relatively rare.

RELATED CONCEPTS

Global Similar Associations:

- *Fraxinus pennsylvanica - Ulmus americana / Prunus virginiana* Woodland (CEGL000643)

Global Related Concepts:

- *Padus virginiana - Symphoricarpos occidentalis / Elytrigia smithii* Plant Association (Johnston 1987) =
- *Padus virginiana - Symphoricarpos oreophilus / Elymus trachycaulus* Plant Association (Johnston 1987) =
- *Prunus virginiana - (Prunus americana)* Plant Association (Kittel et al. 1999b) =
- *Prunus virginiana / Rosa woodsii* Community Type (Manning and Padgett 1995) F
- *Prunus virginiana* (Bourgeron and Engelking 1994) =
- *Prunus virginiana* Community (Copeland 1980a) =
- *Prunus virginiana* Community Type (Hall and Hansen 1997) =
- *Prunus virginiana* Community Type (Hansen et al. 1995) =
- *Prunus virginiana* Dominance Type (Jones and Walford 1995) =
- *Prunus virginiana* var. *melanocarpa* Dominance Type (Evans 1989b) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association is similar to *Prunus virginiana / Carex geyeri* shrubland but is differentiated because *Carex geyeri* is not dominant, although it may be present in small quantities within the herbaceous layer of the stands sampled for this association.

Grand Teton National Park Other Comments:

Global Classification Comments: This is a widespread and highly variable, yet distinct, type. Kovalchik (1987) briefly describes a similar type called Mixed Shrub Canyon Bottom Association from 4 plots. It occurs in low-elevation canyons below U.S. Forest Service ownership in eastern Oregon. Tall shrubs include *Prunus virginiana, Amelanchier alnifolia, Rosa woodsii, Cornus sericea, Salix* spp., *Prunus subcordata*, and/or *Alnus incana*. This may be the same concept.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs near the Snake River drainage and on the southeast-facing footslopes of the Teton Range.
Global Range: This is a widespread, if small-patch, shrubland that is known from the Columbia Plateau of eastern Washington, eastern Oregon, eastern Nevada, southeastern Idaho, throughout Wyoming, Montana, Colorado and western South Dakota.
Nations: US
States/Provinces: CO:S3, ID:S3, MT:S4, NV, OR:S3, SD, WA:S2?, WY:S2?
TNC Ecoregions: 6:?, 7:C, 8:C, 9:C, 10:C, 11:C, 20:C, 25:C, 26:C, 27:C
TNC Ecoregion Comments: ECO11 added (GK 8-05). ECO7, ECO8, ECO27 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331D:CC, 331G:CC, 331H:CC, 342A:CC, 342F:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Badlands, Dinosaur, Florissant Fossil Beds, Grand Teton, Wind Cave)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A013, GT-03A094, GT-03A097, GT-0201086
Accuracy Assessment Points: 04J030, 04J063, 04J140, 04K076, 04R053, 04R122, 04R273, 04R316, 04X303, 04X346, 04X494, 04X623, 04X624
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga and M. Fain
Global Description Author(s): D. Faber-Langendoen, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP pers. comm.	.	.	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Caicco and Wellner 1983n	.	X	.	X	.	.	.	.	.
Copeland 1980a	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Evans 1989a	.	X	.	X	.	.	.	.	.
Evans 1989b	.	.	X	.	.	.	.	.	.
Hall and Hansen 1997	.	.	X	.	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	.	X	.	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Walford 1995	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	.	X	.	.	.	.	.	.
Kovalchik 1987	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	X	.	.	.	.	.
Marriott pers. comm.	.	.	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Von Loh et al. 1999	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-045] *Prunus virginiana / Carex geyeri* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The documented stands of this association typically occur on various southeast-facing slopes at elevations of 7000 to 7900 feet. The slopes have gradients of 15 to 70%. Where data area available the soils are a well-drained loam or sandy loam. The unvegetated and nonvascular ground surface for the stands that have soil data is dominated by litter and duff (60 to 80% cover), rocks greater than 10 cm (10% cover), bare soil (5% cover), and wood (5% cover). Gravel, lichen, and mosses are present in small quantities. Five other stands have a large amount of bare ground being covered primarily by large and small rocks with litter and duff or downed wood occurring in lesser amounts. Common disturbances to various stands include avalanche run-out/snow, fire, ungulate browsing, and/or proximity to trails. The surrounding vegetation may include *Pseudotsuga menziesii-Abies lasiocarpa* forests, *Populus* tremuloides forests, *Populus* sp. regeneration stands, *Rubus parviflorus* shrublands, *Artemisia tridentata* shrublands, mixed coniferous forests, and/or *Vaccinium* spp. shrublands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. The shrub layer is dominated by *Prunus virginiana* (3 to 40% cover). *Amelanchier alnifolia* (trace to 20% cover) is the next most dominant shrub, occurring in almost all stands. Other high constancy shrubs include *Mahonia repens*, *Sorbus scopulina*, and *Artemisia tridentata* ssp. *spiciformis*. The herbaceous layer is diverse with 20 to 80% cover. Graminoids are dominated by *Carex geyeri* (12 to 40% cover), which is the only graminoid to occur in more than half the stands. *Eriogonum umbellatum, Balsamorhiza sagittata, Helianthella uniflora,* and *Agastache urticifolia* are the highest consistency forbs. *Populus tremuloides* seedlings are colonizing almost half the stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Prunus virginiana, Amelanchier alnifolia*
GRAMINOID	*Carex geyerii*
FORB	*Eriogonum umbellatum, Balsamorhiza sagittata*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Amelanchier alnifolia, Artemisia tridentata ssp. *spiciformis, Mahonia repens, Prunus virginiana, Sorbus scopulina, Carex geyeri, Agastache urticifolia, Balsamorhiza sagittata, Eriogonum umbellatum, Helianthella uniflora*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Phleum pratense, Tragopogon dubius*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This fits Shiflet's (1994) concept of the Chokecherry-Serviceberry-Rose Rangeland Cover Type, SRM 421.

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Prunus virginiana* Shrubland association, but is differentiated by the dominance of *Carex geyeri* in the herbaceous layer.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near the Amphitheater Trail, at the Garnet, Hanging, Cascade Canyons, at the base of Mt. Moran, on the lower slopes of Teewinot, and southwest of Lupine Meadows trailhead.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C034, GT-03A012
Accuracy Assessment Points: 04J070, 04R118, 04R331, 04R333, 04S002, 04S022, 04X515, 04X517, 04X519, 04X521, 04X903
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-045

Local Author: C. Brian Villalobos
Date: 23 March 2004
Local Editor: Klara Varga
Date: 31 March 2004
Re-write: Mark Fain
Date: 09 November 2004
Re-edit: Klara Varga
Date: 8 December 2004

Global Author:

REFERENCES: None

A.2530 *Symphoricarpos oreophilus* Shrubland Alliance

Mountain Snowberry Shrubland Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is currently known from Oregon, Utah and Wyoming.
Nations: US

Subnations: OR, UT, WY
TNC Ecoregions: 8:C, 9:C, 18:C, 19:C
USFS Ecoregions: 313A:CC, 341B:CC, M331D:CC, M341C:CC
Federal Lands: NPS (Capitol Reef, Grand Teton, Zion); USFS (Bridger-Teton, Wallowa-Whitman)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL002951] *Symphoricarpos oreophilus* Shrubland

Translated Name: **Mountain Snowberry Shrubland**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This low-statured shrubland is known from Colorado, southern Utah, western Wyoming and central Oregon. It is a poorly described shrubland, documented with plot data between 2070 and 2575 m (6800-8440 feet) elevation, but it probably occurs throughout the known range of the dominant shrub species. It is overlooked as a community type because it often occupies the "transition zone" between forests and grasslands or between riparian vegetation and drier upslope communities. This shrubland is often 0.3-0.9 m (1-3 feet) tall. *Symphoricarpos oreophilus* dominates the shrub canopy. Other shrubs can be present but in much less abundance. The herbaceous undergrowth is highly variable, both in abundance (total cover ranging from 1-30%) and in species composition, depending on local topographic position and geographic locale. It can consist of a mix of graminoids and forbs but is more often dominated by graminoids. Typical graminoid species include *Poa pratensis* and *Carex geyeri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stands of this association occur on shallow to steep slopes and level terrain at elevations ranging from 2073 to 2484 m (6800-8150 feet). The stands on slopes generally face south. The soils vary but are generally well-drained and loam-based. The unvegetated ground surface is codominated by litter and duff (20 to 40% cover), bare soil (10 to 70% soil), gravel (1 to 13% cover), and basal vegetation (0 to 50% cover). Wood, rocks greater than 10 cm, and lichens may be present. Two stands burned in the recent past; pre-burn these stands included *Pseudotsuga menziesii* in the overstory. Adjacent vegetation to one stand includes a *Ceanothus velutinus* shrubland with scattered *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii*.
Global Environment: This low-statured shrubland is known from Colorado, southern Utah and western Wyoming. It is a poorly described shrubland, documented with plot data between 2070 and 2575 m (6800-8440 feet) elevation, but it probably occurs throughout the known range of the dominant species. It is overlooked as a community type because it often occupies the "transition zone" between forests and grasslands (Johnson and Clausnitzer 1992) or between riparian vegetation and drier upslope communities. It occupies steep slopes or even terrain, in depressions or gentle drainages on undulating plateaus, on canyon ridges, and mounded topography. It occurs on shallow or deeper sandy loam to clay loam soils with little surface rock. Stands generally occur on gentle to steep slopes, often facing south, but can be found on all aspects.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to upper montane shrubland that occurs on subxeric sites. Canopy trees may be present within the stands in trace quantities. One stand includes *Abies lasiocarpa*, *Picea engelmannii*, and *Pseudotsuga menziesii*, while another stand includes *Pinus contorta* and *Populus tremuloides*. Seedlings of any of these species may be present. *Symphoricarpos oreophilus* is the only constant shrub throughout all of the stands (7 to 40% cover). The following species are in 29 to 47% of the stands and all average 2% cover: *Amelanchier alnifolia*, *Artemisia tridentata ssp. vaseyana*, and *Prunus virginiana*. *Mahonia repens* has 47% constancy and averages 4% cover. The herbaceous layer is composed of a variety of forbs and graminoids; in general no single species is highly constant or common. When they occur (in roughly one-fifth of the stands), *Calamagrostis rubescens*, *Carex geyeri*, and *Poa pratensis* have the highest average cover (7 to 11%). *Carex hoodii* and *Phleum pratense* have similar constancy but average only 3 to 4% cover. Only four forbs occur in at least one-third of the stands with 3 to 5% cover. These are *Eriogonum umbellatum*, *Geranium viscosissimum*, *Balsamorhiza sagittata*, and *Agastache urticifolia*.
Global Vegetation: This low-statured shrubland is often 0.3-0.9 m (1-3 feet) tall. *Symphoricarpos oreophilus* dominates the shrub canopy. Other shrubs can be present but in much less abundance. Other shrub species include *Amelanchier alnifolia*, *Prunus virginiana*, *Ribes cereum*, *Artemisia tridentata*, *Ericameria nauseosa (= Chrysothamnus nauseosus)*, *Rosa woodsii*, *Mahonia repens*, and *Artemisia nova*. The herbaceous undergrowth is highly variable, both in abundance (total cover ranging from 1-30%) and in species composition, depending on local topographic position and geographic locale. It can consist of a mix of graminoids and forbs

but is more often dominated by graminoids. Typical graminoid species include *Poa pratensis* and *Carex geyeri*. Other graminoid species include *Festuca thurberi, Elymus trachycaulus, Pascopyrum smithii, Elymus repens, Calamagrostis rubescens, Carex geyeri, Carex hoodii, Bromus ciliatus (= Bromus canadensis), Achnatherum* spp. (= *Stipa* spp.), and *Poa fendleriana*. Forbs are usually present and highly variable. In Colorado, forb species include *Geranium richardsonii, Galium boreale (= Galium septentrionale), Symphyotrichum ascendens (= Aster adscendens), Vicia americana, Heliomeris multiflora*, and *Potentilla pulcherrima*; in Wyoming, *Eriogonum umbellatum, Geranium viscosissimum, Balsamorhiza sagittata*, and *Agastache urticifolia*; and in Utah, *Lathyrus brachycalyx, Lupinus argenteus, Artemisia campestris, Mentha x piperita, Penstemon* spp., *Mertensia arizonica, Eriogonum racemosum, Tragopogon dubius*, and *Achillea millefolium*. In central Oregon, forb species include *Eriogonum heracleoides, Potentilla glandulosa, Potentilla gracilis, Geum triflorum, Lupinus* spp., *Erigeron* spp., and *Clarkia pulchella*. *Achillea millefolium (= Achillea lanulosa*) is common to Colorado, southern Utah, as well as central Oregon stands, especially when in a degraded state.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Agastache urticifolia	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Tragopogon sp.	exotic

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Achillea millefolium	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carduus nutans	-	P	exotic
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Thlaspi arvense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (14-Aug-2001).

RELATED CONCEPTS

Global Similar Associations:

Global Related Concepts:

- *Symphoricarpos oreophilus - Bromopsis canadensis* Habitat Type/Association (Komarkova 1986) =
- *Symphoricarpos oreophilus / Festuca thurberi* Plant Association (Johnston 1987) =
- *Symphoricarpos oreophilus* Plant Community (Johnson and Clausnitzer 1992) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association is a variable ecotone concept; at times it can resemble an herbland, and it may occur in forest openings. It can also be an early-seral stage of various forested plant associations, including *~Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest (CEGL000462)$$, *~Pseudotsuga menziesii / Symphoricarpos albus* Forest (CEGL000459)$$, and *~Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus* Forest (CEGL000337)$$.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands for this association occur near the mouth of Death Canyon, in Stewart's Draw, on the JY Ranch, west of String Lake, west of Lupine Meadows, southeast of Elk Ranch Reservoir, north of Oxbow Bend, near the Snake River Pit, north of Emma Matilda Lake, in the mouth of Colter Canyon, in the upper elevations of Granite Canyon, and in the Bridger-Teton National Forest south of Shadow Mountain and southeast of the Teton Science School.
Global Range: This association has currently only been described from Zion National Park in southwestern Utah.
Nations: US
States/Provinces: OR, UT, WY
TNC Ecoregions: 8:C, 9:C, 18:C, 19:C
TNC Ecoregion Comments: ECO8 added (GK 8-05). ECO9 & M331D added for Teton (mjr 3-05).
USFS Ecoregions: 313A:CC, M331D:CC, M341C:CC
Federal Lands: NPS (Grand Teton, Zion); USFS (Bridger-Teton, Wallowa-Whitman)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201013, GT-0202056 GT-03A107, GT-03B031, GT-03B033
Accuracy Assessment Points: 04J014, 04J032, 04J174, 04K057, 04M002, 04R008, 04R346, 04R348, 04X083, 04X460, 04X505
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507017

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Komarkova 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.2636 *Spiraea betulifolia* Shrubland Alliance

Shinyleaf Meadowsweet Shrubland Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is known from the Rocky Mountains of Montana and possibly Alberta, Canada.
Nations: CA?, US
Subnations: AB?, MT
TNC Ecoregions: 7:C
USFS Ecoregions: M332C:CC, M333C:CC
Federal Lands: BIA (Blackfeet); NPS (Glacier)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL005835] *Spiraea betulifolia* Shrubland

Translated Name: **Shinyleaf Meadowsweet Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland (CES306.994)
- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: The association is known from Glacier National Park and the Blackfeet Indian Reservation, on both sides of the Continental Divide in Montana. Stands of this shrubland association are found on mid to lower portions, including toeslopes, of moderate to steep slopes and bedrock outcrops. They occur on all aspects in siltstone and colluvial and glacier-fluvial deposits. The elevation ranges between 1770 and 1973 m (5805-6472 feet). The soil tends to be a rapidly to well-drained sandy or clay loam that contains an abundance of gravel and rock. Ground surface cover is variable, but tends towards very rocky or bedrock outcrops, and significant portions of bare soil. There is moderate cover of litter and duff in most stands, as well as moderate bryophyte cover in some stands. This shrubland association is dominated by a sparse, short-shrub canopy of *Spiraea betulifolia* (38% average cover). Numerous shrub species can be present, including *Rubus parviflorus*, *Juniperus communis*, *Sambucus racemosa*, and *Vaccinium scoparium*, but all have low to insignificant cover and constancy. Tree seedlings and saplings of *Abies lasiocarpa*, *Pinus contorta*, and *Populus tremuloides* can be present, but not abundant. The moderate to dense herbaceous layer (64% average cover) is diverse with graminoids and forb species. Common species include *Carex geyeri*, *Chamerion angustifolium*, *Thalictrum occidentale*, *Arnica cordifolia*, and *Achillea millefolium*. GRTE information not incorporated into Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a step-in-slope, an interfluve, or slopes of 32 and 55% with various aspects at elevations of 6900 to 7400 feet. Three stands have been affected by high intensity fires in recent history. The stand not affected by fire has a moderate amount of downed woody debris as well as small rocks, large rocks, and bare soil. Unvegetated ground cover for one burned stand is about the same as the unburned stand. Adjacent vegetation may include *Ceanothus velutinus* shrublands or *Pseudotsuga menziesii* regeneration.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs on subxeric sites. *Spiraea betulifolia* (7 to 20% cover) is the dominant shrub in either the short or dwarf shrub strata. *Amelanchier alnifolia* (1 to 3% cover) occurs in each stand in the short shrub stratum. Other high constancy shrubs in either the short or dwarf shrub strata are *Ceanothus velutinus* and *Mahonia repens*. Numerous other shrub species may occur with low cover. Seedlings of *Pseudotsuga menziesii* may occur. The herbaceous layer is not necessarily well developed and shares dominance between forbs and graminoids. Constant species include *Carex geyeri*, *Bromus carinatus*, *Elymus glaucus*, *Chamerion angustifolium*, *Geranium viscosissimum*, and *Iliamna rivularis*. *Carex geyeri* and *Chamerion angustifolium* contribute 20% cover to one stand each.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Spiraea betulifolia*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Amelanchier alnifolia, Ceanothus velutinus, Mahonia repens, Spiraea betulifolia, Bromus carinatus, Carex geyeri, Elymus glaucus, Chamerion angustifolium, Geranium viscosissimum, Iliamna rivularis.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur southwest of Lupine Meadows trailhead and near Warm Springs

Global Range:

Nations: CA?, US
States/Provinces: AB?, MT:S3
TNC Ecoregions: 7:C
TNC Ecoregion Comments:
USFS Ecoregions: M332C:CC, M333C:CC
Federal Lands: BIA (Blackfeet); NPS (Glacier, GRTE)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J113, 04J127, 04J128, 04R332
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** CEGL005835
Local Author: Mark Fain
Date: 04 November 2004
Local Editor: Klara Varga
Date: 8 December 2004

Global Author: Western Ecology Group

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

No Alliance Assigned-Park Special cold-deciduous Shrublands

[PARK SPECIAL GRTE-046] *Spiraea splendens* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on footslopes at elevations from 8600 to 9399 feet. The southeast- or east-facing slopes have gradients of 40 or 45%. Soil data is available for only one stand; the soil is a moderately well-drained loamy sand. The unvegetated and nonvascular ground surface for this stand is dominated by litter and duff (60% cover), large rocks (20% cover), and gravel (10% cover). Bare soil, bedrock, mosses, and lichens are all present in trace quantities. Rivulets are noted in two stands and the general vicinity. Higher abundances of graminoids, forbs, and/or *Salix* spp. are found in these drainages. Three stands have a large amount of unvegetated ground cover dominated by large rocks and talus. The adjacent drier areas of one stand are inhabited by *Spiraea splendens* and *Vaccinium scoparium*. Patches of *Salix* spp., or mixed coniferous forests may be adjacent to the sampled stands. Two stands occur in avalanche pathways.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: The association is a montane to subalpine shrubland that occurs on mesic sites. The shrub layer is dominated by *Spiraea splendens* (7 to 50% cover) in either the short or dwarf shrub stratum. *Vaccinium scoparium* occurs in half the stands with 3 to 10% cover. Seedlings of *Pinus albicaulis* occur in two stands. The herbaceous layer is rather diverse and is mixed evenly between graminoids and forbs, though few species occur in large quantities. Herbaceous species with high constancy include by *Carex geyeri, Carex rossii, Juncus parryi, Elymus glaucus, Eucephalus engelmannii, Ligusticum filicinum,* and *Solidago* sp. A variety of other shrubs, forbs, and graminoids are present in no more than one stand.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
DWARF SHRUB	*Spiraea splendens*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Spiraea splendens, Vaccinium scoparium, Carex geyeri, Carex rossii, Elymus glaucus, Juncus parryi, Eucephalus engelmannii, Ligusticum filicinum, Solidago sp.

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on an alpine hillside in Garnet Canyon, in Open Canyon, and in Cascade Canyon.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B068
Accuracy Assessment Points: 04J176, 04R260, 04X321
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-046
Local Author: C. Brian Villalobos
Date: 23 March 2004
Local Editor: Klara Varga
Date: 31 March 2004
Re-write: Mark Fain
Date: 27 October 2004
Re-edit: Klara Varga
Date: 15 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-078] *Vaccinium membranaceum* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur typically on east-facing footslopes with gradients between 40 and 65% and elevations of 7400 to 8500 feet. One stand occurs on an east-facing step-in-slope with a gradient of 18% at an elevation of 7200 feet. Typical disturbances include snow/avalanche and erosion. Bare ground for two stands includes a large amount of small and large rocks. One stand has been affected by recent fire. Adjacent vegetation may include *Abies lasiocarpa – Picea engelmannii* communities, *Ceanothus velutinus* shrublands, mixed conifer forests, *Populus balsamifera* regeneration, and/or various forblands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs on mesic to sub-xeric sites. The shrub layer is diverse and dominated by *Vaccinium membranaceum* with 7 to 20% cover in either the short or dwarf shrub strata. *Sorbus scopulina* occurs in all but one stand with 1 to 7% cover. Although no other shrub species occurs in more than half the stands, they may contribute significantly to overall cover. Seedlings of *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus albicaulis* may occur. The herbaceous layer may be diverse and contribute up to 30% cover, but the only species that occur in more than half the stands are *Carex geyeri* and *Carex hoodii*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Vaccinium membranaceum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Sorbus scopulina, Vaccinium membranaceum, Carex geyeri, Carex hoodii

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on the west side of Leigh Lake, and in Death, Cascade, Avalanche, and Waterfall canyons.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J065, 04J121, 04J242, 04R119, 04R148
Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-078
Local Author: Mark Fain
Date: 09 November 2004
Local Editor: Klara Varga
Date: 13 December 2004

Global Author:

REFERENCES: None

III.B.2.N.d. Temporarily flooded cold-deciduous shrubland

A.950 *Alnus incana* Temporarily Flooded Shrubland Alliance

Speckled Alder Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this riparian shrubland alliance typically occur adjacent to streams and in mountain meadows. Landforms associated with this alliance are streambanks, alluvial bars, and floodplains. Sites are young, active channel shelves that lie between active and flood-stage streambanks along second-order and larger streams in moderately graded (3-5%) valleys. Elevations range from near sea level in Alaska to 3000 m in Colorado. Soils are shallow, skeletal alluvium over water-worked cobbles and gravels. Active channel shelves have surface soil textures that are loamy sands, while older sites are silts and loam. Available water-holding capacity is low; surface water is present briefly during the growing season. The water table usually lies well below the ground surface. *Alnus incana* forms a dense canopy with at least 90% cover. The diverse understory shrub layer may include *Cornus sericea, Betula occidentalis, Ribes hudsonianum, Symphoricarpos albus, Salix drummondiana*, and *Oplopanax horridus*. The forb layer is sparse and may include *Canadanthus modestus (= Aster modestus), Symphyotrichum spathulatum (= Aster occidentalis), Galium triflorum, Senecio triangularis*, and *Thalictrum occidentale*. The graminoid layer is usually dominated by 1 or 2 species that include *Agrostis stolonifera* and *Calamagrostis canadensis*. The fern and fern allies layer is generally dense with at least 40% cover. The dominant species typically are *Gymnocarpium dryopteris* and *Athyrium filix-femina*.
Environment: Vegetation types within this alliance typically occur adjacent to streams and in mountain meadows. Landforms associated with this alliance are streambanks, alluvial bars, and floodplains. Sites are young, active channel shelves that lie between active and flood-stage streambanks along second-order and larger streams in moderately graded (3-5 percent) valleys. Elevations range from near sea level in Alaska to 3000 m in Colorado.

Soils are shallow, skeletal alluvium over water-worked cobbles and gravels. Active channel shelves have surface soil textures that are loamy sands while older sites are silts and loam. Available water-holding capacity is low, surface water is present briefly during the growing season. The water table usually lies well below the ground surface.

Coniferous and cottonwood forests typically grow on adjacent upslopes.
Vegetation: Vegetation types within this alliance are classified as temporarily flooded, cold-deciduous shrublands. *Alnus incana* forms a dense canopy with at least 90% cover. The diverse understory shrub layer may include *Cornus sericea, Betula occidentalis, Ribes hudsonianum, Symphoricarpos albus, Salix drummondiana*, and *Oplopanax horridus*. The forb layer is sparse and may include *Canadanthus modestus (= Aster modestus), Symphyotrichum spathulatum (= Aster occidentalis), Galium triflorum, Senecio triangularis*, and *Thalictrum occidentale*. The graminoid layer is usually dominated by 1 or 2 species that include *Agrostis stolonifera* and *Calamagrostis canadensis*. The fern and fern allies layer is generally dense with at least 40% cover. The dominant species typically are *Gymnocarpium dryopteris* and *Athyrium filix-femina*.
Dynamics: *Alnus incana* is a long-lived, early-seral species. It is one of the first species to establish on fluvial or glacial deposits as well as the spoils of placer mining (Hansen et al. 1989). After establishment, young stands of *Alnus incana* are continually flooded. As stands mature, the stems can slow flood waters and trap sediment. Fine-textured sediments accumulate on top of the coarser alluvial material, and the land surface eventually rises above annual flood levels. Flooding is then less frequent and soils begin to develop (Padgett et al. 1989).

Alnus incana is shade-intolerant (Viereck 1970, Chapin et al. 1994 as cited in Kittel et al. 1999b), and many mature stands are restricted to streambank edges, possibly because these are the only sites where light can penetrate the neighboring overstory canopy.

Alnus incana has been observed on high-gradient streams and is thought to require well-aerated water (Hansen et al. 1988b, Padgett et al. 1989).

Undisturbed *Alnus incana* stands may become dominated by *Salix* species or conifer stands (Hansen et al. 1989). In Alaska, thick stands of alders inhibit succession by competing with spruce for nutrients and light (Chapin et al. 1994 as cited in Kittel et al. 1999b). In Utah, *Acer negundo* often becomes the dominant canopy species on more xeric sites (Padgett et al. 1989).

Alnus incana fixes atmospheric nitrogen through a symbiotic relationship with the bacteria *Frankia* and increases the ecosystem nitrogen supply with the deposition of nitrogen-rich leaf litter (Binkley 1986 as cited in Kittel et al. 1999b). The annual input of nitrogen to soils from alder species ranges from 16 to 150 kg/ha annually compared to 1 to 10 kg/ha/yr deposited by atmospheric precipitation alone (Binkley 1986 as cited in Kittel et al. 1999b). Nitrogen-rich detritus is an important source of nutrients for the aquatic ecosystem as well.

Similar Alliances:
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)

Similar Alliance Comments: The ~*Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)$$ differs mainly due to the duration of surface waters during the growing season and depth to the water table.

ALLIANCE DISTRIBUTION

Range: This alliance ranges from the mixed-coniferous and subalpine zones in the Sierra Nevada and Coast Ranges in California south to Baja California, Mexico. It is found in the Cascade Range, on the eastern slope, in both Washington and Oregon. The principal development of vegetation types within this alliance is in the Rocky Mountains. In Nevada, it is restricted to disjuncts in high mountains in the northeastern and central portion of the state. Mainly it forms a continuous band in the Rocky Mountains throughout Colorado, Utah, Wyoming, Montana, and Idaho. It has also been reported from the northeastern U.S. in New Hampshire, New York, Vermont, and Maine.

Nations: CA, MX, US

Subnations: BC, CA, CO, CT, ID, MA, ME, MT, NH, NM, NV, NY, OR, RI, UT, VT, WA, WY

TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 61:C, 63:C, 64:C, 68:C

USFS Ecoregions: 212A:CP, 212B:CP, 212Cb:CCC, 212D:CP, 212E:CP, 221:C, 311:C, 315A:PP, 331I:CC, 331J:CC, 342B:CC, 342C:CC, 342D:CC, 342H:CC, 342I:CC, M212Ae:CCC, M212B:CP, M212C:CP, M212D:CP, M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Acadia, Curecanti, Florissant Fossil Beds, Grand Teton, Rocky Mountain, Saint-Gaudens); USFS (Medicine Bow, Rio Grande, San Juan, Shoshone); USFWS (Great Meadows)

ALLIANCE SOURCES

Author(s): D. Culver

References: Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Evans 1989a, Evenden 1990, Hansen 1942, Hansen et al. 1988b, Hansen et al. 1989, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, Hickman 1993, Johnson 1968, Johnston 1987, Kauffman 1982, Kauffman et al. 1985, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Manning 1988, Manning and Padgett 1989, Miller 1976, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Sawyer and Keeler-Wolf 1995, Tuhy and Jensen 1982, Youngblood et al. 1985a

[CEGL001147] *Alnus incana* / Mesic Forbs Shrubland

Translated Name: **Speckled Alder / Mesic Forbs Shrubland**

Common Name:

Ecological System(s):
- North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): M. Jankovsky-Jones

ELEMENT CONCEPT

Global Summary: This shrubland association has a widespread distribution that includes the western states of Montana, Idaho, Wyoming, Utah, Nevada, California and Colorado. Stands occur on streambanks and terraces immediately adjacent to streams with a bedload of boulders, cobble or gravel. Channel type is variable, ranging from high-gradient reaches that support the association as stringers, to more extensive stands on sites with a developed floodplain. Soils typically have a seasonally high water table with mottling in the top 25 cm of the surface. These riparian shrublands are characterized by stands of medium-tall and tall deciduous shrubs and a thick herbaceous undergrowth of forbs and wetland-indicator grasses. *Alnus incana* clearly dominates the tall-shrub

overstory with over 25% cover. Conifers, including *Abies lasiocarpa, Picea engelmannii*, and *Pinus contorta*, are sometimes present. A low-shrub layer is often present and may include *Lonicera involucrata, Cornus sericea*, and species of *Ribes, Rosa*, and *Salix*. Undisturbed stands have abundant forbs and native grasses. The undergrowth is characterized by a mixed forb cover of *Angelica arguta, Heracleum maximum (= Heracleum lanatum), Equisetum arvense, Mertensia* spp., *Aconitum columbianum, Senecio triangularis*, and/or *Maianthemum stellatum* with over 100% cover in combination. Native graminoids include *Cinna latifolia, Carex simulata, Glyceria striata*, and *Elymus glaucus*. Stands disturbed by season-long livestock grazing have reduced forb cover and increased non-native grasses, including *Poa pratensis* and *Agrostis stolonifera*. Large stands (>100 square meters), with the native herbaceous undergrowth intact are uncommon.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: One sampled stand for this association occurs in a channel next to the creek draining Leigh Canyon at an elevation of 6939 feet and one occurs on an east-facing toeslope with a gradient of 24% and an elevation of 6900 feet. One stand is in a palustrine area that is intermittently flooded; the soil is a poorly drained loamy sand. The unvegetated ground surface for this stand is comprised of large rocks, litter and duff, small rocks, sand, wood, and water. Large rocks and litter/duff dominate, adding up to 70% of the ground cover. The Leigh Canyon stand has surrounding vegetation composed of an *Abies lasiocarpa-Picea engelmannii* forest with a *Rubus parviflorus* understory.

Global Environment: This association occurs at elevations of 1710 to 2805 m (5600-9200 feet). Stands occur on streambanks in narrow valleys and on moist terraces and floodplains adjacent to streams with a bedload of boulders, cobble or gravel. Channel type is variable, ranging from high-gradient reaches that support the association as stringers, to more extensive stands on sites with a developed floodplain. Soils are sandy-skeletal to loamy-skeletal, often with greater than 50% coarse fragments. Soils typically have a seasonally high water table with mottling in the top 25 cm of the surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: The association is a riparian tall shrubland that occurs on mesic sites. The tall shrub layer is dominated by *Alnus incana* with 20 and 60% canopy cover. *Populus balsamifera* seedlings occur in one stand with 30% canopy cover. The herbaceous layer is diverse and is dominated by forbs. *Heracleum maximum, Thalictrum occidentale,* and *Aconitum columbianum* occur in both stands. *Castilleja miniata* occurs in one stand with 10% cover.

Global Vegetation: These riparian shrublands are characterized by stands of medium-tall and tall deciduous shrubs and a thick herbaceous undergrowth of forbs and wetland-indicator grasses. *Alnus incana* clearly dominates the tall-shrub overstory with over 25% cover. Conifers, including *Abies lasiocarpa, Picea engelmannii*, and *Pinus contorta*, are sometimes present. A somewhat sparse low-shrub layer is often present and may include *Lonicera involucrata, Cornus sericea*, and species of *Ribes, Rosa*, and *Salix*. Undisturbed stands have abundant forbs and native grasses. The undergrowth is characterized by a mixed forb cover of *Angelica arguta, Heracleum maximum (= Heracleum lanatum), Osmorhiza berteroi, Senecio triangularis, Galium triflorum, Polemonium* sp., *Rudbeckia occidentalis, Equisetum arvense, Mertensia* spp., *Aconitum columbianum*, and/or *Maianthemum stellatum* with over 100% cover in combination. Graminoids are often present and include *Cinna latifolia, Elymus glaucus, Glyceria striata, Bromus inermis, Calamagrostis canadensis*, and *Poa pratensis*. Stands disturbed by season-long livestock grazing have reduced forb cover and increased non-native grasses, including *Poa pratensis* and *Agrostis stolonifera*. Large stands (>100 m2), with the native herbaceous undergrowth intact are uncommon.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Thalictrum occidentale	Herb (field)	Forb	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Galium triflorum	Herb (field)	Forb	.	X	.
Osmorhiza berteroi	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Bromus inermis	Herb (field)	Graminoid	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Glyceria striata	Herb (field)	Graminoid	.	X	.

Poa pratensis	Herb (field)	Graminoid	.	X	.
Equisetum arvense	Herb (field)	Fern	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (16-Oct-2000). This association has a wide range, but stands of this riparian shrubland association are restricted to small patches less than 10 acres in size. High-quality examples of this association without non-native species are uncommon as most stands are within watersheds with numerous threats including livestock grazing, logging, recreational activities, hydrologic modifications, and road building. Recent classification work in Washington and Oregon indicates that this association does not occur in those states. The rank is changed from G3G4 to G3 as the range of the association is not as widespread as it was originally considered.

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Alnus incana* - *Ribes* spp. / Mesic Forb Association (Crowe and Clausnitzer 1997) ?
- *Alnus incana* Community Type (Hansen et al. 1995) =
- *Alnus incana* / Mesic Forbs Association (Kovalchik 1993) =
- *Alnus incana* / Mesic Forbs Community Type (Manning and Padgett 1995) =
- *Alnus incana* / Mesic Forbs Community Type (Padgett et al. 1989) =
- *Alnus incana* / Mesic Forbs Shrubland (Kittel et al. 1999a) =
- *Alnus incana*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This fits the Padgett et al. (1989) description well.
Grand Teton National Park Other Comments:
Global Classification Comments: This association was originally ranked G3G4 due to uncertainty about the taxonomy of the association across state lines. The ~*Alnus incana* / Mesic Forbs Shrubland (CEGL001147)$$ has been described in a number of classifications. Stands considered synonymous include those described in Nevada (Manning and Padgett 1995), Colorado (Kittel et al. 1999), and Utah and southeastern Idaho (Padgett et al. 1989). Kovalchik's (1993) Washington *Alnus incana* / Mesic forbs stands have shrub and tree composition similar to Idaho, Utah, and Nevada stands. The understory of Kovalchik's stands are somewhat distinct, however, with *Cinna latifolia*, *Streptopus amplexifolius*, and *Athyrium* spp. having high constancy. Kovalchik's stands are more appropriately treated as other associations. Where stands are codominated by *Alnus incana* and other shrubs such as *Salix* spp., there is inconsistency in the classifications as to which is considered the diagnostic species. Hansen et al. (1995) treat all stands with *Alnus incana* as the dominant shrub as the *Alnus incana* dominance type.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur at the mouth of Leigh Canyon near Leigh Lake Campground and on the west side of Jackson Lake across from Leeks Marina.

Global Range: The plant association is known from Montana, Idaho, Nevada, Utah, Wyoming and Colorado.
Nations: US
States/Provinces: CA:S3, CO:S3, ID, MT, NV, OR?, UT:S2S3, WA, WY
TNC Ecoregions: 4:C, 5:C, 6:C, 8:C, 9:C, 10:C, 12:C, 14:C, 19:C, 20:C, 27:C, 68:C
TNC Ecoregion Comments: ECO4, ECO5, ECO8, ECO12, ECO14, ECO27, ECO68 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331I:CC, 342B:CC, 342C:CC, M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M331A:CC, M331D:CC, M331F:CP, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A039
Accuracy Assessment Points: 04S035
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, and K. Varga
Global Description Author(s): M. Jankovsky-Jones

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cooper and Cottrell 1990	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	.	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	.	.	.	.	.
Kittel et al. 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	X	X	X	.	.	.	.
Kovalchik 1993	.	X	X	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	X	X	X	X	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Young 1982	.	.	.	X	.	.	.	.	.

A.968 *Cornus sericea* Temporarily Flooded Shrubland Alliance

Red-osier Dogwood Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This shrubland alliance occurs adjacent to streams and rivers throughout the montane areas in the western U.S. Stands are restricted to narrow stream benches in ravines and on narrow terraces of wider valleys that are flooded for brief periods during the growing season. Soils are alluvial with little or no development. Vegetation within this alliance is characterized by a moderately dense to dense shrub layer dominated by *Cornus sericea*. Shrub associates may include *Salix* spp., *Ribes inerme, Alnus incana, Lonicera involucrata, Betula occidentalis*, and *Acer glabrum*. Occasional *Populus angustifolia, Pinus ponderosa, Populus deltoides*, and *Pseudotsuga menziesii* trees may be present. The herbaceous layer is sparse due to the dense shrub canopy. Common graminoid species are *Phalaris arundinacea* and *Poa palustris*. Forb species include *Heracleum maximum (= Heracleum lanatum)* and *Galium triflorum*. Diagnostic of this alliance is the dominance of *Cornus sericea* in the shrub layer and the presence of surface water for brief periods during the growing season.

Environment: Plant associations within this alliance occur adjacent to streams and rivers throughout the montane areas in the western United States. They typically occur on alluvial terraces adjacent to stream channels and near seeps on moist toeslopes (slope 0-10%) of canyon walls. They also occur on narrow stream benches in ravines and on narrow terraces of wider valleys. Elevation ranges from 1695 m in Nevada (750 m in Arizona) to 2500 m in Colorado. Surface waters are present for brief periods during the growing season. The water table is typically within 40 cm of the soil surface.

Soils are commonly young with little or no development and usually show evidence of periodic fluvial scouring and deposition. Soil texture varies little from loam to sandy loam with abundant coarse fragments throughout the profile. Johnston (1987) states that pH can be 7.0.

Pinus ponderosa, mixed conifer-*Pseudotsuga menziesii*, and *Picea pungens - Populus tremuloides* forests and *Quercus gambelii* and *Juniperus osteosperma* woodlands occur on adjacent hillslopes in the western United States.
Vegetation: Plant associations within this alliance are classified as temporarily flooded, cold-deciduous shrublands. They are characterized by a dense stand of 20-90% cover of *Cornus sericea*. Other shrub species may include 0-40% cover of *Salix* spp., *Ribes inerme, Alnus incana, Lonicera involucrata, Betula occidentalis*, and *Acer glabrum*. While trees occur in a few stands, typically, this shrubland has no overstory canopy. Scattered tree species can include 0-10% cover of *Populus angustifolia, Pinus ponderosa, Populus deltoides*, and *Pseudotsuga menziesii*. The herbaceous stratum is very sparse due to the dense shrub canopy. Graminoid species can include *Phalaris arundinacea* and *Poa palustris*. Forb cover is also sparse and can include *Heracleum maximum (= Heracleum lanatum)* and *Galium triflorum*. *Cornus sericea* is a common understory in several plant associations that include those dominated by any of the following trees *Picea sitchensis, Picea pungens, Populus tremuloides, Acer negundo, Populus balsamifera ssp. trichocarpa, Juniperus scopulorum*, and *Picea engelmannii*.
Dynamics: *Cornus sericea* forms a relatively stable community because of its strong rhizomes and stolons (Hansen et al. 1988b). Subsequent succession takes place over a long period of time (Padgett et al. 1989). In Montana, this plant association is considered to be early-seral since it colonizes stream bars and adjacent floodplains (Hansen et al. 1995). With time, the association may eventually become dominated by conifer or deciduous tree species.
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is widespread in North America. In the western United States, it has been described from Montana, Idaho, Washington, Oregon, California, Nevada, Utah, Wyoming, and Colorado. It also occurs in British Columbia, Canada, and potentially in Arizona and New Mexico, but has not been formally described.
Nations: CA, US
Subnations: BC, CO, ID, MT, NE, NV, OR, UT, WA, WY
TNC Ecoregions: 2:C, 6:C, 7:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C
USFS Ecoregions: 242A:CC, 251C:CC, 331D:CC, 332C:CP, 332E:CP, 341B:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC
Federal Lands: NPS (Capitol Reef, Curecanti, Glacier, Grand Teton); USFS (Bighorn)

ALLIANCE SOURCES

Author(s): D. Culver
References: Crowe and Clausnitzer 1997, Great Plains Flora Association 1986, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Johnston 1987, Jones 1992b, Kartesz 1994a, Kearney et al. 1969, Kittel et al. 1994, Kittel et al. 1999a, Kovalchik 1993, Manning and Padgett 1995, Mutz and Graham 1982, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Tuhy and Jensen 1982, Youngblood et al. 1985a

[CEGL001165] *Cornus sericea* Shrubland

Translated Name: **Red-osier Dogwood Shrubland**
Common Name:
Ecological System(s):
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)
- North Pacific Shrub Swamp (CES204.865)
- North Pacific Lowland Riparian Forest and Shrubland (CES204.869)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)
- Western Great Plains Wooded Draw and Ravine (CES303.680)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This riparian shrubland is widespread in the Columbia Basin, the Intermountain Basin, and in the Rocky Mountains. It often forms continuous, narrow bands along streambanks, benches and bars. It can form very dense, small stands with limited disturbance, often at the base of a cliff. Soils are relatively deep silty to sandy clay loams, well-drained on alluvial, colluvial or glacial till. Elevation ranges from 715 to 2700 m (2300-8800 feet). The medium-tall (1-2 m) deciduous shrub canopy is dominated by *Cornus sericea*. Other shrubs commonly present are *Ribes aureum, Salix* spp., *Clematis ligusticifolia, Prunus virginiana*, and *Symphoricarpos* spp. The undergrowth is high variable. Some stands are dominated by *Heracleum maximum*, others by *Equisetum arvense*, and others by *Maianthemum stellatum* with other forbs, such as *Urtica dioica, Galium aparine*, and *Rumex crispus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The two sampled stands of this association have moderate slopes and level terrain at elevations of around 2195 m (7200 feet). The soils are moderately well-drained silty clays and loams. The unvegetated and nonvascular ground surface is composed of litter and duff (40% and 70% cover), rocks greater than 10 cm (10% and 40% cover), bare soil (5% cover), wood (5% cover), and gravel (1% and 5% cover). Bedrock, lichens, and fungi occur in trace quantities, and mosses compose 10% cover in one stand. The adjacent vegetation may include *Picea engelmannii, Abies lasiocarpa, Populus balsamifera*, and *Pseudotsuga menziesii*. Both stands are situated in areas frequently disturbed by avalanches.
Global Environment: This association often occurs as a narrow stringer adjacent to stream channels, near seeps on moist toeslopes of canyon walls, on narrow benches in ravines, narrow terraces of wider valleys, as well as floodplains. It is often on a short, steep slope in these settings. Elevation ranges from 715 to 2700 m (2300-8800 feet). Soils are relatively deep silty to sandy clay loams, well-drained on alluvial, colluvial or glacial till. Ground surface can be predominantly litter or mostly bare rock.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is a montane shrubland that occurs on mesic sites. The tall-shrub layer is dominated by *Cornus sericea* (40% and 70% cover). Present as either short or dwarf-shrubs are *Ribes* spp. (1% and 10% cover), *Rosa* spp. (1% and 5% cover), *Symphoricarpos oreophilus* (1% and 3% cover), and *Paxistima myrsinites* (1% cover). *Acer glabrum* and *Populus balsamifera* seedlings each occur in one stand with 10% cover. *Populus angustifolia, Picea engelmannii*, and *Abies lasiocarpa* seedlings may occur in trace quantities. The herbaceous layer is comprised of *Elymus glaucus* (1% and 3% cover), *Heliomeris multiflora* (1% and 3% cover), and *Thalictrum* spp. (1% cover). *Calamagrostis canadensis* (20% cover) and *Cirsium arvense* (10% cover) contribute to the herbaceous layer in one stand.
Global Vegetation: This shrubland can be a pure stand of impenetrable *Cornus sericea* or more open with several other shrub species. Typically *Cornus sericea* is the dominant shrub; other shrubs commonly present are *Ribes aureum, Salix* spp., *Clematis ligusticifolia, Prunus virginiana*, and *Symphoricarpos* spp. In Washington, *Rosa woodsii* and *Ribes aureum* are more prevalent in stands in the sagebrush upland vegetation zones, and *Symphoricarpos* is more common in the coniferous forest zones. The undergrowth is sparse to dense with forbs or grasses and highly variable. Some stands are dominated by *Heracleum maximum*, others by *Equisetum arvense*, and others by *Maianthemum stellatum* with other forbs, such as *Urtica dioica, Galium aparine*, and *Rumex crispus*. Graminoids can be completely absent but when present include *Poa palustris, Phalaris arundinacea, Bromus tectorum, Elymus glaucus, Glyceria striata*, and *Phleum pratense*.
Global Dynamics: Stands have densest shrub cover when undisturbed and tend to open up if grazed by cattle (Hansen et al. 1995).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Cornus sericea	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Heliomeris multiflora	Herb (field)	Forb	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Ribes spp.	characteristic short shrubs
Rosa spp.	characteristic short shrubs
Thalictrum spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Cornus sericea	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Salix exigua	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Lonicera involucrata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ribes aureum	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Rosa woodsii	Herb (field)	Dwarf-shrub	.	X	.
Clematis ligusticifolia	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Mentha arvensis	Herb (field)	Forb	.	X	.
Urtica dioica	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4Q (27-Apr-2000).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Cornus sericea / Heracleum lanatum* Community Type (Youngblood et al. 1985a) =
- *Cornus sericea / Heracleum lanatum* Community Type (Padgett et al. 1989) =
- *Cornus sericea* (Bourgeron and Engelking 1994) =
- *Cornus sericea* Association (Crawford 2003) =
- *Cornus sericea* Community Type (Manning and Padgett 1995) =
- *Cornus sericea* Plant Association (Jankovsky-Jones et al. 2001) =
- *Cornus sericea* ssp. *sericea* Association (Crowe et al. 2004) =
- *Cornus stolonifera / Saxifraga arguta* Community Type (Crowe and Clausnitzer 1997) =
- *Cornus stolonifera* Flood Site Association (MacKenzie and Moran 2004) B
- *Cornus stolonifera* association (Diaz and Mellen 1996) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association appears to be a broadly defined type that may be split in the future as more information becomes available. As such it is low-confidence. All references are surprising similar in their acceptance of variability within this type.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Both of the sampled stands are located in Granite Canyon.
Global Range: This is a widespread riparian shrubland that is documented by plot data in Washington, Oregon, Idaho, Nevada, Utah, Montana, Wyoming and Colorado.
Nations: US
States/Provinces: CO:S3, ID:S3, MT:S3, NV, OR:S4, UT, WA:S2S4, WY
TNC Ecoregions: 2:C, 6:P, 7:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C
TNC Ecoregion Comments: ECO8 & ECO18 added (mjr 7-05). ECO19 added for CARE (mjr 3-05). ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added for Glacier (WCS 1-04).
USFS Ecoregions: 331D:CC, 341B:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC
Federal Lands: NPS (Capitol Reef, Curecanti, Glacier, Grand Teton); USFS (Bighorn)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A078, GT-03B120
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Crawford 2001	.	.	.	X	.	.	.	.	.
Crawford 2003	.	X	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Crowe et al. 2004	.	X	X	X	.	.	.	.	.

Diaz and Mellen 1996	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jankovsky-Jones et al. 2001	.	X	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kovalchik 1993	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
MacKenzie and Moran 2004	.	X	X	X	.	.	.	.	.
Manning and Padgett 1995	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

A.958 *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance

Shrubby-cinquefoil Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This shrubland alliance is highly variable, occupying various landforms in the foothills, montane, and subalpine regions in the Rocky Mountain region. Sites include glacial depressions, terraces along meandering streams, slopes near springs and seeps, steep scree slopes, or broad mountain meadows. Typically, stands occur on broad, gently sloping valley bottoms and floodplains or along the drier edges of isolated wetlands and fens. Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface. The soils are typically sandy loams over sand and gravel layers. Peat accumulation is common in stands located on fens. Soil texture can be fine-textured with occasional mottling and gleying. This alliance is dominated by *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda).* Associates include *Artemisia cana* and *Deschampsia caespitosa* and *Trifolium longipes* on wetter sites. Other graminoids present in the wetter sites may include *Poa secunda, Festuca rubra, Carex aquatilis, Carex buxbaumii, Carex microptera, Carex pachystachya, Juncus balticus*, and *Muhlenbergia filiformis*. The drier sites typically are composed of a dense graminoid layer that includes *Festuca idahoensis, Festuca campestris, Schizachyrium scoparium*, and *Andropogon gerardii*. Diagnostic of this alliance is the dominance of *Dasiphora fruticosa ssp. floribunda* in a shrub layer with over 25% cover.

Environment: Plant associations within this alliance are highly variable, occupying various landforms in the foothills, montane, and subalpine regions. They range in elevation from 860 m in Montana to 3000 m in Colorado. These communities can occupy sites adjacent to glacial depressions, terraces along meandering streams, slopes near springs and seeps, steep scree slopes, or broad mountain meadows. Typically, stands occur on broad, gently sloping valley bottoms and floodplains or along the drier edges of isolated wetlands and fens. Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface.

Parent materials for sites supporting stands of this alliance are either alluvial-glacial or organic. The soils are typically sandy loams over sand and gravel layers. Peat accumulation is common in stands located on fens. Soil texture can be fine-textured with occasional mottling and gleying. *Salix wolfii, Salix boothii*, or *Betula nana* communities can be in the adjacent riparian areas.

Vegetation: Plant associations within this alliance are classified as temporarily flooded, cold-deciduous shrublands. *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* dominates the overstory with a range of 10-60% cover in all stands. *Artemisia cana* and *Deschampsia caespitosa* typically occur with *Dasiphora fruticosa ssp. floribunda* in wetter sites. Other graminoids present in the wetter sites can include *Poa secunda, Festuca rubra, Carex buxbaumii, Carex microptera, Carex pachystachya, Muhlenbergia filiformis*, and *Juncus balticus*. Colorado stands in excellent condition (i.e., not grazing-induced) have high cover of *Carex aquatilis* and *Trifolium longipes.*

The drier sites typically are composed of a dense graminoid layer, up to 75% cover, that includes *Festuca idahoensis, Festuca campestris, Schizachyrium scoparium*, and *Andropogon gerardii*. *Dasiphora fruticosa ssp. floribunda* is a common understory shrub for associations dominated by the following montane trees *Pinus pungens* or *Pinus flexilis*. Riparian stands that include *Dasiphora*

fruticosa ssp. floribunda as a understory can include *Betula occidentalis* or *Betula pumila*. In the Pacific Northwest, common overstory species can include *Larix laricina*, *Acer rubrum*, or *Myrica gale*.
Dynamics: *Dasiphora fruticosa ssp. floribunda* is an opportunistic species and as such occurs on a variety of habitats. Many of the communities dominated by this species appear to be controlled by disturbance. Komarkova (1986) reports stands on subalpine scree slopes that have relatively rapidly moving fine materials or snow.

Heavily grazed sites may support *Dasiphora*-dominated communities as well (Komarkova 1986, Padgett et. al. 1989). ~*Dasiphora fruticosa ssp. floribunda / Deschampsia caespitosa* Shrubland (CEGL001107)$$ in this alliance is a mid-seral stage of secondary succession as a result of heavy grazing. With improper grazing, *Dasiphora fruticosa ssp. floribunda* will increase in abundance because it is unpalatable to livestock. Other species that increase with grazing in this association are *Poa pratensis*, *Juncus balticus* , and *Taraxacum officinale* (Padgett et al. 1989). Extended grazing may cause this plant association to convert to a *Dasiphora fruticosa ssp. floribunda / Poa pratensis* plant association.
Similar Alliances:
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)

Similar Alliance Comments: The ~*Dasiphora fruticosa ssp. floribunda* Shrub Herbaceous Alliance (A.1534)$$ occurs at lower elevations and on drier sites than this alliance.

ALLIANCE DISTRIBUTION

Range: This alliance has been described from scattered locations throughout the Rocky Mountains, from Montana west into Oregon, and south into Nevada, Wyoming, Colorado and New Mexico. *Dasiphora fruticosa ssp. floribunda* is widespread throughout North America. It occurs from Alaska east to Newfoundland, Canada, south to California, New Mexico, Iowa, and New Jersey (Welsh et al. 1987). This alliance could potentially occur in the neighboring states of Washington and the higher elevations of Arizona.
Nations: CA?, US
Subnations: CO, ID, MT, NM, NV, OR, UT, WY
TNC Ecoregions: 6:C, 9:C, 10:C, 11:C, 19:C, 20:C
USFS Ecoregions: 342B:CC, 342D:CC, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ALLIANCE SOURCES

Author(s): D. Culver
References: Baker 1980a, Baker 1983a, Carsey et al. 2003a, Carsey et al. 2003b, Crowe and Clausnitzer 1997, Hansen et al. 1991, Hansen et al. 1995, Johnston 1987, Jones 1992b, Kettler and McMullen 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Lee and Jonkel 1980, Loope 1969, Mutz and Graham 1982, Padgett et al. 1988b, Padgett et al. 1989, Sanderson and March 1996, Welsh et al. 1987, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001106] *Dasiphora fruticosa* ssp. *floribunda / Carex* spp. Shrubland

Translated Name: **Shrubby-cinquefoil / Sedge species Shrubland**
Common Name: **Shrubby-cinquefoil / Sedge Shrub Prairie**
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: Stands in Wyoming occur on valley floors and shallow slopes at elevations ranging from 2103 to 2120 m (6900-7200 feet). One stand occurs in a semipermanently flooded area on silt loam soils. The other stands occur on moderately well- to well-drained clay loams. This association is a montane shrubland that occurs on both mesic and subxeric sites. *Dasiphora fruticosa ssp. floribunda* dominates the shrub canopy in the three stands that are on shallow slopes with 30 to 50% canopy cover. *Betula nana* and *Vaccinium uliginosum* codominate with *Dasiphora fruticosa ssp. floribunda* in the palustrine stand, each composing 5% of the canopy cover. Herbaceous cover ranges from 60 to 80% and is dominated by various graminoids. *Carex* species are present in every stand with 1 to 20% cover. Two stands that have been grazed in the past have high quantities of *Poa pratensis* (40 and 60% cover) and *Phleum pratense* (10 and 20% cover). Information from other studies will be added later.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor, terraces, channels, or shallow slopes at elevations ranging from 6700 to 7200 feet. One stand occurs in a semi-permanently flooded area on silt loam soils. Three other stands occur on moderately well- to well-drained clay loams. Litter and duff compose 80 to 95% of the unvegetated ground cover. Mosses and wood each occupy 10% of the ground cover in the stand located in the palustrine area; they

are absent from the other stands. Two stands do not have detailed environmental data available, although one of these stands has a lot of sandy soil and a small amount of small rocks present. Three of the stands are located in recently disturbed areas. The palustrine stand is situated at the base of a major avalanche path and two other stands are located in areas that were recently burned. Four of the stands are surrounded at least partially by *Populus tremuloides* communities; two of the stands are surrounded by *Artemisia tridentata* ssp. *vaseyana* and mixed forest communities. One stand has *Picea pungens* near the edges.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on both mesic and subxeric sites. *Dasiphora floribunda* dominates the shrub canopy in the three stands that are on shallow slopes and the one stand that occurs in a channel with 20 to 50% canopy cover. *Betula nana* and *Vaccinium uliginosum* co-dominate with *Dasiphora floribunda* in the palustrine stand, each composing 5% of the canopy cover and the final stand, located on the valley floor is co-dominated by *Dasiphora floribunda* (7% cover) and *Artemisia tridentata* ssp. *vaseyana* (12% cover). Herbaceous cover ranges from 20 to 80% and is dominated by various graminoids. *Carex* species are present in every stand with 1 to 20% cover. *Poa pratensis, Achnatherum nelsonii,* and *Juncus balticus* occur in at least half the stands. Two stands that have been grazed in the past have high quantities of *Poa pratensis* (40 and 60% cover) and *Phleum pratense* (10 and 20% cover). Another stand located in an area possibly affected by grazing contains large amounts of *Achnatherum nelsonii* (50% cover) and *Poa arida* (10% cover). Forbs are less abundant within the herbaceous layer. *Taraxacum officinale, Cirsium scariosum,* and *Achillea millefolium* have 1% cover in each of three stands. The palustrine stand includes a low density of *Pinus contorta* seedlings, one stand is being colonized by *Populus tremuloides,* and one stand has *Picea pungens* encroaching into it.

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Cirsium scariosum	Herb (field)	Forb	.	X	.
Taraxacum officinale	Herb (field)	Forb	.	.	.
Achnatherum nelsonii	Herb (field)	Graminoid	X	X	.
Juncus balticus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	dominant and characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Kalmia microphylla	-	P	rare
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Dasiphora fruticosa* ssp. *floribunda / Deschampsia caespitosa* Shrubland (CEGL001107)

Global Related Concepts:
- *Potentilla fruticosa/Carex* spp. (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments: Two of the stands located in the Uhl Hill / Wolf Ridge area have been heavily disturbed by grazing, causing the abundance of *Poa pratensis* and *Phleum pratense* to be unusually high for this association type. *Carex* species are present and remain the indicator species in the herbaceous layers for these stands.
Global Classification Comments: In Montana, the Montana Natural Heritage Program has documented the occurrence of this type. Peter Lesica (1982) describes a dwarf carr type with *Dasiphora fruticosa ssp. floribunda* with *Betula nana (= Betula glandulosa)* and *Salix planifolia* that may or may not represent this type (S. Cooper pers. comm.) at the Pine Butte Swamp.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur in the area around Uhl Hill and Wolf Ridge, on the west side of String Lake, in the Spread Creek area, NE of Moose Head Ranch, and in the Snake River Channel east of the Potholes.

Global Range: This type has been documented in Wyoming and Montana.
Nations: US
States/Provinces: MT:S3, WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332C:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B029, GT-03B083, GT-03C063, GT-03C066
Accuracy Assessment Points: 04X488, 04R212
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper pers. comm.	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Lee and Jonkel 1980	.	X	.	.	.	.	.	.	.
Lesica 1982	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001107] *Dasiphora fruticosa* ssp. *floribunda / Deschampsia caespitosa* Shrubland

Translated Name: **Shrubby-cinquefoil / Tufted Hairgrass Shrubland**
Common Name: **Shrubby-cinquefoil / Tufted Hairgrass Shrub Prairie**
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This montane to subalpine shrubland association is widespread in the Rocky Mountains west to eastern Oregon and Utah on stream terraces above the channel, on drier edges of wetlands, on broad gently sloping valley bottoms and floodplains, on moderately steep mesic slopes near springs, and near glacial depressions. Elevation ranges from 2500-3300 m (8300-10,700 feet) in Colorado to 860-2267 m (2820-7400 feet) in Montana. Aspect is variable. Soils are typically derived from alluvium and are deep, fine-textured, but vary from sandy loam to clay loam. Gleying and mottling are common. Sites have a high water table that fluctuates (40-100 cm) seasonally. These riparian shrublands form an open to moderately dense, low-shrub layer dominated by *Dasiphora*

fruticosa ssp. floribunda (= Pentaphylloides floribunda; = Potentilla fruticosa) with thick cover of bunch grasses. Other shrub species may include low cover of *Artemisia cana, Betula nana, Salix boothii*, and *Salix planifolia*. The lush herbaceous layer is often typically diverse and usually dominated by the graminoid *Deschampsia caespitosa*, which is consistently present as a diagnostic species at least in trace amounts. Other characteristic graminoids may include *Carex aurea, Carex aquatilis, Carex heteroneura var. chalciolepis, Carex nova, Carex pellita (= Carex lanuginosa), Carex microptera, Danthonia intermedia, Elymus trachycaulus, Festuca rubra, Festuca saximontana, Festuca brachyphylla, Phleum alpinum, Poa secunda*, and *Trisetum spicatum*. Numerous forb species may be present such as *Antennaria* spp., *Argentina anserina, Polygonum bistortoides, Caltha leptosepala, Cerastium arvense, Geum rossii, Penstemon procerus, Potentilla* spp., *Selaginella* spp., *Solidago simplex, Symphyotrichum* spp., *Stellaria longipes, Thalictrum* spp., *Trifolium longipes*, and *Valeriana edulis*. With heavy grazing *Achillea millefolium, Antennaria* spp., *Carex nebrascensis, Fragaria virginiana, Juncus balticus*, and *Potentilla gracilis* increase in cover. Exotic graminoids *Poa pratensis* and *Alopecurus pratensis* and forbs *Taraxacum officinale* and *Trifolium repens* may be common in heavily grazed/disturbed stands.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: This association occurs on the valley floor at an elevation of 2035 m (6678 feet). The soil texture is a well-drained silt loam. The unvegetated ground cover is dominated by litter and duff (80% ground cover), bare ground (10% ground cover), and wood (5% ground cover). This stand is surrounded by *Populus* sp., *Salix* sp., and scattered *Pinus contorta*. Wildlife use is evident because of the heavy browsing on *Betula nana* and *Salix* spp.

Global Environment: This montane to subalpine shrubland association is widespread in the Rocky Mountains west to the Cascades of Oregon on stream terraces above the channel, on drier edges of wetlands, on broad gently sloping valley bottoms and floodplains, on moderately steep mesic slopes near springs, and near glacial depressions. Elevation ranges from 2500-3450 m (8300-11,320 feet) in Colorado to 860-2267 m (2820-7400 feet) in Montana. Aspect is variable. Soils are typically derived from alluvium and are deep, fine-textured, but vary from sandy loam to clay loam. Gleying and mottling are common. Sites have a high water table that fluctuates (40-100 cm) seasonally.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane short shrubland that occurs on mesic sites. The shrub layer is dominated by *Dasiphora fruticosa ssp. floribunda* (50% canopy cover) and *Salix boothii* (5% canopy cover). The herbaceous layer is diverse and is dominated by *Poa pratensis* (40% canopy cover), *Carex pellita (= Carex lanuginosa)* (10% canopy cover), and *Taraxacum officinale* (10% canopy cover). Other common forbs include *Trifolium repens* and *Fragaria virginiana*. *Deschampsia caespitosa* composes 1% canopy cover in this association, however, it is present as the diagnostic undergrowth species.

Global Vegetation: These riparian shrublands form an open to moderately dense, low-shrub layer dominated by *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda; = Potentilla fruticosa)* with thick cover of bunch grasses. Other shrub species may include low cover of *Artemisia cana, Betula nana, Salix boothii*, and *Salix planifolia*. The lush herbaceous layer is often typically diverse and usually dominated by the graminoid *Deschampsia caespitosa*, which is consistently present as a diagnostic species in at least trace amounts. Other characteristic graminoids may include *Carex aurea, Carex aquatilis, Carex heteroneura var. chalciolepis, Carex nova, Carex pellita (= Carex lanuginosa), Carex microptera, Danthonia intermedia, Elymus trachycaulus, Festuca rubra, Festuca saximontana, Festuca brachyphylla, Phleum alpinum, Poa secunda*, and *Trisetum spicatum*. Numerous forb species may be present such as *Antennaria* spp., *Argentina anserina, Polygonum bistortoides, Caltha leptosepala, Cerastium arvense, Geum rossii, Penstemon procerus, Potentilla diversifolia, Potentilla gracilis, Potentilla hippiana, Pseudocymopterus montanus, Rhodiola rhodantha, Selaginella* spp., *Solidago simplex var. simplex, Symphyotrichum campestre, Stellaria longipes, Thalictrum alpinum, Thlaspi montanum, Trifolium longipes*, and *Valeriana edulis*. With heavy grazing *Achillea millefolium, Antennaria* spp., *Carex nebrascensis, Fragaria virginiana, Juncus balticus*, and *Potentilla gracilis* increase in cover (Padgett et al. 1989, Hansen et al. 1995, Crowe and Clausnitzer 1997, Hall and Hansen 1997, Kittel et al. 1999b, Carsey et al. 2003b). Exotic graminoids *Poa pratensis* and *Alopecurus pratensis* and forbs *Taraxacum officinale* and *Trifolium repens* may be common in heavily grazed/disturbed stands.

Global Dynamics: *Dasiphora fruticosa ssp. floribunda* increases in abundance with continuous, season-long grazing within riparian areas (Kittel et al. 1999b, Carsey et al. 2003b). *Deschampsia caespitosa* is highly palatable to livestock. With heavy continuous grazing this community is often invaded by the introduced, grazing-tolerant grass *Poa pratensis* and may convert to a *Dasiphora fruticosa ssp. floribunda / Poa pratensis* shrubland, then eventual cause decline in *Dasiphora fruticosa ssp. floribunda* cover (Padgett et al. 1989, Hansen et al. 1995, Crowe and Clausnitzer 1997, Hall and Hansen 1997, Kittel et al. 1999b, Carsey et al. 2003b).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Fragaria virginiana	Herb (field)	Forb	X	X	.
Taraxacum officinale	Herb (field)	Forb	X	X	.
Trifolium repens	Herb (field)	Forb	X	X	.
Carex pellita	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.

Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	invasive introduced forage species
Poa pratensis	-	P	invasive introduced forage species
Taraxacum officinale	-	P	invasive
Trifolium pratense	-	P	invasive introduced forage species

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Dasiphora fruticosa* ssp. *floribunda / Carex* spp. Shrubland (CEGL001106)
- *Dasiphora fruticosa* ssp. *floribunda / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503)
- *Dasiphora fruticosa* ssp. *floribunda / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502)
- *Dasiphora fruticosa ssp. floribunda* Subalpine Shrubland (CEGL003499)

Global Related Concepts:
- *Dasiphora floribunda / Deschampsia cespitosa* Shrubland (Kittel et al. 1999b) =
- *Dasiphora floribunda / Deschampsia cespitosa* Shrubland (Carsey et al. 2003a) =
- *Dasiphora floribunda / Deschampsia cespitosa* Shrubland (Carsey et al. 2003b) =
- *Pentaphylloides floribunda / Deschampsia cespitosa* Plant Association (Johnston 1987) =
- *Potentilla fruticosa / Deschampsia cespitosa* Community Type (Youngblood et al. 1985b) =
- *Potentilla fruticosa / Deschampsia cespitosa* Community Type (Youngblood et al. 1985a) =
- *Potentilla fruticosa / Deschampsia cespitosa* Community Type (Padgett et al. 1989) =
- *Potentilla fruticosa / Deschampsia cespitosa* Habitat Type (Hall and Hansen 1997) =
- *Potentilla fruticosa / Deschampsia cespitosa* Habitat Type (Hansen et al. 1995) =
- *Potentilla fruticosa / Deschampsia cespitosa* Plant Association (Crowe and Clausnitzer 1997) =
- *Potentilla fruticosa/Deschampsia cespitosa* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Although *Deschampsia caespitosa* composes only 1% canopy cover in this association, it is present as the diagnostic undergrowth species (Youngblood et al. 1985a).
Grand Teton National Park Other Comments:
Global Classification Comments: *Dasiphora fruticosa ssp. floribunda* and *Deschampsia caespitosa* are both widespread mesic species that occur in a variety of mesic habitats. *Dasiphora fruticosa ssp. floribunda* shrublands and steppe are highly variable and need more survey and classification work to clarify diagnostic characteristics.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs west of Triangle X Ranch, along the Snake River.
Global Range: This montane riparian shrubland association is widespread in the Rocky Mountain region from Colorado to Montana west into Oregon and Utah.
Nations: US
States/Provinces: CO:S3S4, ID:S3, MT:S4, OR:S2, UT:S3S4, WY:S3
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C
TNC Ecoregion Comments: ECO7 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).

USFS Ecoregions: 342D:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C058
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mutz and Graham 1982	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Sanderson and March 1996	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	X	X	.	.	.	.	.

A.962 *Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance

Alderleaf Buckthorn Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: The vegetation in this alliance occurs in riparian areas in the Caribou and Teton ranges of the far eastern edge of Idaho and adjacent Wyoming. Stands are located below 2070 m on alluvial terraces and adjacent to seeps. Soils are well-developed, have a thick, dark brown surface horizon, and are classified as Mollisols. *Rhamnus alnifolia* forms a dense shrub layer. *Ribes lacustre* and *Lonicera involucrata* are the only other shrub species commonly present. *Calamagrostis canadensis, Elymus glaucus, Galium triflorum, Geum macrophyllum, Heracleum maximum (= Heracleum lanatum)*, and *Maianthemum stellatum* are the most common herbaceous species present in the understory.
Environment: The vegetation in this alliance occurs in riparian areas in the Caribou and Teton ranges of the far eastern edge of Idaho and adjacent Wyoming. Stands are located below 2070 m on alluvial terraces and adjacent to seeps. Soils are well developed, have a thick, dark brown surface horizon, and are classified as Mollisols.
Vegetation: The vegetation in this alliance occurs in riparian areas of mountain ranges in eastern Idaho and northwestern Wyoming. *Rhamnus alnifolia* forms a dense shrub layer. *Ribes lacustre* and *Lonicera involucrata* are the only other shrub species commonly present. *Calamagrostis canadensis, Elymus glaucus, Galium triflorum, Geum macrophyllum, Heracleum maximum (= Heracleum lanatum)*, and *Maianthemum stellatum* are the most common herbaceous species present in the understory.
Dynamics:

Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance occurs in eastern Idaho in the Caribou and Teton ranges and in adjacent areas of northwestern Wyoming. *Rhamnus alnifolia* has a broad distribution from British Columbia to Newfoundland and south to California, Nevada, and Utah (Welsh et al. 1987). Stands of the alliance may occur in this larger area.
Nations: CA, US
Subnations: BC?, ID, MT, OR, WA, WY
TNC Ecoregions: 8:C, 9:C
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): M. Damm
References: Bursik and Moseley 1995, Jones 1992b, Welsh et al. 1987, Youngblood et al. 1985a

[CEGL001132] *Rhamnus alnifolia* Shrubland

Translated Name: **Alderleaf Buckthorn Shrubland**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland (CES306.994)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): C. Murphy

ELEMENT CONCEPT

Global Summary: This association is known from the Blue Mountains of northeastern Oregon, scattered locations in moist mountainous regions of Idaho, Montana, and in western Wyoming. Stands of this *Rhamnus alnifolia* association occur at low to mid elevations (e.g., up to 2074 m [6800 feet]) in seeps, along sloped spring-fed creeks, on alluvial terraces of small streams (orders 1 and 2), and in broad basins or fens. Soils are typically loams and contain coarse rock fragments. Soils often show signs of a seasonally high water table (e.g., mottling), but the association also occurs on semipermanently saturated sites. Nearly complete cover of *Rhamnus alnifolia* characterizes this association, with few associates having consistently high cover due to the dense canopy. Associated shrubs that may be present include *Alnus incana, Lonicera involucrata, Ribes* spp., *Salix geyeriana*, and *Symphoricarpos albus*. The herbaceous understory is diverse, but most species have low to moderate cover. Common graminoid species include *Bromus* spp., *Calamagrostis canadensis, Cinna latifolia, Elymus glaucus*, and *Glyceria* spp. Tall forbs are characteristically present, including *Heracleum maximum, Mertensia* spp., *Thalictrum occidentale*, and *Urtica dioica*, but no single species has high cover and constancy throughout the association's range.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs on the valley floor. The elevations for these stands vary between 1964 and 2033 m (6443-6670 feet). The silty clay loam and silty clay soil textures are moderately well-drained. Litter and duff account for 98% of the unvegetated and nonvascular ground cover. Adjacent vegetation includes *Pinus contorta, Picea engelmannii*, and *Salix lemmonii*.
Global Environment: *Rhamnus alnifolia* apparently requires wet, loamy soils containing coarse fragments. It apparently requires seasonally high water tables or semipermanent saturation (e.g., sites such as seeps or spring-fed creeks). *Rhamnus alnifolia* is not found on organic, acidic, saline, alkaline, or heavy clay soils (Elzinga and Rosentreter 2000). The species does appear resilient and vigorous on favorable sites. The competitive habit of *Rhamnus alnifolia* decreases establishment of other species. Where there is a mix of shrub species present it is thought that it may have invaded stands (Youngblood et al. 1985a).

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane shrubland that occurs on mesic sites. The shrub layer is dominated by *Rhamnus alnifolia* with 20-40% canopy cover. The herbaceous layer is usually dominated by *Poa pratensis* with 10-60% canopy cover. In the plot where *Poa pratensis* is absent, *Poa nemoralis ssp. interior* is dominant with 10% canopy cover. The forbs within the sampled stands are very diverse with no species dominating either in presence or abundance.
Global Vegetation: Nearly complete cover of *Rhamnus alnifolia* characterizes this association, with few associates having consistently high cover due to the dense canopy. Associated shrubs that may be present include *Alnus incana, Lonicera involucrata, Ribes* spp., *Salix geyeriana*, and *Symphoricarpos albus*. The herbaceous understory is diverse, but most species have low to moderate cover. Common graminoid species include *Bromus* spp., *Calamagrostis canadensis, Cinna latifolia, Elymus glaucus, Poa pratensis, Poa nemoralis ssp. interior*, and *Glyceria* spp. Tall forbs are characteristically present, including *Heracleum maximum, Mertensia*

spp., *Thalictrum occidentale*, *Rudbeckia occidentalis*, and *Urtica dioica*, but no single species has high cover and constancy throughout the association's range.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Rhamnus alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Poa nemoralis ssp. *interior*	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Rhamnus alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Heracleum maximum	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Cirsium arvense	-	P	exotic
Cirsium vulgare	-	P	exotic
Cynoglossum officinale	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (22-Oct-2002). This is a wide-ranging, but infrequently encountered association known from less than 30 occurrences in the Blue Mountains, moist mountainous areas of Idaho, Montana, and western Wyoming. This association requires wet, coarse loamy soils in areas of seasonally high water tables or semipermanent saturation (e.g., alluvial terraces, seeps, spring-fed creeks, and fens). However, sites favorable for the occurrence of *Rhamnus alnifolia*-dominated stands are uncommon across the landscape. The competitive, rhizomatous habit of *Rhamnus alnifolia* minimizes establishment of exotic species and makes the association resilient when disturbed. Although the number of occurrences is low, the wide range and resiliency of this association justify a G3 rank.

RELATED CONCEPTS

Global Similar Associations:

Global Related Concepts:

- *Rhamnus alnifolia / Mertensia paniculata* Association (Crowe et al. 2004) =
- *Rhamnus alnifolia* (Bourgeron and Engelking 1994) =
- *Rhamnus alnifolia* / Mesic Forb Community (Crowe and Clausnitzer 1997) = *Rhamnus alnifolia* Dominance Type (Hansen et al. 1988b) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The local stands closely fit the description by Youngblood et al. (1985a). According to Youngblood et al., a typical *Rhamnus alnifolia* stand will have almost continuous cover and be associated with few other shrub species. Since the local stands have between 20-40% canopy cover and are associated with five to six other shrub species, they appear to be encroaching into other associations.

Grand Teton National Park Other Comments: All of the stands occur in moist soils; one stand is seasonally saturated.

Global Classification Comments: Because no understory herbaceous species has consistently high cover and constancy, and *Rhamnus alnifolia* is clearly dominant with high cover, this association is broadly defined. Similar associations have not yet been incorporated into the National Vegetation Classification: Crowe and Clausnitzer (1997) identified a *Rhamnus alnifolia* / mesic forb community from the Blue Mountains of northeast Oregon. Oregon Natural Heritage Program (2002) identified a *Rhamnus alnifolia / Mertensia paniculata* community from the Blue Mountains of eastern Oregon that includes Crowe and Clausnitzer's stands. Youngblood et al. (1985a) did not have data supporting identification of an understory diagnostic species. Idaho stands of *Rhamnus alnifolia* are likely synonymous with Crowe and Clausnitzer's (1997) *Rhamnus alnifolia* / mesic forb community. The Idaho stands

and *Rhamnus alnifolia* / mesic forb community (Crowe and Clausnitzer 1987) differ from *Rhamnus alnifolia / Mertensia paniculata* by lacking the diagnostic forb *Mertensia paniculata*. They are otherwise similar and all three types are synonymous according to Oregon Natural Heritage Program (2002). Further sampling is needed to confirm the existence of different *Rhamnus alnifolia* types.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The stands all occur near the Moose and Beaver Creek housing area.
Global Range: This association is known from eastern Oregon and Washington, throughout Idaho and into western Wyoming and Montana.
Nations: CA?, US
States/Provinces: BC?, ID:S3, MT:S5, OR, WA:S1?, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 & ECO9 added (MSR/CM 10-02).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: This vegetation type was searched for in other parts of the park but was only found in the areas described above.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C045, GT-0202105, GT-0202107
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): C. Murphy, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Bursik and Moseley 1995	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	X	.	.	.	.
Crowe et al. 2002	.	.	.	X	X	.	.	.	.
Crowe et al. 2004	.	.	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Elzinga and Rosentreter 2000	.	.	.	X	X	.	.	.	.
Hansen and Hall 2002	.	.	.	.	X	.	.	.	.
Hansen et al. 1988b	.	.	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
IDCDC unpubl. data 2002	.	.	.	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
NRCS 2001	.	.	.	.	X	.	.	.	.
Norton et al. 1981	.	.	.	.	X	.	.	.	.
ORNHP unpubl. data 2002	.	.	.	X	.	.	.	.	.
WANHP unpubl. data 2002	.	.	.	X	.	.	.	.	.
Walford et al. 2001	.	.	.	.	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	X	.	.	.	.

A.972 *Salix boothii* Temporarily Flooded Shrubland Alliance

Booth's Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This widespread riparian shrubland alliance is found throughout the interior western U.S. between 1320-2800 m in elevation. Stands occur in valley bottoms, swales, streambanks, and occasionally terraces of stream channels in areas that have surface water present for only brief periods of time during the growing season, and are usually found within 1 m of the water table. Stands are also located adjacent to seeps on gently sloping toeslopes. The ground surface is often uneven and hummocky due to past flooding and beaver activity. The soils are variable and include highly stratified alluvium or fine-textured, highly organic soils. Shrublands

within this alliance are dominated by *Salix boothii* with a canopy ranging from 20-80% cover. *Salix geyeriana, Salix lemmonii*, or *Salix drummondiana* may codominate. Other shrubs present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* and *Betula nana (= Betula glandulosa)*. A mixture of forbs and graminoids growing on raised hummocks characterizes the moderately dense herbaceous layer. Common forb and graminoid species include *Swertia perennis, Pedicularis groenlandica, Polygonum bistortoides, Heracleum maximum (= Heracleum lanatum), Achillea millefolium, Carex aquatilis, Carex utriculata*, and *Calamagrostis canadensis*. Diagnostic of this riparian alliance is a *Salix boothii*-dominated or -codominated tall shrubland that is flooded for brief periods during the growing season and has a shallow water table.

Environment: Vegetation types in this alliance occur in valley bottoms on swales, banks, and occasionally terraces of stream channels, areas which have surface water present for only brief periods of time during the growing season. Stands are usually found within 1.0 m of the water table, but are occasionally located above the channel on low terraces of straight sections of rivers. Vegetation in the alliance is also located adjacent to seeps on gently sloping toeslopes. Elevation ranges from 1320-2800 m. The ground surface is often uneven and hummocky due to past flooding and beaver activity. Soils are typically highly stratified with alternating layers of sandy loam and clay loam and are mottled within the top 10 cm. Other soils are finely textured, dark-colored, highly organic soils with silty clay loam. Lower profiles typically contain a gravel or cobble layer which may indicate that the soil section is a silted-in beaver pond (Kittel et al. 1999b). Mixed conifer-*Populus tremuloides* and *Populus tremuloides* forests often occur on adjacent hillslopes at higher elevations, and *Artemisia tridentata* scrub occurs on adjacent hillsides at lower elevations.

Vegetation: The tall-shrub layer is dominated by large stands of *Salix boothii* with a canopy ranging from 20-80% cover. Several stands are codominated (35-50% cover) by *Salix geyeriana, Salix lemmonii*, or *Salix drummondiana*. Other shrubs present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* and *Betula nana (= Betula glandulosa)*. The herbaceous layer is characterized by a moderate forb layer growing on raised hummocks. No one forb species is dominant, but rather several species have a combined cover of 40-60%. Forb species include *Swertia perennis, Pedicularis groenlandica, Polygonum bistortoides, Heracleum maximum (= Heracleum lanatum)*, and *Achillea millefolium*. Graminoid cover is moderate (<40%) and commonly includes *Carex aquatilis, Carex utriculata*, and *Calamagrostis canadensis*.

Dynamics: Stands within this alliance are dominated by *Salix boothii* which is often highly productive. Understory production varies, depending on the density of overstory shrubs. Thick shrub stands make access by livestock difficult, therefore stands within this alliance are somewhat resistant to grazing effects (Youngblood et al. 1985b).

Similar Alliances:

- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)

Similar Alliance Comments: The ~*Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)$$ differs from the ~*Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)$$ due to hydrologic regime. The seasonally flooded shrubland has surface water present for extended periods of time, especially during the early part of the growing season. The water table is at or near the soil surface. The temporarily flooded shrubland has surface water present for only brief periods during the growing season, and the water table usually lies well below the soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is common in the Great Basin and the Rocky Mountain regions. The alliance extends from central Oregon, east to south-central Montana, south to Utah and north-central Colorado. Stands occur in California but are not common.

Nations: US

Subnations: CA, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C

USFS Ecoregions: 342B:CC, 342C:CC, 342D:CC, 342E:CC, M242C:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333C:CC, M341A:CC

Federal Lands: NPS (Glacier, Grand Teton); USFS (Bighorn?, Deschutes, Medicine Bow?, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver

References: Dorn 1997, Girard et al. 1997, Johnston 1987, Kagan 1997, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kovalchik 1987, Manning and Padgett 1991, Mutz and Graham 1982, Mutz and Queiroz 1983, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Reid 1990, Sawyer and Keeler-Wolf 1995, Tuhy and Jensen 1982, Weixelman et al. 1996, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001178] *Salix boothii / Carex utriculata* Shrubland

Translated Name: **Booth's Willow / Beaked Sedge Shrubland**

Common Name:

Ecological System(s):

- North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: Stands occur between 1800 and 2805 m (5900-9200 feet) in elevation. Sites are usually in wide valley bottoms on low-gradient floodplains, often associated with abandoned and current beaver ponds. This cold-deciduous shrubland is composed of tall willows, from 1.2-2.4 m (4-8 feet) in height. *Salix boothii* is the dominant species, as a monoculture or with lesser amounts to near codominance of *Salix geyeriana, Salix lucida, Salix drummondiana,* or *Salix wolfii*. Other shrubs may be present in small amounts; generally underneath the taller shrubs are *Lonicera involucrata, Betula nana (= Betula glandulosa), Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Ribes inerme,* or *Ribes lacustre*. The herbaceous undergrowth is very abundant, often a dense sward of pure *Carex utriculata*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor near streams or in low lying wetlands. The elevations for these stands range from 6755 to7552 feet. The soils for two sites are moderately well drained silty clay loam and the other site has poorly drained sandy soil. Seasonal flooding occurs at each site. The ground cover consists of 70 to 90% litter and duff with moss or lichen making up the rest. The highest elevation stand is surrounded by *Picea engelmannii, Abies lasiocarpa, Pinus contorta,* and *Pinus albicaulis*. Adjacent vegetation for the remaining stands may include *Artemisia tridentata, Populus tremuloides,* or mixed conifer forests.

Global Environment: This is one of the wettest *Salix boothii* shrublands. Stands occur between 1800 and 2805 m (5900-9200 feet) in elevation. Sites are usually in wide valley bottoms on low-gradient floodplains, often associated with abandoned and current beaver ponds. However, this shrubland can occur on seeps, wet toeslopes, streambanks of small meandering streams, and moist terraces, and has been seen on narrow and steep riparian corridors as well, but this is more the exception. Ground surface can be smooth or of undulating topography. Soils are for the most part accumulated fine particles from periodic inundation and are most often classified as Mollisols, but occasionally are Entisols. Soil textures are clays, fine loams or sandy, and can have an organic layer at the surface. Soils are usually wet, with the water table at the surface throughout the growing season, but can be drier with water tables up to 1 m in depth.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on mesic sites. The shrub layer is dominated by *Salix boothii,* contributing 7 to 40% canopy cover. *S. drummondiana, S. geyeriana,* and *S. wolfii* can contribute between 3 to 40% canopy cover, but they do not occur in every stand. The herb layer is dominated by *Carex utriculata* (12 to 70% canopy cover). Many other graminoids occur with high cover, but in only one or two stands. Although forb diversity is high, usually no single species is dominant. In the high elevation plot, *Symphyotrichum lanceolatum* contributes 20% canopy cover. All other forbs account for 3% canopy cover or less. Moss provides 10 to 20% ground cover.

Global Vegetation: This cold-deciduous shrubland is composed of tall willows, from 1.2-2.4 m (4-8 feet) in height. *Salix boothii* is the dominant species, as a monoculture or with lesser amounts to near codominance of *Salix geyeriana, Salix lucida, Salix drummondiana,* or *Salix wolfii*. Other shrubs may be present in small amounts; generally underneath the taller shrubs are *Lonicera involucrata, Betula nana (= Betula glandulosa), Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Ribes inerme,* or *Ribes lacustre*. The herbaceous undergrowth is very abundant, often a dense sward of pure *Carex utriculata*. Other graminoids can be present, rarely codominant, and include *Carex aquatilis, Carex pellita (= Carex lanuginosa), Glyceria grandis, Calamagrostis stricta, Calamagrostis canadensis, Poa palustris,* and *Deschampsia caespitosa*. Forb cover is generally sparse; the species present are highly variable but are usually high-moisture indicators. Forb species reported include *Symphyotrichum foliaceum (= Aster foliaceus), Chamerion angustifolium (= Epilobium angustifolium), Castilleja miniata, Fragaria virginiana, Symphyotrichum lanceolatum, Maianthemum stellatum (= Smilacina stellata), Mentha arvensis, Veronica americana,* or *Pedicularis groenlandica*, and many others.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix boothii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix drummondiana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Carex utriculata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium pratense	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Salix drummondiana / Carex utriculata* Shrubland (CEGL002631)
- *Salix geyeriana / Carex utriculata* Shrubland (CEGL001207)

Global Related Concepts:
- *Salix / Carex rostrata* Association (Kovalchik 1987) B
- *Salix boothii - Salix geyeriana / Carex utriculata* Association (Crowe et al. 2004) B
- *Salix boothii / Carex rostrata* Community Type (Walford et al. 2001) =
- *Salix boothii / Carex rostrata* Community Type (Youngblood et al. 1985a) =
- *Salix boothii / Carex rostrata* Community Type (Norton et al. 1981) B
- *Salix boothii / Carex rostrata* Community Type (Padgett et al. 1989) =
- *Salix boothii / Carex utriculata* Plant Association (Kittel et al. 1999b) =
- *Salix boothii/Carex rostrata* (Bourgeron and Engelking 1994) =
- *Salix drummondiana - Salix myrtillifolia / Carex rostrata* Community Type (Mutz and Queiroz 1983) B
- *Salix geyeriana / Carex rostrata* Habitat Type (Hansen et al. 1995) B
- *Salix* spp. / *Carex rostrata* Association (Crowe and Clausnitzer 1997) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Stands reported in Oregon (Kovalchik 1987, Crowe and Clausnitzer 1997, Crowe et al. 2004) may be mixed with other willows (*Salix geyeriana, Salix lemmonii, Salix bebbiana*); stands dominated by *Salix boothii* are a possibility.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur over a wide range. One stand occurs south of Uhl Hill, one stand occurs west of Survey Peak in the Berry creek drainage, one stand occurs near Jackson Lake Dam, two occur near Jackson Lake Lodge, and two occur in the Pacific Creek area.

Global Range: This wet riparian shrubland is known from Colorado, Wyoming, Idaho, Montana, Idaho, Oregon and possibly California.
Nations: US
States/Provinces: CA?, CO:S3, ID:S4, OR:S3, UT:S3?, WY:S2S3
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO4 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, 342D:CC, M242C:CC, M331A:CC, M331D:CC, M331H:CC, M332A:CC, M332E:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Bighorn?, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C072, GT-03C082, GT-0201090
Accuracy Assessment Points: 04X067, 04X069, 04X503, 04X533
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga

Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Christy pers. comm.	.	X	.	.	.	.	.	.	.
Crowe and Clausnitzer 1997	.	.	X	.	.	.	.	.	.
Crowe et al. 2004	.	.	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	.	X	.	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	.	X	.	.	.	.	.	.
Kovalchik 1987	.	X	X	X	.	.	.	.	.
Mutz and Graham 1982	.	X	.	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	.	.	.	.	.
Norton et al. 1981	.	X	X	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	.	X	.	.	.	.	.
Walford et al. 2001	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

[CEGL001180] *Salix boothii* / Mesic Forbs Shrubland

Translated Name: **Booth's Willow / Mesic Forbs Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is known from southern and central Idaho, western Montana, western Colorado, Utah, California, and Wyoming. Stands are found over a broad range of elevations from 1412-3050 m (4630-10,000 feet), in riparian areas on stream benches, meadows, and seeps located in narrow or broad valley bottoms. Soils are often organic. The vegetation has a 1- to 2-m tall-shrub layer that often forms extensive thickets, or willow carrs, on broad montane floodplains. The overstory of this shrubland association is dominated by *Salix boothii*. *Salix geyeriana* or *Salix drummondiana* may codominate. *Salix wolfii, Lonicera involucrata*, and/or *Ribes inerme* commonly form a low-shrub layer, generally tucked under the bases of the taller willows. The dense herbaceous understory is dominated by forbs. No one species in dominant or consistently present in all stands; however, when taken together, the total forb cover is greater than the total graminoid cover. Forb species typically include *Heracleum maximum (= Heracleum lanatum), Mertensia* spp., *Maianthemum stellatum (= Smilacina stellata), Symphyotrichum foliaceum, Aconitum columbianum, Cirsium arvense, Fragaria virginiana, Geranium viscosissimum, Hydrophyllum fendleri, Urtica dioica*, and *Rudbeckia occidentalis*. Although highly variable, graminoid cover is typically less than 20%. Graminoid species include *Poa pratensis, Carex microptera, Calamagrostis canadensis, Agrostis gigantea*, and *Phleum pratense*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: A stand of this willow association occurs on an east-facing terrace with a slope of 2%. The elevation of the stand is 2100 m (6891 feet). The stand is situated in a seasonally saturated palustrine area in which the substrate is saturated to the surface for extended periods during the growing season. Moderately well-drained clay loam soils are present, covered by 98% litter and duff, 5% moss, and a trace of wood. Adjacent vegetation includes a mixed coniferous forest in which *Pinus*

contorta, Abies lasiocarpa, and *Picea engelmannii* are present. The understory for this forested vegetation is a mix between *Calamagrostis rubescens* and *Vaccinium scoparium*.

Global Environment: Stands are found over a broad range of elevations from 1412-3050 m (4630-10,000 feet), and in riparian areas on stream benches, meadows, and seeps located in narrow or broad valley bottoms. Soils are often organic.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The tall-shrub stratum contains *Salix boothii* (60% cover) and *Salix drummondiana* (20% cover). The short-shrub stratum is composed of several shrubs but is not well-developed; *Ribes lacustre* (10% cover) and *Salix wolfii* (5% cover) dominate. A 1.2-m (4-foot) *Abies lasiocarpa* is also present within the short-shrub layer. The herbaceous layer is dominated by forbs. Graminoids are present and fairly diverse but only in trace quantities; the only common graminoid is *Calamagrostis* sp. (10% cover). The dominant forb is *Symphyotrichum foliaceum* (20% cover). Other forbs occurring at 3% cover include *Aconitum columbianum, Cirsium arvense, Fragaria virginiana, Geranium viscosissimum*, and *Rudbeckia occidentalis*.

Global Vegetation: The vegetation has a 1- to 2-m tall-shrub layer that often forms extensive thickets, or willow carrs, on broad montane floodplains. The overstory of this shrubland association is dominated by *Salix boothii*. *Salix geyeriana* or *Salix drummondiana* may codominate. *Salix wolfii, Lonicera involucrata,* and/or *Ribes inerme* commonly form a low-shrub layer. The dense herbaceous understory is dominated by forbs. No one species in dominant or consistently present in all stands; however, when taken together, the total forb cover is greater than the total graminoid cover. Forb species typically include *Heracleum maximum (= Heracleum lanatum), Mertensia* spp., *Maianthemum stellatum (= Smilacina stellata), Symphyotrichum foliaceum, Aconitum columbianum, Cirsium arvense, Fragaria virginiana, Geranium viscosissimum, Hydrophyllum fendleri, Urtica dioica*, and *Rudbeckia occidentalis*. Although highly variable, graminoid cover is typically less than 20%. Graminoid species include *Poa pratensis, Carex microptera, Calamagrostis canadensis, Agrostis gigantea*, and *Phleum pratense*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix drummondiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ribes lacustre	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Cirsium arvense	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Symphyotrichum foliaceum	Herb (field)	Forb	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	X	.	.
Urtica dioica	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (19-Sep-2000). This association occurs in Idaho, California, and is a widespread type across Utah and Colorado where most of the known occurrences are located. In many parts of its range this association is threatened by livestock overgrazing, stream flow alterations, and heavy recreational use.

RELATED CONCEPTS

Global Similar Associations:
- *Salix boothii / Maianthemum stellatum* Shrubland (CEGL001187)
- *Salix boothii* / Mesic Graminoids Shrubland (CEGL001181)
- *Salix boothii / Poa palustris* Shrubland (CEGL001183)
- *Salix geyeriana* / Mesic Forbs Shrubland (CEGL002666)

Global Related Concepts:
- *Salix boothii* / Mesic Forb Community Type (Padgett et al. 1989) =
- *Salix boothii* / Mesic Forb Plant Association (Kittel et al. 1997b) =
- *Salix boothii*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is similar to the community type of the same name described by Padgett et al. (1989).
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand for this association is near Glade Creek.
Global Range: This association is known from Colorado, Utah, Idaho, California, and possibly Wyoming.
Nations: US
States/Provinces: CA:S2?, CO:S3, ID:S3, MT, NV:S3, OR:SU, UT:S3?, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04). ECO7 added (GK 1-04).
USFS Ecoregions: 342B:CC, 342E:CC, M331D:CC, M331H:CC, M332E:CC, M333C:CC, M341A:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Medicine Bow?, Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand of this association was sampled.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B094
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): J. Thompson and J. Stevens, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1988b	.	.	.	.	X	.	.	.	.
Hansen et al. 1995	.	.	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	X	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	X	.	.	.	.
Kittel et al. 1994	.	X	.	X	X	.	.	.	.
Kittel et al. 1995	.	X	.	X	X	.	.	.	.
Kittel et al. 1997b	.	.	X	.	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	.	.	.	X	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Norton et al. 1981	.	X	.	X	X	.	.	.	.
Padgett et al. 1988b	.	X	.	X	X	.	.	.	.

Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Sawyer and Keeler-Wolf 1995	.	.	.	.	X	.	.	.	.
Weixelman et al. 1996	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	X	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	X	.	.	.	.

[CEGL001181] *Salix boothii* / Mesic Graminoids Shrubland

Translated Name: **Booth's Willow / Mesic Graminoids Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This riparian community is currently known from Colorado, Idaho, Utah, Wyoming, and Montana. This cold-deciduous shrubland occurs between 2045 and 2990 m **(**6700-9800 feet) in elevation. It occurs mostly on moist stream terraces, streambanks, gently sloping wide floodplains or sideslope seeps, and can be associated with beaver ponds. The local micro-topography is highly variable, from smooth to very hummocky. Soil textures range from clay and fine-loams to sandy-skeletal, usually over coarse alluvium. Water tables range from the surface to 80 cm (31 inches), and signs of mottling are common. Some stands receive runoff and seepage from irrigated pastures. These tall mesic shrublands are dominated by *Salix boothii*. Other willows are often present, but in lower amounts, and include *Salix geyeriana, Salix wolfii, Salix lucida, Salix lutea, Salix drummondiana*, and rarely *Salix monticola*. *Ribes inerme* and *Lonicera involucrata* may also be present. The herbaceous undergrowth is dominated by graminoids. No single graminoid species is consistently dominant or present in all stands, and typically, no single species can be said to dominate any one stand. Common graminoid species include *Agrostis gigantea, Poa palustris, Phleum pratense, Deschampsia caespitosa, Carex hoodii, Carex pellita (= Carex lanuginosa), Carex praegracilis, Carex praticola, Carex microptera, Juncus balticus*, and *Glyceria striata*. Forbs are usually present, and may be diverse, but are never as abundant as the graminoid cover. Forb species include *Fragaria virginiana, Potentilla pulcherrima X hippiana, Symphyotrichum foliaceum, Mentha arvensis, Vicia americana, Veronica americana, Mimulus guttatus, Ranunculus cymbalaria*, and *Epilobium* spp. This association is distinguished from ~*Salix boothii* / Mesic Forbs Shrubland (CEGL001180)$$ by having a higher cover of graminoid species. Stands with predominantly non-native graminoid species in the undergrowth are considered grazing-induced.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association primarily occur on the valley floor with a few occurring on shallow slopes, and one occurs on a step-in-slope. Almost all stands are seasonally flooded or saturated. The elevations for these stands range from 6719 feet to 7572 feet. Where data is available, this association occurs on either sandy loam, loamy sand, or moderately well drained clay loam soils. The two stands with detailed unvegetated ground cover descriptions have 98% litter and duff ground cover. The stand on the step is surrounded by *Populus tremuloides* and mixed conifers.

Global Environment: This cold-deciduous shrubland occurs between 2045 and 2990 m **(**6700-9800 feet) in elevation. It occurs mostly on moist stream terraces, streambanks, gently sloping wide floodplains or sideslope seeps, and can be associated with beaver ponds. The local micro-topography is highly variable, from smooth to very hummocky. Soil textures range from clay and fine-loams to sandy-skeletal, usually over coarse alluvium. Water tables range from the surface to 80 cm (31 inches), and signs of mottling are common. Some stands received runoff and seepage from irrigated pastures.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on mesic sites. The shrub layer is dominated by *Salix boothii* contributing between 12 and 90% canopy cover. Numerous other *Salix* species combine to contribute 1 to 20% canopy cover in various stands. The stands that make up this association occur over a wide range throughout GTNP and have a very diverse herbaceous layer. *Phleum pratense, Calamagrostis canadensis*, and *Deschampsia caespitosa* are the most consistent graminoid species. Constant graminoid genera include *Carex, Poa*, and *Juncus*. Forbs are very diverse, though none occur in one-third of the stands.

Global Vegetation: These tall mesic shrublands are dominated by *Salix boothii*. Other willows are often present but in lower amounts. Other willow species include *Salix geyeriana, Salix wolfii, Salix lucida, Salix lutea, Salix drummondiana*, and *Salix monticola*. *Ribes inerme* and *Lonicera involucrata* may also be present. The herbaceous undergrowth is dominated by graminoids. No single graminoid species is consistently dominant or present in all stands, and typically, no single species can be said to dominate any one stand. Common graminoid species include *Agrostis gigantea, Poa palustris, Phleum pratense, Deschampsia caespitosa, Carex hoodii, Carex pellita (= Carex lanuginosa), Carex praegracilis, Carex praticola, Carex microptera, Juncus balticus*, and *Glyceria*

striata. Forbs are usually present, and may be diverse, but are never as abundant as the graminoid cover. Forb species include *Fragaria virginiana, Potentilla pulcherrima X hippiana, Symphyotrichum foliaceum, Mentha arvensis, Vicia americana, Veronica americana, Mimulus guttatus, Ranunculus cymbalaria,* and *Epilobium* spp.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix boothii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix geyeriana	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.
Phleum pratense	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Salix drummondiana	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix lucida	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Agrostis gigantea	Herb (field)	Graminoid	.	X	.
Carex pellita	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Agrostis stolonifera	-	P	exotic
Cirsium arvense	-	P	exotic
Hordeum jubatum	-	P	exotic
Lactuca serriola	-	P	exotic
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Plantago major	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Polygonum aviculare	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium hybridum	-	P	exotic
Trifolium pratense	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (6-Dec-1999). This association is known over a broad range including Colorado, Utah, Idaho, and possibly Wyoming and Montana. There are at least 21 known occurrences with at least 75 to 100 more expected. Invasion by non-native herbaceous species is cited as the greatest threat to this community. In mid-montane locations with low gradients, impacts from development in the riparian zone may alter this community.

RELATED CONCEPTS

Global Similar Associations:

- *Salix boothii* / Mesic Forbs Shrubland (CEGL001180)

Global Related Concepts:

- *Salix boothii* / Mesic Graminoid Community Type (Padgett et al. 1989) B
- *Salix boothii* / Mesic Graminoid Shrubland (Carsey et al. 2003a) =
- *Salix boothii*/Mesic graminoid (Bourgeron and Engelking 1994) =

- *Salix geyeriana* Community Type (Hansen et al. 1995) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Hansen et al. (1995) lumped *Salix boothii* communities into the *Salix geyeriana* types due to similarities in environmental settings and management concerns. Both communities contain stands where *Salix boothii* is the dominant shrub. Differences in the understory composition are dependent on the specific substrate and moisture regime.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This is plant community is fairly common and easy to find on the valley floor in the central part of the park. One stand occurs to the southwest, one to the northwest, and one to the northeast of Uhl Hill, one occurs southeast of Survey Peak, one occurs in the John D. Rockefeller Parkway willow flats, two occur along Pacific Creek, and six occur along or close to the Snake River near the Grassy Lake Road.

Global Range: This riparian community is currently known from Colorado, Idaho, Utah, Wyoming and Montana.
Nations: US
States/Provinces: CO:S3, ID:S3?, MT, UT:S3?, WY
TNC Ecoregions: 6:C, 9:C, 10:C, 19:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A124, GT-03C098, GT-0202114, GT-0203003
Accuracy Assessment Points: 04R214, 04R226, 04X075, 04X080, 04X439, 04X443, 04X446, 04X447, 04X448
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): J. Thompson and J. Stevens, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	X	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Reid 1990	.	X	.	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.973 *Salix drummondiana* Temporarily Flooded Shrubland Alliance

Drummond's Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this alliance occur on alluvial terraces adjacent to mountain rivers and streams. They range in elevation from 2135-3300 m, on slopes that range from 5-30%. These shrublands occur as small, isolated patches in forest and shrubland openings along channels in narrow valley bottoms along steep, narrow stream margins. They are often associated with beaver activity and can occasionally occur along low-gradient streams. Soils are usually poorly developed and contain high percentages of gravel and cobbles. Water table depths range from surface level to greater than 1 m. Open, corridor-like canopies

characterize this major riparian alliance with a dense graminoid layer in the understory. They are cold-deciduous, temporarily flooded shrublands that are dominated by *Salix drummondiana*. *Alnus incana* and *Salix geyeriana* are often present in the shrub layer. The graminoid layer is dominated by *Calamagrostis canadensis* with cover of 50-75%. *Carex aquatilis* and *Carex utriculata* can be present is lesser amounts (0-30% cover). Forb cover is relatively low. It is characterized by *Geum macrophyllum*, *Equisetum arvense*, and *Canadanthus modestus (= Aster modestus)*. *Populus tremuloides* woodlands and *Abies lasiocarpa - Picea engelmannii* forests occur on adjacent hillsides.

Environment: This alliance occurs on alluvial terraces adjacent to mountain rivers and streams. They range in elevation from 2135-3300 m. Occurrences occupy slopes that range from 5-30%. These shrublands occur as small, isolated patches in forest and shrubland openings along channels in narrow valley bottoms along steep, narrow stream margins. They are often associated with beaver activity and can occasionally occur along low-gradient streams. Soils are usually poorly developed and contain high percentages of gravel and cobbles. Soil textures range from silt to clay loam. Water tables range from surface levels to greater than 1 m (Hansen et al. 1995). Mottles and gleyed soil are common at any depth. According to Johnston (1987), the soils classify as Cryaquolls and Cryaquepts. *Populus tremuloides* woodlands and *Abies lasiocarpa - Picea engelmannii* forests occur on adjacent hillsides.

Vegetation: This major riparian alliance is characterized by open, corridor-like canopies with a dense graminoid layer in the understory. They are cold-deciduous, temporarily flooded shrublands that are dominated by *Salix drummondiana*. *Alnus incana* and *Salix geyeriana* are often present in the shrub layer. The graminoid layer is dominated by *Calamagrostis canadensis* with a percent cover of 50-75%. *Carex aquatilis* and *Carex utriculata* can be present is lesser amounts (0-30% cover). Forb cover is relatively low. It is characterized by *Geum macrophyllum*, *Equisetum arvense*, and *Canadanthus modestus (= Aster modestus)*.

Dynamics: Grazing pressure by livestock will cause a decrease in the more desirable native grasses such as *Calamagrostis canadensis* with a corresponding increase in hay grasses and shrubs (Hansen et al. 1995).

Similar Alliances:

- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)

Similar Alliance Comments: The ~*Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)$$ differs because the surface water is present for extended periods especially early in the growing season, instead of brief periods as in the temporarily flooded alliance. Additionally, the water table is at or near the surface as opposed to well beneath the soil surface as in the temporarily flooded alliance.

ALLIANCE DISTRIBUTION

Range: This alliance has been described from the Rocky Mountains, including Montana south into Colorado, and eastern Washington. It is likely that this alliance is more widespread and could occur elsewhere in the West, as well as parts of Canada.

Nations: CA, US

Subnations: AB, BC?, CO, ID, MT, OR, WA, WY

TNC Ecoregions: 7:C, 9:C, 10:C, 11:C, 19:C, 20:C

USFS Ecoregions: M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1986, Baker 1989b, Boggs et al. 1990, Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Hansen et al. 1989, Hansen et al. 1991, Hansen et al. 1995, Hickman 1993, Hitchcock et al. 1964, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Manning and Padgett 1995, Mutz and Queiroz 1983, Phillips 1977, Sanderson and Kettler 1996, Tuhy and Jensen 1982

[CEGL001192] *Salix drummondiana* / Mesic Forbs Shrubland

Translated Name: **Drummond's Willow / Mesic Forbs Shrubland**

Common Name: **Drummond's Willow / Mesic Forbs**

Ecological System(s):

- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This riparian shrubland most commonly occurs on relatively steep streams and rarely forms more than a narrow, 1.5- to 7.5-m (5-25 feet) wide band along streambanks. It is known from the mountains of Colorado, Utah, Wyoming and Montana, from 960-3450 m (3150-11,300 feet). It occurs in narrow, V-shaped valleys as a dense, narrow band along high-gradient (1-41%) streams and as large willow shrublands in broad valleys, 50-305 m (150-1000 feet) wide, along low-gradient (1-3%), moderately sinuous streams. Stands also occur along broad, highly sinuous streams and broad, actively down-cutting channels. This association can also occur near seeps. Soils range from deep sandy loams and sandy clay loams with no coarse fragments to shallow silty clay

loams and sandy clay loams over coarse, angular cobbles. The closed to partially open canopy of *Salix drummondiana* and a thick carpet of many forb species, with no single species dominant nor consistently present, characterize this plant association.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The stands that define this association occur on a terrace, in a channel, or on slopes no greater than 30%. Elevations for these stands range from 6459 to 8681 feet. Soil data are available for two stands; the moderately well-drained sandy clay loams or loams are covered predominantly by litter and duff. Other ground cover components that may be present include rocks greater than 10cm, gravel, wood, bare soil, and mosses. One stand is situated on a concave seep drainage adjacent to a convex toeslope supporting forb meadows separated by *Abies lasiocarpa – Picea engelmannii* patches. Adjacent vegetation to other stands may include coniferous forests or *Populus tremuloides* stands.

Global Environment: This riparian shrubland most commonly occurs on relatively steep streams and typically forming a narrow, 1.5- to 7.5-m (5-25 feet) band along streambanks, from 960-3500 m (3150-11,300 feet) in elevation. It occurs in narrow, V-shaped valleys as a dense, narrow band along high-gradient (1-41%) streams, but can also occur as large willow shrublands in broad valleys, 50-300 m (150-1000 feet) wide, along low-gradient (1-3%), moderately sinuous streams. It also occurs along broad, highly sinuous streams and broad, actively down-cutting channels. This association also occur near seeps. Soils range from deep sandy loams and sandy clay loams with no coarse fragments to shallow silty clay loams and sandy clay loams over coarse, angular cobbles.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix drummondiana* dominates the tall and short shrub strata (12 to 70% cover). A variety of short shrubs are present in one plot with no more than 7% cover, although most occur in trace amounts. Conifers may also be present in trace to low quantities within the shrub layer. Graminoids are diverse and have 1 to 7% cover each but none have 50% constancy. Common genera include *Bromus, Carex,* and *Elymus.* Forbs are diverse and dominate the herbaceous layer; species present in over half the stands include *Heracleum maximum, Delphinium* x *occidentale, Thalictrum occidentale, Geranium viscosissimum,* and *Chamerion angustifolium.* Many other species occur in less than half the stands, but may contribute significantly to the herbaceous cover of individual stands.

Global Vegetation: *Salix drummondiana* forms an open to closed canopy of tall shrubs lining the streambank with 20-98% cover. Several other shrub species may be present, some with equal cover, but none that exceed that of *Salix drummondiana*. Other shrub species that may be present include *Salix brachycarpa, Salix planifolia*, and *Alnus incana* in Colorado, and *Salix glauca, Ribes lacustre, Lonicera involucrata,* and *Alnus viridis* in Montana. Mature trees may be present, not forming a true overhead canopy, but a few individuals may be scattered about the shrubland or with their canopy leaning over from an adjacent forested association. Tree species that may be present include *Picea engelmannii, Abies lasiocarpa, Populus angustifolia*, and *Populus tremuloides*. The herbaceous undergrowth in some stands is sparse due to heavy shade and shallow soils. Other stands have a rich diversity of forbs and graminoids in the undergrowth. In general, total forb cover exceeds that of graminoid cover, and no single species is dominant. Forb species include *Mertensia ciliata, Heracleum maximum (= Heracleum lanatum), Thalictrum occidentale, Cardamine cordifolia, Oxypolis fendleri, Hydrophyllum fendleri, Galium triflorum, Rudbeckia occidentalis, Saxifraga odontoloma, Solidago canadensis, Angelica arguta, Cirsium arvense, Delphinium X occidentale, Eucephalus engelmannii, Ligusticum filicinum, Maianthemum stellatum, Valeriana occidentalis*, and *Delphinium barbeyi*. Graminoid species include *Carex utriculata, Equisetum arvense*, and *Calamagrostis canadensis*.
Global Dynamics: More disturbed stands tend to have a higher number and abundance of increaser non-native forbs such as *Cirsium, Taraxacum*, and non-native *Galium* species.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix drummondiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Delphinium x *occidentale*	Herb (field)	Forb	X	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Thalictrum occidentale	Herb (field)	Forb	X	X	.
Taraxacum officinale	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Bromus spp.	characteristic graminoids
Carex spp.	characteristic graminoids
Elymus spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix drummondiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Heracleum maximum	Herb (field)	Forb	X	.	.

Thalictrum occidentale	Herb (field)	Forb	X	.	.
Urtica dioica	Herb (field)	Forb	X	.	.

Higher Taxon	Note
other *Salix* spp.	are dominant tall shrubs
Alnus spp.	are dominant tall shrubs
Osmorhiza spp.	are dominant forbs

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Agrostis stolonifera	-	P	exotic
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (7-Apr-1998).

RELATED CONCEPTS

Global Similar Associations:
- *Salix drummondiana / Calamagrostis canadensis* Shrubland (CEGL002667)

Global Related Concepts:
- *Salix drummondiana*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association was sampled southeast of Marion Lake, in Granite Canyon, and in Death Canyon.

Global Range: This plant association occurs in Colorado, Montana and Alberta, Canada. It is likely to be more widespread, but is currently undocumented elsewhere.
Nations: CA, US
States/Provinces: AB, CO:S4, MT, WY
TNC Ecoregions: 7:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added (GK 1-04).
USFS Ecoregions: M331D:CC, M331G:CC, M331H:CC, M331I:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C019, GT-03A076
Accuracy Assessment Points: 04X042, 04X043, 04J245
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cooper and Cottrell 1990	.	X	.	X	.	.	.	.	.

Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	.	.	.	.	.
Kittel et al. 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Phillips 1977	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-077] *Salix drummondiana* / Mesic Graminoids Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on valley floors, with one on a south-facing toeslope with a gradient of 25%. The elevations for these stands are 7600 to 7900 feet. Two stands occur near or on islands in streams and the other stand is in an unspecified moist environment. Two stands show evidence of ungulate browsing. Adjacent vegetation may include *Calamagrostis rubescens* grasslands, *Abies lasiocarpa* stands, and/or other *Salix* spp. riparian areas. The stand that occurs on an island of a braided drainage is surrounded by islands with dense cover of *Salix drummondiana*.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a willow shrubland that occurs on mesic sites. *Abies lasiocarpa* occurs in two stands as either pole sized trees or seedlings. The short shrub stratum is dominated by *Salix drummondiana* with 12 to 60% cover. Unidentified *Salix* species occur in two stands with 1 to 7% cover. The herbaceous layer is dominated by graminoids. Graminoids may be diverse and constitute a high amount of cover for individual stands, but the only graminoid to occur in more than one stand is *Poa pratensis* with 3 and 20% cover. No forb occurs in more than one stand or with more than 3% cover.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Salix drummondiana*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Salix drummondiana, Poa pratensis

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Death Canyon and on an island in a braided section of the Cascade Canyon drainage.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J035, 04J246, 04R114
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-077
Local Author: Mark Fain
Date: 05 November 2004
Local Editor: Klara Varga
Date: 13 December 2004

Global Author:

REFERENCES: None

A.975 *Salix geyeriana* Temporarily Flooded Shrubland Alliance

Geyer's Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this riparian shrubland alliance occur from the foothills to high elevations in the mountains of the western United States. Elevation ranges from 1320-2900 m. Landforms include broad benches and alluvial terraces of streams, springs, and seeps. Stands often develop on abandoned and sediment-filled beaver ponds. Soils are composed of deep, fine-textured alluvium over subsurface soils of various textures and origin. Soils have a high water-holding capacity. A tall-shrub layer dominated by *Salix geyeriana* characterizes these communities. Occasional codominants include *Salix monticola*, *Salix boothii*, *Salix lemmonii*, or *Salix eriocephala*. Some stands have shorter willows in the understory, including *Salix wolfii* and *Salix planifolia*. Other shrub species include *Lonicera utahensis*, *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides fruticosa)*, and *Ribes* spp. *Calamagrostis canadensis*, *Calamagrostis stricta*, *Poa palustris*, *Deschampsia caespitosa*, *Carex aquatilis*, and *Carex utriculata* are the dominant graminoid species with 10-60% cover. The forb layer is minor with 10-20% cover and includes *Geum macrophyllum*, *Pyrola asarifolia*, *Galium trifidum*, and *Epilobium ciliatum*. *Populus tremuloides*, *Pinus contorta*, and *Pinus ponderosa* forests occur on surrounding hillslopes.
Environment: Communities within this alliance occur from the foothills to high elevations in the mountains of the western United States. Elevation ranges from 1320-2900 m. Landforms include broad benches and alluvial terraces of streams, springs, and seeps.

Stands often develop on abandoned and sediment-filled beaver ponds. Soils are composed of deep, fine-textured alluvium over subsurface soils of various textures and origin. Surface textures are sandy to sandy clay loam with mottling near the surface. Soils have a high water-holding capacity. *Populus tremuloides, Pinus contorta*, and *Pinus ponderosa* forests occur on surrounding hillslopes.

Vegetation: Communities within this alliance are classified as temporarily flooded cold-deciduous shrublands. These communities are characterized by a tall-shrub layer dominated by *Salix geyeriana*. Occasional codominants include *Salix monticola, Salix boothii, Salix lemmonii* or *Salix eriocephala*. Some stands have shorter willows in the understory, including *Salix wolfii* and *Salix planifolia*. Other shrub species include *Lonicera utahensis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides fruticosa)*, and *Ribes* spp. *Calamagrostis canadensis, Calamagrostis stricta, Poa palustris, Deschampsia caespitosa, Carex aquatilis*, and *Carex utriculata* are the dominant graminoid species with 10-60% cover. The forb layer is minor with 10-20% cover and includes *Geum macrophyllum, Pyrola asarifolia, Galium trifidum*, and *Epilobium ciliatum*.

Dynamics: Characteristics of the herbaceous layer and soils suggest that many of the vegetation types within this alliance are stable (Youngblood et al. 1985b). However, livestock grazing pressure will cause a decrease in the native graminoids (Hansen et al. 1995).

Similar Alliances:

- *Salix geyeriana* Seasonally Flooded Shrubland Alliance (A.1006)

Similar Alliance Comments: The ~*Salix geyeriana* Seasonally Flooded Shrubland Alliance (A.1006)$$ differs from the ~*Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)$$ due to hydrologic regime. The seasonally flooded shrubland has surface water present for extended periods of time, especially during the early part of the growing season. The water table is at or near the soil surface. The temporarily flooded shrubland has surface water present for only brief periods during the growing season, and the water table usually lies well below the soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread throughout the Rocky Mountains, Great Basin, and the Pacific Northwest.

Nations: US

Subnations: CA?, CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions: 4:C, 6:C, 7:C, 9:C, 10:C, 11:C, 19:C, 20:C

USFS Ecoregions: 313B:??, 341D:CC, 342B:CC, 342C:CC, 342D:CC, M242A:CC, M242C:CC, M331A:CC, M331B:C?, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC, M333C:CC, M341A:CC

Federal Lands: NPS (Curecanti, Glacier, Grand Teton, Rocky Mountain); USFS (Arapaho-Roosevelt, Deschutes, Fremont, Pike-San Isabel, Rio Grande, Routt, San Juan, Shoshone?, Winema)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1986, Baker 1989b, Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Hallock et al. 1986, Hansen et al. 1995, Hess 1981, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kagan 1997, Kearney et al. 1969, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, MTNHP unpubl. data, Mutz and Queiroz 1983, Norton et al. 1981, ORNHP unpubl. data, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001210] *Salix geyeriana* / Mesic Graminoids Shrubland

Translated Name: **Geyer's Willow / Mesic Graminoids Shrubland**

Common Name:

Ecological System(s):

- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): C. Murphy

ELEMENT CONCEPT

Global Summary: This is an important association in Idaho, Oregon, Montana, Utah, Colorado, and northwestern Wyoming. Stands of this association are often found in wide mountain valleys, cirques, and troughs, at elevations from about 1525 to 2745 m (5000-9000 feet) with narrow, meandering streams or braided rivers. The association mainly occurs on seasonally saturated or flooded sites such as streambanks, terraces, floodplains, abandoned meanders, spring-fed meadows, lake or reservoir shores, and occasionally alluvial gravel bars. Soils vary but are mostly silt to clay loams with organic/sedge peat horizons. An open canopy of tall, clumped *Salix geyeriana*, with occasionally intermixed *Salix boothii* (with <20% cover), characterizes this association. Other shrubs, including *Dasiphora fruticosa ssp. floribunda, Ribes* spp., *Rosa woodsii*, and low *Salix* spp., are scattered around the bases of taller *Salix* clumps. The herbaceous understory is dominated by a diverse mix of mesic graminoid species that always has greater total cover than the total cover of mesic forbs. In good-condition, mid- to late-seral stands, the most common graminoids are *Carex microptera, Carex pellita, Deschampsia caespitosa*, and occasionally *Carex nebrascensis*, but no single species consistently has high cover. Other graminoids with moderate cover and constancy include *Calamagrostis canadensis, Carex aquatilis, Carex praegracilis, Carex*

rostrata, Carex utriculata, Glyceria spp., and *Juncus balticus*. *Poa pratensis* is present in nearly all stands, but its cover varies depending on the amount of grazing disturbance and site desiccation. Stands in poor condition need to be codominated by a mixture of native graminoids (not a single species such as *Deschampsia caespitosa*) with the introduced graminoids and forbs. The most common forb species are sometimes indicative of grazing disturbance (e.g., *Achillea millefolium, Geum macrophyllum, Iris missouriensis, Maianthemum stellatum, Potentilla gracilis, Thalictrum* spp., *Taraxacum officinale*, and *Trifolium* spp.).

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor. All stands, except one, are seasonally flooded. The elevations of the stands range from 6699 to 6900 feet. The soil textures for these stands include loam, silty clay loam, poorly drained silty clay, and moderately well drained clay loam. Two of the stands with detailed descriptions of the ground cover contain 90 to 100% litter and duff ground cover. One plot is surrounded by *Artemisia tridentata* and another is surrounded by unspecified burnt areas.

Global Environment: This riparian shrubland association is found in Idaho, Oregon, Montana, Utah, Colorado, and northwestern Wyoming. Stands of this association are often found in wide mountain valleys, cirques, and troughs, at elevations from about 1525 to 3000 m (5000-9900 feet), with narrow, meandering streams or braided rivers. The association mainly occurs on seasonally saturated or flooded sites such as streambanks, terraces, floodplains, abandoned meanders, spring-fed meadows, lake or reservoir shores, and occasionally alluvial gravel bars. Soils vary but are mostly silt to clay loams with organic/sedge peat horizons.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on mesic sites. The shrub layer is dominated by *Salix geyeriana* contributing between 12 and 70% canopy cover with *Dasiphora floribunda* occurring in over half the stands with 7 to 20% cover. The herbaceous layer is very diverse with no species dominating. High constancy graminoids are *Poa pratensis, Phleum pratense,* and *Carex* spp. contributing up to 60% canopy cover. Forbs that occur in more than half the stands include *Cirsium arvense, Potentilla gracilis, Fragaria virginiana, Trifolium repens, Maianthemum stellatum, and Achillea millefolium.*

Global Vegetation: This plant association is a tall (2-5m), deciduous shrubland with an open to nearly closed canopy of clumped willows and a thick layer of sedges and grasses in the undergrowth. Dominance of *Salix geyeriana* (20-70% cover), occasionally intermixed with *Salix boothii* (with <20% cover), characterizes this association. Other shrubs, including *Alnus incana ssp. tenuifolia, Dasiphora fruticosa ssp. floribunda, Ribes inerme, Ribes lacustre, Rosa woodsii,* and other *Salix* spp. such as *Salix drummondiana, Salix lemmonii, Salix monticola, Salix planifolia,* or *Salix wolfii* are scattered around the bases of taller *Salix* clumps. The herbaceous understory is dominated by a diverse mix of mesic graminoid species that always has greater total cover than the total cover of mesic forbs. In good-condition, mid- to late-seral stands, the most common graminoids are *Carex microptera, Carex pellita, Deschampsia caespitosa*, and occasionally *Carex nebrascensis*, but no single species consistently has high cover. Other graminoids with low to moderate cover and constancy include *Calamagrostis canadensis, Carex aquatilis, Carex athrostachya, Carex pellita (= Carex lanuginosa), Carex praegracilis, Carex rostrata, Carex simulata, Carex subnigricans, Carex utriculata, Glyceria* spp., *Juncus balticus, Juncus orthophyllus,* and *Muhlenbergia richardsonis*. Introduced grasses *Phleum pratense* and *Poa pratensis* are frequently present, but their cover varies depending on the amount of grazing disturbance and site desiccation. Stands in poor condition need to be codominated by a mixture of native graminoids (not a single species such as *Deschampsia caespitosa*) with the introduced graminoids and forbs. The most common forb species are sometimes indicative of grazing disturbance (e.g., *Achillea millefolium, Antennaria* spp., *Caltha leptosepala, Geum macrophyllum, Iris missouriensis, Maianthemum stellatum, Pedicularis groenlandica, Penstemon* spp., *Polygonum bistortoides, Potentilla gracilis, Thalictrum* spp., *Taraxacum officinale, Trifolium* spp., and *Urtica dioica*).

Global Dynamics: The high cover of grasses and sedges makes this association highly productive for livestock forage. In addition, this association has many corridors between willow clumps that allow for livestock access (Padgett et al. 1989, Hansen et al. 1995, Walford et al. 2001). These attributes make this type susceptible to overgrazing and conversion of the understory from native species to exotic grasses. While stands do exist in less disturbed, late-seral states with native understory species, it is more often expressed as disturbance-induced (e.g., by livestock grazing) states (Padgett et al. 1989, Manning and Padgett 1995, Weixelman et al. 1996, Walford et al. 2001). Similarly, understory shrub and forb composition may be the result of grazing disturbance (Weixelman et al. 1996, Hansen and Hall 2002). Thus, it is hypothesized that under persistent, heavy livestock grazing the association will move toward *Salix geyeriana / Poa pratensis, Salix geyeriana / Poa palustris, Salix geyeriana* / mesic graminoid-forb, or *Salix geyeriana* / mesic forbs (Youngblood et al. 1985a, Padgett et al. 1989, Evenden 1990, Walford et al. 2001). Overgrazing may directly or indirectly eliminate *Salix geyeriana* by decreasing its vigor or altering hydrologic conditions (Hansen and Hall 2002). The resulting associations may be drier types such as *Poa pratensis* meadows or other associations. Alternatively, *Salix geyeriana* / mesic graminoids possibly originated from *Salix geyeriana / Calamagrostis canadensis, Salix geyeriana / Carex aquatilis, Salix geyeriana / Carex rostrata*, or *Salix geyeriana / Deschampsia caespitosa* associations which have been disturbed by grazing, or alterations in hydrology, and subsequently invaded by various mesic graminoid species (Mutz and Queiroz 1983, Youngblood et al. 1985a, Padgett et al. 1989, Hansen et al. 1995, Manning and Padgett 1995, Walford et al. 2001, Hansen and Hall 2002, IDCDC 2002).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Dasiphora floribunda	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Cirsium arvense	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Maianthemum stellatum	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Trifolium repens	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Phleum pratense	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	dominant and characteristic graminoids
Salix spp.	dominant and characteristic tall shrubs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Carex microptera	Herb (field)	Graminoid	X	X	.
Carex pellita	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Cirsium vulgare	-	P	exotic
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Rumex acetosella	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium pratense	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	invasive
Cirsium vulgare	-	P	invasive
Medicago lupulina	-	P	invasive
Rumex acetosella	-	P	invasive
Taraxacum officinale	-	P	invasive
Trifolium pratense	-	P	invasive
Trifolium repens	-	P	invasive
Phleum pratense	-	P	invasive
Poa pratensis	-	P	invasive

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (22-Oct-2002). This association is widely distributed at mid to high elevations, ranging from the Great Basin to the Central Rockies, north to central and eastern Idaho and adjacent Wyoming. Extensive stands of the association are relatively frequently observed in a wide variety of fluvial settings, but they are especially common on seasonally wet sites in wide montane valley bottoms (e.g., glacial troughs and basins). This association is distinguished by having moderate cover and constancy of mixed mesic graminoid species, none of which are distinctly dominant. The high cover of mesic graminoids under an open *Salix geyeriana* canopy makes this association susceptible to overgrazing by livestock and conversion of the understory to dominance by exotic grasses (e.g., *Poa pratensis*). While stands of this type do exist in less disturbed, late-seral states with native understory species, the association is more often expressed as disturbance-induced stands. If stands in poor to fair ecological condition with understories dominated by exotic grass species are not considered, the total known occurrences of this association is probably less than 100. Unfortunately, this is a broadly defined type that sometimes encompasses *Salix geyeriana / Poa pratensis* and other

disturbance-induced *Salix geyeriana* stands with no clearly dominant understory graminoid species. In addition, some stands dominated by *Salix boothii* are also included within this association based on similarities in environmental setting and composition. This broad lumping is problematic for determining a clear definition of this association and assessing its true extent across its range. More in-depth analysis of existing stand data needs to occur in order to determine the actual number of occurrences. Until this occurs, G3? is an appropriate rank.

RELATED CONCEPTS

Global Similar Associations:
- *Salix geyeriana / Carex aquatilis* Shrubland (CEGL001206)

Global Related Concepts:
- *Salix geyeriana* / Mesic Graminoid Community Type (Manning and Padgett 1995) =
- *Salix geyeriana* / Mesic Graminoid Community Type (Padgett et al. 1989) =
- *Salix geyeriana* / Mesic Graminoid-Forb Community Type (Evenden 1990) B
- *Salix geyeriana* Community Type (Hansen and Hall 2002) I
- *Salix geyeriana* Community Type (Hansen et al. 1995) I
- *Salix geyeriana*/Mesic graminoid (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
GRAND TETON NATIONAL PARK Other Comments: The two plots that have 20% canopy cover of *Poa pratensis* occur west of Triangle X Ranch. This association is similar to the *Salix geyeriana – Salix wolfii* / Mesic Graminoids association, but is differentiated by the absence of *Salix wolfii* as a dominant species.

Global Classification Comments: This association has a high cover and constancy of *Poa pratensis* and may be anthropogenic. This is a widespread, well-sampled association. It has been sampled throughout eastern Idaho (5 plots by Youngblood et al. 1985a; 2 plots by Padgett et al. 1989) and across central Idaho (at least 6 plots) (IDCDC 2002). The association has been sampled in northwestern Wyoming (6 plots by Walford et al. 2001), Utah (4 plots by Padgett et al. 1989), northern and central Nevada (9 plots by Manning and Padgett 1995). An unknown portion of 71 plots sampled in Montana (Hansen et al. 1995) and 58 plots sampled in southeastern Idaho (Hansen and Hall 2002) of a broader *Salix geyeriana* community type likely include stands fitting this association. When ecological conditions are good, this type is clearly distinguished from other *Salix geyeriana*-dominated stands by having moderate cover and constancy of mixed native mesic graminoid species including (but not limited to) *Calamagrostis canadensis*, *Carex aquatilis*, *Carex pellita*, *Carex utriculata*, and/or *Deschampsia caespitosa*, none of which are distinctly dominant. This can cause confusion with *Salix geyeriana* associations named for dominance of any one of these species (Mutz and Queiroz 1983, Youngblood et al. 1985a, Padgett et al. 1989, Hansen et al. 1995, Manning and Padgett 1995, Walford et al. 2001, Hall and Hansen 2002, Crowe et al. 2002). This association is a broadly defined type that encompasses *Salix geyeriana / Poa pratensis* (as in Padgett et al. 1989) and other disturbance-induced *Salix geyeriana* stands with no clearly dominant understory graminoid species (as in Evenden 1990). Some stands dominated by *Salix boothii* are also included based on similarities in environmental setting and composition (Hansen et al. 1995, Hansen and Hall 2002). This broad lumping is problematic for determining a clear definition of this association and assessing its true extent.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One plot occurs east of Half Moon Bay, one occurs south of Cow Lake, one occurs southeast of The Potholes, one occurs in the Snake River Channel east of Burnt Ridge, and the other occurs east of the highway near Snake River Pit.

Global Range: This association is widely distributed in the West at mid to high elevations, ranging from Idaho, Wyoming, Utah, Nevada, Colorado, and possibly California, Montana and Oregon.
Nations: US
States/Provinces: CO:S3, ID, NV, UT:S2S3, WY
TNC Ecoregions: 6:C, 7:C, 9:C, 10:C, 11:C, 19:C, 20:C
TNC Ecoregion Comments: ECO7 & ECO9 added (MSR 10-02).
USFS Ecoregions: 341D:CC, 342B:CC, 342D:CC, M331A:CC, M331D:CC, M331I:CC, M333C:CC, M341A:CC
Federal Lands: NPS (Curecanti, Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A020, GT- 03A095, GT-0201025
Accuracy Assessment Points: 04R201, 04X459
Other plots within park boundaries, from other projects: None

Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. Varga
Global Description Author(s): C. Murphy, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Crowe et al. 2002	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Evenden 1990	.	.	X	X	X	.	.	.	.
Hansen and Hall 2002	.	X	X	X	X	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
IDCDC unpubl. data 2002	.	X	.	X	X	.	.	.	.
Kovalchik 2001	.	.	.	.	X	.	.	.	.
Manning and Padgett 1995	.	X	X	X	X	.	.	.	.
Mutz and Queiroz 1983	.	.	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Norton et al. 1981	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Walford et al. 2001	.	X	.	X	X	.	.	.	.
Weixelman et al. 1996	.	.	.	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	X	.	.	.	.

[PARK SPECIAL GRTE-033] *Salix geyeriana – Salix wolfii* / Mesic Graminoid Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on the valley floor at elevations around 6800 feet. The sampled stands are located on uplands or in intermittently flooded palustrine areas. Where data are available soils are either poorly-drained sandy loams or moderately well-drained loams. Litter and duff (80 and 100% cover) dominate the unvegetated and non-vascular ground surface. Lichens, bare soil, wood, or fungi may be present in trace quantities. Adjacent vegetation to one stand includes low density *Pinus contorta* poles and *Artemisia tridentata – Artemisia cana* shrublands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The tall shrub stratum is dominated by either *Salix geyeriana* (30% cover) or *Salix lemmonii* (30 to 60% cover), although the latter occurs in less than half the stands. Mixes of these species or hybrids between these species are also possible within the tall shrub layer. The short shrub stratum is composed primarily of *Salix wolfii* (7 to 40% cover) with low cover by*Salix boothii, Lonicera involucrata,* and *Dasiphora floribunda.* The most common graminoid species present are *Poa pratensis, Deschampsia caespitosa, Juncus balticus, Bromus* spp., and *Carex* spp. Forbs within the herbaceous layer are diverse but are not necessarily present in large quantities. Forb species present in at least half the stands include *Fragaria virginiana, Achillea millefolium, Geum macrophyllum, Potentilla gracilis, Pedicularis groenlandica,* and *Taraxacum officinale.*

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TALL SHRUB	*Salix geyeriana, Salix lemmonii*
SHORT SHRUB	*Salix wolfii*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Salix boothii, Salix geyeriana, Salix wolfii, Bromus spp., *Carex* spp., *Deschampsia caespitosa, Juncus balticus, Poa pratensis, Achillea millefolium, Fragaria virginiana, Geum macrophyllum, Pedicularis groenlandica, Potentilla gracilis, Taraxacum officinale*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Phleum pratense, Poa pratensis, Cirsium arvense, Taraxacum officinale, Trifolium pratense, Trifolium repens*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This association fits the Walford et al. (2001) *Salix geyeriana* / Mesic graminoid Community Type well. The vegetation structure described by this study is very similar to the stands sampled in GTNP. Either *Salix geyeriana* or *Salix lemmonii* may compose the tall shrub layer. These are closely related species whose taxonomy is poorly understood (Brunsfeld and Johnson, 1985).

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Salix geyeriana /* Mesic Graminoids association, but is differentiated by the presence of *Salix wolfii* as a co-dominant component of the shrub layer.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Willow Flats, south of Two Ocean Lake near Pacific Creek, near Jackson Lake Lodge, and in the John D. Rockefeller Memorial Parkway.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202021, GT-03A018, GT-03C008
Accuracy Assessment Points: 04J102, 04R220, 04X531
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-033

Local Author: Rob Massatti
Date: 6 April 2004
Local Editor: Klara Varga
Date: 7 April 2004
Re-write: Mark Fain
Date: 03 November 2004
Re-edit: Klara Varga
Date: 14 December 2004

Global Author:

REFERENCES: None

A.963 *Salix glauca* Temporarily Flooded Shrubland Alliance

Grayleaf Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this alliance occur in dry areas in the lower alpine and upper subalpine habitats. They occupy a narrow belt immediately above timberline with a range of elevation from 2590-3810 m. Landforms can include dry, rocky slopes to mesic meadows, typically of early-melting snowpatches. The plant associations within this alliance are specific to well-drained, mineral soils of mesic environments. They occur primarily on protected, low slopes of moderately inclined (20-45%), non-southerly exposed terrain. Sites representing these associations are found on alluvial and colluvial parent materials of granitic, gneiss, and schist origins. The soils originating from these parent materials are Inceptisols. Communities within this alliance are characterized as cold-deciduous, temporarily flooded shrublands. The short-shrub layer is dominated by *Salix glauca* with 60-100% cover. The graminoid layer is typically continuous with 25-60% cover and dominated by *Deschampsia caespitosa*. Other graminoids can include *Carex heteroneura var. chalciolepis, Festuca brachyphylla*, and *Trisetum spicatum*. The forb layer is sparse (10-25% cover), consisting of *Artemisia scopulorum, Castilleja occidentalis, Geum rossii*, and *Polygonum bistortoides*. Adjacent upslope communities are typically subalpine fir/Engelmann spruce.
Environment: Vegetation types within this alliance occur in dry areas in the lower alpine and upper subalpine habitats. They occupy a narrow belt immediately above timberline with a range of elevation from 2590 to 3810 m (Dorn 1997, Hess 1981). Landforms can include dry, rocky slopes to mesic meadows, typically of early-melting snowpatches (Komarkova 1986).

The plant associations within this alliance are specific to well-drained, mineral soils of mesic environments. They occur primarily on protected, low slopes of moderately inclined (20-45%), non-southerly exposed terrain.

Sites representing these associations are found on alluvial and colluvial parent materials of granitic, gneiss, and schist origins. The soils originating from these parent materials are Inceptisols (Hess 1981, Komarkova 1986, Padgett et al. 1989).

Adjacent upslope communities are typically subalpine fir/Engelmann spruce.
Vegetation: Communities within this alliance are characterized as cold-deciduous, temporarily flooded shrublands. The short-shrub layer is dominated by *Salix glauca* with 60-100% cover. The graminoid layer is typically continuous with 25-60% cover and dominated by *Deschampsia caespitosa*. Other graminoids can include *Carex heteroneura var. chalciolepis, Festuca brachyphylla*, and *Trisetum spicatum*. The forb layer is sparse (10-25% cover), consisting of *Artemisia scopulorum, Castilleja occidentalis, Geum rossii*, and *Polygonum bistortoides*.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance occurs within alpine and subalpine meadows in the Rocky Mountains of Colorado, Wyoming, Montana, and Utah, and Alberta, Canada.
Nations: CA, US
Subnations: AB, CO, MT, UT, WY
TNC Ecoregions: 7:C, 9:C, 10:C
USFS Ecoregions: M331A:C?, M331D:CC, M331I:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Beaverhead)

ALLIANCE SOURCES

Author(s): D. Culver
References: Cooper and Lesica 1992, Dorn 1997, Heifner 1974, Hess 1981, Hess and Wasser 1982, Johnston 1987, Komarkova 1986, Padgett et al. 1989, Terwilliger et al. 1979a, Wasser and Hess 1982

[CEGL001136] *Salix glauca* Shrubland

Translated Name: **Grayleaf Willow Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This cold-deciduous, mesic, subalpine shrubland occurs on moderate to steep slopes at elevations between 1770 and 3000 m (5800-9900 feet), in areas of snow catchment, fluvial and colluvial landforms, talus and scree in avalanche paths. Stands are mesic and can be temporarily flooded by seasonal runoff. Soils are thin, poorly developed and well-drained with or without calcareous sandstone gravels. Stands can occur as a uniform shrubland or, in the alpine, within ribbons that alternate with talus and scree. Stands are dominated by *Salix glauca* with 25-60% cover. Co-occurring shrub species are highly variable. In Glacier National Park, *Spiraea betulifolia, Amelanchier alnifolia, Penstemon fruticosus, Dasiphora fruticosa ssp. floribunda, Symphoricarpos occidentalis*, and *Arctostaphylos uva-ursi* can be present with 5-15% cover. *Abies lasiocarpa* seedlings may also be present in the shrub layer with low cover. In southeastern Montana and in Grand Teton National Park, stands had no other shrubs present. Graminoid cover is low (1-15%) with *Festuca campestris, Bromus inermis, Poa alpina, Trisetum spicatum*, or *Elymus caninus (= Agropyron caninum)*. Forb cover can be low to high with several species combined contributing 10-60%. Species present may include *Aquilegia flavescens, Hedysarum sulphurescens, Heracleum maximum, Thalictrum occidentale, Anemone multifida, Antennaria umbrinella, Arenaria congesta, Erigeron* sp., *Potentilla gracilis, Chamerion angustifolium, Oreostemma alpigenum (= Aster alpigenus), Castilleja miniata, Clematis occidentalis, Valeriana sitchensis*, and *Synthyris pinnatifida*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The single sampled stand of this association occurs on a shallow northwest-facing slope at an elevation of 2911 m (9550 feet). The soil is a well-drained loam that is very stony.
Global Environment: This association occurs on moderate to steep slopes at elevations between 1770 and 3000 m (5800-9900 feet) in areas of snow catchment, fluvial and colluvial landforms, talus and scree in avalanche paths. Stands are mesic and can be temporarily flooded by seasonal runoff. Soils are thin, poorly developed and well-drained, or calcareous sandstone, with high gravel or coarse-fragment content averaging 30%. Litter can be high due to slow decomposition. Stands in Glacier National Park are influenced by periodic avalanches and flooding. Elsewhere, the high elevation and more gentle slopes indicate more stable conditions. Thus, stands can occur as a uniform shrubland or, at higher alpine elevations, within ribbons that alternate with talus and scree.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is an alpine shrubland community that occurs on mesic sites. *Picea engelmannii* occurs in trace quantities in the tree canopy. *Salix glauca* (3% cover) is the only common shrub. Common graminoids with 3% cover each include *Poa alpina* and *Trisetum spicatum*. Common forbs with 3% cover each include *Antennaria umbrinella, Arenaria congesta, Erigeron* sp., *Oreostemma alpigenum*, and *Potentilla gracilis*. A variety of other forbs occur in trace quantities.
Global Vegetation: This cold-deciduous, mesic, subalpine shrubland is dominated by *Salix glauca* that ranges in cover from 3-60%. Co-occurring shrub species are highly variable. In Glacier National Park, *Spiraea betulifolia, Amelanchier alnifolia, Penstemon fruticosus, Dasiphora fruticosa ssp. floribunda, Symphoricarpos occidentalis*, and *Arctostaphylos uva-ursi* can be present with 5-15% cover. *Abies lasiocarpa* seedlings may also be present in the shrub layer with low cover. Further south in southeastern Montana and Grand Teton National Park, stands had no other shrubs present. Graminoid cover is low (1-15%) with *Festuca campestris, Bromus inermis, Poa alpina, Trisetum spicatum*, or *Elymus caninus (= Agropyron caninum)*. Forb cover can be low or high, 10-60%, with such species as *Aquilegia flavescens, Hedysarum sulphurescens, Heracleum maximum, Thalictrum occidentale, Anemone multifida, Antennaria umbrinella, Arenaria congesta, Erigeron* sp., *Potentilla gracilis, Chamerion angustifolium, Fragaria virginiana, Achillea millefolium, Symphyotrichum foliaceum (= Aster foliaceus), Oreostemma alpigenum (= Aster alpigenus), Castilleja miniata, Clematis occidentalis, Valeriana sitchensis*, and *Synthyris pinnatifida*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix glauca	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Antennaria umbrinella	Herb (field)	Forb	.	X	.

Arenaria congesta	Herb (field)	Forb	.	X	.
Oreostemma alpigenum	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Poa alpina	Herb (field)	Graminoid	.	X	.
Trisetum spicatum	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Erigeron sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix glauca	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Hedysarum sulphurescens	Herb (field)	Forb	X	X	.
Oreostemma alpigenum	Herb (field)	Forb	.	X	.
Poa alpina	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note		
Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Salix glauca / Deschampsia caespitosa* Shrubland (CEGL001137)

Global Related Concepts:
- *Salix glauca* (Bourgeron and Engelking 1994) =
- *Salix glauca* Community Type (Cooper et al. 1997) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: The name *Salix glauca* Shrubland is based on one plot published by Cooper et al. (1997). Two stands in Glacier National Park have much higher species richness, and related stands (mentioned in Cooper et al. (1997)) that occur in Alberta have yet again different species composition. The Glacier National Park and Cooper et al. (1997) plots fall into a general category of a *Salix glauca* / mesic forb type, while the other stands mentioned have various graminoid-dominated understories. More information is needed to determine if two different *Salix glauca* associations are warranted. Padgett et al. (1989) describe an unclassified plot dominated by *Salix glauca* with a forb undergrowth dominated by *Mertensia ciliata* on a rocky steep ephemeral stream in the Uinta Mountains in northern Utah that could be included in this concept.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs south of the North Fork of Granite Creek.
Global Range: This association occurs in Montana and Alberta, Canada
Nations: CA, US
States/Provinces: AB, MT:S2, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added (GK 1-04).
USFS Ecoregions: M331A:C?, M331D:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Beaverhead)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201044
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Lesica 1992	.	X	.	X	.	.	.	.	.
Cooper et al. 1997	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001137] *Salix glauca / Deschampsia caespitosa* Shrubland

Translated Name: **Grayleaf Willow / Tufted Hairgrass Shrubland**
Common Name: **Grayleaf Willow / Tufted Hairgrass**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s):

ELEMENT CONCEPT

Global Summary: No global information available at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occurs on an east-facing toeslope at an elevation of 9665 feet and the other sampled stand occurs on a valley floor at an elevation of 10,000 feet. Soil data is available for one stand; the soil is a well-drained gravelly loam. Small drainage rivulets involved with the spring melt occur in this stand and vicinity.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane to subalpine shrubland community that occurs on mesic sites. The short shrub stratum includes *Salix glauca* (10 and 12% cover) and *Salix brachycarpa*, which occurs in one stand with 12% cover. *Salix arctica* occurs in one stand with 7% cover as a dwarf shrub. Dominant graminoids include *Deschampsia caespitosa* (12 and 20% cover) in both stands and *Carex microptera* (7% cover) in one stand. Forbs that occur in both stands include *Caltha leptosepala* (12 and 30% cover), *Potentilla diversifolia* (1 and 3% cover), *Gentiana calycosa* (1% cover), and *Pedicularis groenlandica* (1% cover). Many other graminoids and forbs are present in just one stand with trace to 10% cover.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Salix glauca*
GRAMINOID	*Deschampsia caespitosa*
FORB	*Caltha leptosepala*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Salix glauca, Deschampsia caespitosa, Caltha leptosepala, Gentiana calycosa, Pedicularis groenlandica, Potentilla diversifolia

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
- *Salix glauca* Shrubland (CEGL001136)

Global Related Concepts:
- *Salix glauca/Deschampsia cespitosa* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand is located near Moose Basin Divide and the other is located in the south fork of Cascade Canyon at the base of Hurricane Divide.

Global Range:

Nations: US
States/Provinces: CO:S3S4, UT:S3?
TNC Ecoregions: 10:C, 20:C
TNC Ecoregion Comments: ECO20 added (mjr 7-05).
USFS Ecoregions: M331I:CC
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201082
Accuracy Assessment Points: 04R251
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** CEGL001137
Local Author: C. Brian Villalobos
Date: 02 April 2004
Local Editor: Klara Varga
Date: 10 April 2004
Re-write: Mark Fain
Date: 25 October 2004
Re-edit: Klara Varga
Date: 14 December 2004

Global Author: Western Ecology Working Group

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Heifner 1974	.	X	.	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
Hess and Wasser 1982	.	X	.	X	.	.	.	.	.
Komarkova 1986	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	.	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Wasser and Hess 1982	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.980 *Salix lutea* Temporarily Flooded Shrubland Alliance

Yellow Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this cold-deciduous, temporarily flooded shrubland alliance occur on alluvial terraces adjacent to mountain rivers and streams. They occupy broad floodplains (0-6% slope), stream and river edges, ditches, seeps, and moist alluvial terraces. Elevations range from 1100-3600 m. Soils on the alluvial terraces are usually a deep silt or sand. These soils are saturated early in spring and often remain moist throughout the growing season. The tall-shrub canopy is continuous and dominated by *Salix lutea* with varying amounts of *Salix exigua, Salix bebbiana*, and *Salix boothii*. The short-shrub layer's cover is typically 25% or greater and consists of *Ribes aureum, Ribes inerme*, and *Rosa woodsii*. The graminoid layer ranges from sparse to dense canopy cover. Major herbaceous species include *Calamagrostis canadensis, Carex utriculata, Calamagrostis stricta*, and *Carex microptera*.
Environment: Communities within this alliance occur on alluvial terraces adjacent to mountain rivers and streams. They occupy broad floodplains (0-6% slope), stream and river edges, ditches, seeps, and moist alluvial terraces. Elevations range from 1100-3600 m. Soils can range from Entisols to Mollisols. Soils on the alluvial terraces are usually a deep silt or sand. Stands adjacent to stream channels consist of a thin sandy loam overlying gravel or cobbles. These soils are saturated early in spring and often remain moist throughout the growing season. Adjacent upland communities include forests dominated by *Pinus contorta* and *Populus tremuloides.*
Vegetation: Vegetation types within this alliance are characterized as cold-deciduous, temporarily flooded shrublands. The tall-shrub canopy is continuous and dominated by *Salix lutea* with varying amounts of *Salix exigua, Salix bebbiana*, and *Salix boothii*. The short-shrub layer's cover is typically 25% or greater and consist of *Ribes aureum, Ribes inerme*, and *Rosa woodsii*. The graminoid layer ranges from sparse to dense percent cover. Major herbaceous species include *Calamagrostis canadensis, Carex utriculata, Calamagrostis stricta*, and *Carex microptera*.
Dynamics: If browsing pressure is heavy, willow coverages will decrease, resulting in more open communities. Grazing pressure by livestock will cause a decrease in the more desirable grasses with a corresponding increase in weedy species such as *Phleum pratense, Poa pratensis*, and *Agrostis stolonifera*.
Similar Alliances:
- *Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)

Similar Alliance Comments: The ~*Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)$$ differs because the surface water is present for extended periods especially early in the growing season, instead of brief periods as in the temporarily flooded alliance.

ALLIANCE DISTRIBUTION

Range: This alliance has been reported from scattered localities in the Great Basin and adjacent areas of the Rocky Mountains, as well as the northwestern Great Plains.
Nations: US
Subnations: CA, ID, MT, NV, OR, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 26:C
USFS Ecoregions: 331D:CC, 341D:CC, 341E:CC, 341G:CC, 342B:CC, 342C:CC, 342F:CC, 342H:CC, 342I:C?, M331A:C?, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333B:CC, M333C:C?, M333D:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Culver
References: Dorn 1997, Evenden 1990, Great Plains Flora Association 1986, Hansen et al. 1991, Hansen et al. 1995, Kagan 1997, Kartesz 1999, Kearney et al. 1969, Manning and Padgett 1992, Manning and Padgett 1995, Padgett 1982, Sawyer and Keeler-Wolf 1995

[CEGL002073] *Salix lutea* / Mesic Graminoids Shrubland

Translated Name: **Yellow Willow / Mesic Graminoids Shrubland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association occurs in mountain valleys at 1645 to 2585 m (5400-8480 feet) in elevation. It occurs on stream benches, streambanks, moist terraces and occasionally on seeps and meadows. Slopes are gentle (<6%). Stands are dominated by *Salix lutea*. Other tall willows present include *Salix boothii, Salix geyeriana, Salix drummondiana,* and *Salix exigua*. Other shrubs present may include *Lonicera involucrata* and *Ribes lacustre*. Common graminoids include *Agrostis stolonifera, Deschampsia caespitosa, Poa pratensis,* and *Poa palustris*. Other graminoid species include *Carex pellita (= Carex lanuginosa), Carex microptera, Carex nebrascensis, Carex utriculata, Carex aquatilis, Calamagrostis stricta,* and *Juncus balticus*. Forbs are typically present but are less abundant than graminoids. Forb species include *Achillea millefolium, Equisetum arvense, Aconitum columbianum, Geum macrophyllum, Maianthemum stellatum (= Smilacina stellata), Plantago major,* and *Mentha arvensis*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stand of this association occurs on a valley floor floodplain at an elevation of 2031 m (6663 feet). The stand is situated in a semipermanently flooded palustrine area on poorly drained silty clay soils. The unvegetated ground surface is composed mainly of water with a moderate amount of litter and duff. A trace of wood is also present. A beaver pond in the vicinity helps to keep the stand flooded. *Salix wolfii* inhabits the adjacent drier areas.
Global Environment: This association occurs in mountain valleys at 1645 to 2585 m (5400-8480 feet) in elevation. It occurs on stream benches, streambanks, moist terraces and occasionally on seeps and meadows. Slopes are gentle (<6%), in narrow to typically broad valleys. Soil textures range from fine clayey to loamy skeletal to sandy. Many stands have high water tables with signs of mottling, although the water table can also be below 100 cm.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The tall-shrub stratum is dominated by *Salix lutea* (40% cover); *Salix boothii* is also present with 3% cover. *Dasiphora fruticosa ssp. floribunda* and *Salix wolfii* are present in trace quantities in the short-shrub stratum. Several graminoids dominate the herbaceous layer. *Poa pratensis* is the most abundant species (30% cover), followed by *Carex* sp., *Carex utriculata*, and *Poa palustris* (10% cover each). *Carex aquatilis* and *Calamagrostis stricta* are common with 3% cover each. The forbs present are a mixture between weedy and mesic species; only *Geum macrophyllum* is present in more than trace quantities (3% cover).
Global Vegetation: Stands are dominated by *Salix lutea*. Other tall willows present include *Salix boothii, Salix geyeriana, Salix drummondiana,* and *Salix exigua*. Other shrubs present may include *Lonicera involucrata* and *Ribes lacustre*. Higher elevation stands have a shorter shrub component, with species such as *Dasiphora fruticosa ssp. floribunda* and *Salix wolfii*. Common graminoids include *Agrostis stolonifera, Deschampsia caespitosa, Poa pratensis,* and *Poa palustris*. Other graminoid species include *Carex pellita (= Carex lanuginosa), Carex microptera, Carex nebrascensis, Carex utriculata, Carex aquatilis, Calamagrostis stricta,* and *Juncus balticus*. Forbs are typically present but are less abundant than graminoids. Forb species include *Achillea millefolium, Equisetum arvense, Aconitum columbianum, Geum macrophyllum, Maianthemum stellatum (= Smilacina stellata), Plantago major,* and *Mentha arvensis*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix lutea	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Geum macrophyllum	Herb (field)	Forb	.	X	.
Calamagrostis stricta	Herb (field)	Graminoid	.	X	.
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Carex sp.	characteristic graminoid

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.

Salix lutea	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Agrostis stolonifera	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Equisetum arvense	Herb (field)	Fern	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium vulgare	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (26-Jul-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Salix lutea* / Mesic Graminoid Community Type (Manning and Padgett 1995) =
- *Salix lutea* Community Type (Hansen et al. 1995) =
- *Salix lutea* Community Type (Youngblood et al. 1985a) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association has little in common with the Youngblood et al. (1985a) *Salix lutea* Community Type. The dominant herbaceous species are at least superficially completely different.
Grand Teton National Park Other Comments:
Global Classification Comments: Seems likely this type occurs in Utah, but it has not been documented there. *Salix lutea* has been reported to occur with *Salix exigua* in Utah (Padgett et al. 1989). The species *Salix lutea* may have different subtaxa in eastern Montana than western Montana according to Dorn (1995). However, at the current time Kartesz (1999) does not recognize Dorn's work.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association was sampled west of Triangle X Ranch.
Global Range: This association is known from throughout the northern half of Nevada, eastern Idaho, western Wyoming, and Montana.
Nations: US
States/Provinces: ID, MT, NV, WY
TNC Ecoregions: 6:C, 9:C, 11:C
TNC Ecoregion Comments: ECO6 & ECO11 added (GK 8-05).
USFS Ecoregions: 341D:CC, 341E:CC, 341G:CC, 342C:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C057
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Dorn 1995	.	X	.	.	.	.	.	.	.
Hansen et al. 1995	.	.	X	.	.	.	.	.	.
Kartesz 1999	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	.	.	.	.	.	.
Padgett et al. 1989	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	.	X	.	.	.	.	.	.

A.983 *Salix wolfii* Temporarily Flooded Shrubland Alliance

Wolf Willow Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this cold-deciduous shrubland alliance occur in wide mountain valleys. Elevation ranges from 1950-3000 m. Stands occur along first- or second-order streams on well-drained slopes and on hummocks on the valley floor. The water table is usually within the top meter of soil, and groundwater slowly seeps to the surface. Stream channels are narrow, relatively deep and sinuous. Soils may be saturated in the spring and early summer, but dry somewhat during the summer as the water table drops. Soil textures often have a high organic content. *Salix wolfii* dominates the short-shrub layer with 20-100% cover. Other shrub species present include 0-80% cover of *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Salix planifolia, Salix boothii, Salix geyeriana*, and *Salix brachycarpa*. Graminoid species are diverse, yet generally have a low cover. Graminoid species include 0-40% cover of *Deschampsia caespitosa* and *Poa palustris* and 0-10% cover each of *Calamagrostis canadensis* and various *Carex* species. Forb cover is variable with no single dominant species. Forb species include *Mertensia ciliata, Senecio triangularis, Ligusticum porteri, Fragaria virginiana, Cardamine cordifolia, Geum macrophyllum*, and *Heracleum maximum (= Heracleum lanatum).*

Environment: Communities within this alliance occur in wide mountain valleys. Elevation ranges from 1950-3000 m. Stands occur along first- or second-order streams on well-drained slopes and on hummocks on the valley floor. The water table is usually within the top meter of soil, and groundwater slowly seeps to the surface. Stream channels are narrow, relatively deep and sinuous. Soils may be saturated in the spring and early summer, but dry somewhat during the summer as the water table drops. Soil textures often have a high organic content and are silty clays, silty clay loams, silty loams, or deep sandy clays, clay loams, and sandy clay loams over gravels and rocks.

Abies lasiocarpa - Picea engelmannii, Pinus contorta, and *Populus tremuloides* forests occur on steep-sided slopes. In broad valleys, *Artemisia tridentata* scrub and *Festuca thurberi* subalpine meadows occur outside of riparian areas.

Vegetation: Communities within this alliance are defined as cold-deciduous shrublands. *Salix wolfii* dominates the short-shrub layer with 20-100% cover. Other shrub species present include 0-80% cover of *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Salix planifolia, Salix boothii, Salix geyeriana*, and *Salix brachycarpa*. Graminoid species are diverse, yet generally have a low cover. Graminoid species include 0-40% cover of *Deschampsia caespitosa* and *Poa palustris* and 0-10% cover each of *Calamagrostis canadensis* and various *Carex* species. Forb cover is variable with no single dominant species. Forb species include *Mertensia ciliata, Senecio triangularis, Ligusticum porteri, Fragaria virginiana, Cardamine cordifolia, Geum macrophyllum*, and *Heracleum maximum (= Heracleum lanatum).*

Dynamics: Browsing may weaken or eventually eliminate *Salix wolfii*. With increasing levels of grazing, *Deschampsia caespitosa* will be replaced by *Juncus balticus, Poa pratensis*, and *Taraxacum officinale*.

Similar Alliances:

- *Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)

Similar Alliance Comments: The ~*Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)$$ differs from the ~*Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)$$ due to hydrologic regime. The seasonally flooded shrubland has surface water present for extended periods of time, especially during the early part of the growing season. The water table is at or near the soil surface. The temporarily flooded shrubland has surface water present for only brief periods during the growing season, and the water table usually lies well below the soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread in the subalpine zone throughout the Rocky Mountains in Idaho, Montana, Wyoming, Colorado, and Utah.

Nations: US

Subnations: CO, ID, MT, UT, WY

TNC Ecoregions: 6:C, 9:C, 20:C

USFS Ecoregions: M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332E:CC, M333B:CC

Federal Lands: NPS (Grand Teton, Rocky Mountain, Yellowstone); USFS (Medicine Bow, Routt, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Baker 1989b, Carsey et al. 2003a, Carsey et al. 2003b, Girard et al. 1997, Hansen et al. 1991, Hansen et al. 1995, Hitchcock et al. 1964, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Mattson 1984, Mutz and Queiroz 1983, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Sanderson and Kettler 1996, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001238] *Salix wolfii / Deschampsia caespitosa* Shrubland

Translated Name: **Wolf Willow / Tufted Hairgrass Shrubland**
Common Name: **Wolf Willow / Tufted Hairgrass Shrubland**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): M. Jankovsky-Jones

ELEMENT CONCEPT

Global Summary: This is a minor plant association with a widespread distribution including mid to upper elevations throughout the Rocky Mountains. The association is found in meadows, on lower toeslopes, and on benches or terraces in broad valley bottoms. *Salix wolfii* creates a dense, low overstory with *Dasiphora fruticosa ssp. floribunda (= Potentilla fruticosa)* frequently present. *Deschampsia caespitosa* is the diagnostic graminoid with up to 10% cover. A diverse mix of other graminoids and forbs are usually present, including *Juncus balticus, Danthonia intermedia, Phleum alpinum, Potentilla gracilis*, and *Senecio integerrimus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occupy level terrain on the valley floor at elevations of 6674 and 6800 feet. One stand is situated in a temporarily flooded palustrine area on moderately well-drained silty clay loam soils and another stand is located on a glacial moraine with very deep, well-drained Taglake-Sebud soils (Young, 1982). The data available indicate that litter and duff dominate the ground surface. Traces of mosses, fungi, bare soil, wood, and gravel may also be present. Adjacent vegetation may include *Carex utriculata*-dominated riparian areas and various other *Salix*-dominated communities.

Global Environment: This association occurs from 2000 to 3100 m (6550-10,170 feet) in elevation, usually on broad valley bottoms. Soils are fine-textured and highly erodible. Soils range from sandy loam to clayey. Neally all studies report mottling or a gleyed layer between 40 and 99 cm depth.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix wolfii* (30 to 50% cover) dominates the shrub layer as either a short or dwarf shrub. *Dasiphora floribunda* occurs in two stands with 7 and 20% cover. Various other shrubs, including *Arctostaphylos uva-ursi, Artemisia tridentata* ssp. *vaseyana, Betula nana* and *Salix* spp., may also be present within the stands in trace quantities. Graminoids dominate the herbaceous layer, particularly *Deschampsia caespitosa* (20 to 30% cover). Also present in all stands are *Carex utriculata* and *Phleum pratense.* Each stand additionally has a co-dominant sedge present with 20% cover: in one stand it is *Carex praegracilis* and in the other stands it is an unidentified *Carex*. Forbs are diverse and present in low quantities; the only forb to occupy all stands is *Fragaria virginiana* (1 to 7% cover). Forbs occurring in two stands include *Achillea millefolium, Cirsium scariosum,* and *Potentilla gracilis.*

Global Vegetation: These shrublands have an open canopy and low stature dominated by *Salix wolfii*. Other shrubs present include *Dasiphora fruticosa ssp. floribunda, Vaccinium caespitosum, Arctostaphylos uva-ursi, Betula nana*, and various *Salix* spp. The herbaceous layer is dominated by *Deschampsia caespitosa*; however, degraded stands may have low cover of this diagnostic species. Other graminoids that may be present include *Phleum pratense, Juncus balticus, Danthonia intermedia, Agrostis stolonifera, Carex utriculata, Carex microptera, Carex praegracilis*, and *Carex aquatilis*. Forbs can be abundant and include *Fragaria virginiana, Valeriana edulis, Angelica arguta, Taraxacum officinale, Achillea millefolium var. occidentalis, Antennaria* spp., *Caltha leptosepala var. leptosepala, Erigeron* spp., *Fragaria virginiana ssp. glauca, Gentiana parryi, Penstemon procerus var. procerus, Potentilla diversifolia, Sibbaldia procumbens, Solidago* spp., *Stellaria longipes, Taraxacum officinale, Thlaspi montanum var. montanum*, and *Veronica wormskjoldii*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix wolfii	Herb (field)	Dwarf-shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.

Cirsium scariosum	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (20-Oct-2000). The quality of remaining stands of this plant association has been compromised because of changes in hydrology and shifts in species composition. Beaver frequently play a role in the maintenance of the hydrology associated with sites dominated by *Salix wolfii*. Removal of beaver and stream downcutting have lowered water tables in many of the areas where this association formerly occurred. In some locations this has changed the site potential to one that supports upland associations. This is one of the driest of the *Salix wolfii* types and is accessible to livestock (sheep and cattle) throughout much of the growing season. Improper livestock grazing may contribute to channel downcutting and result in replacement of *Deschampsia caespitosa* with species that increase with grazing pressure (*Juncus balticus*, *Carex nebrascensis*, and *Fragaria virginiana*) and exotic species (*Poa pratensis*, *Agrostis scabra*, and *Taraxacum officinale*).

RELATED CONCEPTS

Global Similar Associations:
- *Salix wolfii / Carex microptera* Shrubland (CEGL001235)

Global Related Concepts:
- *Salix wolfii / Deschampsia cespitosa* Community Type (Youngblood et al. 1985a) =
- *Salix wolfii / Deschampsia cespitosa* Community Type (Padgett et al. 1989) =
- *Salix wolfii / Deschampsia cespitosa* Habitat Type (Hansen et al. 1995) =
- *Salix wolfii/Deschampsia cespitosa* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Salix wolfii / Deschampsia caespitosa* Community Type well, although the common mesic forbs that Youngblood et al. list as occurring within this type are basically not found within the Grand Teton National Park stands. The Grand Teton National Park association fits the Walford et al. (2001) *Salix wolfii / Deschampsia caespitosa* Community Type better because these researchers state that *Dasiphora fruticosa ssp. floribunda* can occasionally codominate within the shrub canopy, and *Betula nana* and *Salix boothii* may be present.
Global Classification Comments: This plant association has been described in numerous classifications. The difficulty in classification comes when stands are disturbed and the diagnostic understory species, *Deschampsia caespitosa*, is only present with low cover and exotic grasses dominate the stand.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association were sampled west of Triangle X Ranch and near Jackson Lake Lodge.

Global Range: This is a minor type in Utah, Wyoming, Idaho and Montana.
Nations: US
States/Provinces: CO, ID:S2, MT:S3, UT:S2S3, WY:S2S3

TNC Ecoregions: 6:?, 7:C, 9:C, 20:C
TNC Ecoregion Comments: ECO7 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331I:CC, M333B:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association. In one stand only species composition data were collected.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C056
Accuracy Assessment Points: 04X529
Other plots within park boundaries, from other projects: GT-tm2d
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): M. Jankovsky-Jones, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Walford et al. 2001	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Young 1982	.	.	.	X	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	X	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

[CEGL001240] *Salix wolfii* / Mesic Forbs Shrubland

Translated Name: **Wolf Willow / Mesic Forbs Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Padgett et al. (1989)

ELEMENT CONCEPT

Global Summary: This plant association occurs from mid-montane to upper subalpine elevations of 1890-3355 m (6200-11,000 feet) in Colorado, Idaho, western Wyoming, and Utah. It frequently covers wide, open, low-gradient areas near first- and second-order streams. It can be recognized by the generally dense layer of low-growing, silvery *Salix wolfii* dominating the short-shrub layer, with a variety of mesic forbs and some graminoids in the undergrowth. Other willow species that may be present include *Salix planifolia*, *Salix boothii*, and *Salix geyeriana*. Additional short shrubs that are often present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Betula nana (= Betula glandulosa), Ribes inerme*, and *Lonicera involucrata*. Total forb cover exceeds that of total graminoid cover. No single forb species is particularly more abundant than any other, and no one species is present in every stand. The forb species most commonly present include *Caltha leptosepala, Mertensia ciliata, Senecio triangularis, Ligusticum porteri, Fragaria virginiana, Cardamine cordifolia, Geum macrophyllum, Saxifraga odontoloma*, and *Heracleum maximum*. Graminoid species that may be present include *Deschampsia caespitosa, Calamagrostis canadensis*, and various *Carex* species.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: Two sampled stands of this association occur on valley floors at elevations of 6801 and 8934 feet. Five stands occur on south-facing foot-slopes with elevations of 9000 to 9700 feet and slopes between 20 and

50%. The sampled stands occupy either palustrine areas that are saturated or temporarily flooded, or areas that are snow impacted. Soil data is available for two stands; the soils of these stands are poorly-drained silt loams or clay loams that are covered predominantly by litter and duff. Mosses and bare soil are also present in high quantities in one stand each. Gravel, wood, water, and bare soil may be present in small quantities. Adjacent vegetation may include tall forblands, *Salix boothii* communities, and/or the *Picea engelmannii / Equisetum arvense* Forest association.

Global Environment: This plant association occurs from mid-montane to upper subalpine elevations of 1890-3355 m (6200-11,000 feet) in Colorado, Idaho, western Wyoming, and Utah. It frequently covers wide, open, low-gradient areas near first- and second-order streams. The type can occur on toeslopes and valley sideslopes, seeps, meadows, benches, stream terraces, as well as flat to gently undulating valley floors. Slopes range form 0 to 35%; valleys are typically wide, but occurrences in narrow, steep valleys are not unusual. Soils are thick and well-developed, often with Mollic Epipedon, occasionally with thick organic layers at the surface. Textures range from clayey to fine loamy to coarse-loam, with up to 35% coarse fragments. Soils are moist, often saturated to near-saturated for much of the growing season. Water tables can be at the surface or greater than 100 cm below the surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix wolfii* dominates the shrub layer with 12 to 80% canopy cover. *Salix eastwoodiae* is present in five of seven stands with trace to 20% cover. Various other shrubs occur within the short and dwarf shrub strata. Conifer seedlings or poles/saplings are present in five stands. Graminoids are diverse but occur mostly in trace quantities. *Elymus glaucus* (3 to 20% cover) is the only graminoid species to occur in more than half the stands. Forbs are diverse and dominate the herbaceous layer. The highest constancy forbs are *Ligusticum filicinum* (1 to 30% cover), *Thalictrum occidentale* (3 to 20% cover), and *Eucephalus engelmannii* (1 to 7% cover).

Global Vegetation: It can be recognized by the generally dense layer of low-growing, silvery *Salix wolfii* dominating the short-shrub layer with a variety of mesic forbs and some graminoids in the undergrowth. Other willow species that may be present include *Salix planifolia, Salix boothii*, and *Salix geyeriana*. Additional short shrubs that are often present include *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Betula nana (= Betula glandulosa), Ribes inerme*, and *Lonicera involucrata*. Total forb cover exceeds that of total graminoid cover. No single forb species is particularly more abundant than any other, and no one species is present in every stand. The forb species most commonly present include *Caltha leptosepala, Mertensia ciliata, Senecio triangularis, Ligusticum porteri, Fragaria virginiana, Cardamine cordifolia, Geum macrophyllum, Veratrum californicum, Saxifraga odontoloma*, and *Heracleum maximum*. Graminoid species that may be present include *Deschampsia caespitosa, Calamagrostis canadensis, Carex microptera*, and other *Carex* species.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Short shrub/sapling	Needle-leaved evergreen tree	.	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Eucephalus engelmannii	Herb (field)	Forb	X	X	.
Fragaria vesca	Herb (field)	Forb	X	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Thalictrum occidentale	Herb (field)	Forb	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Caltha leptosepala	Herb (field)	Forb	.	X	.
Cardamine cordifolia	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Geum macrophyllum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Ligusticum porteri	Herb (field)	Forb	.	X	.
Mertensia ciliata	Herb (field)	Forb	.	X	.
Saxifraga odontoloma	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (15-Dec-1999). This is a widespread association, known from Colorado, Utah, Wyoming and Idaho, although never very abundant where it occurs. Stands are found in wide mountain valleys along first- or second-order streams on well-drained slopes and hummocks on the valley floor. The water table is usually within the top meter of soil, and groundwater slowly seeps to the surface. Threats include overuse by livestock and changes in the hydrologic regime that can result in a lower water table.

RELATED CONCEPTS

Global Similar Associations:
- *Salix wolfii / Carex microptera* Shrubland (CEGL001235)
- *Salix wolfii / Fragaria virginiana* Shrubland (CEGL001239)

Global Related Concepts:
- *Salix wolfii / Swertia perennis - Pedicularis groenlandica* Community Type (Mutz and Queiroz 1983) =
- *Salix wolfii / Swertia perennis* Community Type (Tuhy and Jensen 1982) B
- *Salix wolfii* / Mesic Forb Community Type (Youngblood et al. 1985a) =
- *Salix wolfii* / Mesic Forb Community Type (Padgett et al. 1989) =
- *Salix wolfii* / Mesic Forb Plant Association (Kittel et al. 1999b) =
- *Salix wolfii* / Mesic Forbs Community Type (Walford et al. 2001) =
- *Salix wolfii*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Low *Salix* / Mesic Forb Community Type (Manning and Padgett 1995) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: The sampled stands forming this association fit the Walford et al. (2001) *Salix wolfii /* Mesic Forb community type well. The species composition of the GRTE plots fit the Youngblood et al. (1985) description well, but the Youngblood description has an upper elevation limit of 8600 feet, which is lower than six of the seven stands sampled in GRTE. Youngblood also limits this community type to slopes of 25% or less, and four of the GRTE stands occur on slopes of 40% or higher.

Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association were sampled south of Marion Lake, on the river delta formed by Moose and Berry Creeks southwest of Lower Berry Cabin, north or east of Mink Lake, and the Death Canyon Shelf area.

Global Range: This association is known from Colorado, Utah, Wyoming and Idaho.
Nations: US
States/Provinces: CO:S3, ID:S2, UT:S2S3, WY
TNC Ecoregions: 6:?, 9:C, 20:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331G:CC, M331H:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C031, GT-03B061
Accuracy Assessment Points: 04R167, 04J202, 04J204, 04J206, 04J207
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): J. Thompson and J. Stevens, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jensen and Tuhy 1981	.	X	.	X	X	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	X	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	X	.	.	.	.
Kittel et al. 1994	.	X	.	X	X	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	.	X	.	X	.	.	.	.
Manning and Padgett 1995	.	.	X	.	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	X	.	.	.	.
Padgett et al. 1988b	.	X	.	X	X	.	.	.	.
Padgett et al. 1989*	.	X	X	X	X	.	.	.	.
Sanderson and Kettler 1996	.	X	.	X	X	.	.	.	.
Tuhy and Jensen 1982	.	.	X	.	.	.	.	.	.
Walford et al. 2001	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	.	.	.	.	.	.

III.B.2.N.e. Seasonally flooded cold-deciduous shrubland

A.986 *Alnus incana* Seasonally Flooded Shrubland Alliance

Speckled Alder Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance occurs adjacent to streams, lakes, and seeps in the midwestern and western United States and southern Canada. The elevation of stands range from near sea level in the Midwest to 2800 m in Utah. In the Midwest, soils are wet, often mucks or peats. The water is non-stagnant, nutrient-rich, and often slightly calcareous. In the West, stands are located on active fluvial surfaces, floodplains and streambanks, along moderate to steep-gradient streams. Stands are found on well-aerated, alluvial soils that range in texture from silty loam to sandy loam. Some soils have a large percentage of coarse fragments in the upper horizons. Soils are wet throughout the growing season and are flooded during spring runoff. Tall shrubs (2-8 m) dominate stands, with a moderately open to dense shrub canopy. *Alnus incana* often forms a dense canopy, but in more open stands, other tall and short shrubs, such as *Cornus sericea, Ribes inerme, Ribes lacustre, Rosa woodsii, Rubus idaeus, Salix* spp., *Spiraea douglasii, Symphoricarpos* spp., and *Viburnum* spp. can be found. The herbaceous layer often has a rich diversity of species; the density of the layer varies inversely with the cover of the tall-shrub canopy. *Aconitum columbianum, Athyrium filix-femina, Calamagrostis canadensis, Caltha palustris, Carex* spp., *Equisetum arvense, Impatiens capensis, Lycopus uniflorus, Maianthemum stellatum, Symplocarpus foetidus, Thelypteris palustris,* and *Typha* spp. are common herbaceous associates. Trees are found in many stands of this alliance and can include *Acer rubrum, Fraxinus nigra, Picea pungens, Populus angustifolia*, and *Thuja occidentalis*.

Environment: Vegetation types within this alliance occur adjacent to streams, lakeshores, and seeps in the midwestern and western United States. The elevation of the stands range from near sea level in the Midwest to 2800 m in Utah. In the Midwest, soils are wet, often mucks or peats (Anderson 1982, Chapman 1986). The water is non-stagnant, nutrient-rich, and often slightly calcareous (Curtis 1959). In the West, stands are located on active fluvial surfaces, floodplains and streambanks, along moderate- to steep-gradient streams. Stands are found on well-aerated, alluvial soils that range in texture from silty loam to sandy loam. Some soils have a large percentage of coarse fragments in the upper horizons. Soils are wet throughout the growing season and are flooded during spring runoff.

Vegetation: The vegetation in this alliance occurs adjacent to streams, lakes, and seeps in the midwestern and western United States and southern Canada. Stands are dominated by tall shrubs, 2-8 m tall, with a moderately open to dense shrub canopy. *Alnus incana* often forms a dense canopy, but in more open stands, other tall and short shrubs, such as *Cornus sericea, Ribes inerme, Ribes lacustre, Rosa woodsii, Rubus idaeus, Salix* spp., *Spiraea douglasii, Symphoricarpos* spp., and *Viburnum* spp. can be found.

The herbaceous layer often has a rich diversity of species; the density of the layer varies inversely with the cover of the tall-shrub canopy. *Aconitum columbianum, Athyrium filix-femina, Calamagrostis canadensis, Caltha palustris, Carex* spp., *Equisetum arvense, Impatiens capensis, Lycopus uniflorus, Maianthemum stellatum, Symplocarpus foetidus, Thelypteris palustris*, and *Typha* spp. are common herbaceous associates. Trees are found in many stands of this alliance and include *Acer rubrum, Fraxinus nigra, Picea pungens, Populus angustifolia*, and *Thuja occidentalis*.

Dynamics: *Alnus incana* is a long-lived, early-seral species. It is one of the first species to establish on fluvial or glacial deposits as well as the spoils of placer mining (Hansen et al. 1989). After establishment, young stands of *Alnus incana* are continually flooded. As stands mature, the stems can slow flood waters and trap sediment. Fine-textured sediments accumulate on top of the coarser alluvial material, and the land surface eventually rises above annual flood levels. Flooding is then less frequent and soils begin to develop (Padgett et al. 1989).

Alnus incana is shade-intolerant (Viereck 1970, Chapin et al. 1994 as cited in Kittel et al. 1999b), and many mature stands are restricted to streambank edges, possibly because these are the only sites where light can penetrate the neighboring overstory canopy. *Alnus incana* has been observed on high-gradient streams and is thought to require well-aerated water (Hansen et al. 1988a, Padgett et al. 1989).

Alnus incana fixes atmospheric nitrogen through a symbiotic relationship with the bacteria *Frankia* and increases the ecosystem nitrogen supply with the deposition of nitrogen-rich leaf litter (Binkley 1986 as cited in Kittel et al. 1999b). The annual input of nitrogen to soils from alder species ranges from 16 to 150 kg/ha annually compared to 1 to 10 kg/ha/yr deposited by atmospheric precipitation alone (Binkley 1986 as cited in Kittel et al. 1999b). Nitrogen-rich detritus is an important source of nutrients for the aquatic ecosystem as well.

Undisturbed *Alnus incana* stands may become dominated by *Salix* species or conifer stands (Hansen et al. 1989).

Similar Alliances:
- *Alnus incana* Saturated Shrubland Alliance (A.1020)--occurs in bogs in New England and the upper Allegheny region.
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)--has surface water present only briefly during the growing season.
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Fraxinus nigra - Acer rubrum* Saturated Forest Alliance (A.347)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Thuja occidentalis* Saturated Forest Alliance (A.200)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in northern Indiana, northern Ohio, Michigan, northern Illinois, Iowa, Wisconsin, Minnesota, and North Dakota. It can also be found in Idaho, Washington, Oregon, California, Utah, Wyoming, and Colorado, and in Canada in Ontario and southern Manitoba. In the east, it occurs from Maine to New Jersey and Pennsylvania.

Nations: CA, US

Subnations: BC?, CA, CO, IA, ID, IL, IN?, MA, MB?, ME, MI, MN, MT?, NB?, ND, NH, NJ, NM, NS?, NY, OH, ON, OR, PA, PE?, QC?, UT, VT, WA, WI, WY

TNC Ecoregions: 2:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 18:C, 19:C, 20:C, 34:C, 35:C, 46:C, 47:C, 48:C, 59:C, 60:?, 61:C, 62:C, 63:C, 64:C, 68:C, 81:C

USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212E:CP, 212Ha:CCP, 212Hb:CCP, 212He:CCP, 212Hh:CCP, 212Hi:CCP, 212Hj:CCP, 212Hk:CCP, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCP, 212Hp:CCP, 212Hq:CCC, 212Hr:CCP, 212Hs:CCP, 212Ht:CCC, 212Hu:CCP, 212Hv:CCP, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ib:CCC, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCC, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCP, 212Jo:CCP, 212Jr:CCC, 212Ka:CCP, 212Kb:CCC, 212La:CCC, 212Lb:CCC, 212Lc:CCP, 212Ld:CCP, 212Ma:CPP, 212Mb:CPP, 212Na:CCC, 212Nb:CCP, 212Nc:CCC, 212Nd:CCP, 221Ae:CCC, 221Ai:CCC, 221Ak:CCP, 221Al:CCP, 222Je:CCC, 222Lb:CCC, 222Lc:CCC, 222Mc:CCC, 222Md:CCC, 222Na:CCC, 242A:CC, 251Aa:CCC, 251Ab:CCC, 342H:CC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ae:CCC, M212Af:CCC, M212B:CC, M212C:CC, M212D:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333D:CC, M341B:CC

Federal Lands: NPS (Acadia, Grand Teton, Isle Royale, Minute Man, Rocky Mountain, Voyageurs); USFS (Arapaho-Roosevelt, Cibola, Gunnison, Medicine Bow, Nez Perce, Rio Grande, Routt, San Juan, Shoshone, White River NF); USFWS (Assabet River)

ALLIANCE SOURCES

Author(s): M. Damm

References: Anderson 1982, Bunin 1975c, Bursik and Moseley 1995, Carsey et al. 2003a, Carsey et al. 2003b, Chapman 1986, Chappell et al. 1997, Crowe and Clausnitzer 1997, Curtis 1959, Faber-Langendoen et al. 1996, Hansen et al. 1988a, Hansen et al. 1989, Harrington 1978, Harris et al. 1996, Hess 1981, Hitchcock et al. 1977a, Johnston 1987, Kartesz 1999, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986,

Kovalchik 1987, Kovalchik 1993, MNNHP 1993, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Vestal 1917, Vestal 1919, Walker 1962, Welsh et al. 1987

[CEGL001146] *Alnus incana / Equisetum arvense* Shrubland

Translated Name: **Speckled Alder / Field Horsetail Shrubland**
Common Name:
Ecological System(s):
- North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): K.A. Schulz

ELEMENT CONCEPT

Global Summary: These seasonally flooded, tall shrublands have been reported from montane sites in Colorado, Utah, Oregon, Washington, and may occur in California and Idaho. They have been described from frequently flooded streambanks, swales, floodplains, and shores of lakes and ponds. Soils range from shallow loamy sand, loam or silt over alluvial gravel or cobbles, to organic loam, peat and muck. Vegetation is dominated by a moderate to dense canopy (>40% cover) of the deciduous, broad-leaved tall shrub *Alnus incana ssp. tenuifolia*. Other shrubs may include scattered *Salix, Betula, Cornus,* or *Ribes* spp. *Equisetum arvense* often forms a thick carpet beneath young to mature alder shrubs. Mesic forbs or other graminoids are typically sparse but may include *Calamagrostis canadensis, Glyceria striata (= Glyceria elata),* Asteraceae spp., *Galium boreale,* or *Geum macrophyllum*. This shrubland can be distinguished from other *Alnus incana ssp. tenuifolia*-dominated shrublands by the presence of at least 25% cover of *Equisetum arvense*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: This association occurs on east-facing slops with gradients of 4 to 31%. The sampled stand elevations range from 6900 to 7100 feet. Soil data is available for one stand; the soil is a poorly drained silty clay. This association occurs in areas with saturated soil. Mosses and liverworts comprise 90% of the ground cover; litter and duff and wood each comprise 5% ground cover. The landscape patterning is patchy with local stringers of *Picea engelmannii* and clumps of *Alnus incana* and *Cornus sericea.* Standing water was present at three of the four sampled stands.

Global Environment: This minor riparian shrubland association has been reported from montane sites in Colorado, Utah, Oregon, Washington, and may occur in California and Idaho. Elevation ranges between 2100 and 3000 m (6800-10,000 feet) in Colorado to 1800-2500 m (5900-8200 feet) in Utah and 730-1525 m (2400-5000 feet) in eastern Washington. Stands occur on frequently flooded streambanks, swales, floodplains, and shores of lakes and ponds that are saturated most of the growing season. Soils are typically shallow and coarse-textured but range from well-drained loamy sand to poorly drained silt or silty clay over alluvial gravel or cobbles, to organic loam, peat and muck (Hess 1981, Padgett et al. 1989, Kittel et al. 1997b, Carsey et al. 2003a, 2003b). Water tables appear to be shallow, with mottling near the soil surface (Kittel et al. 1999b, Carsey et al. 2003a, 2003b).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane tall shrubland that occurs on mesic sites. The shrub layer is diverse and dominated by *Alnus incana* (12 to 30% canopy cover). The herbaceous layer is dominated by *Equisetum arvense* (20 to 60% canopy cover). Forbs are more diverse than graminoids, but graminoids tend to have a higher cover. Constant species include *Phleum pratense, Urtica dioica, Geranium richardsonii, Heracleum maximum, Mimulus guttatus, Senecio triangularis, Aconitum columbianum, Rudbeckia occidentalis,* and *Pteridium aquilinum.*

Global Vegetation: This association is characterized by a moderate to dense canopy (>40% cover) dominated by the deciduous, broad-leaved tall shrub *Alnus incana ssp. tenuifolia*, with *Equisetum arvense* forming a thick herbaceous layer. Other shrubs may include scattered *Salix* spp. (*Salix ligulifolia (= Salix eriocephala var. ligulifolia), Salix exigua, Salix geyeriana, Salix lucida ssp. caudata*, and *Salix monticola*), *Acer glabrum, Betula occidentalis, Cornus sericea, Lonicera involucrata*, or *Ribes inerme*. Occasionally scattered trees of *Picea pungens, Pinus contorta*, or *Populus angustifolia* may be present. Mesic forbs or graminoids are typically sparse but may include *Aconitum columbianum, Calamagrostis canadensis, Cardamine cordifolia, Carex disperma, Carex pellita (= Carex lanuginosa), Chamerion angustifolium, Cinna latifolia, Galium boreale, Geum macrophyllum, Glyceria striata (= Glyceria elata), Heracleum maximum, Juncus balticus, Maianthemum stellatum, Pyrola asarifolia ssp. asarifolia, Pyrola chlorantha, Rudbeckia laciniata, Saxifraga odontoloma, Senecio triangularis, Saxifraga odontoloma, Swertia perennis*, and introduced species *Agrostis stolonifera, Poa pratensis*, and *Taraxacum officinale* (Hess 1981, Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a, 2003b). This shrubland can be distinguished from other *Alnus incana ssp. tenuifolia*-dominated shrublands by the presence of at least 25% cover of *Equisetum arvense*.
Global Dynamics: Both *Alnus incana* and *Equisetum arvense* are considered long-lived, early-seral species and are among the first species to establish on flood-scoured streambanks (Hess 1981, Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a, 2003b). *Alnus incana* appears to be shade-intolerant and is common on the edges of taller upland vegetation forming stringers along the

channel. *Alnus incana* communities appear to be maintained by frequent flooding, and as stands mature *Salix* or other species begin to dominate (Padgett et al. 1989).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Geranium richardsonii	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Mimulus guttatus	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	.	.
Urtica dioica	Herb (field)	Forb	.	X	.
Equisetum arvense	Herb (field)	Fern	X	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana ssp. *tenuifolia*	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Equisetum arvense	Herb (field)	Fern	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Plantago major	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	invasive
Taraxacum officinale	-	P	invasive

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (5-Oct-1999). Although these seasonally flooded shrublands are reported from several western states, they are restricted to narrow palustrine and lacustrine environments. There are few known occurrences with even fewer protected. These shrublands are threatened by modification of hydrological processes, overuse for recreation, overuse by livestock, conversion to hay meadows and invasion of associated introduced forage species.

RELATED CONCEPTS

Global Similar Associations:
- *Alnus incana - Salix drummondiana* Shrubland (CEGL002652)
- *Alnus incana / Athyrium filix-femina* Shrubland (CEGL002628)
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148)

Global Related Concepts:
- *Alnus incana - Salix drummondiana / Equisetum arvense* Plant Association (Johnston 1987) =
- *Alnus incana / Equisetum arvense* Association (Kovalchik 1993) =
- *Alnus incana / Equisetum arvense* Association (Crowe and Clausnitzer 1997) =
- *Alnus incana / Equisetum arvense* Community Type (Walford et al. 2001) =
- *Alnus incana / Equisetum arvense* Community Type (Padgett et al. 1989) =
- *Alnus incana/Equisetum arvense* (Bourgeron and Engelking 1994) =
- *Alnus incana* / Bench Community Type (Manning and Padgett 1995) B
- *Alnus incana* ssp. *tenuifolia - Equisetum arvense* Habitat Type/Plant Association (Komarkova 1986) =
- *Alnus incana* ssp. *tenuifolia / Equisetum arvense* Plant Association (Kittel et al. 1999b) =
- *Alnus incana* ssp. *tenuifolia / Equisetum arvense* Shrubland (Carsey et al. 2003a) =
- *Alnus incana* ssp. *tenuifolia / Equisetum arvense* Shrubland (Carsey et al. 2003b) =
- *Alnus tenuifolia / Equisetum arvense* Habitat Type (Wasser and Hess 1982) =
- *Alnus tenuifolia / Equisetum arvense* Habitat Type (Hess 1981) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

Grand Teton National Park Other Comments: The soil has a high percentage of organic matter. It might be humic or peat rather than silty clay.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near the mouth of Colter Canyon, south of Waterfall Canyon, south of Warm Springs, and off the Death Canyon trail below the overlook.

Global Range: This minor riparian shrubland association has been reported from montane sites in Colorado, Wyoming, Utah, Oregon, Washington, and may occur in British Columbia, California and Idaho.
Nations: CA, US
States/Provinces: BC?, CA?, CO:S3, ID:S3, OR:S2, UT:S2S3, WA:S3, WY
TNC Ecoregions: 4:C, 7:C, 8:C, 9:C, 20:C, 68:C
TNC Ecoregion Comments: ECO4, ECO7, ECO8, ECO68 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M242C:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Gunnison, Medicine Bow, Routt, San Juan, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Although *Alnus* types were intensively searched for, few were found in the park. This is one of the three *Alnus* types found during the survey.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A105
Accuracy Assessment Points: 04J029, 04J125, 04J136
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Bunin 1975c	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	X	.	.	.	.
Carsey et al. 2003b	.	X	X	X	X	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Harrington 1978	.	X	.	X	.	.	.	.	.
Hess 1981	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1997b	.	.	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Komarkova 1986	.	X	X	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	X	.	.	.	.
Manning and Padgett 1995	.	.	X	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	X	.	.	.	.
Padgett et al. 1989	.	X	X	X	X	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
Sawyer and Keeler-Wolf 1995	.	.	.	.	X	.	.	.	.
Vestal 1917	.	X	.	X	.	.	.	.	.
Vestal 1919	.	X	.	X	.	.	.	.	.

Walford et al. 2001	.	X	X	X	X	.	.	.	.
Walker 1962	.	X	.	X	.	.	.	.	.
Wasser and Hess 1982	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL000228] *Alnus incana / Glyceria striata* Shrubland

Translated Name: **Speckled Alder / Fowl Mannagrass Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): R.C. Crawford

ELEMENT CONCEPT

Global Summary: This shrubland association is a widespread community known from around the rim of the northwestern end of the Columbia Plateau in Washington, in the Blue Mountains of Oregon, and in northern Idaho but of limited extent in the Pacific Northwest. Stands occur in narrow to moderately wide floodplains on streambanks and around springs. Sites are usually very low-gradient and can be characterized as "stagnant"; soils can include silts and mucks. These shrublands are characterized by stands of medium-tall and tall deciduous shrubs and herbaceous undergrowth of wetland-indicator grasses and forbs. They have little to no overstory tree canopy, although individual *Picea engelmannii, Abies grandis, Abies lasiocarpa,* or *Thuja plicata* trees may be present. Total shrub cover usually exceeds 50% and is dominated by *Alnus incana ssp. tenuifolia,* the diagnostic shrub. Other shrubs include *Cornus sericea, Symphoricarpos albus,* and *Ribes* spp. The understory of undisturbed stands has an herbaceous layer with abundant cover of *Glyceria striata (= Glyceria elata)* and/or *Cinna latifolia*. These grasses are often accompanied by *Calamagrostis canadensis* or *Elymus glaucus*. Other common herbs include *Geum macrophyllum, Galium triflorum,* and *Equisetum* spp. Heavily disturbed stands have abundant non-native grasses.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs on low slopes of the Teton Mountains. The single stand is on a south slope of 23% at an elevation is 2229 m (7314 feet). The soil is a poorly drained loam and is in a palustrine area that is semipermanently flooded. Mosses comprise 98% of the ground cover. *Ceanothus velutinus, Symphoricarpos oreophilus,* and various forbs compose the vegetation on the slope above this plot. North of the plot is an avalanche chute.
Global Environment: Stands occur in narrow to moderately wide floodplains on streambanks and around springs. Sites are usually very low-gradient and can be characterized as "stagnant"; soils can include silts and mucks to sandy loams to organic fibric. It occurs at elevations between 533 and 2229 m (1750-7314 feet). Slopes are flat to 45%, and valleys are narrow, averaging 24.4-30.5 m (80-100 feet), to very wide (91.5 m [300 feet]). Stands occur on streambanks, floodplains, overflow swales, and springs.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane tall shrubland that occurs on mesic sites. The tall-shrub layer is dominated by *Alnus incana*, which has 60% canopy cover. The short-shrub layer may include *Lonicera involucrata* and *Ribes lacustre* in small quantities. Graminoids are dominated by *Glyceria striata* (40% canopy cover) and *Calamagrostis canadensis* (20% canopy cover). Dominant forbs within the herbaceous layer are *Nemophila breviflora* (80% canopy cover), *Mimulus guttatus* (30%), and *Equisetum arvense* (10%). Other common herbaceous species include *Juncus ensifolius, Senecio triangularis, Heracleum maximum, Galium triflorum,* and *Valeriana* sp.
Global Vegetation: These shrublands are characterized by stands of medium-tall and tall deciduous shrubs and herbaceous undergrowth of wetland-indicator grasses and forbs. They have little to no overstory tree canopy, although individual *Picea engelmannii, Abies grandis, Abies lasiocarpa,* or *Thuja plicata* trees may be present. Total shrub cover usually exceeds 50% and is dominated by *Alnus incana ssp. tenuifolia,* the diagnostic shrub. Other shrubs include *Cornus sericea, Lonicera involucrata, Symphoricarpos albus,* and *Ribes* spp. The understory of undisturbed stands has an herbaceous layer with abundant cover of *Glyceria striata (= Glyceria elata)* and/or *Cinna latifolia*. These grasses are often accompanied by *Calamagrostis canadensis, Juncus ensifolius,* and *Elymus glaucus*. Other common herbs include *Nemophila breviflora, Geum macrophyllum, Galium triflorum, Senecio triangularis, Heracleum maximum, Galium triflorum, Valeriana* sp., and *Equisetum* spp. Heavily disturbed stands have abundant non-native grasses.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Galium triflorum	Herb (field)	Forb	.	X	.
Hesperis matronalis	Herb (field)	Forb	.	X	.

Mimulus guttatus	Herb (field)	Forb	X	X	.
Nemophila breviflora	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Glyceria striata	Herb (field)	Graminoid	X	X	.
Juncus ensifolius	Herb (field)	Graminoid	.	X	.
Equisetum arvense	Herb (field)	Fern	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Alnus incana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Mimulus guttatus	Herb (field)	Forb	.	X	.
Glyceria striata	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note		
Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-Oct-2002). This association has a wide range, but stands of this riparian shrubland are restricted to mosaics of small patches around 10 acres. High-quality examples of this association without non-native species are unusual. Most stands are within watersheds with continued livestock grazing, logging, recreational activities, hydrologic modifications, and road building. Heavy grazing will reduce the cover of herbaceous species and compact soils, which may increase soil erosion. Other activities in the watershed such as road construction and maintenance, logging, and heavy recreational use may contribute weeds and sediments that alter species composition in stands. Stands are also threatened by impacts to hydrology from streamflow modification.

RELATED CONCEPTS

Global Similar Associations:
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148)--an intermountain type.

Global Related Concepts:
- *Alnus incana / Glyceria elata* Association (Kovalchik 1993) =
- *Alnus incana / Glyceria elata* Association (Kovalchik 2001) =
- *Alnus incana / Glyceria elata* Association (Crowe and Clausnitzer 1997) =
- *Alnus incana* /springs (Kovalchik 1987) B
- *Salix* spp. / Mesic Forb Community Type (Crowe and Clausnitzer 1997) I

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Kovalchik (1993, 2001) described the *Alnus incana / Glyceria elata* association, using either *Glyceria elata* or *Cinna latifolia* as indicators; Crowe and Clausnitzer (1997) also described the *Alnus incana / Glyceria elata* association, using *Glyceria elata* as the indicator. None of these authors refer to citations south of the Blue Mountains of Oregon. All these authors refer to *Glyceria striata* as *Glyceria elata*. Where both species are recognized they are lumped into *G. elata*.

This type has previously been included as part of ~*Alnus incana* / Mesic Graminoids Shrubland (CEGL001148)$$, which has more recently been defined to be more of an intermountain type. *Alnus incana / Glyceria striata* sites are wetter, often springs, found in more moist climatic regimes of maritime climatic influence. These two associations do grade into each other in some locations. The type discussed here is distinguished by >10% cover of *Glyceria striata* or *Cinna latifolia*.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs northwest of the Phelps Lake Overlook.
Global Range: This shrubland association is a widespread community in the Pacific Northwest, known from around the rim of the northwestern end of the Columbia Plateau in Washington, in the Blue Mountains of Oregon, and in northern Idaho.
Nations: US
States/Provinces: ID:S2, OR:S2S3, WA:S3, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 68:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342H:CC, M331D:CC, M332G:CC, M333A:CC
Federal Lands: NPS (Grand Teton); USFS (Nez Perce)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Although *Alnus* types were intensively searched for, few were found in the park. This is one of the three *Alnus* types found during the survey.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B012B
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): R.C. Crawford, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Crowe and Clausnitzer 1997	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kovalchik 1987	.	.	X	X	X	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
Kovalchik 2001	.	.	X	X	X	.	.	.	.
MacKenzie pers. comm.	.	.	.	.	X	.	.	.	.
ORNHP unpubl. data	.	.	.	.	X	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.995 *Betula nana* Seasonally Flooded Shrubland Alliance

Swamp Birch Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this seasonally flooded, cold-deciduous alliance occur in marshes in the subalpine and montane riparian zones. Elevations range from 900 m in Montana to 3000 m in Colorado. Communities can occur on beaver ponds, lakes, marshes, seeps, swales, and wet alluvial terraces adjacent to low-gradient meandering streams. They are found in areas where soils are saturated from snowmelt runoff for a significant part of the growing season, often on fens, where the vegetation receives water from seeps and springs. Soils are commonly Histosols, flooded until mid summer and saturated all year in many sites. Quaking mats are typical of many stands. Soil pH in Colorado is 6.3. *Betula nana (= Betula glandulosa)* dominates the canopy with 25-60% cover. The canopy is typically dense; however, there are large, open spaces between individual shrub clumps. Other shrubs present include *Salix planifolia, Salix monticola, Salix wolfii,* and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* in the Colorado stands. In the Montana sites *Cornus sericea, Alnus incana,* and *Rhamnus alnifolia* can occur. The herbaceous undergrowth is found on small hummocks and is usually dominated by a dense mixture of mesic forbs and mesic graminoids. Mesic graminoids (25-60% cover) include *Calamagrostis canadensis, Calamagrostis stricta, Carex aquatilis, Carex utriculata, Carex livida,* and *Deschampsia caespitosa*. Forb cover is sparse and may include *Epilobium ciliatum, Caltha leptosepala, Ligusticum filicinum, Ranunculus sceleratus, Sparganium natans (= Sparganium minimum),* and *Thalictrum alpinum*. The fern layer can consist of as much as 80% cover with *Equisetum laevigatum*. *Salix planifolia, Salix wolfii, Salix geyeriana,* and *Dasiphora fruticosa ssp. floribunda* shrublands occur in adjacent riparian areas. *Carex* spp., *Deschampsia caespitosa,* and *Eleocharis quinqueflora* meadows may also be present.
Environment: Vegetation types within this alliance occur in marshes in the subalpine and montane riparian zones. Elevations range from 900 m in Montana to 3000 m in Colorado. Communities can occur on beaver ponds, lakes, marshes, seeps, swales, and wet alluvial terraces adjacent to low-gradient meandering streams. They are found in areas where soils are saturated from snowmelt runoff for a significant part of the growing season, often on fens, where the vegetation receives water from seeps and springs.

Soils are commonly Histosols, flooded until midsummer and saturated all year in many sites. Quaking mats are typical of many stands. Komarkova (1986) states that soil pH in Colorado is 6.3.

Salix planifolia, Salix wolfii, Salix geyeriana, and *Dasiphora fruticosa ssp. floribunda* shrublands occur in adjacent riparian areas. *Carex* spp., *Deschampsia caespitosa* and *Eleocharis quinqueflora* meadows are also present.
Vegetation: Vegetation types within this alliance are described as seasonally flooded, cold-deciduous shrublands. *Betula nana (= Betula glandulosa)* dominates the canopy with 25-60% cover. The canopy is typically dense, however there are large, open spaces between individual shrub clumps. Other shrubs present include *Salix planifolia, Salix monticola, Salix wolfii,* and *Dasiphora fruticosa*

ssp. floribunda (= Pentaphylloides floribunda) in the Colorado stands. In the Montana sites *Cornus sericea, Alnus incana*, and *Rhamnus alnifolia* can occur. The herbaceous undergrowth is found on small hummocks and is usually dominated by a dense mixture of mesic forbs and mesic graminoids. Mesic graminoids (25-60% cover) include *Calamagrostis canadensis, Calamagrostis stricta, Carex aquatilis, Carex utriculata, Carex livida*, and *Deschampsia caespitosa*. Forb cover is sparse and may include *Epilobium ciliatum, Caltha leptosepala, Ligusticum filicinum, Ranunculus sceleratus, Sparganium natans (= Sparganium minimum)*, and *Thalictrum alpinum*. The fern layer can consist of as much as 80% cover with *Equisetum laevigatum*.
Dynamics: This plant association appears to be a long-lived mid- to late-seral community (Viereck et al. 1992 as cited in Kittel et al. 1999b). As peatland hummocks develop (become more pronounced), they may become more heavily dominated by *Salix* species (Wendell et al. 1986 as cited in Kittel et al. 1999b). Due to cold temperatures and a short growing season, this process may take several decades to occur (Phillips 1977).
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from Montana, Colorado, Wyoming, and Alberta. *Betula nana* is widely distributed from Alaska south to the Sierra Nevada, east to Newfoundland, Canada, and the northeastern United States (Hitchcock et al. 1964). This alliance likely occurs throughout the higher elevations in the western United States, specifically in Wyoming, Utah, Nevada, and Idaho.
Nations: CA, US
Subnations: AB, BC?, CA?, CO, ID, MT, OR, WA?, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 20:C, 68:P
USFS Ecoregions: M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332B:CP, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Flathead, Gunnison, Idaho Panhandle, Kootenai, Lolo, Routt)

ALLIANCE SOURCES

Author(s): D. Culver
References: Carsey et al. 2003a, Carsey et al. 2003b, Hansen et al. 1991, Hansen et al. 1995, Hitchcock et al. 1964, Johnston 1987, Kartesz 1994a, Kettler and McMullen 1996, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Phillips 1977, Sanderson and Kettler 1996

[CEGL002653] *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland

Translated Name: **Swamp Birch / Mesic Forbs - Mesic Graminoids Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: Most stands of this association occur in subalpine meadows and willow communities. It grows in areas where soils are saturated from snowmelt runoff for a significant part of the growing season, often on fens or bogs, where the vegetation receives water from seeps and springs. Elevational range is 2600-3000 m (8500-10,000 feet). *Betula nana* dominates the canopy with 20-80% cover. Due to their small size, *Betula nana* patches often intergrade with surrounding communities. Other shrubs present include 0-20% cover each of *Salix planifolia, Salix monticola, Salix wolfii*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and 0-10% cover each of *Salix brachycarpa* and *Lonicera involucrata*. The herbaceous undergrowth grows on small hummocks and is usually dominated by a dense mixture of mesic forbs and mesic graminoids. Mesic graminoids include *Calamagrostis canadensis, Carex aquatilis, Carex norvegica, Carex utriculata*, and *Deschampsia caespitosa*. Forb species with lower cover include *Chamerion angustifolium (= Epilobium angustifolium), Caltha leptosepala, Conioselinum scopulorum, Ligusticum filicinum, Angelica pinnata, Mertensia ciliata*, and *Thalictrum alpinum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs in an avalanche path in the heart of the Teton Range. The aspect is north with a slope of 62%. The elevation is 2430 m (7973 feet). The soil is a well-drained sandy loam. The unvegetated ground cover is dominated by litter and duff (70% ground cover) and mosses and liverworts (20% ground cover). Large rocks and bedrock provide the rest of the ground cover. The surrounding vegetation in the avalanche chute is composed of *Salix* sp., *Menziesia ferruginea* and *Betula* sp. with a few *Abies lasiocarpa* and *Picea engelmannii* seedlings and scattered *Abies lasiocarpa* saplings.

Global Environment: This low shrubland association occurs in upper subalpine and lower alpine zones in the southern Rocky Mountains and Teton Range between 2500 and 3520 m (8200-11,540 feet) elevation in Colorado and is reported from 2430 m (7973 feet) in northwestern Wyoming. Stands are found on flat to moderate sloping mountain valleys, bottomlands, benches, and low slopes. They are often patchy and occur intermixed with willow shrublands and wet sedge meadows, forming complex wetland mosaics (Kittel et al. 1999b, Carsey et al. 2003a, 2003b). Sites are saturated from snowmelt runoff for a significant part of the growing season or occur as groundwater-fed fens where the vegetation receives water from seeps and springs, but also include steep, north-facing avalanche chutes. Soils are generally deep, poorly drained peat or muck soils but include moderately deep mineral soils of silty clay loams over gravels to well-drained sandy loams. Water table depth is 25-120 cm. Ground cover typically has high cover (to 70%) of litter and duff and mosses and liverworts, and occasionally has high cover of large rock and bedrock.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane tall shrubland that occurs on mesic sites. A few saplings of *Abies lasiocarpa* are present, but shrubs dominate this vegetation type. The short-shrub layer consists of *Betula nana* and *Menziesia ferruginea* (both at 40% canopy cover) with *Salix* sp. (30% canopy cover) and *Ribes lacustre* (10% canopy cover). Other common short shrubs include *Lonicera involucrata, Cornus sericea, Rubus parviflorus, Sorbus scopulina*, and *Spiraea splendens*. The dwarf-shrub layer consists of *Abies lasiocarpa* and *Picea engelmannii* seedlings. The herbaceous layer is diverse and dominated by *Athyrium filix-femina, Streptopus amplexifolius*, and *Parnassia fimbriata*.

Global Vegetation: This wetland association is characterized by a moderately dense to dense low-shrub canopy dominated by *Betula nana* with 20-80% cover. Due to their small size, *Betula nana* patches often intergrade with surrounding communities. Other shrubs present with less than 20% cover each are *Salix monticola, Salix planifolia, Salix wolfii*, or *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and less than 10% cover each are *Cornus sericea, Lonicera involucrata, Menziesia ferruginea* (in northern Wyoming), *Ribes lacustre, Rubus parviflorus, Salix brachycarpa, Sorbus scopulina*, and *Spiraea splendens*. Occasional trees and shrub of *Picea engelmannii* and *Pinus contorta* may be present in some stands. The herbaceous undergrowth grows on small hummocks and is usually dominated by a dense and often diverse mixture of mesic forbs and mesic graminoids (Kittel et al. 1999b, Carsey et al. 2003a, 2003b). Mesic graminoids include *Bromus ciliatus, Calamagrostis canadensis, Carex aquatilis, Carex norvegica, Carex utriculata, Deschampsia caespitosa, Festuca brachyphylla, Fragaria virginiana, Juncus drummondii, Trisetum spicatum*, and *Trisetum wolfii*. Forb species may include low to moderate cover of *Angelica pinnata, Athyrium filix-femina, Caltha leptosepala, Chamerion angustifolium (= Epilobium angustifolium), Conioselinum scopulorum, Erigeron peregrinus, Ligusticum* spp., *Mertensia ciliata, Parnassia fimbriata, Pedicularis groenlandica, Polygonum viviparum, Potentilla diversifolia, Rhodiola rhodantha, Sibbaldia procumbens, Streptopus amplexifolius*, and *Thalictrum alpinum*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Betula nana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Cornus sericea	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Lonicera involucrata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Menziesia ferruginea	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ribes lacustre	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Rubus parviflorus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Sorbus scopulina	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Spiraea splendens	Short shrub/sapling	Broad-leaved deciduous shrub	.	.	.
Parnassia fimbriata	Herb (field)	Forb	.	X	.
Streptopus amplexifolius	Herb (field)	Forb	X	X	.
Athyrium filix-femina	Herb (field)	Fern	X	X	.
Grand Teton National Park Higher Taxa					
Salix sp.	characteristic shrub				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Betula nana	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Dasiphora fruticosa ssp. *floribunda*	Short shrub/sapling	Broad-leaved deciduous shrub	X	.	.
Arnica mollis	Herb (field)	Forb	X	.	.
Caltha leptosepala	Herb (field)	Forb	X	.	.
Conioselinum scopulorum	Herb (field)	Forb	X	.	.
Epilobium angustifolium	Herb (field)	Forb	X	.	.
Erigeron peregrinus	Herb (field)	Forb	X	.	.
Mertensia ciliata	Herb (field)	Forb	X	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	.	.
Carex aquatilis	Herb (field)	Graminoid	X	.	.

Carex utriculata	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note
Mosses	dominant nonvasculars

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (7-Apr-1998).

RELATED CONCEPTS

Global Similar Associations:
- *Betula nana / Carex* spp. Shrubland (CEGL005887)
- *Betula nana / Carex utriculata* Shrubland (CEGL001079)

Global Related Concepts:
- *Betula glandulosa (= nana)* / Mesic Forbs - Mesic Graminoids Shrubland (Carsey et al. 2003b) =
- *Betula glandulosa / Carex rostrata* Habitat Type (Hansen et al. 1995) I
- *Betula glandulosa / Carex scopulorum* Plant Association (Johnston 1987) =
- *Betula glandulosa* / Mesic Forb - Mesic Graminoid Plant Association (Kittel et al. 1999b) = *Betula nana (= glandulosa)* / Mesic Forbs - Mesic Graminoids Shrubland (Carsey et al. 2003a) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs on an avalanche chute below forks of Cascade Canyon.
Global Range: This shrubland association is found in the upper subalpine and lower alpine zones in the southern Rocky Mountains and Teton Range from central Colorado to northwestern Wyoming.
Nations: US
States/Provinces: CO:S3, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04). ECO20 & M331I added for ROMO (KAS 5-04).
USFS Ecoregions: M331D:CC, M331G:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Arapaho-Roosevelt, Gunnison, Routt)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: A number of avalanche chutes were documented, however, only this one was so heavily dominated by *Betula nana* and *Menziesia ferruginea*.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B043
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	X	.	.	.	.
Carsey et al. 2003b	.	X	X	X	X	.	.	.	.
Hansen et al. 1995	.	.	X	.	.	.	.	.	.
Johnston 1987	.	.	X	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	.	.	.	.	.

Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Sanderson and Kettler 1996	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1004 *Salix drummondiana* Seasonally Flooded Shrubland Alliance

Drummond's Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within the ~*Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)$$ occur on alluvial terraces adjacent to mountain rivers and streams. Occurrences occupy gentle undulating surfaces with slopes ranging from 5-30%. They range in elevation from 2135-3300 m. These communities are often associated with beaver activity. They are typically located adjacent to beaver ponds, lakes, seeps and springs, and on alluvial terraces adjacent to mountain rivers and streams. Soils are usually peaty with organic matter accumulation. Soil textures range from silt to clay loam. Water tables are usually at or near the surface. Gleyed soil is common at any depth. Soil texture is fine-loamy, loamy-skeletal, and sandy. The soils classify as Cryaquolls and Cryaquepts. Vegetation types within this alliance are classified as seasonally flooded, cold-deciduous shrublands. *Salix drummondiana* dominates the tall-shrub layer with open, corridor-like canopies with a dense graminoid layer in the understory. *Salix monticola, Salix planifolia*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* are often present in the shrub layer. The graminoid layer is typically dominated by *Carex utriculata* with cover of 50-75%. Forb cover is relatively low. Species can include *Geum macrophyllum* and *Epilobium ciliatum* with 1-10% cover. *Pinus contorta* and *Populus tremuloides* forests occur on adjacent hillslopes.

Environment: Communities within the ~*Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)$$ occur on alluvial terraces adjacent to mountain rivers and streams. Occurrences occupy gentle undulating surfaces with slopes ranging from 5-30%. They range in elevation from 2135-3300 m. These communities are often associated with beaver activity. They are typically located adjacent to beaver ponds, lakes, seeps and springs, and on alluvial terraces adjacent to mountain rivers and streams.

Soils are usually peaty with organic matter accumulation. Soil textures range from silt to clay loam. Water tables are usually at or near the surface Gleyed soil is common at any depth. Soil texture is fine-loamy, loamy-skeletal, and sandy. According to Johnston (1987), the soils classify as Cryaquolls and Cryaquepts.

Pinus contorta and *Populus tremuloides* forests occur on adjacent hillslopes.

Vegetation: Vegetation types within this alliance are classified as seasonally flooded, cold-deciduous shrublands. *Salix drummondiana* dominates the tall-shrub layer with open, corridor-like canopies with a dense graminoid layer in the understory. *Salix monticola, Salix planifolia*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* are often present in the shrub layer. The graminoid layer is typically dominated by *Carex utriculata* with a percent cover of 50-75%. Forb cover is relatively low. Species can include *Geum macrophyllum* and *Epilobium ciliatum* with 1-10% cover.

Dynamics: The areal abundance of the plant association within this alliance appears to be limited to saturated wetland environments and therefore may be dependent on beaver populations that maintain a high water table. In addition, near beaver activity, this association may be a mid-successional community that will eventually become a *Salix planifolia*- or *Salix monticola*-dominated type as the area dries slightly and becomes filled in by sedimentation (Sanderson and Kettler 1996).

Similar Alliances:

- *Salix drummondiana* Temporarily Flooded Shrubland Alliance (A.973)--differs because the surface water is present for brief periods during the growing season instead of prolonged periods as in the seasonally flooded alliance. Additionally, the water table usually lies well below the soil surface for most of the season, as opposed to at or near the surface in the seasonally flooded alliance.

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from Washington, Idaho, Montana, Wyoming, and Colorado and may possibly occur in British Columbia. *Salix drummondiana* occurs throughout the Rocky Mountains, the Great Basin, Pacific Northwest, and California. It is likely that this alliance is more widespread.

Nations: CA?, US

Subnations: BC, CO, ID, MT, OR, UT?, WA, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 20:C, 68:C

USFS Ecoregions: 342B:PP, M242C:CC, M331D:CC, M331I:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC, M333C:CC

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); USFS (Nez Perce)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1989b, Carsey et al. 2003a, Carsey et al. 2003b, Hansen et al. 1995, Hickman 1993, Hitchcock et al. 1964, Johnston 1987, Kittel and Lederer 1993, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1993, Manning and Padgett 1995, Moseley et al. 1994, Mutz and Queiroz 1983, Sanderson and Kettler 1996

[CEGL002631] *Salix drummondiana / Carex utriculata* Shrubland

Translated Name: **Drummond's Willow / Beaked Sedge Shrubland**
Common Name: **Drummond's Willow / Northwest Territory Sedge**
Ecological System(s):
- North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This is a broadly distributed association ranging from British Columbia, south into eastern Washington, west into Idaho, Montana, and south into Wyoming and Colorado. It has an elevational range spanning over 1525 m (5000 feet) from 700 to 2380 m (2300-7800 feet). Its primary habitat is adjacent to beaver ponds, mountain rivers and streams, alluvial terraces and marshes, as well as seeps and springs. *Salix drummondiana* is 100% constant, its cover averaging over 50%, and no other shrubs are even 50% constant or have more than 30% cover. Other shrubs typically present include *Salix monticola, Salix geyeriana, Salix boothii*, mixed with but never as abundant as *Salix drummondiana*. Shorter shrubs can be present as well and include *Lonicera involucrata, Ribes inerme*, and *Rubus* sp. *Carex utriculata* is the dominant graminoid in the herbaceous layer, and at least in a major part of its range, 10% of canopy cover may consist of any one of several *Carex* spp. (*Carex vesicaria, Carex atherodes, Carex aquatilis, Carex lenticularis*). Modal stands tend to have *Carex utriculata* dominant or codominant with *Carex aquatilis*. Other graminoids that may be present include *Calamagrostis canadensis*. A whole host of introduced graminoids proliferate with grazing disturbance, such as *Poa pratensis* and *Phleum pratense*. The forb component is generally insignificant, only occasionally comprising more than 10% cover, and component species vary widely. Documented forb species include *Canadanthus modestus (= Aster modestus), Symphyotrichum spathulatum var. spathulatum (= Aster occidentalis), Geum macrophyllum, Epilobium ciliatum, Comarum palustre (= Potentilla palustris)*, and *Mentha arvensis*. In Colorado, other forbs with a cover of trace to up to 10% include *Trifolium* sp., *Trollius laxus ssp. albiflorus, Caltha leptosepala var. leptosepala, Chamerion angustifolium ssp. circumvagum, Epilobium saximontanum, Galium triflorum, Heracleum maximum, Pedicularis groenlandica, Rorippa* sp., *Rumex crispus*, and *Thalictrum fendleri*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on basin or valley floors at elevations of 6900 to 7907 feet. All stands are situated in palustrine areas that are seasonally flooded or have standing water within the plot. One stand has saturated silty clay soils. Moss composes a high percentage of the ground surface. Adjacent vegetation may include *Abies lasiocarpa* forests or *Pinus contorta* forests.

Global Environment: This is a broadly distributed association ranging from British Columbia, south into eastern Washington, west into Idaho, Montana, and south into Wyoming and Colorado. The elevational range spans 1525 m (5000 feet) from 700 to 2815 m (2300-9235 feet). Its primary habitat is adjacent to beaver ponds, mountain rivers and streams, alluvial terraces and marshes, as well as seeps and springs. Soils are very moist and poorly drained, silty clay loam to sandy loam with large amounts of organic matter intermixed. Mottling can be present, indicative of seasonal flooding followed by drawdown of the water table in late summer.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The tall shrub stratum is dominated exclusively by *Salix drummondiana* with 20 to 30% cover, which occurs as a short shrub in two stands. The herbaceous layer is dominated by *Carex utriculata* (40 to 70% cover). No other species contributes more than 12% cover to the herbaceous layer. Species that occur in half the stands are *Calamagrostis canadensis, Equisetum arvense*, and *Cirsium arvense*.

Global Vegetation: *Salix drummondiana* is 100% constant, its cover averaging over 50%, and no other shrubs are even 50% constant or have more than 30% cover. In southern Montana the *Salix drummondiana*-dominated types occupy higher elevation sites with *Salix geyeriana*- and *Salix boothii*-dominated types tending to occur at intermediate elevations, though this is not necessarily the distribution pattern in other areas. *Carex utriculata* is the dominant graminoid in the herbaceous layer, and at least in a major part of its range, 10% of canopy cover consists of any one of several *Carex* spp. (*Carex vesicaria, Carex atherodes, Carex aquatilis, Carex lenticularis*). Modal stands tend to have *Carex utriculata* dominant or codominant with *Carex aquatilis*. Other native graminoids include *Glyceria* species and *Juncus balticus*. A whole host of introduced graminoids proliferate with grazing disturbance. The forb component is generally insignificant, only occasionally comprising more than 10% cover. *Canadanthus modestus (= Aster modestus), Symphyotrichum spathulatum var. spathulatum (= Aster occidentalis), Geum macrophyllum, Epilobium ciliatum, Comarum palustre (= Potentilla palustris)*, and *Mentha arvensis* are the forbs having both the highest constancy and coverage values.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix drummondiana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Cirsium arvense	Herb (field)	Forb	.	X	.
Equisetum arvense	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	.	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Galium sp.	characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix drummondiana	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (29-Jan-2000). This association (or the environments it represents) is very common, perhaps one of the most common, *Salix* spp.-dominated riparian/wetland types of the Northwest and Intermountain West. Even were it to be most narrowly defined, say by the dominance of *Salix drummondiana* and *Carex utriculata* alone (other species a minor component) or by these species having very high cover values, say in excess of 50%, then this type would still be abundant. The most significant threat to this community is livestock overuse, which can lead to the reduced vigor, highlining, clubbing, or death of willows. The principal graminoids, *Carex utriculata* and *Carex aquatilis*, are not particularly palatable, but on narrow riparian or small wetland sites within extensive rangeland, these and other sedge species are heavily utilized, particularly where stocking rates are high. Vegetation trampling, hummocking and a shift to weedy species (or their introduction) occurs as a result and can result in an irremediable type conversion.

RELATED CONCEPTS

Global Similar Associations:
- *Picea engelmannii / Salix drummondiana* Woodland [Provisional] (CEGL005843)
- *Salix boothii / Carex utriculata* Shrubland (CEGL001178)
- *Salix candida / Carex utriculata* Shrubland (CEGL001188)
- *Salix drummondiana / Calamagrostis canadensis* Shrubland (CEGL002667)
- *Salix geyeriana / Carex utriculata* Shrubland (CEGL001207)
- *Salix lutea / Carex utriculata* Shrubland (CEGL001220)
- *Salix wolfii / Carex utriculata* Shrubland (CEGL001237)

Global Related Concepts:
- *Salix boothii / Carex rostrata* Community Type (Youngblood et al. 1985a) B
- *Salix drummondiana - Carex utriculata* Swamp (MacKenzie and Moran 2004) =
- *Salix drummondiana - Salix myrtillifolia / Carex rostrata - Carex aquatilis* Community Type (Mutz and Queiroz 1983) B
- *Salix drummondiana / Carex rostrata* Habitat Type (Hansen et al. 1995) =
- *Salix drummondiana / Carex utriculata* Association (Kovalchik 1993) =
- *Salix drummondiana/Carex utriculata* (Bourgeron and Engelking 1994) =
- *Salix* spp. / *Carex rostrata* Community Type (Tuhy and Jensen 1982) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Salix boothii / Carex rostrata* Habitat Type extremely well. Youngblood et al. mention that, because of the compatibility of *Salix boothii* and *Salix drummondiana*, they are treated as ecological equivalents.

Global Classification Comments: This type is substantiated by 43 plots in Montana and 20 plots in Washington. In addition, surrounding states have a number of well-documented, highly similar tall *Salix* spp.-dominated associations in which *Salix drummondiana* can be both a dominant/codominant and highly constant, including *Salix drummondiana - Salix boothii / Carex rostrata - Carex aquatilis* Shrubland (not in USNVC), ~*Salix boothii / Carex utriculata* Shrubland (CEGL001178)$$, ~*Salix*

geyeriana / Carex utriculata Shrubland (CEGL001207)$$, and ~*Salix lutea / Carex utriculata* Shrubland (CEGL001220)$$. *Salix drummondiana* can also be a major component in short willow communities, e.g., ~*Salix candida / Carex utriculata* Shrubland (CEGL001188)$$ and ~*Salix wolfii / Carex utriculata* Shrubland (CEGL001237)$$. Other *Salix* spp.-dominated associations have appreciable coverages of *Carex utriculata*, raising the issue of what coverages of *Carex utriculata* will be accorded indicator status. Another significant hurdle in establishing confidence in this type is what, if any, *Carex* spp. will be accepted as ecological equivalents (as used by Hansen et al. 1995). In addition *Salix drummondiana* is easily confused with *Salix sitchensis* making community identification difficult. There is a monumental amount of crosswalk work to accomplish before this type can be unequivocally classified across its considerable geographic range. Similar, if not identical, types under different names have been described throughout the Northwest and Intermountain West. However, a type of this exact name (accepting *Carex utriculata* as synonymous with *Carex rostrata*) was first described for Montana; its identifying series or alliance level features are *Salix* spp. having at least 10% canopy cover and *Salix drummondiana* having greater canopy cover than the combined cover of *Salix geyeriana* and *Salix boothii* and less cover than *Salix lutea*.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the upper elevations of Granite Canyon, in the Flagg Ranch area, and off the Grassy Lake Road.

Global Range: This association is found abundantly in the Northern Rocky Mountains of Montana and Idaho, and in eastern Washington. It may also occur in northern Utah and western Wyoming, but has not been confirmed from these states.
Nations: CA, US
States/Provinces: BC, CO, ID:S3, MT:S4, UT?, WA:S3, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 20:C
TNC Ecoregion Comments: ECO6 changed from ? to C (GK 6-05> ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 added (GK 1-04).
USFS Ecoregions: M242C:CC, M331D:CC, M331I:CC, M332F:CC, M332G:CC, M333A:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand for this association was sampled.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202058
Accuracy Assessment Points: 04R116, 04X451, 04X456
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): S.V. Cooper, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall and Hansen 1997	.	X	.	X	X	.	.	.	.
Hansen et al. 1995	.	X	X	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kovalchik 1993	.	X	X	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
MacKenzie and Moran 2004	.	.	X	X	.	.	.	.	.
Moseley et al. 1994	.	X	.	X	.	.	.	.	.
Mutz and Queiroz 1983	.	.	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	.	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

A.1005 *Salix eastwoodiae* Seasonally Flooded Shrubland Alliance

Sierran Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within the ~*Salix eastwoodiae* Seasonally Flooded Shrubland Alliance (A.1005)$$ are scattered throughout the high-elevation, late snowmelt areas. They are found within glacial valley bottoms (e.g., seeps, toeslopes, benches, and stream benches), wet mountain meadows, and streambanks with gentle slopes (3%). Elevations range from 2300-3200 m. Sites that support these communities contain surface waters that collect in rivulets or are fed by seeps with water flowing at or near the surface. Soils are characterized by organic surface horizons. Textures of the underlying mineral horizons range from silty clay loam to loam sand. Vegetation types within this alliance are characterized as cold-deciduous seasonally flooded shrublands. They are dominated by *Salix eastwoodiae*. *Salix planifolia, Salix boothii*, and *Betula nana (= Betula glandulosa)* also occur in the shrub layer. Total shrub cover varies from 30 to over 75%. *Carex scopulorum, Carex aquatilis*, and *Carex utriculata* are usually dominant in the understory with at least 40% cover. *Carex cusickii (= Carex obovoidea)* and *Carex luzulina* are frequent and abundant. *Calamagrostis canadensis* is a dominant graminoid in their Idaho stands. Forb cover is low with *Mertensia ciliata, Saxifraga odontoloma*, and *Thalictrum occidentale*. Adjacent upland communities are dominated by *Pinus monticola, Pinus contorta*, and *Abies concolor*.
Environment: Communities within this shrubland alliance are scattered throughout the high-elevation, late snowmelt areas. They are found within glacial valley bottoms (e.g., seeps, toeslopes, benches, and stream benches), wet mountain meadows, and streambanks with gentle slopes (3%). Elevations range from 2300-3200 m (Dorn 1997). Sites that support these communities contain surface waters that collect in rivulets or are fed by seeps with water flowing at or near the surface (Mutz and Queiroz 1983). Soils are characterized by organic surface horizons. Textures of the underlying mineral horizons range from silty clay loam to loam sand.

Adjacent upland communities are dominated by *Pinus monticola, Pinus contorta*, and *Abies concolor*.
Vegetation: Vegetation types within this alliance are characterized as cold-deciduous, seasonally flooded shrublands. They are dominated by *Salix eastwoodiae*. *Salix planifolia, Salix boothii*, and *Betula nana (= Betula glandulosa)* also occur in the shrub layer. Total shrub cover varies from 30 to over 75%. *Carex scopulorum, Carex aquatilis*, and *Carex utriculata* are usually dominant in the understory with at least 40% cover. *Carex cusickii (= Carex obovoidea)* and *Carex luzulina* are frequent and abundant (Mutz and Queiroz 1983). Tuhy and Jensen (1982) report *Calamagrostis canadensis* as a dominant graminoid in their Idaho stands. Forb cover is low with *Mertensia ciliata, Saxifraga odontoloma*, and *Thalictrum occidentale*.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is an incidental type found in the Rocky Mountains (western Wyoming and eastern Idaho), western Nevada, and California.
Nations: US
Subnations: CA, ID, WY
TNC Ecoregions: 9:C, 12:C
USFS Ecoregions: M261E:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton, Yosemite); USFS (Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Dorn 1997, Mutz and Queiroz 1983, Padgett and Manning 1988, Sawyer and Keeler-Wolf 1995, Tuhy and Jensen 1982, Walford et al. 1997, Youngblood et al. 1985a

[CEGL001194] *Salix eastwoodiae* Shrubland [Provisional]

Translated Name: **Sierran Willow Shrubland**
Common Name: **Sierran Willow**
Ecological System(s):
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.821)

Status: Provisional **Circumscription Confidence:** 3 - Weak
Concept Author(s): G.P. Jones

ELEMENT CONCEPT

Global Summary: This riparian shrubland type has been described from northwestern Wyoming. *Salix eastwoodiae* occurs in the high subalpine as a low shrub, and at lower elevations as a taller shrub. Consequently, the undergrowth is variable. The shrub canopy is often shared with smaller amounts of *Salix planifolia, Salix drummondiana, Salix boothii, Salix geyeriana, Dasiphora fruticosa*, and *Lonicera involucrata*. The herbaceous layer can be dense and dominated by graminoids, such as *Carex praegracilis, Carex nigricans, Deschampsia caespitosa, Calamagrostis canadensis*, and *Juncus balticus*, or dominated by mesic forbs such as *Mertensia ciliata, Saxifraga odontoloma, Viola* sp., *Arnica mollis, Caltha leptosepala, Dodecatheon jeffreyi*, and *Thalictrum occidentale*. With more data, it may prove prudent to create a *Salix eastwoodiae* / mesic graminoid type and a *Salix eastwoodiae* / mesic forb type.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur in the mountains at elevations ranging from 8200 to 9100 feet. They occur in channels, interfluves, on canyon valley floors, or a variety of slopes. The stands have slopes ranging from 10 to 45% with most aspects generally facing south, two that face north, and one that faces west. All stands occur in palustrine areas that are either permanently or temporarily flooded, or have seasonal or permanent streams. Soil data is available for two plots; soils include poorly-drained loams and silt clay loams. Unvegetated and non-vascular ground surface data from one stand indicate that litter and duff dominate with 70% cover. Mosses compose 20% of the ground cover. The remaining surface is co-dominated by water, gravel, bare soil, wood, and rocks greater than 10cm. Most other stands have a higher percentage of rock or gravel than unvegetated ground cover. Adjacent to one stand is a mixed *Picea engelmannii – Abies lasiocarpa – Pinus albicaulis* forest and various forb and graminoid meadows. Some of the stands are located in avalanche chutes or run-out areas, and most are noted as being located where there are harsh growing conditions.

Global Environment: This association occurs between 2400 and 2926 m (7874- 9600 feet) elevation in narrow and wide valleys, on narrow or wide floodplains, or on seeps. Soils are poorly drained loams and silt clay loams, often saturated to the surface for much of the growing season.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane deciduous shrubland that occurs in mesic areas. *Salix eastwoodiae* dominates as either tall, short, or dwarf shrubs with 12 to 90% cover. *Vaccinium scoparium* is the only other shrub to occur in over half of the plots, occurring as a dwarf shrub with trace to 12% cover. The herbaceous layer is diverse with the most constant species (occurring in 4 of 9 stands) being *Poa alpina* (trace to 3% cover), *Arnica longifolia* (1 to 30% cover), and *Senecio triangularis* (1 to 3% cover). *Abies lasiocarpa* occurs in all but one stand as poles, saplings, and/or seedlings.

Global Vegetation: *Salix eastwoodiae* occurs in the high subalpine as a low shrub, and at lower elevations as a taller shrub. Consequently, the undergrowth is variable The shrub canopy is often shared with smaller amounts of *Salix planifolia, Salix drummondiana, Salix boothii, Salix geyeriana, Dasiphora fruticosa*, and *Lonicera involucrata*. The herbaceous layer can be dense and dominated by graminoids, such as *Carex praegracilis, Carex nigricans, Deschampsia caespitosa, Calamagrostis canadensis*, and *Juncus balticus*, or dominated by mesic forbs such as *Mertensia ciliata, Saxifraga odontoloma, Viola* sp., *Arnica mollis, Caltha leptosepala, Dodecatheon jeffreyi*, and *Thalictrum occidentale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Tall shrub/sapling	Needle-leaved tree	.	X	.
Vaccinium scoparium	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix eastwoodiae	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix eastwoodiae	Tall shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix eastwoodiae	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex luzulina var. *ablata*	-	P	rare
Dodecatheon jeffreyi	-	P	rare
Kalmia microphylla	-	P	rare
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2Q (14-Dec-2000). The G2Q conservation rank is assigned because this putative association seems to occur over a small geographic area. Although the number of documented stands is less than 5, additional stands are assumed to exist because this type apparently is not restricted to a particular environment, and a large area of potentially suitable habitat has not been surveyed. The scant information on *Salix eastwoodiae* vegetation makes the validity of this type as an association highly questionable and its conservation rank highly uncertain. More information will almost certainly show that this putative association, as it is now

known, is simply a collection of disparate stands that have been grouped together because they do not fit into already-described associations.

RELATED CONCEPTS

Global Similar Associations:
- *Salix commutata / Carex scopulorum* Shrubland (CEGL001189)

Global Related Concepts:
- *Salix eastwoodiae* (Bourgeron and Engelking 1994) =
- *Salix eastwoodiae* / Mesic Graminoid Community Type (Walford et al. 2001) =
- *Salix eastwoodiae* Community Type (Youngblood et al. 1985b) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Youngblood et al. (1985a) give few details of the *Salix eastwoodiae* Habitat Type. Most aspects of the stands sampled in Grand Teton National Park are similar to the Youngblood et al. description, except that the stands in Grand Teton National Park seem to have a more dominant and diverse graminoid component.
Global Classification Comments: This putative association is based on a general description of vegetation from the Teton Mountains, and on plot data from two stands elsewhere, one on the Beartooth Plateau and one in the southern Absaroka Mountains. The only feature shared among these three examples of *Salix eastwoodiae* vegetation is their poor fit into already-named *Salix eastwoodiae* associations. More detailed information from the stands in the Tetons, and information from additional stands elsewhere, is needed to determine how the various *Salix eastwoodiae* stands in northwestern Wyoming should be classified. Compare this association to ~*Salix commutata / Carex scopulorum* Shrubland (CEGL001189)$$ in Idaho. Additional plots from Grand Teton National Park in 2003 and 2004 did not help to clarify the type, as the plots were quite different in understory species composition.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near the headwaters of North Moran Creek, north of Mink Lake, in the North and South Fork of Cascade Canyon, in Open Canyon, and in Upper Granite Canyon.

Global Range: This association is known from northwestern Wyoming.
Nations: US
States/Provinces: WY:S2
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202131, GT-03A067
Accuracy Assessment Points: 04J187, 04X317, 04X318, 04X319, 04J205, 04K109, 04K111
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G.P. Jones, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Walford et al. 1997	.	.	.	.	X	.	.	.	.
Walford et al. 2001	.	.	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	X	.	.	.	.
Youngblood et al. 1985b	.	.	X	.	.	.	.	.	.

A.1006 *Salix geyeriana* Seasonally Flooded Shrubland Alliance

Geyer's Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this temporarily flooded, cold-deciduous shrubland alliance occur from the foothills to high elevations in the mountains of the western United States. Elevation ranges from 1320-2900 m. Landforms include broad benches and alluvial terraces of streams, springs, and seeps. Stands often develop on abandoned and sediment-filled beaver ponds. Soils are composed of deep, fine-textured alluvium over subsurface soils of various textures and origin. Surface textures are silt to silty clay loam with mottling near the surface. Soils have a high water-holding capacity. Organic matter may accumulate on the surface. The communities are characterized by a tall-shrub layer dominated by *Salix geyeriana*. Occasional codominants include *Salix monticola, Salix boothii, Salix lemmonii*, or *Salix eriocephala*. Some stands have shorter willows in the understory, including *Salix wolfii* and *Salix planifolia*. Other shrub species include *Lonicera utahensis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides fruticosa)*, and *Ribes* spp. *Calamagrostis canadensis, Calamagrostis stricta, Poa palustris, Deschampsia caespitosa, Carex aquatilis*, and *Carex utriculata* are the dominant graminoid species with 10-60% cover. The forb layer is minor with 10-20% cover and includes *Geum macrophyllum, Pyrola asarifolia, Galium trifidum*, and *Epilobium ciliatum*. *Populus tremuloides, Pinus contorta*, and *Pinus ponderosa* forests occur on surrounding hillslopes.

Environment: Communities within this alliance occur from the foothills to high elevations in the mountains of the western United States. Elevation ranges from 1320-2900 m. Landforms include broad benches and alluvial terraces of streams, springs, and seeps. Stands often develop on abandoned and sediment-filled beaver ponds. Soils are composed of deep, fine-textured alluvium over subsurface soils of various textures and origin. Surface textures are silt to silty clay loam with mottling near the surface. Soils have a high water-holding capacity. Organic matter may accumulate on the surface.

Populus tremuloides, Pinus contorta, and *Pinus ponderosa* forests occur on surrounding hillslopes.

Vegetation: Communities within this alliance are classified as temporarily flooded cold-deciduous shrublands. The communities are characterized by a tall-shrub layer dominated by *Salix geyeriana*. Occasional codominants include *Salix monticola, Salix boothii, Salix lemmonii* or *Salix eriocephala*. Some stands have shorter willows in the understory, including *Salix wolfii* and *Salix planifolia*. Other shrub species include *Lonicera utahensis, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides fruticosa)*, and *Ribes* spp. *Calamagrostis canadensis, Calamagrostis stricta, Poa palustris, Deschampsia caespitosa, Carex aquatilis*, and *Carex utriculata* are the dominant graminoid species with 10-60% cover. The forb layer is minor with 10-20% cover and includes *Geum macrophyllum, Pyrola asarifolia, Galium trifidum*, and *Epilobium ciliatum*.

Dynamics: Characteristics of the herbaceous layer and soils suggest that many of the vegetation types within this alliance are stable (Youngblood et al. 1985b). However, livestock grazing pressure will cause a decrease in the native graminoids (Hansen et al. 1995).

Similar Alliances:

- *Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)

Similar Alliance Comments: The ~*Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)$$ differs from this seasonally flooded shrubland alliance (A.1006) due to hydrologic regime. The temporarily flooded shrubland has surface water present for only brief periods during the growing season, and the water table usually lies well below the soil surface. The seasonally flooded shrubland has surface water present for extended periods of time, especially during the early part of the growing season. The water table is at or near the soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread throughout the Rocky Mountains (western Colorado, Wyoming, Utah, Idaho, and Montana), Great Basin (Nevada), and the Pacific Northwest (Oregon and Washington). The alliance may also occur in northern Arizona.

Nations: US

Subnations: CO, ID, MT, NV, OR, UT, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C

USFS Ecoregions: 342B:CC, 342C:CC, 342D:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333B:CC, M333C:CC, M333D:CC

Federal Lands: NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); USFS (Arapaho-Roosevelt, Bighorn, Gunnison, Medicine Bow, Routt, Shoshone, White River NF)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1989b, Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Hansen et al. 1991, Hansen et al. 1995, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kagan 1997, Kearney et al. 1969, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Mutz and Queiroz 1983, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001205] *Salix geyeriana / Calamagrostis canadensis* Shrubland

Translated Name: **Geyer's Willow / Bluejoint Shrubland**

Common Name: **Geyer's Willow / Bluejoint Shrubland**

Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This riparian shrubland often forms large expanses of willows on broad montane valley floors. Stands have a 2- to 3-m tall, cold-deciduous shrub canopy that is dominated by *Salix geyeriana*. The ground is usually hummocky with a dense herbaceous layer that is dominated by the perennial graminoid *Calamagrostis canadensis*. These shrublands are often associated with beaver-created wetlands. This shrubland generally occurs on broad, flat mountain valleys where the valley gradient is not more than 5% between 1585 and 3050 m (5200-10,000 feet) in elevation. It is known from Idaho, Montana, Utah, Nevada, Wyoming and Colorado. This is a tall, cold-deciduous willow shrubland with an open canopy of *Salix geyeriana*. The stands are generally open with only 40% cover but can occur with a near-continuous canopy. A shorter shrub layer is often present, these generally tucked underneath the taller willows, even in more open stands, although short shrubs away from the taller canopy are not unexpected. Common coexisting tall shrubs include *Salix boothii* and *Salix drummondiana*. Common shorter shrub species include *Salix planifolia, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera involucrata, Ribes lacustre*, and *Betula nana (= Betula glandulosa)*. The undergrowth is a very thick carpet of graminoids dominated by *Calamagrostis canadensis*. *Carex aquatilis* and *Carex utriculata* are often present but never in as great abundance as *Calamagrostis canadensis*. *Bromus ciliatus, Poa pratensis, Deschampsia caespitosa*, and *Phleum alpinum* are also commonly encountered. Forbs contribute very little to the overall biomass but are always present in small amounts. No species are consistently present, but often seen species include *Geum macrophyllum, Thalictrum fendleri, Heracleum maximum*, and *Fragaria virginiana*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The one sampled stand composing this association occurs on level terrain on the valley floor at 2096 m (6875 feet). The stand is located in a palustrine area that is temporarily flooded during the growing season. It occurs on moderately well-drained silt loam soils that are covered primarily by mosses (60% cover) and litter and duff (30% cover). Traces of wood and bare soil are also present. The stand is surrounded by *Pinus contorta* regeneration from the 1988 Huckleberry Fire.
Global Environment: This shrubland generally occurs on broad, flat mountain valleys where the valley gradient is not more than 5% between 1585 and 3050 m (5200-10,000 feet) in elevation. It is known from Idaho, Montana, Utah, Nevada and Colorado. It is often associated with active and abandoned beaver ponds and dams and can also occupy wet soils around seeps and springs. Typically it occurs on flat, broad floodplains, but it has been seen in narrow valleys and long narrow streambanks as well. Soils are generally fine silty loams with considerable organic matter. The stands often have hummocky microtopography differentiating the very wet-tolerant herbaceous species from the less wet species.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix geyeriana* composes the tall-shrub stratum with 80% cover. *Salix boothii* and *Ribes* sp. are present in the short-shrub stratum in small quantities. Graminoids form the prominent component of the herbaceous layer, including *Calamagrostis canadensis* (40% cover), *Poa pratensis* (20% cover), *Deschampsia caespitosa* (10% cover), *Bromus ciliatus* (3% cover), and *Carex vesicaria* (3% cover). The only common forb is *Symphyotrichum lanceolatum* with 20% cover.
Global Vegetation: This is a tall, cold-deciduous willow shrubland with an open canopy of *Salix geyeriana*. The stands are generally open with only 40% cover but can occur with a near-continuous canopy. A shorter shrub layer is often present, these generally tucked underneath the taller willows, even in more open stands, although short shrubs away from the taller canopy are not unexpected. Common coexisting tall shrubs include *Salix boothii* and *Salix drummondiana*. Common shorter shrub species include *Salix planifolia, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda), Lonicera involucrata, Ribes lacustre*, and *Betula nana (= Betula glandulosa)*. The undergrowth is a very thick carpet of graminoids dominated by *Calamagrostis canadensis*. *Carex aquatilis* and *Carex utriculata* are often present but never in as great abundance as *Calamagrostis canadensis*. *Bromus ciliatus, Poa pratensis, Deschampsia caespitosa*, and *Phleum alpinum* are also commonly encountered. Forbs contribute very little to the overall biomass but are always present in small amounts. No species are consistently present, but often seen species include *Geum macrophyllum, Thalictrum fendleri, Heracleum maximum*, and *Fragaria virginiana*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Symphyotrichum lanceolatum	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Carex vesicaria	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

Poa pratensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Ribes sp.	characteristic short shrub

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Ribes inerme	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	X
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Salix geyeriana - Salix monticola / Calamagrostis canadensis* Shrubland (CEGL001247)
- *Salix geyeriana / Carex aquatilis* Shrubland (CEGL001206)

Global Related Concepts:
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Hall and Hansen 1997) B
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Walford et al. 2001) =
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Tuhy and Jensen 1982) =
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Youngblood et al. 1985a) =
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Mutz and Queiroz 1983) =
- *Salix geyeriana / Calamagrostis canadensis* Community Type (Padgett et al. 1989) =
- *Salix geyeriana / Calamagrostis canadensis* Ecological Type (Girard et al. 1997) B
- *Salix geyeriana / Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) B
- *Salix geyeriana / Calamagrostis canadensis* Shrubland (Carsey et al. 2003a) =
- *Salix geyeriana /Calamagrostis canadensis* Association (Crowe et al. 2004) =
- *Salix geyeriana/Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- *Salix geyeriana* / Mesic Graminoid Community Type (Manning and Padgett 1995) B
- *Salix* spp. / *Calamagrostis canadensis* Association (Crowe and Clausnitzer 1997) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Salix geyeriana / Calamagrostis canadensis* Community Type well. Youngblood et al. note that, throughout their study, this type was found only in the Centennial Mountains.

Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand for this association occurs in the John D. Rockefeller, Jr. Memorial Parkway northeast of Steamboat Mountain.

Global Range: It is known from Oregon, Idaho, Montana, Utah, Nevada, Wyoming and Colorado.

Nations: US

States/Provinces: CO:S3, ID:S4, MT:S4, OR, UT:S2?, WY

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C

TNC Ecoregion Comments: ECO7 added (mjr 7-05). ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).

USFS Ecoregions: 342D:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M333B:CC, M333D:CC

Federal Lands: NPS (Grand Teton?, Rockefeller, Rocky Mountain); USFS (Bighorn, Medicine Bow)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand was sampled for this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C099
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Carsey et al. 2003b	.	.	.	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	.	X	X	.	.	.	.	.
Crowe et al. 2004	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1997	.	.	X	X	.	.	.	.	.
Hall and Hansen 1997	.	.	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	X	.	.	.	.	.
Mutz and Queiroz 1983	.	.	X	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Walford et al. 2001	.	.	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

[CEGL001207] *Salix geyeriana / Carex utriculata* Shrubland

Translated Name: **Geyer's Willow / Beaked Sedge Shrubland**
Common Name: **Geyer's Willow / Beaked Sedge Shrubland**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: Throughout its distribution, this association occurs in mountains and high valleys at elevations ranging from 1310 to 2740 m (4300-9000 feet). This is the wettest of the *Salix geyeriana*-dominated willow shrublands. It is most common on broad, level floodplains but does occur in narrow bands along smaller streams in open U-shaped valleys. Valley bottom gradients are usually low. Surface microtopography is often hummocky as a result of the irregular buildup of organic material. Stands have a 1- to 3-m tall, nearly closed canopy to open clumps that are dominated by the deciduous shrub *Salix geyeriana*, with a thick carpet of graminoids in the undergrowth that is dominated by *Carex utriculata*. A diversity of other shrubs may be present but usually in low amounts. Some of these subordinate shrubs are present in the upper canopy along with *Salix geyeriana*, such as *Salix boothii, Salix drummondiana, Salix monticola*, and *Alnus incana*. Often there are shorter shrubs present but usually with not more than 20% cover. Shorter shrub species include *Salix planifolia, Salix wolfii, Betula nana (= Betula glandulosa), Ribes inerme, Lonicera involucrata*, or *Dasiphora*

fruticosa ssp. floribunda (= Potentilla fruticosa). Carex utriculata clearly dominates the understory. Other sedges and grasses, such as *Carex aquatilis, Carex interior, Carex scopulorum, Carex simulata, Carex praegracilis*, or *Calamagrostis canadensis*, may be present, but they have low cover. Forb species are sparse, but *Geum macrophyllum* appears to be the most constant species across the range of this type.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The one sampled stand of this association occurs in a channel at an elevation of 2110 m (6924 feet). The stand is situated in a palustrine area that has a saturated hydrologic regime. The poorly drained clay loam soils are covered by litter and duff (70%) and interspersed with water (20%). Wood, bare soil, fungi, and mosses may also be present in small quantities. Adjacent vegetation may include *Salix wolfii, Artemisia cana*, and/or forbland communities.

Global Environment: Throughout its distribution, this association occurs in mountains and high valleys at elevations ranging from 1310 to 2740 m (4300-9000 feet). This is the wettest of the *Salix geyeriana*-dominated willow shrublands. It is most common on broad, level floodplains but does occur in narrow bands along smaller streams in open U-shaped valleys. Valley bottom gradients are usually low. Surface microtopography is often hummocky as a result of the irregular buildup of organic material. Hydrology of these sites is usually maintained through subirrigation, and soil moisture is maintained at or near the surface in most cases. These sites may or may not be annually flooded during high water in the spring and early summer. This association occurs on a range of soil types that are typically wet, cold, and organic or have organic surface horizons. They are generally classified as Mollisols and Histisols. Organic surface horizons, often extending to a depth of 45 cm (18 inches) or more, are riddled with fibrous roots and plant material. Soil textures are categorized as fine, generally silts and clays. Deeper alluvial mineral deposits are comprised of coarse and fine sands and gravels. The soils are usually mottled, indicating seasonal flooding and water table recession.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix geyeriana* forms the tall-shrub stratum with 90% ground cover. The short-shrub stratum may include *Lonicera involucrata* (10% cover), *Ribes inerme* (10% cover), and *Rosa* sp. (3% cover). The herbaceous layer is dominated by graminoids; *Carex utriculata* (40% cover) and *Agrostis* sp. (30% cover) codominate the canopy with small quantities of *Phalaris arundinacea* and *Poa palustris* present. The forbs are fairly diverse, but only a few are present in more than trace quantities, including *Heracleum maximum* (10% cover), *Thalictrum sparsiflorum* (10% cover), and *Geum macrophyllum* (3% cover).

Global Vegetation: *Salix geyeriana* dominates the overstory and can have large, often widely spaced clumps. *Salix geyeriana* can be as much as 3 m tall. A diversity of other shrubs may be present but usually in low amounts. Some of these subordinate shrubs are present in the upper canopy along with *Salix geyeriana*, such as *Salix boothii, Salix drummondiana, Salix monticola*, and *Alnus incana*. Often there are shorter shrubs present but usually with not more than 20% cover. Shorter shrub species include *Salix planifolia, Salix wolfii, Betula nana (= Betula glandulosa), Ribes inerme, Lonicera involucrata*, and *Dasiphora fruticosa ssp. floribunda (= Potentilla fruticosa). Carex utriculata* clearly dominates the understory. Other sedges and grasses, such as *Carex aquatilis, Carex interior, Carex scopulorum, Carex simulata, Carex praegracilis*, or *Calamagrostis canadensis*, may be present, but they have low cover. Forb species are sparse, but *Geum macrophyllum* appears to be the most constant species across the range of this type.

Global Dynamics: This association is the wettest of all *Salix geyeriana* types. Prolonged, intense utilization by livestock and wild ungulates may shift the site potential to a drier grazing disclimax, characterized by more open stands with exotic grasses, such as *Poa pratensis* and *Agrostis stolonifera*, dominating the understory. Beavers may exert a significant influence on sites as well. Active dams maintain high water tables needed to support this type. However, sustained removal of willows by beavers may reduce the site to a *Carex utriculata* association. When beaver abandon a site, the dams eventually deteriorate, and the water table may drop, shifting the site potential to ~*Salix geyeriana / Calamagrostis canadensis* Shrubland (CEGL001205)$$. The wet organic soils can be strongly impacted by livestock and heavy machinery, but the dense roots and rhizomes of *Carex utriculata* bind the soil and stabilize the site. Loss of the shallow water table, through soil damage and/or stream incision, will initially shift undergrowth composition towards drier graminoids and forbs. Willow regeneration will be limited, and the mature individuals will eventually become decadent. *Carex utriculata* provides a very high level of streambank stabilization.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Lonicera involucrata	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ribes inerme	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Geum macrophyllum	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Thalictrum sparsiflorum	Herb (field)	Forb	.	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.
Phalaris arundinacea	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Agrostis sp.	dominant and characteristic graminoid
Rosa sp.	characteristic short shrub

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix geyeriana	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Ribes inerme	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Geum macrophyllum	Herb (field)	Forb	.	X	.
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Salix boothii / Carex utriculata* Shrubland (CEGL001178)
- *Salix drummondiana / Carex utriculata* Shrubland (CEGL002631)
- *Salix geyeriana / Carex aquatilis* Shrubland (CEGL001206)

Global Related Concepts:
- *Salix geyeriana / Carex rostrata - Carex aquatilis* Community Type (Mutz and Queiroz 1983) B
- *Salix geyeriana / Carex rostrata* Community Type (Manning and Padgett 1995) =
- *Salix geyeriana / Carex rostrata* Community Type (Walford et al. 2001) =
- *Salix geyeriana / Carex rostrata* Community Type (Youngblood et al. 1985a) B
- *Salix geyeriana / Carex rostrata* Community Type (Padgett et al. 1989) =
- *Salix geyeriana / Carex rostrata* Habitat Type (Hall and Hansen 1997) B
- *Salix geyeriana / Carex rostrata* Habitat Type (Hansen et al. 1995) B
- *Salix geyeriana/Carex rostrata* (Bourgeron and Engelking 1994) =
- *Salix geyeriana* / Wet *Carex* Ecological Type (Girard et al. 1997) =
- *Salix* spp. / *Carex rostrata* Community Type (Tuhy and Jensen 1982) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Willow / Beaked Sedge Association (Kovalchik 1987) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Salix geyeriana / Carex rostrata* Community Type extremely well.

Global Classification Comments: Many studies throughout the Rocky Mountain west have documented this association. All of these classifications have used the old name *Carex rostrata*, which is now known to be strictly boreal. This name is superseded by *Carex utriculata* (Reznicek 1987).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand for this association occurs east of Two Ocean Lake Road.
Global Range: This association has been document in Colorado, Idaho, Montana, Nevada, Oregon, Utah and Wyoming.
Nations: US
States/Provinces: CO:S3, ID:S4, MT:S5, NV, OR:S2, UT:S2S3, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO7 added (mjr 7-05). ECO8 added (mjr 8-04). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, 342D:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand composes this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C009
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1997	.	.	X	.	.	.	.	.	.
Hall and Hansen 1997	.	.	X	.	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kovalchik 1987	.	.	X	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	.	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Reznicek 1987	.	X	.	.	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Walford et al. 2001	.	.	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

[PARK SPECIAL GRTE-034] *Salix geyeriana / Carex praticola* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The one sampled stand of this association is situated on the valley floor at 6864 feet near a river. The stand is located in a palustrine area that is temporarily flooded during the growing season. The moderately well-drained loam soils are covered almost exclusively by litter and duff (98%). Wood, bare soil, mosses, and lichens compose the remaining unvegetated and non-vascular ground surface. Adjacent to this stand are shrubland patches dominated by either *Artemisia cana* or *Dasiphora floribunda.*

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix geyeriana* forms the tall shrub stratum with 40% ground cover. Shrubs that may be present in the short shrub stratum include *Dasiphora floribunda* and *Salix boothii*. Graminoid cover dominates the herbaceous layer. *Carex praticola* (40% cover) and *Poa pratensis* (10% cover) are the common graminoids. Also present in more than trace quantities are *Deschampsia caespitosa* and *Elymus trachycaulus.* The only common forb species present is *Taraxacum officinale* (10% cover).

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TALL SHRUB	*Salix geyeriana*
GRAMINOID	*Carex praticola, Poa pratensis*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Dasiphora floribunda, Salix boothii, Salix geyeriana, Carex praticola, Deschampsia caespitosa, Elymus trachycaulus, Poa pratensis, Taraxacum officinale

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Poa pratensis, Cirsium arvense, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand for this association occurs near the Buffalo River.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C091
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one sampled stand composes this association.

Classification Confidence: **Identifier:** New-GRTE-034
Local Author: Rob Massatti
Date: 2 April 2004

Local Editor: Klara Varga
Date: 7 April 2004

Global Author:

REFERENCES: None

A.2523 *Salix lemmonii* Seasonally Flooded Shrubland Alliance

Lemmon's Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is currently known from California, Idaho, Nevada, Oregon, and Wyoming.
Nations: US
Subnations: CA, ID, NV, OR, WY
TNC Ecoregions: 6:C, 9:C, 11:C, 12:C
USFS Ecoregions: 341D:CC, 341G:CC, 342C:CC, M261E:CC, M331D:CC
Federal Lands: NPS (Grand Teton, Yosemite); USFS (Bridger-Teton, Humboldt-Toiyabe)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL002069] *Salix lemmonii* / Mesic Graminoids Shrubland

Translated Name: **Lemmon's Willow / Mesic Graminoids Shrubland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): Manning and Padgett (1995)

ELEMENT CONCEPT

Global Summary: This riparian shrubland occurs in the Sierra Nevada, Carson and Sweetwater ranges of western Nevada, the Wildhorse Range of northern Nevada, and in the Teton Range of western Wyoming. Elevation ranges from 2045-2660 m (6700-8720 feet). It occurs on stream terraces, benches or on seeps in narrow to wide valleys, on low- to moderate-gradient slopes. Stream channels are often wide and only slightly sinuous. This is a tall willow shrubland dominated by *Salix lemmonii*. Other shrubs present include *Salix geyeriana* and *Salix lutea* intermixed in the upper canopy, with *Ribes inerme* occasionally occurring as a sub-shrub canopy. The herbaceous undergrowth is moderate to dense with several graminoid species; none are singly dominant, but graminoid cover is greater than that of any forbs present. Typical graminoid species are *Carex pellita (= Carex lanuginosa), Carex nebrascensis, Carex simulata, Carex hoodii, Poa pratensis*, and/or *Calamagrostis canadensis*. Forbs, when present, are sparse or low-growing species not visible due to the dense graminoid cover. Forb species in Nevada indicate moist surface conditions and include *Mimulus guttatus, Mentha arvensis, Polemonium caeruleum*, and *Cardamine* spp. In Wyoming, sampled stands were disturbed from grazing and had dry-condition indicator forb species present such as *Eriogonum umbellatum, Achillea millefolium, Potentilla pulcherrima*, and *Symphyotrichum ascendens*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on flat terraces, channels, or the valley floor at elevations of 6800 to 7100 feet. The loam soils for one stand are composed of 70% gravel. Openings scattered throughout this willow stand are generally less than 5 feet in diameter and dominated by the same species as are in the herbaceous layer. Browsing or heavy grazing is evident in all stands.

Global Environment: Elevation ranges from 2045-2660 m (6700-8720 feet). This association occurs on stream terraces, benches or on seeps in narrow to wide valleys, on low- to moderate-gradient slopes. Stream channels are often wide and only slightly sinuous

(Rosgen Channel Type: B2 or B4). Soils are Cumulic Haploxerolls and Aquic Cryoborolls, with up to 70% gravel content. The water table is well below 1 meter of the soil surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in subxeric to mesic areas. *Salix lemmonii* dominates the tall shrub stratum with 7 to 70% cover. *Artemisia tridentata* ssp. *vaseyana* occurs in two stands with 1 to 3% cover. A variety of graminoids and forbs compose the herbaceous layer. The most constant graminoids, which also contribute the highest cover include *Carex utriculata, Carex aquatilis,* and *Poa pratensis.* No forb contributes more than 3% cover to the herbaceous layer except *Eriogonum umbellatum* with 20% cover in one stand. The only forbs to occur in more than one stand are *Eriogonum umbellatum* and *Polygonum douglasii*.

Global Vegetation: This is a tall willow shrubland dominated by *Salix lemmonii*. Other shrubs present include *Salix geyeriana* and *Salix lutea* intermixed in the upper canopy, with *Ribes inerme* occasionally occurring as a sub-shrub canopy. The herbaceous undergrowth is moderate to dense with several graminoid species; none are singly dominant, but graminoid cover is greater than that of any forbs present. Typical graminoid species are *Carex pellita (= Carex lanuginosa), Carex nebrascensis, Carex simulata, Carex hoodii, Poa pratensis*, and/or *Calamagrostis canadensis*. Forbs, when present, are sparse or low-growing species not visible due to the dense graminoid cover. Forb species in Nevada indicate moist surface conditions and include *Mimulus guttatus, Mentha arvensis, Polemonium caeruleum*, and *Cardamine* spp. In Wyoming, sampled stands were disturbed from grazing and had dry-condition indicator forb species present such as *Eriogonum umbellatum, Achillea millefolium, Potentilla pulcherrima*, and *Symphyotrichum ascendens*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix lemmonii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Hordeum jubatum	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Cirsium arvense	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (26-Jul-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Salix lemmonii* / Mesic Graminoid Community Type (Manning and Padgett 1995) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Grand Teton National Park Other Comments: The sampled stand of this association shows signs of degradation through overgrazing. It is assumed that, under a natural disturbance regime, this stand would fit the mesic graminoid classification more completely.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the Pacific Creek drainage, on the John D. Rockefeller Memorial Parkway valley floor, in the Grassy Lake area, and east of Moose Pond.

Global Range: This riparian shrubland occurs in the Sierra Nevada, Carson and Sweetwater ranges of western Nevada, the Wildhorse Range of northern Nevada, and in the Teton Range of western Wyoming.
Nations: US
States/Provinces: ID, NV, WY
TNC Ecoregions: 6:C, 9:C, 11:C
TNC Ecoregion Comments: ECO6 & ECO11 added (GK 7-05).
USFS Ecoregions: 341D:CC, 342C:CC, M261E:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Humboldt-Toiyabe)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202095
Accuracy Assessment Points: 04J162, 04R213, 04R221, 04X066
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
IDCDC 2005	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995*	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[CEGL002771] *Salix lemmonii* / Mesic-Tall Forbs Shrubland

Translated Name: **Lemmon's Willow / Mesic-Tall Forbs Shrubland**
Common Name:
Ecological System(s):
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Manning and Padgett (1995)

ELEMENT CONCEPT

Global Summary: This upper montane-subalpine riparian shrubland association is known from the eastern Sierra Nevada, Carson Range, and Independence Range in northeastern Nevada at elevations ranging from 2088 to 3110 m (6800-10,200 feet). Stand widths are typically narrow on terraces and benches along streams but are occasionally very wide in wet meadows near seeps and springs. Valley-bottom gradients vary from flat to very high (0-7%) with sideslopes gentle to moderate (<25%). Substrates are generally Cryoborolls with fine or coarse textures. Litter and cryptogams comprise half the ground cover. The vegetation is characterized by a dense tall-shrub layer (2-5 m tall) that is dominated by *Salix lemmonii*, with an herbaceous layer dominated by tall and mesic forbs. Occasional *Alnus incana* are emergent over willows, and *Ribes* spp., *Lonicera involucrata*, and *Symphoricarpos oreophilus* are often present and may form an open short-shrub layer (1-2 m tall). Abundant and consistent species in the moderately dense herbaceous layer include dominance or codominance by *Aconitum columbianum, Castilleja miniata, Conium maculatum, Lupinus polyphyllus, Mertensia ciliata, Osmorhiza occidentalis, Senecio triangularis, Thalictrum fendleri,* or *Veratrum californicum*. Other common forbs include *Chamerion angustifolium (= Epilobium angustifolium), Hackelia micrantha*, and *Solidago canadensis*. Low cover of graminoids, including *Bromus carinatus, Carex athrostachya, Carex microptera, Carex scopulorum*, or *Hordeum brachyantherum*, is common.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The two sampled stands for this association occur on level terrain with elevations of 2088 and 2271 m (6850 and 7450 feet). One stand is located in a saturated palustrine area on clay loam soils. Adjacent vegetation may include *Populus tremuloides* and/or *Pinus contorta* communities.
Global Environment: This association occurs on floodplains at elevations ranging from 2088 to 3110 m (6800-10,200 feet). Stand widths are typically narrow on terraces and benches along streams but are occasionally very wide in wet meadows near seeps and springs. Valley-bottom gradients vary from flat to very high (0-7%) with sideslopes gentle to moderate (<25%). Substrates are generally Cryoborolls with fine or coarse textures. Litter and cryptogams comprise half the ground cover.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix lemmonii* dominates the tall-shrub stratum in both stands with 20 and 80% canopy cover. The short-shrub stratum includes *Ribes inerme* (1 and 10% cover) and *Lonicera involucrata* (1 and 3% cover). *Populus tremuloides* seedlings contribute 3% cover to the dwarf-shrub stratum in one stand. A variety of graminoid species populate the stands; no single species is present in more than one stand. Common graminoids, both present in the same stand, are *Poa palustris* (20% cover) and *Carex utriculata* (10% cover). Forbs found in each stand include *Fragaria virginiana* (1 and 10% cover), *Geum macrophyllum* (1 and 3% cover), and *Urtica dioica* (1% cover). Forbs present in only one stand with 10% canopy cover include *Cirsium arvense, Epilobium ciliatum, Mentha arvensis,* and *Thalictrum fendleri*.

Global Vegetation: The vegetation is characterized by a dense tall-shrub layer (2-5 m tall) that is dominated by *Salix lemmonii*, with an herbaceous layer dominated by tall and mesic forbs. Occasional *Alnus incana* are emergent over willows, and *Ribes inerme, Lonicera involucrata*, and *Symphoricarpos oreophilus* are often present and may form an open short-shrub layer (1-2 m tall). Abundant and consistent species in the moderately dense herbaceous layer include dominance or codominance by *Aconitum columbianum, Castilleja miniata, Conium maculatum, Lupinus polyphyllus, Geum macrophyllum, Mertensia ciliata, Osmorhiza occidentalis, Senecio triangularis, Thalictrum fendleri, Urtica dioica*, or *Veratrum californicum*. Other common forbs include *Chamerion angustifolium (= Epilobium angustifolium), Hackelia micrantha*, and *Solidago canadensis*. Low cover of graminoids, including *Bromus carinatus, Carex athrostachya, Carex utriculata, Carex microptera, Carex scopulorum*, or *Hordeum brachyantherum*, is common.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix lemmonii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Lonicera involucrata	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Ribes inerme	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Geum macrophyllum	Herb (field)	Forb	.	X	.
Urtica dioica	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix lemmonii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Aconitum columbianum	Herb (field)	Forb	.	X	.
Mertensia ciliata	Herb (field)	Forb	.	X	.
Osmorhiza occidentalis	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Solidago canadensis	Herb (field)	Forb	.	X	.
Thalictrum fendleri	Herb (field)	Forb	.	X	.
Veratrum californicum	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cerastium fontanum	-	P	exotic
Cirsium arvense	-	P	exotic
Rumex crispus	-	P	exotic
Torreyochloa pallida var. *pauciflora*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (28-Jun-2001).

RELATED CONCEPTS

Global Similar Associations:

Global Related Concepts:

- *Salix lemmonii* / Mesic Forb Community Type (Manning and Padgett 1995) F
- *Salix lemmonii* / Tall Forb Community Type (Manning and Padgett 1995) F

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: The concept of this shrubland association includes both *Salix lemmonii* / Mesic Forb and *Salix lemmonii* / Tall Forb community types (Manning and Padgett 1995).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association was sampled in the Pacific Creek drainage near Emma Matilda Lake and in the Bridger-Teton National Forest east of Triangle X Ranch.
Global Range: This upper montane-subalpine riparian shrubland association is known from the eastern Sierra Nevada, Carson Range, and Independence Range in northeastern Nevada, and in the Teton Range of western Wyoming.
Nations: US
States/Provinces: NV:S3?, WY
TNC Ecoregions: 9:C, 11:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 341D:CC, 341G:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: This association is defined by two sampled stands.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202036, GT-0201094
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Manning and Padgett 1995*	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-035] *Salix lemmonii / Carex pellita* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stand of this association occurs on the valley floor at 6810 feet. The stand is situated in a saturated palustrine environment on moderately well-drained silty clay soils. The unvegetated and non-vascular ground surface is composed of 90% litter and duff and 10% mosses. Traces of wood and bare soil are also present. Interspersed within the willow shrubland are graminoid patches generally not exceeding 64m^2.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The tall shrub stratum is dominated by *Salix lemmonii* (70% cover). Present within the short shrub stratum at 3% cover are *Salix wolfii* and *Dasiphora floribunda*. A variety of graminoids and forbs populate the herbaceous layer. The graminoids are dominated by *Carex pellita* (30% cover). *Poa pratensis* and *Deschampsia caespitosa* are also present in greater than trace quantities. Co-dominant forbs with 10% cover include *Fragaria virginiana, Trifolium repens,* and *Taraxacum officinale*. Other forbs present in greater than trace quantities include *Galium* sp., *Maianthemum stellatum, Symphyotrichum foliaceum, Solidago canadensis,* and *Potentilla gracilis*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
TALL SHRUB	*Salix lemmonii*
GRAMINOID	*Carex pellita*
FORB	*Fragaria virginiana*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Dasiphora floribunda, Salix lemmonii, Salix wolfii, Carex pellita, Deschampsia caespitosa, Poa pratensis, Fragaria virginiana, Galium sp., *Maianthemum stellatum, Potentilla gracilis, Solidago canadensis, Symphyotrichum foliaceum, Taraxacum officinale, Trifolium repens*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Poa pratensis, Taraxacum officinale, Trifolium repens*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand occurs south of the Flagg Ranch gravel pit.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C016
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one stand was sampled of this association.

Classification Confidence: **Identifier:** New-GRTE-035
Local Author: Rob Massatti
Date: 6 April 2004

Local Editor: Klara Varga
Date: 7 April 2004

Global Author:

REFERENCES: None

A.1008 *Salix planifolia* Seasonally Flooded Shrubland Alliance

Planeleaf Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within the ~*Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)$$ are common and abundant in the upper montane and subalpine zones (above 1525 m) throughout the western United States. They occur in wide, wet valleys on snowmelt-fed swales. They also occur in narrow valleys with sinuous streams and wet floodplains associated with beaver ponds. Snowmelt is the primary source of moisture during the growing season. Soils have an organic peat top layer over mineral silty clays, heavy silty clay loams, silty loams, sandy loams, or loamy sands. Mottling is often evident. The water table at several stands is usually near the surface throughout the growing season and may be perched by a clay horizon. Still other stands occur on deep, dark clay loams with high organic content or a fibric or hemic layer on top. Soil pH levels are acidic, ranging from 4.8-7.8. *Salix planifolia* dominates the shrub layer with at least 70% cover. Other willows can include *Salix monticola, Salix wolfii, Salix boothii, Salix geyeriana*, and *Salix drummondiana*. The undergrowth is dominated by graminoids and can include *Carex aquatilis, Carex utriculata, Calamagrostis canadensis*, and *Deschampsia caespitosa*. Forb cover is typically less than 20% of the total undergrowth cover and may include *Caltha leptosepala, Cardamine cordifolia*, and *Pedicularis groenlandica*. Adjacent riparian and wetland vegetation includes *Carex aquatilis, Carex utriculata*, or *Calamagrostis canadensis* wet meadows. *Salix brachycarpa* shrublands occur on higher ground. At higher elevations, *Abies lasiocarpa - Picea engelmannii* or *Pinus contorta* forests occur on adjacent hillsides.
Environment: Communities within the ~*Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)$$ are common and abundant in the upper montane and subalpine zones (above 1525 m) throughout the western United States. They occur in wide, wet valleys on snowmelt-fed swales. They also occur in narrow valleys with sinuous streams and wet floodplains associated with beaver ponds. Snowmelt is the primary source of moisture during the growing season. Soils have an organic peat top layer over mineral silty clays, heavy silty clay loams, silty loams, sandy loams, or loamy sands. Mottling is often evident. The water table at several stands is usually near the surface throughout the growing season and may be perched by a clay horizon. Still other stands occur on deep, dark clay loams with high organic content or a fibric or hemic layer on top (Kittel et al. 1999b). Soil pH levels are acidic, ranging from 4.8-7.8 (Komarkova 1986).

Adjacent riparian and wetland vegetation includes *Carex aquatilis, Carex utriculata*, or *Calamagrostis canadensis* wet meadows. *Salix brachycarpa* shrublands occur on higher ground. At higher elevations, *Abies lasiocarpa - Picea engelmannii* or *Pinus contorta* forests occur on adjacent hillsides.
Vegetation: Communities within this alliance are characterized as seasonally flooded, cold-deciduous shrublands. *Salix planifolia* dominates the shrub layer with at least 70% cover. Other willows can include *Salix monticola, Salix wolfii, Salix boothii, Salix geyeriana*, and *Salix drummondiana*. The undergrowth is dominated by graminoids and can include *Carex aquatilis, Carex utriculata, Calamagrostis canadensis*, and *Deschampsia caespitosa*. Forb cover is typically less than 20% of the total undergrowth cover and may include *Caltha leptosepala, Cardamine cordifolia*, and *Pedicularis groenlandica*.
Dynamics: *Carex utriculata, Carex aquatilis*, and *Calamagrostis canadensis* are dominant understory species of several *Salix* alliances. These graminoids indicate different microenvironments within the *Salix* communities (Padgett et al. 1989) and may represent different stages of succession of the floodplain (Cooper 1986a). *Carex utriculata, Carex aquatilis*, and *Calamagrostis canadensis* separate out along a moisture gradient related to the depth of the water table at a particular site. *Carex utriculata* occurs on the wettest sites, such as low-lying swales, with the highest water tables. *Carex aquatilis* occurs on intermediate sites. *Calamagrostis canadensis* dominates the driest sites with the lowest water tables and often colonizes clumps of *Carex utriculata* and *Carex aquatilis* (Cooper 1986a).

Floodplain aggradation, or build up, can result in a change in species composition over time. Late spring snowmelt and long periods of summer rain cause upper elevation streams to overflow their banks. Sediments are deposited on the floodplain, raising the surface higher above the water table (Cooper 1986a). As aggradation of the floodplain proceeds and the site becomes less saturated, the dominant graminoid understory can change from *Carex utriculata* to *Carex aquatilis* to *Calamagrostis canadensis*.
Similar Alliances:
- *Salix planifolia* Temporarily Flooded Shrubland Alliance (A.982)

Similar Alliance Comments: The *Salix planifolia* Temporarily Flooded Shrubland Alliance differs because the surface water is present for brief periods during the growing season and the water table usually lies well below soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread throughout the subalpine and alpine areas of Alaska, south to New Mexico and Arizona, west to Nevada, and east to western South Dakota.
Nations: CA, US
Subnations: BC?, CO, ID, MT, NM, UT, WA, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 19:C, 20:C, 26:C
USFS Ecoregions: 313B:??, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CC, M332E:CC, M332F:CC, M333B:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain, Yellowstone); USFS (Arapaho-Roosevelt, Bighorn, Gunnison, Medicine Bow, Pike-San Isabel, Rio Grande, Routt, San Juan, Shoshone, White River NF)

ALLIANCE SOURCES

Author(s): D. Culver
References: Baker 1986, Baker 1989a, Baker 1989b, Cooper 1986a, Cooper and Cottrell 1990, Dorn 1997, Girard et al. 1997, Hallock et al. 1986, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Heifner 1974, Hess 1981, Hess and Wasser 1982, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Keammerer and Stoecker 1980, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Lewis 1970, Marr et al. 1973a, Mattson 1984, May 1973, Mutz and Queiroz 1983, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Spencer 1975, Terwilliger et al. 1979b, Viereck et al. 1992, Youngblood et al. 1985a

[CEGL005937] *Salix planifolia / Carex utriculata* Shrubland

Translated Name: **Planeleaf Willow / Beaked Sedge Shrubland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is a low-statured willow shrubland known from high mountain valleys on saturated, usually organic soils from central Utah and western Colorado north to southwestern Montana. Elevation ranges from 1750 to 2690 m (5740-8830 feet) in Montana and Wyoming and from 2710 to 3350 m (8900-11,000 feet) in Colorado and Utah. The shrub canopy is dominated by *Salix planifolia* with 30-98% cover. Other willows can be present to codominant and include *Salix geyeriana, Salix wolfii, Salix monticola, Salix boothii*, and *Salix commutata*. The herbaceous undergrowth is usually dense with graminoids, often low in species diversity. *Carex utriculata* (erroneously reported as *Carex rostrata* in several references) is the most abundant and characteristic sedge in the understory with 10-80% cover. Other graminoids that may be present include *Carex aquatilis, Calamagrostis canadensis, Juncus balticus, Juncus ensifolius, Equisetum arvense, Luzula parviflora, Phleum alpinum*, and *Poa pratensis*. Forbs are generally much less abundant than graminoids and include a wide variety of species, none being characteristic of the plant association but indicative of high montane to subalpine wetland habitats. Typical forbs include *Arnica mollis, Caltha leptosepala var. leptosepala, Conioselinum scopulorum, Epilobium* spp., and *Mertensia ciliata*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The one sampled stand of this association occurs on the valley floor at an elevation of 2097 m (6879 feet). The stand is situated in a palustrine area with a saturated hydrologic regime. The poorly drained silt loam soils are covered predominantly by litter and duff (40% cover) and mosses (60% cover). Lichens, fungi, bare soil, wood, and gravel are also present in trace quantities. The area surrounding this stand burned in the recent past. Scattered in and around the plot are *Picea engelmannii* pole-sized trees. Patches of *Rhamnus alnifolia* and *Betula nana* are also present in the vicinity.
Global Environment: This association is known from high mountain valleys. Elevation ranges from 1750 to 2690 m (5740-8830 feet) in Montana and northern Wyoming and from 2710 to 3350 m (8900-11,000 feet) in Colorado and Utah. This association occurs on wet to saturated soils along low-gradient streams in valley bottoms. It usually occurs in wide, wet valleys on snowmelt-fed swales but has been known to occur in narrow valleys with sinuous streams, as well as wet floodplains associated with beaver ponds. Moisture comes from overland flow and some lateral streamflow. Slopes range from 0-24%. Soils are often organic peats over a mineral layer. Water tables are often at the surface for much of the growing season. It is one of the wettest sites for willows within the riparian setting.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix planifolia* dominates the short-shrub layer with 70% cover. The herbaceous layer is dominated by graminoids. Common species within the stand include *Carex utriculata* (30% cover), *Calamagrostis canadensis* (10% cover), and *Equisetum arvense* (10% cover). Graminoids with 3% cover include *Poa palustris* and *Juncus ensifolius*. Forbs are diverse but do not occur in high quantities; the only

common forbs are *Arnica mollis, Symphyotrichum spathulatum*, and *Galium bifolium*, each contributing 3% to the herbaceous canopy. *Picea engelmannii* pole-sized trees (4.6 to 9.1 m [15-30 feet], 3% cover) are also present within the stand.

Global Vegetation: This association is a low-statured willow dominated shrubland, usually 1-1.5 m (3-5 feet) tall, but often not more than 1 m (3 feet) in height. The shrub canopy is dominated by *Salix planifolia*. Other willows can be present to codominant and include *Salix geyeriana, Salix wolfii, Salix monticola, Salix boothii*, and *Salix commutata*. Shrub species that are incidental but not uncommon are *Betula nana (= Betula glandulosa), Dasiphora fruticosa ssp. floribunda (= Potentilla fruticosa)*, and *Ribes oxyacanthoides ssp. setosum (= Ribes setosum)*. The herbaceous undergrowth is usually dense with graminoids, often low in species diversity. *Carex utriculata* (reported as *Carex rostrata* in many of the references) is the dominant sedge with 10-80% cover. Other graminoids that may or may not be present include *Carex aquatilis, Calamagrostis canadensis, Juncus balticus, Juncus ensifolius, Equisetum arvense, Luzula parviflora, Phleum alpinum*, and *Poa pratensis*. Forbs are generally much less abundant than graminoids and include a wide variety of species, none being characteristic of the plant association but indicative of high montane to subalpine wetland habitats. Forb species include *Achillea millefolium var. occidentalis, Arnica mollis, Caltha leptosepala var. leptosepala, Conioselinum scopulorum, Epilobium* spp., *Mertensia ciliata, Rhodiola rhodantha, Saxifraga odontoloma, Senecio triangularis, Swertia perennis, Trollius laxus ssp. albiflorus, Veronica wormskjoldii, Symphyotrichum spathulatum*, and *Galium bifolium*. Within this association there may also be upwards of 90% cover of mosses.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Picea engelmannii	Tall shrub/sapling	Needle-leaved tree	.	X	.
Salix planifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Arnica mollis	Herb (field)	Forb	.	X	.
Galium bifolium	Herb (field)	Forb	.	X	.
Symphyotrichum spathulatum	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.
Juncus ensifolius	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	.	X	.
Equisetum arvense	Herb (field)	Fern	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix planifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Carex utriculata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	
Poa pratensis	-	P	
Taraxacum officinale	-	P	

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (26-May-2004).

RELATED CONCEPTS

Global Similar Associations:

- *Salix planifolia / Carex aquatilis* Shrubland (CEGL001227)

Global Related Concepts:

- *Salix phylicifolia / Carex rostrata - Carex aquatilis* Community Type (Mutz and Queiroz 1983) B
- *Salix planifolia - Salix geyeriana* / Wet *Carex* Ecological Type (Girard et al. 1997) =
- *Salix planifolia / Carex aquatilis* Community Type (Padgett et al. 1989) B
- *Salix planifolia / Carex aquatilis* Habitat Type (Hansen et al. 1995) B *Salix planifolia / Carex utriculata* Shrubland (Carsey et al. 2003a) =
- *Salix planifolia* / Forb Ecological Type (Girard et al. 1997) =
- *Salix planifolia* Community Type (Youngblood et al. 1985a) =
- *Salix* spp. / *Carex rostrata* Community Type (Tuhy and Jensen 1982) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand for this association occurs north of the mouth of Waterfalls Canyon.
Global Range: This association is known from central and northern Utah, central and western Idaho, north through the Rocky Mountains to southwestern Montana, western and north-central Wyoming, and throughout the mountains of western Colorado.
Nations: US
States/Provinces: CO, MT, UT, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one sampled stand composes this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B089
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Carsey et al. 2003b	.	X	.	X	.	.	.	.	.
Girard et al. 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

[CEGL002893] *Salix planifolia* / Mesic Forbs Shrubland

Translated Name: **Planeleaf Willow / Mesic Forbs Shrubland**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:**
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is often a low-statured shrubland, but it can be up to 2 m in height. It typically occurs on slightly sloping valley floors. Stands occur in wide, glaciated valleys, in swales, depressions and on slopes where snowmelt runoff saturates soils for much of the growing season. This shrubland is dominated by *Salix planifolia* with 14-90% canopy cover. It can be the only shrub present, or other shrubs may be present and sometimes codominant, such as *Salix brachycarpa* and *Betula nana*. Other shrub species may be present but are generally never as abundant as *Salix planifolia*; they include *Salix boothii, Dasiphora fruticosa ssp. floribunda*, and *Lonicera involucrata*. Forbs dominate the herbaceous layer over graminoids. The herbaceous understory typically covers 40% of the surface and is dominated by a mix of mesic forbs, particularly *Caltha leptosepala var. leptosepala, Cardamine cordifolia, Delphinium barbeyi, Mertensia ciliata, Pedicularis* spp., *Senecio triangularis, Saxifraga odontoloma, Trollius laxus ssp. albiflorus, Viola macloskeyi ssp. pallens, Veronica wormskjoldii*, and *Angelica ampla*. There are also typically a few graminoids. The most frequent include *Calamagrostis canadensis, Carex aquatilis*, and *Carex haydeniana*. Scattered *Picea engelmannii* trees are rarely present.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The one sampled stand of this association occurs on a shallowly sloped terrace at an elevation of 2332 m (7651 feet). The loam soils contain about 10% gravel. The stand is situated in a patchy shrubland landscape that has the same species in different quantities throughout.

Global Environment: This is often a low-statured shrubland, but it can be up to 2 m in height. It typically occurs on slightly sloping valley floors. Stands occur in wide, glaciated valleys, in swales, depressions and on slopes where snowmelt runoff saturates soils for much of the growing season. The ground may be flat or uneven with raised hummocks. Stream gradient range from <1 to 14%. Stream channels may be steep, narrow first-order streams or relatively wide and straight, or narrow and sinuous, even braided channels that run through a myriad of beaver dams and ponds. Soils are highly variable; wetter sites have silty clays to silt loams. Drier locations have loamy sands. Some sites have an organic layer over mineral alluvium; many sites have indications of a fluctuating water table.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix boothii* occupies the tall-shrub stratum with 20% canopy cover. *Salix planifolia* and *Betula nana* codominate the short-shrub layer with 30% canopy cover each. Other shrubs are also present, including *Dasiphora fruticosa ssp. floribunda* and *Lonicera involucrata*. Graminoids are diverse but not common; the only graminoid present in more than trace quantities is *Bromus marginatus* with 3% canopy cover. Forbs are diverse and dominate the herbaceous layer. Codominant species with 10 or 20% canopy cover include *Maianthemum stellatum, Fragaria virginiana, Ligusticum filicinum, Symphyotrichum ascendens*, and *Thalictrum* sp. Other common forbs include *Achillea millefolium, Galium boreale, Chamerion angustifolium, Aconitum columbianum*, and *Helianthella quinquenervis*. Scattered *Picea engelmannii* pole-sized trees are present within the plot and in the surrounding area

Global Vegetation: This shrubland is dominated by *Salix planifolia* with 14-90% canopy cover. It can be the only shrub present, or other shrubs may be present and sometimes codominant, such as *Salix brachycarpa* and *Betula nana*. Other shrub species may be present but are generally never as abundant as *Salix planifolia*; they include *Salix boothii, Dasiphora fruticosa ssp. floribunda*, and *Lonicera involucrata*. Forbs dominate the herbaceous layer over graminoids. The herbaceous understory typically covers 40% of the surface and is dominated by a mix of mesic forbs, particularly *Caltha leptosepala var. leptosepala, Cardamine cordifolia, Delphinium barbeyi, Mertensia ciliata, Pedicularis* spp., *Senecio triangularis, Saxifraga odontoloma, Trollius laxus ssp. albiflorus, Viola macloskeyi ssp. pallens, Veronica wormskjoldii*, and *Angelica ampla*. There are also typically a few graminoids. The most frequent include *Calamagrostis canadensis, Carex aquatilis*, and *Carex haydeniana*. Scattered *Picea engelmannii* trees are rarely present.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Betula nana	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix planifolia	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Achillea millefolium	Herb (field)	Forb	.	X	.
Aconitum columbianum	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	X	X	.
Galium boreale	Herb (field)	Forb	.	X	.
Helianthella quinquenervis	Herb (field)	Forb	.	.	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Maianthemum stellatum	Herb (field)	Forb	X	X	.
Symphyotrichum ascendens	Herb (field)	Forb	.	X	.
Bromus marginatus	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Thalictrum sp.	dominant and characteristic forb

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix planifolia	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Caltha leptosepala var. *leptosepala*	Herb (field)	Forb	.	X	.
Cardamine cordifolia	Herb (field)	Forb	.	X	.
Delphinium barbeyi	Herb (field)	Forb	.	X	.
Mertensia ciliata	Herb (field)	Forb	.	X	.
Saxifraga odontoloma	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Trollius laxus ssp. *albiflorus*	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Trifolium pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (28-Oct-2002).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Salix planifolia* / Mesic Forb Shrubland (Carsey et al. 2003a) =

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand for this association occurs along Berry Creek.
Global Range: This association is documented to occur in Colorado and Wyoming.
Nations: US
States/Provinces: CO:S4, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: This association is represented by only one sampled stand.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202123
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
CONHP Ecology Team 2001	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1009 *Salix wolfii* Seasonally Flooded Shrubland Alliance

Wolf Willow Seasonally Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this cold-deciduous shrubland alliance occur in moderately narrow to wide valleys and glacial basins in saturated peat wetlands and on floodplains with lateral seepage of groundwater. Valley slopes range from 3-7%, and stream channels that run through the valleys vary from deep, narrow, and sinuous to shallow, broad, and gently meandering. Beavers are often active within the stands. Some stands occur on seeps, which remain wet throughout the growing season. Elevation ranges from 1950-3350 m. Soils vary from highly organic or peat to mineral based. Soil textures include silty clay loams, silty loams, and sandy clay loams with mottling. Some stands occur on deep sandy clays, often with a high organic content, while other stands occur on shallow silty clays over gravels and rocks. The shrub layer is typically dominated by at least 70% cover of *Salix wolfii*. Other willow

species may include *Salix planifolia, Salix boothii, Salix monticola*, and *Salix brachycarpa*. *Betula nana (= Betula glandulosa)* also occurs on wetter sites. The graminoid undergrowth is generally dense and rich, dominated by *Carex aquatilis, Carex utriculata, Deschampsia caespitosa, Carex nebrascensis*, and *Carex microptera*. Forb cover varies from sparse (<10%) to moderately dense (60%) and is generally diverse. Forb species include *Caltha leptosepala, Ligusticum tenuifolium, Swertia perennis, Pedicularis groenlandica*, and *Thalictrum alpinum*. At higher elevations, adjacent hillsides are often covered with *Abies lasiocarpa - Picea engelmannii* or *Pinus contorta* forests, *Festuca thurberi* subalpine meadows, or alpine tundra. At lower elevations, *Artemisia tridentata* scrub is often present on adjacent hillslopes.
Environment: Communities within this alliance occur in moderately narrow to wide valleys and glacial basins in saturated peat wetlands and on floodplains with lateral seepage of groundwater. Valley slopes range from 3-7%, and stream channels that run through the valleys vary from deep, narrow, and sinuous to shallow, broad, and gently meandering. Beavers are often active within the stands. Some stands occur on seeps, which remain wet throughout the growing season. Elevation ranges from 1950-3350 m.

Soils vary from highly organic or peat to mineral based. Soil textures include silty clay loams, silty loams, and sandy clay loams with mottling. Some stands occur on deep sandy clays, often with a high organic content, while other stands occur on shallow silty clays over gravels and rocks.

At higher elevations, adjacent hillsides are often covered with *Abies lasiocarpa - Picea engelmannii* or *Pinus contorta* forests, *Festuca thurberi* subalpine meadows, or alpine tundra. At lower elevations, *Artemisia tridentata* scrub is often present on adjacent hillslopes.
Vegetation: Communities within this alliance are defined as cold-deciduous shrublands. The shrub layer is typically dominated by at least 70% cover of *Salix wolfii*. Other willow species may include *Salix planifolia, Salix boothii, Salix monticola*, and *Salix brachycarpa*. *Betula nana (= Betula glandulosa)* also occurs on wetter sites. The graminoid undergrowth is generally dense and rich, dominated by *Carex aquatilis, Carex utriculata, Deschampsia caespitosa, Carex nebrascensis*, and *Carex microptera*. Forb cover varies from sparse (<10%) to moderately dense (60%) and is generally diverse. Forb species include *Caltha leptosepala, Ligusticum tenuifolium, Swertia perennis, Pedicularis groenlandica*, and *Thalictrum alpinum*.
Dynamics: In Colorado, *Salix wolfii* grows on deep, undecomposed peat, while *Salix planifolia* tends to grow on more decomposed (humified) organic soils (Phillips 1977). In Montana, *Salix planifolia* stands are observed on wetter and more fine-textured soils than sites containing *Salix wolfii* communities (Hansen et al. 1988).
Similar Alliances:
- *Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)

Similar Alliance Comments: The ~*Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)$$ differs from the ~*Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)$$ due to hydrologic regime. The temporarily flooded shrubland has surface water present for only brief periods during the growing season, and the water table usually lies well below the soil surface. The seasonally flooded shrubland has surface water present for extended periods of time, especially during the early part of the growing season. The water table is at or near the soil surface.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread throughout the Rocky Mountains in Idaho, Montana, Wyoming, Colorado, and Utah. The alliance also occurs in the Wallowa Mountains of Oregon.
Nations: US
Subnations: CO, ID, MT, UT, WY
TNC Ecoregions: 6:C, 8:C, 9:C, 10:C, 11:C, 20:C
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain, Yellowstone); USFS (Bighorn?, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Baker 1986, Baker 1989b, Girard et al. 1997, Hansen et al. 1991, Hansen et al. 1995, Hitchcock et al. 1964, Jensen and Tuhy 1981, Johnston 1987, Jones 1992b, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Mattson 1984, Mutz and Graham 1982, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Tuhy 1981, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL002064] *Salix wolfii / Calamagrostis canadensis* Shrubland

Translated Name: **Wolf Willow / Bluejoint Shrubland**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:**
Concept Author(s): Kittel et al. (1999a)

ELEMENT CONCEPT

Global Summary: This association is known from eastern Idaho, western Wyoming and the western slope of Colorado. It occurs between 2650 and 2990 m (8700-9800 feet) elevation in narrow and broad valley bottoms on flat to rolling floodplains and stream terraces. It can also occur on hillside seeps. Soils range from clay, silty loam to sand, usually with signs of a fluctuating water table. Associated stream channels can be wide and sinuous or braided from beaver activity. This is a low-statured shrubland dominated by *Salix wolfii*. The canopy cover can be nearly continuous or moderately patchy. Other willows may be present but not codominant and include *Salix planifolia, Salix monticola*, and *Salix geyeriana*. The herbaceous undergrowth is thick and dominated by graminoids; *Calamagrostis canadensis* is the most abundant and constant species present. Other graminoids include *Carex microptera, Carex utriculata, Carex aquatilis, Bromus ciliatus, Alopecurus alpinus*, and *Poa pratensis*. Forbs are always present and diverse but not as abundant as the graminoid cover. Forb species include *Thalictrum occidentale, Senecio triangularis, Senecio sphaerocephalus, Chamerion angustifolium, Cardamine cordifolia, Vicia americana, Mertensia ciliata, Valeriana edulis*, and *Heracleum maximum*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The stands sampled for this association occur on shallow to moderate north- or southeast-facing slopes at elevations of 8176 to 8830 feet, except one stand that occurs in a channel with streams on both sides of the stand at an elevation of 8900 feet. Two stands are situated in a saturated palustrine area while the other stands are located on uplands. Two stands occur in poorly-drained silty clay loams that are covered predominately by litter and duff (90 and 80% cover). Other components represented on the ground surface with up to 5% cover include rocks greater than 10cm, gravel, wood, bare soil, standing water, fungi, mosses, and lichens. *Abies lasiocarpa* are scattered in various densities in and around three stands.

Global Environment: This association occurs between 2650 and 2990 m (8700-9800 feet) elevation in narrow and broad valley bottoms on flat to rolling floodplains and stream terraces. It can also occur on hillside seeps. Soils range from silty loam to clay and even sand, usually with signs of a fluctuating water table. Associated stream channels can be wide and sinuous or braided from beaver activity.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix wolfii* dominates the short or dwarf shrub strata with 50 to 80% cover. The shrub layer also contains various other shrub species in trace quantities, though none occurr in more than one stand. The herbaceous layer is dominated by graminoids. *Calamagrostis canadensis* (7 to 50% cover) is the only species to occur in all stands. *Carex microptera* (1 and 10% cover) and *Elymus glaucus* (1 and 7% cover) occupy two stands. *Heracleum maximum* is the most constant forb, and has 1-7% cover. *Thalictrum occidentale* is present in only two stands, but contributes 20 and 40% cover. Other forbs present in two stands include *Senecio triangularis, Eucephalus engelmannii*, and *Chamerion angustifolium. Abies lasiocarpa* occurs in three stands and *Picea engelmannii* occurs in two stands either as pole-sized trees or as seedlings.

Global Vegetation: This is a low-statured shrubland dominated by *Salix wolfii*. The canopy cover can be nearly continuous or moderately patchy. Other willows may be present but not codominant and include *Salix planifolia, Salix monticola*, and *Salix geyeriana*. The herbaceous undergrowth is thick and dominated by graminoids; *Calamagrostis canadensis* is the most abundant and constant species present. Other graminoids include *Carex microptera, Carex utriculata, Carex aquatilis, Bromus ciliatus, Alopecurus alpinus*, and *Poa pratensis*. Forbs are always present and diverse but not as abundant as the graminoid cover. Forb species include *Thalictrum occidentale, Senecio triangularis, Senecio sphaerocephalus, Chamerion angustifolium, Cardamine cordifolia, Vicia americana, Mertensia ciliata, Valeriana edulis*, and *Heracleum maximum*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Dwarf-shrub	X	X	.
Chamerion angustifolium	Herb (field)	Forb	.	X	.
Eucephalus engelmannii	Herb (field)	Forb	.	X	.
Heracleum maximum	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	X	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	.
Carex microptera	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex luzulina var. *ablata*	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (27-Jul-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Salix wolfii / Calamagrostis canadensis* Community Type (Youngblood et al. 1985a) =
- *Salix wolfii / Calamagrostis canadensis* Plant Association (Kittel et al. 1999b) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Salix wolfii / Calamagrostis canadensis* Community Type fairly well. Little information is available from the Youngblood et al. study; they only sampled this community type along one creek in the Centennial Mountains, and other studies are not available.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Cascade Canyon near Alpha Lake and in the lower North Fork and in Leigh Canyon near Mink Lake.

Global Range: This association is known from eastern Idaho in the Centennial Mountains, in the Teton Range of western Wyoming, and on the western slope of Colorado.
Nations: US
States/Provinces: CO:S2S3, ID, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO20 & M331A, M331H added (GK 7-05).
USFS Ecoregions: M331A:CC, M331D:CC, M331H:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A083, GT-03A084
Accuracy Assessment Points: 04J195, 04J197
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kittel et al. 1999a*	.	.	.	.	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

[CEGL001234] *Salix wolfii / Carex aquatilis* Shrubland

Translated Name: **Wolf Willow / Aquatic Sedge Shrubland**
Common Name: **Wolf Willow / Aquatic Sedge Shrubland**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is a short-statured wetland shrubland, generally never exceeding 1.2 m (4 feet) in height. It occurs in Idaho, Montana, Utah, Wyoming, and Colorado, in very wet valley bottoms of low-gradient streams, and is found on stream benches, terraces, toeslopes and floodplains. *Salix wolfii* is the dominant shrub, forming a continuous to patchy short-shrub layer. Other short-statured shrubs often present are *Betula nana (= Betula glandulosa), Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and *Salix planifolia*. Taller shrubs may be scattered about but are never as abundant as *Salix wolfii*. Tall-shrub species include *Salix boothii, Salix geyeriana*, or *Salix monticola*. The herbaceous layer is dense, dominated by *Carex aquatilis*. Other graminoids are often part of this layer and include *Carex utriculata, Carex microptera*, other wet sedges, and *Deschampsia caespitosa*. Forbs can be sparse to very dense and include a variety of species such as *Caltha leptosepala, Ligusticum tenuifolium, Senecio integerrimus, Geum macrophyllum, Fragaria virginiana, Swertia perennis*, and *Pedicularis groenlandica*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occupies a channel at an elevation of 6883 feet and the other occurs in a drainage on a valley floor at 9300 feet. The lower elevation stand is situated in a saturated palustrine area on exclusively organic materials. The adjacent vegetation for the lower elevation stand includes multiple *Salix* spp.

Global Environment: This association is located in the upper montane and subalpine zones of montane valleys at elevations of 1707 to 3474 m (5600-11,400 feet). It occurs on valley bottoms on stream terraces, benches, toeslopes, valley edges and rarely stream edges. Nearly always in broad valleys, it occasionally occupies narrow valley bottoms. Soils are saturated throughout the growing season, generally organic but can have mineral layers as well. Mineral soil textures are usually heavy silty clay loam to sandy clay loam. Slopes are gentle (0-20%).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane to subalpine deciduous shrubland that occurs in mesic areas. Occupying the tall shrub stratum of the lower elevation stand with 3% canopy cover each are *Salix boothii* and *Salix lemmonii. Salix wolfii* dominates the short shrub stratum of both stands with 20 and 30% cover. *Carex aquatilis* occurs in both stands with 10 and 20% cover. No other species are common to both stands. Species occurring in the lower elevation stand with 10% cover include *Antennaria anaphaloides, Muhlenbergia filiformis*, and *Carex* sp. *Caltha leptosepala* contributes 30% cover to the higher elevation stand.

Global Vegetation: *Salix wolfii* is the dominant shrub, forming a continuous to patchy short-shrub layer. Other short-statured shrubs often present are *Betula nana (= Betula glandulosa), Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and *Salix planifolia*. Taller shrubs may be scattered about but are never as abundant as *Salix wolfii*. Tall-shrub species include *Salix boothii, Salix geyeriana*, or *Salix monticola*. The herbaceous layer is dense, dominated by *Carex aquatilis*. Other graminoids are often part of this layer and include *Carex utriculata, Carex microptera, Carex praegracilis, Carex nebrascensis, Carex haydeniana, Juncus balticus*, and *Deschampsia caespitosa*. Forbs can be sparse to very dense and include a variety of species such as *Caltha leptosepala, Ligusticum tenuifolium, Senecio integerrimus, Geum macrophyllum, Fragaria virginiana, Swertia perennis*, and *Pedicularis groenlandica*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Carex aquatilis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Betula nana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Ligusticum tenuifolium	Herb (field)	Forb	.	X	.
Symphyotrichum foliaceum	Herb (field)	Forb	.	X	.
Carex aquatilis	Herb (field)	Graminoid	X	X	X
Carex utriculata	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Salix wolfii - Betula glandulosa / Carex rostrata - Carex aquatilis* Community Type (Mutz and Queiroz 1983) I
- *Salix wolfii / Carex aquatilis* Community Type (Walford et al. 2001) B
- *Salix wolfii / Carex aquatilis* Community Type (Youngblood et al. 1985a) =
- *Salix wolfii / Carex aquatilis* Community Type (Padgett et al. 1989) =
- *Salix wolfii / Carex aquatilis* Habitat Type (Mattson 1984) =
- *Salix wolfii / Carex aquatilis* Habitat Type (Hansen et al. 1995) B
- *Salix wolfii / Carex aquatilis* Plant Association (Kittel et al. 1999b) =
- *Salix wolfii / Swertia perennis* Community Type (Tuhy and Jensen 1982) B
- *Salix wolfii / Swertia perennis* Community Type (Norton et al. 1981) B
- *Salix wolfii/Carex aquatilis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The sampled stand differs slightly from the Youngblood et al. (1985a) *Salix wolfii / Carex aquatilis* Community Type. *Carex aquatilis* is not as common as in the Youngblood et al. type, and *Betula nana* is much more common than normal.
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur west of Emma Matilda Lake and in the north fork of Death Canyon.

Global Range: This association is known from throughout the range of *Salix wolfii*, namely Idaho, Montana, Utah, Wyoming and Colorado.
Nations: US
States/Provinces: CO:S3, ID:S4, MT:S3, UT:S2S3, WY:S3
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 20:C
TNC Ecoregion Comments: ECO7 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333D:CC
Federal Lands: NPS (Grand Teton); USFS (Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0203002
Accuracy Assessment Points: 04R173
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1986	.	X	.	X	.	.	.	.	.
Baker 1989b	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.

IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	.	.	.	.	.
Kittel et al. 1996	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	.	X	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mattson 1984	.	X	X	X	.	.	.	.	.
Mutz and Queiroz 1983	.	.	X	.	.	.	.	.	.
Norton et al. 1981	.	X	X	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Walford et al. 2001	.	.	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

[CEGL001237] *Salix wolfii / Carex utriculata* Shrubland

Translated Name: **Wolf Willow / Beaked Sedge Shrubland**
Common Name: **Idaho Willow / Swollen-beak Sedge**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This riparian shrubland is a common community of very wet, high montane and subalpine sites throughout the western Rocky Mountains. It is common but never the most abundant type. It occurs on wet alluvial terraces, broad meadows and large seeps. It generally occupies low-gradient valleys and is almost never found adjacent to rapidly flowing water. It occurs from 2320 to 3260 m (7600-10,700 feet) in elevation. *Salix wolfii* dominates the low-statured upper canopy (<1.5 m in height) with continuous to patchy cover. Other shrubs are typically present but never codominant and include *Salix planifolia, Salix boothii, Salix geyeriana, Betula nana (= Betula glandulosa)*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*. The herbaceous layer is dominated by *Carex utriculata* but often has other graminoids, such as *Carex aquatilis, Carex microptera, Carex limosa*, and *Deschampsia caespitosa*, present in small amounts. Other graminoids present in trace quantities include *Juncus balticus var. montanus, Phleum pratense, Danthonia intermedia*, and *Luzula comosa*. Forbs are few and include *Pedicularis groenlandica, Caltha leptosepala, Symphyotrichum foliaceum*, and *Swertia perennis*. In more disturbed stands, forbs such as *Cirsium arvense* and *Fragaria virginiana* may become common.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association is defined by two stands that occur on level terrain on the valley floor at elevations of 2081 and 2235 m (6827 and 7332 feet). Both stands are located in palustrine areas that are either intermittently or seasonally flooded. The poorly drained silty clay soils common to both stands are covered primarily by litter and duff. Other unvegetated and nonvascular components that may be present include rocks greater than 10 cm, gravel, bare soil, water, fungi, mosses, and lichens. Adjacent to one stand are *Pinus contorta* clumps and an *Artemisia tridentata* shrubland.
Global Environment: This riparian shrubland is a common community of very wet, high montane and subalpine sites throughout the western Rocky Mountains. It is common but never the most abundant type. It occurs on wet alluvial terraces, broad meadows and large seeps. It generally occupies low-gradient valleys and is almost never found adjacent to rapidly flowing water. It occurs from 2320 to 3260 m (7600-10,700 feet) in elevation.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The shrub layer may include tall-, short-, and dwarf-shrub components. *Salix wolfii* (60% cover) dominates both stands, either as a short or dwarf-shrub. *Salix drummondiana* (1 and 3% cover) occupies both stands as a short shrub. *Salix boothii* (3 and 20% cover) also occupies the stands in either the short- or tall-shrub stratum. Other shrubs may be present in trace quantities. The herbaceous layer is

dominated by Carices, particularly *Carex utriculata* (20% cover). Codominant with *Carex utriculata* in one stand each is *Carex microptera* (20% cover) and *Carex lenticularis* (10% cover). A variety of mesic forbs characteristic of wet areas are found in both stands in trace quantities. Two species that occupy 1 to 10% cover in both stands are *Cirsium arvense* and *Fragaria virginiana*. *Symphyotrichum foliaceum* occurs in one stand with 10% cover.

Global Vegetation: *Salix wolfii* dominates the low-statured upper canopy (<1.5 m in height) with continuous to patchy cover. Other shrubs are typically present but never codominant and include *Salix planifolia, Salix boothii, Salix geyeriana, Betula nana (= Betula glandulosa)*, and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*. The herbaceous layer is dominated by *Carex utriculata* but often has other graminoids, such as *Carex aquatilis, Carex microptera, Carex limosa*, and *Deschampsia caespitosa*, present in small amounts. Other graminoids present in trace quantities include *Juncus balticus var. montanus, Phleum pratense, Danthonia intermedia*, and *Luzula comosa*. Forbs are few and include *Pedicularis groenlandica, Caltha leptosepala, Symphyotrichum foliaceum*, and *Swertia perennis*. In more disturbed stands, forbs such as *Cirsium arvense* and *Fragaria virginiana* may become common.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix boothii	Tall shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix boothii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix drummondiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Salix wolfii	Herb (field)	Dwarf-shrub	X	X	.
Cirsium arvense	Herb (field)	Forb	.	X	.
Fragaria virginiana	Herb (field)	Forb	.	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix wolfii	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	X
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Salix drummondiana / Carex utriculata* Shrubland (CEGL002631)

Global Related Concepts:

- *Salix wolfii - Betula glandulosa / Carex rostrata* Community Type (Mutz and Queiroz 1983) B
- *Salix wolfii / Carex rostrata* Community Type (Tuhy and Jensen 1982) B
- *Salix wolfii / Carex rostrata* Community Type (Hansen et al. 1995) B
- *Salix wolfii / Carex rostrata* Community Type (Youngblood et al. 1985a) =
- *Salix wolfii / Carex rostrata* Community Type (Padgett et al. 1989) =
- *Salix wolfii / Carex utriculata* Shrubland (Carsey et al. 2003a) =
- *Salix wolfii / Swertia perennis* Community Type (Tuhy and Jensen 1982) B
- *Salix wolfii/Carex rostrata* (Bourgeron and Engelking 1994) =
- *Salix wolfii* / wet *Carex* Ecological Type (Girard et al. 1997) =
- *Salix* spp. / *Carex rostrata* Community Type (Tuhy and Jensen 1982) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The stands defining this association fit the Youngblood et al. (1985a) *Salix wolfii / Carex rostrata (= Carex utriculata*) Community Type well. The Youngblood et al. researchers note that *Carex aquatilis* is present in all of their stands; none of the Grand Teton National Park stands contain this species.
Global Classification Comments: Studies throughout the Rocky Mountain west have documented this association. All of these classifications have used the old name *Carex rostrata*, which is now known to be strictly boreal. This name is superseded by *Carex utriculata* (Reznicek 1987).

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association was sampled along Pacific and Owl creeks.
Global Range: This association occurs throughout the western central Rocky Mountains in Colorado, Wyoming, Utah and Idaho.
Nations: US
States/Provinces: CO:S3, ID:S4, UT:S2?, WY:S2S3
TNC Ecoregions: 8:C, 9:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bighorn?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C007, GT-03C075
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jensen and Tuhy 1981	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	X	.	X	.	.	.	.	.
Mutz and Graham 1982	.	X	.	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	X	X	.	.	.	.	.
Norton et al. 1981	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Reznicek 1987	.	X	.	.	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

[PARK SPECIAL GRTE-040] *Salix wolfii / Carex pellita* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The one sampled stand defining this association occurs on the valley floor at an elevation of 6800 feet. The moderately well-drained clay loam soils are predominately covered by litter and duff and mosses. Traces of bare soil and wood are also present. A large amount of *Salix* has died in the area presumably due to either fire or insects. The landscape is homogenously patchy and includes *Salix boothii* and *Salix lutea*. *Pinus contorta* is present in the vicinity.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. *Salix wolfii* (70% cover) exclusively dominates the short shrub layer. Graminoids are more diverse within the herbaceous layer than are forbs; the herbaceous layer is dominated by *Carex pellita* (30% cover). Common graminoids and forbs with 3% canopy cover each include *Deschampsia caespitosa*, *Carex utriculata*, *Poa pratensis*, *Erigeron speciosus*, *Epilobium ciliatum*, and *Symphyotrichum lanceolatum*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Salix wolfii*
GRAMINOID	*Carex pellita*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Salix wolfii, Deschampsia caespitosa, Carex pellita, Carex utriculata, Poa pratensis, Epilobium ciliatum, Erigeron speciosus, Symphyotrichum lanceolatum

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis, Cirsium arvense*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association was sampled south of the Flagg Ranch gravel pit.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:

USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C012
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one sampled stand defines this association.

Classification Confidence: **Identifier:** New-GRTE-040
Local Author: Rob Massatti
Date: 8 April 2004
Local Editor: Klara Varga
Date: 10 April 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-041] *Salix wolfii / Carex praegracilis* Shrubland

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands occur on level or nearly level terrain at elevations around 6800 feet. One stand occurs on Cryaquolls that are deep and poorly-drained flood plain soils. The other stand occurs on glacial moraine Taglake-Sebud soils that are very deep and well-drained. All of the above information was gathered from the Soil Survey of Teton County, Grand Teton National Park Area (Young, 1982).

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane deciduous shrubland that occurs in mesic areas. The short shrub stratum is exclusively dominated by *Salix wolfii* (50 and 70% cover). The herbaceous layer is dominated by graminoids, particularly *Carex praegracilis* (30 and 40% cover). Other graminoids that occupy 1 to 10% cover in one or both stands include *Carex pellita, Carex utriculata, Deschampsia caespitosa,* and *Poa pratensis. Fragaria virginiana* is the only forb species present in both stands and occupies 10 and 50% canopy cover.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
SHORT SHRUB	*Salix wolfii*
GRAMINOID	*Carex praegracilis*
FORB	*Fragaria virginiana*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Salix wolfii, Carex praegracilis, Fragaria virginiana

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association was sampled along the Two Ocean Lake drainage and in Willow Flats.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: GT-tm1d, GT-tm1e
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association. The researchers who collected this data only recorded species composition.

Classification Confidence: **Identifier:** New-GRTE-041
Local Author: Rob Massatti
Date: 8 April 2004
Local Editor: Klara Varga
Date: 10 April 2004

Global Author:

REFERENCES: None

IV. Dwarf-shrubland

IV.B.2.N.a. Cespitose cold-deciduous dwarf-shrubland

A.1114 *Vaccinium (caespitosum, myrtillus, scoparium)* Dwarf-shrubland Alliance

(Dwarf Blueberry, Whortleberry, Grouseberry) Dwarf-shrubland Alliance

ALLIANCE CONCEPT

Summary: Vegetation in this alliance occurs in the alpine tundra in Colorado. The climate regime is continental, with long, cold winters and short summers with frequent afternoon thunderstorms. Strong westerly winds are common in the winter and spring and distribute snow on the leeward side of the mountains. Large areas of late-lying snowpatches are located on the eastern slope. Stands are found between 3220 and 3580 m elevation on gentle- to moderate-gradient slopes. Stands are located in the lower alpine just above treeline in areas where snow accumulates in the winter and melts relatively late in the summer. The soils are poorly developed, may have a high organic matter content, and are classified as Inceptisols (Cryumbrepts or Cryochrepts). The soil profile has A and B horizons; the B horizon is moderately thick. The average surface pH is 5.0, indicating leached soils. The vegetation in the alliance is found in snowbed habitats, areas where snow accumulates in the winter and melts relatively late in the summer. *Vaccinium caespitosum* and *Vaccinium scoparium* dominate the dwarf-shrub canopy. A number of herbaceous species occur in the understory. *Carex rossii (= Carex brevipes), Danthonia intermedia, Gentiana calycosa, Geum rossii, Hieracium gracile, Penstemon whippleanus, Poa reflexa*, and *Viola adunca* are the most common species. The cryptogam layer is dominated by lichens; *Cladonia pyxidata* and *Catapyrenium cinereum (= Dermatocarpon cinereum)* are the most common.

Environment: Vegetation in this alliance occurs in the alpine tundra in Colorado. The following information is based on Komarkova (1976). The climate regime is continental, with long, cold winters and short summers with frequent afternoon thunderstorms. Strong westerly winds are common in the winter and spring and distribute snow on the leeward side of the mountains. Large areas of late-lying snowpatches are located on the eastern slope. Stands are found between 3220 and 3580 m elevation on gentle to moderate-gradient slopes. Stands are located in the lower alpine just above treeline in areas where snow accumulates in the winter and melts relatively late in the summer. The soils are poorly developed, may have a high organic matter content, and are classified as Inceptisols (Cryumbrepts or Cryochrepts). The soil profile has A and B horizons; the B horizon is moderately thick. The average surface pH is 5.0, indicating leached soils.

Vegetation: Vegetation in this alliance commonly occurs in the alpine tundra in the Rocky Mountains. The vegetation in the alliance is found in snowbed habitats, areas where snow accumulates in the winter and melts relatively late in the summer. *Vaccinium caespitosum* and *Vaccinium scoparium* dominate the dwarf-shrub canopy. A number of herbaceous species occur in the understory. *Carex rossii (= Carex brevipes), Danthonia intermedia, Gentiana calycosa, Geum rossii, Hieracium gracile, Penstemon whippleanus, Poa reflexa*, and *Viola adunca* are the most common species. The cryptogam layer is dominated by lichens; *Cladonia pyxidata* and *Catapyrenium cinereum (= Dermatocarpon cinereum)* are the most common.

Dynamics:

Similar Alliances:

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in the alpine tundra in the mountains of Colorado, Wyoming, Nevada, and Montana, and Alberta, Canada.

Nations: CA?, US

Subnations: AB, CA, CO, MT, NV, WY

TNC Ecoregions: 7:C, 9:C, 10:C, 12:C, 20:C

USFS Ecoregions: M261E:CC, M331D:CC, M331H:CC, M331I:CC, M332C:CC, M333C:CC

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Yosemite); PC (Banff, Waterton Lakes?); USFS (Arapaho-Roosevelt, Gunnison)

ALLIANCE SOURCES

Author(s): M. Damm

References: Benedict 1977b, Holway 1960, Holway 1962a, Holway and Ward 1963, Komarkova 1976, Komarkova 1986, Olmsted and Taylor 1977a, Welsh et al. 1987

[CEGL001140] *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland

Translated Name: **(Dwarf Blueberry, Grouseberry) Dwarf-shrubland**

Common Name:

Ecological System(s):

- Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This dwarf-shrub association occurs near treeline in the mountains of northern Colorado and northwestern Wyoming. It has also been reported from the Ruby Mountains of northeastern Nevada and Banff National Park in Alberta, Canada. Slopes range from gentle to steep (1-100%), and sites may be oriented to any aspect. Sites are generally on lee slopes and are snow-covered throughout the winter and into the late spring, but one Colorado stand was on an exposed ridgetop below treeline. Sites generally remain mesic throughout the growing season. This vegetation is characterized by a moderate to dense carpet of either *Vaccinium caespitosum* and/or *Vaccinium scoparium*. Herbaceous species reflect the subalpine/low alpine character of the association and vary greatly across the range of this association. Because of the late snowmelt and mesic soil conditions, some wetland species may be present. Herbaceous species that are abundant may include *Polygonum bistortoides (= Bistorta bistortoides), Danthonia intermedia, Sibbaldia procumbens, Penstemon whippleanus, Poa cusickii, Carex pyrenaica, Geum rossii, Erigeron peregrinus, Caltha leptosepala*, and *Juncus drummondii*. *Abies lasiocarpa, Picea engelmannii*, and/or *Pinus albicaulis* seedlings may be scattered through the community.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occurs on a very steep northeast-facing slope at an elevation 9847 feet. The other stand occurs in a stream channel on a moderate, east-facing slope at an elevation of 9500 feet. Soil data is available for only one stand; the soil is a moderately well-drained loam. The unvegetated and non-vascular ground surface for this stand is composed of litter and duff (80% cover), rocks greater than 10 cm (20% cover), mosses (5% cover), gravel (1% cover), lichens (1% cover), and bedrock (1% cover). Adjacent to the sampled stands are large boulders and a few scattered forbs.

Global Environment: This dwarf-shrub association occurs near treeline in the mountains of northern Colorado and northwestern Wyoming. It has also been reported from the Ruby Mountains of northeastern Nevada and Banff National Park in Alberta, Canada. Slopes range from gentle to steep (1-100%), and sites may be oriented to any aspect. Sites are generally on lee slopes and are snow-covered throughout the winter and into the late spring, but one Colorado stand was on an exposed ridgetop below treeline. Sites generally remain mesic throughout the growing season. The unvegetated surface is typically covered by rocks and litter.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is an upper montane to alpine, dwarf-shrubland community that occurs on mesic sites. *Abies lasiocarpa, Picea engelmannii*, and *Pinus albicaulis* occur as either trees or seedlings in both stands. *Vaccinium scoparium* (7 and 40% cover) and *Phyllodoce empetriformis* (3% cover) are the only shrub species that are present in the both stands. Numerous graminoids and forbs occur with 3% or more cover, but no species are present in both stands.

Global Vegetation: This association is characterized by a moderate to dense carpet of dwarf-shrubs occurring near treeline. Total vegetation cover ranges from 40 to 70% and is dominated by either *Vaccinium caespitosum* or *Vaccinium scoparium*. Both shrubs may be present, but typically one species is dominant. Herbaceous species reflect the subalpine/low alpine character of the association and vary greatly across the range of this association, with few species in common between Wyoming and Colorado stands. Because of the late snowmelt and mesic soil conditions, some wetland species may be present. Herbaceous species that are abundant may include *Polygonum bistortoides (= Bistorta bistortoides), Danthonia intermedia, Sibbaldia procumbens, Penstemon whippleanus, Poa cusickii, Carex pyrenaica, Geum rossii, Erigeron peregrinus, Caltha leptosepala*, and *Juncus drummondii*. *Abies lasiocarpa, Picea engelmannii*, and/or *Pinus albicaulis* seedlings may occur with 1-3% cover in the short-shrub layer.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Abies lasiocarpa	Short shrub/sapling	Needle-leaved evergreen tree	.	X	.
Picea engelmannii	Short shrub/sapling	Needle-leaved evergreen tree	.	X	.
Pinus albicaulis	Short shrub/sapling	Needle-leaved evergreen tree	.	X	.
Phyllodoce empetriformis	Short shrub/sapling	Dwarf-shrub	.	X	.
Vaccinium scoparium	Short shrub/sapling	Dwarf-shrub	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Vaccinium caespitosum	Short shrub/sapling	Dwarf-shrub	X	X	.
Vaccinium scoparium	Short shrub/sapling	Dwarf-shrub	X	X	.
Erigeron peregrinus ssp. *callianthemus*	Herb (field)	Forb	X	X	.
Geum rossii var. *turbinatum*	Herb (field)	Forb	X	X	.
Sibbaldia procumbens	Herb (field)	Forb	X	X	.

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
- *Vaccinium caespitosum - (Salix farriae) / Danthonia intermedia* Dwarf-shrubland (CEGL000484)
- *Vaccinium caespitosum / Calamagrostis breweri* Dwarf-shrub Herbaceous Vegetation (CEGL008655)
- *Vaccinium caespitosum / Carex filifolia* Dwarf-shrubland (CEGL008653)
- *Vaccinium caespitosum / Sanguisorba officinalis* Dwarf-shrubland (CEGL003438)

Global Related Concepts:
- *Vaccinium (caespitosum-scoparium)* (Bourgeron and Engelking 1994) =
- *Vaccinium scoparium - Vaccinium caespitosum / Lidia biflora* Habitat Type/Association (Komarkova 1986) =
- *Vaccinium scoparium - Vaccinium caespitosum / Lidia biflora* Plant Association (Johnston 1987) =
- Association *Vaccinium scoparium - Vaccinium caespitosum* (Komarkova 1976) (Komarkova 1979) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs south of Amphitheater Lake and the other stand occurs in Open Canyon.

Global Range: This association has been documented from the southern Rocky Mountains of Colorado and Wyoming. It is reported to occur in the Ruby Mountains of northeastern Nevada, as well as in Banff National Park in Alberta, Canada.
Nations: CA, US
States/Provinces: AB, CO:S1?, NV, WY
TNC Ecoregions: 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); PC (Banff); USFS (Arapaho-Roosevelt, Gunnison)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two sampled stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B070
Accuracy Assessment Points: 04X306
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, and K. Varga
Global Description Author(s): J.J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Benedict 1977b	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Holway 1960	.	X	.	X	.	.	.	.	.
Holway 1962a	.	X	.	X	.	.	.	.	.
Holway and Ward 1963	.	X	.	X	.	.	.	.	.

Johnston 1987	.	X	X	X	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Komarkova 1979	.	X	X	X	.	.	.	.	.
Komarkova 1986	.	X	X	X	.	.	.	.	.
Olmsted and Taylor 1977a	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

IV.B.2.N.b. Creeping or matted cold-deciduous dwarf-shrubland

A.1117 *Salix arctica* Dwarf-shrubland Alliance

Arctic Willow Dwarf-shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within this alliance occur in alpine meadows or on high mountain peaks. They range in elevation from 2900-4000 m. Landforms that support these communities are typically of gentle topography, with northerly aspects. They occur where snow lingers into the spring and summer, in places such as lees of cliffs and boulders, secondary slopes, and shallow depressions. Some stands also occur on moist gravel slopes and terraces or along stony margins of streams or lakes, thriving among coarse rock margins with almost no soil. Communities within this alliance are defined as cold-deciduous dwarf-shrublands. They are dominated by *Salix arctica*, which forms a thick canopy with a mat-forming growth form seldom rising more than 5 cm above the ground. *Salix reticulata* occasionally is found as a codominant in the dwarf-shrub layer. These shrubs occur with a mix of forbs and graminoids, including *Carex pyrenaica, Geum rossii, Polygonum bistortoides, Sibbaldia procumbens, Erigeron melanocephalus, Agrostis rossiae*, and *Juncus drummondii*. Several bryophyte and lichen species have been reported from Longs Peak, Colorado. On James Peak, Colorado, *Salix arctica* did not receive any competition and dominated with a mat-forming growth form. In the Sangre de Cristo Mountains in New Mexico there was a conspicuous absence of cushion plants associated with *Salix arctica* communities.

Environment: Communities within this alliance occur in alpine meadows or on high mountain peaks. They range in elevation from 2900-4000 m. Landforms that support these communities are typically of gentle topography, with northerly aspects. They occur where snow lingers into the spring and summer, in places such as lees of cliffs and boulders, secondary slopes, and shallow depressions (Kiener 1967). Some stands also occur on moist gravel slopes and terraces or along stony margins of streams or lakes, thriving among coarse rock margins with almost no soil (Cox 1933, Baker 1983a).

Vegetation: Communities within this alliance are defined as cold-deciduous dwarf-shrublands. They are dominated by *Salix arctica*, which forms a thick canopy with a mat-forming growth form seldom rising more than 5 cm above the ground. *Salix reticulata* occasionally is found as a codominant in the dwarf-shrub layer. These shrubs occur with a mix of forbs and graminoids, including *Carex pyrenaica, Geum rossii, Polygonum bistortoides, Sibbaldia procumbens, Erigeron melanocephalus, Agrostis rossiae*, and *Juncus drummondii*. Kiener (1967) reported several bryophyte and lichen species on Longs Peak, Colorado. Cox (1933) noted that on James Peak, Colorado, *Salix arctica* did not receive any competition and dominated with a mat-forming growth form. In the Sangre de Cristo Mountains in New Mexico there was a conspicuous absence of cushion plants associated with *Salix arctica* communities (Baker 1980a, 1983a).

Dynamics:

Similar Alliances:

- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)
- *Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)

Similar Alliance Comments: The ~*Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)$$ differs in that surface water is seldom present, but the substrate is saturated to the surface for extended periods during the growing season. The ~*Salix reticulata* Dwarf-shrubland Alliance (A.1119)$$ differs in the dominance of a different nominal species.

ALLIANCE DISTRIBUTION

Range: This alliance has been reported from high-elevation mountain peaks in California, Montana, Wyoming, Colorado and New Mexico, and Alberta, Canada. It is highly likely to occur in northwestern Wyoming. It may also occur elsewhere in the western U.S. and Canada at high elevations.

Nations: CA, US

Subnations: AB, CA, CO, MT, NM, WY

TNC Ecoregions: 7:C, 9:C, 10:C, 12:C, 20:C

USFS Ecoregions: M261E:CC, M331A:CC, M331B:C?, M331D:CC, M331F:CC, M331G:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC, M333D:C?

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Yosemite); PC (Waterton Lakes); USFS (Shoshone?)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1980a, Baker 1983a, Cooper and Lesica 1992, Cooper et al. 1997, Cox 1933, Curry 1962, Dorn 1997, Hitchcock et al. 1964, Johnson 1970a, Kiener 1939, Kiener 1967, Komarkova 1976, Marr and Willard 1970, Spencer 1975, Webber et al. 1976, Whitfield 1933, Willard 1963, Willard 1979

[CEGL001431] *Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides* Dwarf-shrubland

Translated Name: **Arctic Willow - (Alpine Willow, Snow Willow) / American Bistort Dwarf-shrubland**
Common Name: **Arctic Willow / American Bistort**
Ecological System(s):
- Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This dwarf-shrub alpine association is known from the Rocky Mountains of Alberta, Montana and Wyoming. It occurs primarily as small patches, from the uppermost subalpine to the highest alpine elevations, from 1980 to 3231 m (6495-10,600 feet). It is mainly associated with receiving positions, toeslopes and lower to midslopes of gentle terrain. It occurs in mesic areas with slopes that range from flat to moderate (up to 50% grade), with all aspects represented. The type occurs predominantly in small, visually salient patches that appear as a continuous blanket of green due to high coverage of both the vascular and bryophyte components. The dwarf-shrub layer is commonly dominated by *Salix arctica, Salix petrophila*, or *Salix nivalis*. *Dryas octopetala* may be present or absent in the dwarf-shrub layer with up to 20% cover. Graminoids are present in all stands but are neither diverse nor in high quantities. Common species include *Poa alpina* and moist-site *Carex* spp. (*Carex albonigra, Carex phaeocephala*, and *Carex nova*). The herbaceous layer is dominated by forbs, most notably *Polygonum bistortoides*, but other forbs, including *Polygonum viviparum, Geum rossii, Potentilla diversifolia, Oreostemma alpigenum (= Aster alpigenus), Solidago multiradiata*, and *Claytonia lanceolata*, are often codominant. Other common species include *Astragalus kentrophyta, Phlox pulvinata, Tetraneuris grandiflora, Arenaria congesta, Oxytropis deflexa*, and *Castilleja* spp. *Picea engelmannii* seedlings may be present. This association most often grades to moist turf types or unequivocal snowbed communities (e.g., ~*Carex nigricans* Herbaceous Vegetation (CEGL001816)$$) or wet meadows (e.g., ~*Deschampsia caespitosa - Caltha leptosepala* Herbaceous Vegetation (CEGL001882)$$). Most other dwarf-shrub *Salix* spp.-dominated types occur on yet wetter sites; therefore, they should be recognized first in working keys.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs from mountain backslopes to interfluves at elevations ranging from 3124 to 3231 m (10,250-10,600 feet). Slopes may be as great as 50% and generally face southeast or southwest. Soils are well-drained and include sandy clays and sandy loams. Either gravel (10 to 70% cover) or litter and duff (5 to 60% cover) compose the major component of the unvegetated ground surface. The remainder is codominated by rocks greater than 10 cm (5 to 10% cover) and bare soil (5 to 20% cover). Mosses may be present in trace quantities, and lichens may compose up to 5% cover. Adjacent vegetation often includes *Abies lasiocarpa* krummholz.
Global Environment: This community occurs primarily as small patches, from the uppermost subalpine to the highest alpine elevations, from 1980 to 3231 m (6495-10,600 feet). It is mainly associated with receiving positions, toeslopes and lower to midslopes of gentle terrain. Stands are found in gentle terrain on toeslope to midslope, potentially water-receiving positions, as well as shallow swales and broad depressions (potential snowbed sites). Slopes range from flat to moderate (up to 50%), with all aspects represented. This community is also noted to occur downslope from snowbed communities, which may augment its moisture supply. Substrates include various sedimentary rock types, both calcareous (limestone) and not (siltstones, argillite). Owing to a nearly continuous mat of vegetation comprised of vascular plants, bryophytes and lichens (in the aggregate usually exceeding 80% cover), which in turn generates a rich litter layer, the amount of exposed soil and rock can be limited, but occasionally as high as 70%.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is an alpine association that occurs in mesic areas. The dwarf-shrub layer is commonly dominated by *Salix arctica* (40 to 80% cover); *Salix petrophila* replaces *Salix arctica* in one stand and covers 30% of the ground. *Dryas octopetala* may be present or absent in the dwarf-shrub layer with up to 20% cover. Graminoids are present in all stands but are neither diverse nor in high quantities. Common species include *Carex* spp. and *Poa* spp. The herbaceous layer is dominated by forbs, most notably *Solidago multiradiata* (1 to 10% cover). Other common species include *Astragalus kentrophyta, Phlox pulvinata, Tetraneuris grandiflora, Arenaria congesta, Oxytropis deflexa, Castilleja* spp., and *Polygonum bistortoides*. *Picea engelmannii* seedlings are present in one stand contributing 1% cover to the dwarf-shrub layer.
Global Vegetation: This type occurs predominantly in small, visually salient patches that appear as a continuous blanket of green due to high coverage of both the vascular and bryophyte components. It occurs in mesic areas. The dwarf-shrub layer is commonly dominated by *Salix arctica*; *Salix petrophila* replaces *Salix arctica* in one stand. *Dryas octopetala* may be present or absent in the dwarf-shrub layer with up to 20% cover. Graminoids are present in all stands but are neither diverse nor in high quantities. Common species include *Poa alpina* and moist-site *Carex* spp. (*Carex albonigra, Carex phaeocephala*, and *Carex nova*). The herbaceous layer is dominated by forbs, most notably *Polygonum bistortoides*, but other forbs, including *Polygonum viviparum, Geum rossii, Potentilla*

diversifolia, Solidago multiradiata, Oreostemma alpigenum (= Aster alpigenus), and *Claytonia lanceolata*, are often codominant. Other common species include *Astragalus kentrophyta, Phlox pulvinata, Tetraneuris grandiflora, Arenaria congesta, Oxytropis deflexa*, and *Castilleja* spp. *Picea engelmannii* seedlings are present in one stand contributing 1% cover to the dwarf-shrub layer.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Dryas octopetala	Short shrub/sapling	Dwarf-shrub	X	X	.
Salix arctica	Short shrub/sapling	Dwarf-shrub	X	X	.
Salix petrophila	Short shrub/sapling	Dwarf-shrub	X	X	.
Arenaria congesta	Herb (field)	Forb	.	X	.
Astragalus kentrophyta	Herb (field)	Forb	.	X	.
Oxytropis deflexa	Herb (field)	Forb	.	X	.
Phlox pulvinata	Herb (field)	Forb	.	X	.
Polygonum bistortoides	Herb (field)	Forb	.	X	.
Solidago multiradiata	Herb (field)	Forb	X	X	.
Tetraneuris grandiflora	Herb (field)	Forb	.	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	characteristic graminoids
Castilleja spp.	characteristic forbs
Poa spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix arctica	Short shrub/sapling	Dwarf-shrub	X	X	.
Salix nivalis	Short shrub/sapling	Dwarf-shrub	X	.	.
Salix petrophila	Short shrub/sapling	Dwarf-shrub	X	.	.
Polygonum bistortoides	Herb (field)	Forb	X	X	.
Polygonum viviparum	Herb (field)	Forb	X	X	.
Sibbaldia procumbens	Herb (field)	Forb	X	.	.

Higher Taxon	Note		
Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3Q (4-Jan-2000). This type is ranked G2G3Q to emphasize the lack of confidence in the classification status. While documentation of this association has improved based on data from Glacier National Park, its differentiation from other *Salix arctica* or *Salix nivalis* associations is still not clear. This type is described for only western Montana, with possible occurrences in the Beartooth Plateau vicinity. However, very possibly it is synonymous with named associations in Canada, Wyoming, Colorado and New Mexico. Based on known locations this association should be rated G2, but there is significant potential habitat for the type within Montana alone, which has occasioned adding the G3 designation.

RELATED CONCEPTS

Global Similar Associations:

- *Dryas octopetala - Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894)
- *Salix arctica - Salix nivalis* Dwarf-shrubland (CEGL001432)
- *Salix arctica / Carex nigricans* Dwarf-shrubland (CEGL005878)
- *Salix arctica / Geum rossii* Dwarf-shrubland (CEGL001430)

Global Related Concepts:

- *Aulacomnio - Kalmietum microphyllae* Association (Damm 2001) I
- *Leprario caesioalbae - Salicetum arcticae* Association (Damm 2001) I
- *Polytricho piliferi - Arenarietum capillaris* Association (Damm 2001) I *Salix arctica/Polygonum bistortoides* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IV.B.3.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Neither *Salix arctica* nor *Polygonum bistortoides* need to be present within a stand for that stand to be classified as this association type. The unifying characteristic is the presence of an alpine dwarf *Salix* species.

Global Classification Comments: This association is weakly supported by plot data, and almost no formal inventory has been conducted, though the authors of the type noted it to be common in some mountain ranges other than those in which it was sampled for classification purposes. This type has not been crosswalked with several other similarly named associations (~*Salix arctica / Geum rossii* Dwarf-shrubland (CEGL001430)$$ [Colorado], *Salix arctica / Polygonum viviparum* Dwarf-shrubland Association (no equivalent in USNVC) [Wyoming], ~*Salix arctica - Salix nivalis* Dwarf-shrubland (CEGL001432)$$ [New Mexico], as well as *Salix arctica*-dominated snowbed communities from the Canadian Rockies that appear, at least superficially, to be comparable in vegetation and environment. Until this crosswalk is completed this association should be considered of questionable taxonomy and may be more common than the global rank indicates. In addition, plot work in Waterton Lakes National Park, Alberta, and in Grand Teton National Park included stands dominated by *Salix nivalis* or *Salix petrophila* rather than *Salix arctica*. Stands dominated by *Salix petrophila (= Salix arctica ssp. petraea)* and *Salix arctica* can stay together, as these are very closely related taxa, but stands dominated by *Salix nivalis (= Salix reticulata)* may be better served in their own association.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs near Avalanche Divide and at upper Open Canyon below Prospectors Mountain.
Global Range: This alpine association has been defined for western Montana, southern Alberta, and western Wyoming.
Nations: CA, US
States/Provinces: AB, CO?, MT:S2S3, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 20:P
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04). ECO7 & ECO20 added (MSR 1-04).
USFS Ecoregions: M331A:CC, M331B:C?, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC, M333D:C?
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Shoshone?)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B046, GT-03C052, GT-0202129
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.V. Cooper, mod. M.S. Reid and G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff and Corns 1982	.	X	.	X	X	.	.	.	.
Baker 1983a	.	X	.	X	X	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Lesica 1992	.	X	.	X	X	.	.	.	.
Cooper et al. 1997	.	X	.	X	X	.	.	.	.
Damm 2001	.	X	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Komarkova 1976	.	X	.	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Potkin and Munn 1989	.	X	.	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Willard 1979	.	X	.	X	X	.	.	.	.

IV.B.2.N.d. Saturated cold-deciduous dwarf-shrubland

A.1124 *Salix arctica* Saturated Dwarf-shrubland Alliance

Arctic Willow Saturated Dwarf-shrubland Alliance

ALLIANCE CONCEPT

Summary: Communities within the ~*Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)$$ occur on subalpine meadows or on high mountain peaks in Nevada. They range in elevation from 2800 to over 3500 m. Landforms that support these associations are typically gentle to moderate in slope and have northerly aspects. They occur where snow lingers into the spring and summer in places such as lees of cliffs and boulders, secondary slopes, and shallow depressions. Soils are probably wet throughout the growing season, as *Caltha leptosepala* is always associated with wet soils. Communities within this alliance are defined as cold-deciduous dwarf-shrublands. They are dominated by *Salix arctica*, which forms a thick canopy with a mat-forming growth form seldom rising more than 1 dm above the ground. *Salix reticulata* occasionally is found as a codominant in the dwarf-shrub layer. The herbaceous layer commonly includes *Caltha leptosepala, Erigeron peregrinus, Polygonum bistortoides*, and *Pedicularis groenlandica*. No other information on species composition is available.

Environment: Communities within the ~*Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)$$ occur on subalpine meadows or on high mountain peaks in Nevada. They range in elevation from 2800 to over 3500 m. Landforms that support these associations are typically gentle to moderate in slope and have northerly aspects. They occur where snow lingers into the spring and summer in places such as lees of cliffs and boulders, secondary slopes, and shallow depressions (Kiener 1967). Soils are probably wet throughout the growing season, as *Caltha leptosepala* is always associated with wet soils.

Vegetation: Communities within this alliance are defined as cold-deciduous dwarf-shrublands. They are dominated by *Salix arctica*, which forms a thick canopy with a mat-forming growth form seldom rising more than 1 dm above the ground. *Salix reticulata* occasionally is found as a codominant in the dwarf-shrub layer. The herbaceous layer commonly includes *Caltha leptosepala, Erigeron peregrinus, Polygonum bistortoides*, and *Pedicularis groenlandica*. No other information on species composition is available.

Dynamics:

Similar Alliances:

- *Salix arctica* Dwarf-shrubland Alliance (A.1117)
- *Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)

Similar Alliance Comments: The ~*Salix arctica* Dwarf-shrubland Alliance (A.1117)$$ differs in that the hydrologic regime is not that of a wetland system. The ~*Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)$$ differs in that it is dominated by a different species of *Salix*, but is similar in that both of these alliances have associations that are codominated by the two nominal species. The classification of these dwarf-willow vegetation types needs review.

ALLIANCE DISTRIBUTION

Range: At present, this alliance is reported only from high-elevation ranges of northeastern Nevada and western Wyoming. Given the widespread distribution of the most important species, it likely occurs elsewhere in the Rocky Mountains, Cascades and Sierra Nevada.

Nations: US

Subnations: NV, WY

TNC Ecoregions: 9:C, 11:C

USFS Ecoregions: 341E:PP, M331D:CC, M341A:CC

Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Culver

References: Dorn 1997, Hitchcock et al. 1964, Kiener 1967, Loope 1969

[CEGL001429] *Salix arctica - Salix petrophila / Caltha leptosepala* Dwarf-shrubland

Translated Name: **Arctic Willow - Alpine Willow / White Marsh-marigold Dwarf-shrubland**

Common Name: **Arctic Willow - White Marsh-marigold**

Ecological System(s):

- Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

Status: Standard **Circumscription Confidence:** 2 - Moderate

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This mesic alpine dwarf-shrubland is found at 2800 to 3050 m (9200-10,000 feet) elevation in ranges of the Intermountain Basin of northern Nevada and in the Rocky Mountains of western Wyoming. Sites are on gentle, northerly slopes. It is found on mesic sites and is one of the wettest associations in the ~*Salix arctica* Dwarf-shrubland Alliance (A.1117)$$. The dwarf-shrub is creeping along the ground and is rarely taller than 12.7-20.3 cm (5-8 inches), forming the dwarf-shrub layer. Snowmelt keeps the site wet to saturated for much of the growing season. The vegetation is characterized by the dominance of the dwarf-shrub *Salix arctica* or *Salix petrophila (= Salix arctica ssp. petraea)*, sometimes with *Salix reticulata* and with *Caltha leptosepala* as a dominant forb. Other common species include *Antennaria* spp., *Astragalus alpinus, Carex elynoides, Erigeron peregrinus, Gentiana calycosa,*

Festuca brachyphylla, Packera dimorphophylla, Pedicularis groenlandica, Polygonum bistortoides, Ranunculus eschscholtzii, Sibbaldia procumbens, and *Senecio crassulus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The two sampled stands of this association occur on shallow and moderate northwest-facing slopes at elevations of 2937 and 2821 m (9636 and 9255 feet).
Global Environment: This mesic alpine dwarf-shrubland is found at 2800 to 3050 m (9200-10,000 feet) elevation in ranges of the Intermountain Basin of northern Nevada and in the Rocky Mountains of western Wyoming. Sites are on gentle, northerly slopes. It is found on mesic sites and is one of the wettest associations in the ~*Salix arctica* Dwarf-shrubland Alliance (A.1117)$$. The soil textures of the stands include very stony, well-drained silty clay loams and sandy clay loams. Rocks greater than 10 cm form a large component of the nonvegetated ground surface with adjacent talus slopes of stones, cobbles, and boulders. Snowmelt keeps the site wet to saturated for much of the growing season.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is a subalpine to alpine dwarf-shrubland community that occurs on mesic sites. *Salix glauca* (1% and 10% cover) and *Salix petrophila* (20% and 40% cover) occur in the short- and dwarf-shrub layer, respectively. Graminoids with 1-10% cover include *Poa* spp., *Carex* spp., and *Trisetum spicatum*. Forbs with 1-10% cover include *Caltha leptosepala, Ranunculus eschscholtzii, Packera dimorphophylla, Gentiana calycosa, Pedicularis* spp., *Erigeron* spp., *Senecio crassulus, Antennaria* spp., and *Polygonum viviparum*. A variety of other forbs and a few graminoids occur in trace quantities.
Global Vegetation: This alpine dwarf-shrubland occur in mesic sites and is one of the wettest associations in the ~*Salix arctica* Dwarf-shrubland Alliance (A.1117)$$. The dwarf-shrub is creeping along the ground and is rarely taller than 12.7-20.3 cm (5-8 inches), forming the dwarf shrub-layer. The herbaceous layer is patchy, and species generally have low cover, although there is no question *Caltha leptosepala* is the characteristic forb. Grasses occur, but are low in cover, and include *Festuca brachyphylla, Poa* spp., *Carex elynoides*, other *Carex* species, and *Trisetum spicatum*. Other forbs present may include *Astragalus alpinus, Erigeron peregrinus, Pedicularis groenlandica, Polygonum bistortoides, Sibbaldia procumbens, Ranunculus eschscholtzii, Packera dimorphophylla, Gentiana calycosa, Pedicularis* spp., *Erigeron* spp., *Senecio crassulus, Antennaria* spp., and *Polygonum viviparum*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix glauca	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Salix petrophila	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	X	X	.
Caltha leptosepala	Herb (field)	Forb	.	X	.
Gentiana calycosa	Herb (field)	Forb	.	X	.
Packera dimorphophylla	Herb (field)	Forb	.	X	.
Polygonum viviparum	Herb (field)	Forb	.	X	.
Ranunculus eschscholtzii	Herb (field)	Forb	.	X	.
Senecio crassulus	Herb (field)	Forb	.	X	.
Trisetum spicatum	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Antennaria spp.	characteristic forbs
Carex spp.	characteristic graminoids
Erigeron spp.	characteristic forbs
Pedicularis spp.	characteristic forbs
Poa spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix arctica	Short shrub/sapling	Dwarf-shrub	X	X	X
Salix petrophila	Short shrub/sapling	Dwarf-shrub	.	X	.
Caltha leptosepala	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Carex scirpoidea	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (23-Feb-1994).

RELATED CONCEPTS

Global Similar Associations:
- *Salix reticulata / Caltha leptosepala* Dwarf-shrubland (CEGL001435)

Global Related Concepts:
- *Salix arctica-Caltha leptosepala* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IV.B.3.b. (Driscoll et al. 1984) B
- Mesic alpine turf community (Loope 1969) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: *Salix arctica* was not identified in the two sampled stands for this association, and its presence is not required based on the definition of this type.
Global Classification Comments: This association includes stands dominated by *Salix arctica* or *Salix petrophila (= Salix arctica ssp. petraea)*. Kartesz (1999) recognizes both as distinct species, but it seems imprudent at this time to separate the only two known locations into separate associations. It is very similar to ~*Salix reticulata / Caltha leptosepala* Dwarf-shrubland (CEGL001435)$$ in environment and in species composition (it lists both *Salix reticulata* and *Salix arctica* as characteristically present) and may warrant combining these two concepts into one.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: Both of the sampled stands occur near Moose Basin Divide.
Global Range: This alpine dwarf-shrubland occurs in the Ruby Mountains in northeastern Nevada and in Grand Teton National Park in western Wyoming.
Nations: US
States/Provinces: NV:S2S3, WY
TNC Ecoregions: 9:C, 11:?
TNC Ecoregion Comments: ECO11 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M341A:??
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two sampled stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201074, GT-0201075
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga, mod. G. Kittel
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kartesz 1999	.	X	.	.	.	.	.	.	.
Loope 1969	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V. Herbaceous Vegetation

V.A.5.N.c. Medium-tall sod temperate or subpolar grassland

A.2637 *Calamagrostis rubescens* Herbaceous Alliance

Pinegrass Herbaceous Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is currently described for Montana and Wyoming.
Nations: US
Subnations: MT, WY
TNC Ecoregions: 7:C, 9:C
USFS Ecoregions: M331D:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL005862] *Calamagrostis rubescens* Herbaceous Vegetation

Translated Name: **Pinegrass Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Northern Rocky Mountain Montane Grassland (CES306.836)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This is a small- to large-patch herbaceous association found in northwestern Montana in Glacier National Park. Small to large patches of this type are located on flat benches or east-facing slight slopes at elevations between 1070 and 1220 m (3500-4000 feet) on low slopes. Soil texture ranges from loam to silt loam, derived from argillite glacial till. Soils are moderately to well-drained. Litter covers most of the ground surface at 80%. Downed wood ranges from 4-10%, since both of the sampled stands were intensely burned in the 1980s. Overall, this stand-replacing fire has altered soils (rendering them aquaphobic, severely retarding infiltration rates), altered site potential, mostly totally consumed duff, and caused some soil erosion. This association is montane and grass-dominated, with *Calamagrostis rubescens* the dominant. Overall herbaceous cover is very high, ranging from 80-100%. Average cover of *Calamagrostis rubescens* is 45%, twice the cover of any other herbaceous species. *Symphyotrichum laeve (= Aster laevis), Lathyrus ochroleucus*, and *Achillea millefolium* are also consistently common. Other high-constancy herbaceous species include native species *Packera pseudaurea (= Senecio pseudaureus), Galium boreale*, and *Fragaria virginiana*, and exotic species *Poa pratensis* and *Taraxacum officinale*. *Vicia americana, Arnica cordifolia, Carex concinnoides*, and *Carex microptera* may be present with conspicuous cover. Shrub cover can be moderate in this association ranging from 5-25%. Short shrubs may be common in some areas, with *Symphoricarpos albus, Amelanchier alnifolia*, and *Rubus parviflorus* the most common. *Mahonia repens, Rosa woodsii*, and *Vaccinium caespitosum*, may also be present in low amounts. *Pinus contorta* saplings, averaging 9% cover, are consistently present in this association. In some occurrences, the tree seedling and sapling layers may be quite abundant, up to 30% or more cover. As these trees mature, this association will change over time to become a forested community.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stand of this association occurs on a moderate south-facing slope at an elevation of 2161 m (7091 feet). The unvegetated ground surface is dominated by basal vegetation and litter and duff. Bare soil and gravel are also present in small quantities.
Global Environment:

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous grassland community that occurs in mesic areas. Shrubs, trees, and tree seedlings are all present in trace quantities within the sampled stand, including *Artemisia tridentata ssp. vaseyana*, *Pinus flexilis*, *Populus tremuloides*, *Rosa woodsii*, and *Symphoricarpos* sp. *Calamagrostis rubescens* is the most abundant species in the stand with 20% cover. Other well-represented graminoids and forbs with 10% cover each are *Bromus ciliatus*, *Comarum palustre*, *Galium trifidum*, and *Helianthella uniflora*.
Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Comarum palustre	Herb (field)	Forb	X	X	.
Galium trifidum	Herb (field)	Forb	X	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Bromus ciliatus	Herb (field)	Graminoid	X	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4? (2-Feb-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: As defined, this association is comprised of stands undergoing secondary succession or, depending on fire severity, something approximating primary succession. These sites probably take at least 40 years to become pole-sized stands; it is unclear what time spans would be required to achieve full stocking or closed-canopy condition. Stands wherein *Calamagrostis rubescens* would be the long-persisting dominant (climax) or diagnostic species have not been inventoried as yet.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs west of Shadow Mountain in the Bridger-Teton National Forest.
Global Range:
Nations: US
States/Provinces: MT:S3S4, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association. This stand is located in the Bridger-Teton National Forest, and the plot data sheet contains little environmental data.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407021

Grand Teton National Park Description Author(s): R. Massatti and K. Varga

Global Description Author(s): Western Ecology Group

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.A.5.N.d. Medium-tall bunch temperate or subpolar grassland

A.1251 *Festuca idahoensis* Herbaceous Alliance

Idaho Fescue Herbaceous Alliance

ALLIANCE CONCEPT

Summary: These grasslands are characteristic of the Palouse Prairie on the Columbia Plateau but extend east into the Rocky Mountains and south into the Great Basin. Stands are found on undulating prairie, valley bottoms, canyon benches, and expansive park meadow openings in montane and subalpine forests, on ridges above subalpine forests in the Rocky Mountains, on coastal terraces and inland bald hills, and glacial outwash plains. Stands also occur in coastal and inland prairies on the western side of the Cascade Range. Soils are moderately to well-drained, loams or silt loams or silty clays, that are generally deep, and derived from alluvium, colluvium, or loess. Vegetation included in this alliance is characterized by the dominance or codominance of *Festuca idahoensis*. Other important species may include *Sericocarpus rigidus (= Aster curtus), Carex filifolia, Carex inops ssp. heliophila, Carex obtusata, Danthonia intermedia, Elymus caninus, Elymus trachycaulus, Eriogonum caespitosum, Eriogonum heracleoides, Festuca thurberi, Geranium caespitosum, Koeleria macrantha, Pascopyrum smithii, Poa secunda, Pseudoroegneria spicata*, or *Achnatherum richardsonii (= Stipa richardsonii)*. Scattered shrubs and dwarf-shrubs, such as species of *Symphoricarpos* and *Rosa*, are present in some stands. Diagnostic of this widespread grassland alliance is the dominance or codominance of *Festuca idahoensis*.
Environment: These grasslands are characteristic of the Palouse Prairie on the Columbia Plateau, but extend east into the Rocky Mountains and south into the Great Basin. Stands also occur in coastal and inland prairies on the western side of the Cascade Range. Elevations range from 20-3500 m. Climate varies geographically. East of the Cascade Range, climate is temperate and mostly continental. Mean annual precipitation ranges from 33-60 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil profile and utilized throughout the typically dry summers. West of the Cascade Mountains, the maritime climate is much wetter, with mean annual precipitation over 100 cm. Stands are found on undulating prairie, valley bottoms, canyon benches, expansive park meadow openings in montane and subalpine forests, on ridges above subalpine forests in the Rocky Mountains, on coastal terraces and inland bald hills, and glacial outwash plains. Sites are nearly level to steep slopes. Aspect varies depending on elevation, latitude and soil moisture. Soils are generally deep, but may be shallow and rocky. They are moderately to well-drained, loams or silt loams or silty clays, with pH of 5.8-7.2 and derived from alluvium, colluvium, or loess. Parent material may include igneous, sedimentary and metamorphic rocks such as basalt, tuff, granite, lava, breccia, calcareous conglomerate, volcanic andesite, quartzite, sandstone, shale, limestone and rhyolite.

Adjacent stands vary with geography. In the Palouse Prairie and Rocky Mountains, adjacent stands often include other grasslands dominated by *Pseudoroegneria spicata, Poa secunda* or other perennial grasses, shrublands dominated by *Artemisia tridentata*, and montane and subalpine forests dominated by *Pinus ponderosa, Picea engelmannii, Pseudotsuga menziesii, Abies lasiocarpa* or one of a number of other species. West of the Cascades, adjacent stands are wet meadows dominated by *Festuca rubra* and *Deschampsia caespitosa*, and forests or woodlands dominated by *Pseudotsuga menziesii* or *Quercus garryana*.
Vegetation: These grasslands occur east of the Cascade Range in the Palouse Prairie and intermountain steppe, west of the Cascade Range in grasslands of the Willamette Valley, Puget Sound basin and along the coast in the northwestern U.S. They also occur in parks and on ridges in the montane and subalpine zones in the Rocky Mountains. Stands have a moderate to dense cover of graminoids (<1 m tall) that is dominated or codominated by the cool-season, perennial bunchgrass *Festuca idahoensis*. The associated species in these grasslands vary geographically.

In the Palouse region codominant and characteristic species may include *Pseudoroegneria spicata, Poa secunda, Koeleria macrantha, Eriogonum caespitosum, Eriogonum heracleoides* and on drier sites *Hieracium cynoglossoides*. Scattered shrubs and dwarf-shrubs such as *Symphoricarpos albus, Rosa nutkana*, and *Rosa woodsii* are present in some stands. Disturbed stands may be codominated by *Ericameria nauseosa (= Chrysothamnus nauseosus)* and the exotics *Poa pratensis* or *Bromus tectorum* (on dry sites). In the Rocky Mountains codominants can include *Carex filifolia, Carex inops ssp. heliophila, Carex obtusata, Danthonia intermedia, Elymus trachycaulus, Festuca thurberi, Geranium caespitosum, Koeleria macrantha, Pascopyrum smithii, Pseudoroegneria spicata* or *Achnatherum richardsonii (= Stipa richardsonii)*. Other characteristic species include *Artemisia ludoviciana, Antennaria rosea, Gaura coccinea, Bouteloua gracilis* or *Hesperostipa comata (= Stipa comata)*.

West of the Cascades, codominants include *Elymus caninus, Koeleria macrantha*, and *Sericocarpus rigidus (= Aster curtus)* for inland stands. These fire-dependent stands often are invaded by woody species such as *Pseudotsuga menziesii* and *Cytisus scoparius*

(an exotic), exotic forage species like *Agrostis capillaris (= Agrostis tenuis), Agrostis gigantea (= Agrostis alba), Dactylis glomerata* or *Poa pratensis*, and many exotic weeds. *Festuca idahoensis* stands on the coast may include species such as *Danthonia californica, Festuca rubra, Melica californica, Nassella pulchra (= Stipa pulchra),* and often many exotic species.

Dynamics: Most associations included in this alliance are rare or threatened and ranked as a G3 to G1. Most of these grasslands in the Palouse Region have been converted to agriculture. Without fire, tall shrubs or trees invade and displace grassland species on the remnant other sites. This has lead to conversion of isolated grassland fragments to shrublands and forests. Lower treeline occurrences also tend to invasion by shrubs or trees with fire suppression. Past grazing has resulted in altered composition and structure of many stands. Exotic species such as *Poa pratensis* and *Bromus tectorum* have invaded many mesic and xeric stands, respectively (Daubenmire 1970, 1992).

Similar Alliances:

- *Andropogon gerardii - (Sorghastrum nutans)* Herbaceous Alliance (A.1192)
- *Carex hoodii* Herbaceous Alliance (A.1253)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Festuca viridula* Herbaceous Alliance (A.1257)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)

Similar Alliance Comments: Two of the similar alliances have *Festuca idahoensis* as a dominant or codominant in the alliance. The other similar alliances include grasslands that have at least one association where *Festuca idahoensis* is a codominant species. *Festuca idahoensis* is a widespread grassland species in the northern half of the western U.S. and is also a dominant understory species in many forests, woodlands and shrublands.

ALLIANCE DISTRIBUTION

Range: Grasslands included in this alliance are most characteristic of the Palouse Prairie of eastern Washington and eastern Oregon and Idaho, but also extend east into the northwestern Great Plains of eastern Montana, and south into the southern Rocky Mountains, Colorado Plateau and Modoc Plateau. The alliance also occurs west of the Cascades in the Willamette Valley, Puget Sound basin, and along the coast south into northern California. It may also occur in Alberta and other adjacent Canadian provinces.

Nations: CA, US

Subnations: AB, BC, CA, CO, ID, MT, NV, OR, UT?, WA, WY

TNC Ecoregions: 2:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C, 67:P, 68:P

USFS Ecoregions: 242A:CC, 331A:CC, 331D:CC, 331F:C?, 331G:CC, 342B:CC, 342C:CC, 342I:CC, M331A:CC, M331B:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CC

Federal Lands: BIA (Blackfeet); DOD (Fort Lewis); NPS (Glacier, Grand Teton, Yellowstone); PC (Waterton Lakes); USFS (Bighorn, Bridger-Teton, Medicine Bow, Nez Perce, Shoshone, White River NF)

ALLIANCE SOURCES

Author(s): K. Schulz

References: Bond 1959, Brown and Thompson 1965, Caicco 1983, Chappell et al. 1997, Cooper and Lesica 1992, Cooper et al. 1995, Cooper et al. 1997, Crawford et al. 1994, Daubenmire 1970, Daubenmire 1992, DeVelice and Lesica 1993, Evans et al. 1984, Hansen 1985, Hansen and Hoffman 1988, Harrington 1978, Hess 1981, Hess and Wasser 1982, Holland 1986b, Hurd 1961, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Johnston 1987, Klish 1977, Komarkova 1986, Lang 1961, Lewis 1971, Macdonald 1989, Magee 1985, Mattson 1984, McLean 1970, Mueggler and Stewart 1980, Paulsen 1969, Poulton 1955, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Terwilliger et al. 1979a, Tisdale 1947, Tisdale 1986, Tisdale and Bramble-Brodahl 1983, Turner and Dortignac 1954, WANHP unpubl. data, Ward and Keith 1962, Wasser and Hess 1982

[CEGL001612] *Festuca idahoensis - Danthonia intermedia* Herbaceous Vegetation

Translated Name: **Idaho Fescue - Timber Oatgrass Herbaceous Vegetation**

Common Name:

Ecological System(s):

- Northern Rocky Mountain Montane Grassland (CES306.836)
- Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

Status: Standard **Circumscription Confidence:** 3 - Weak

Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is a type of open meadow vegetation found in the central plateau of Yellowstone National Park and adjacent Grand Teton National Park, northwestern Wyoming. Stands occur as inclusions on dry sites in extensive moist meadows. Elevations are between 1980 and 2134 m (6500-7000 feet), and stands occur on level to gentle slopes. Substrates are deep, mesic, medium-textured, mineral soils. The vegetation is less than 3 dm tall and moderately open, with patchy moss ground cover. *Festuca idahoensis* and *Danthonia intermedia* are constant species, and other common species (that may be abundant) include *Phleum alpinum, Carex praticola, Potentilla diversifolia, Antennaria corymbosa, Deschampsia caespitosa*, and several other forb species. *Carex filifolia* is not present.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The sampled stand of this association occurs on level terrain on the valley floor at an elevation of 2068 m (6786 feet). The moderately well-drained sandy clays are codominated by litter and duff and mosses; gravel is well-represented, and bare soil, wood, and lichens are present in trace quantities. Adjacent vegetation includes *Artemisia tridentata ssp. vaseyana* shrublands with varying graminoid understories. Other graminoid meadows throughout The Potholes area have similar species compositions as the one that this stand represents.

Global Environment: This is short, open meadow vegetation in the central plateau of Yellowstone and Grand Teton national parks in northwestern Wyoming. Elevations are between 1980 and 2134 m (6500-7000 feet), and stands occur on level to gently sloping dry sites in extensive moist meadows. The soils are deep, mesic, and medium-textured.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. Shrubs within these meadows are only incidental but may include *Artemisia tridentata ssp. vaseyana*. The herbaceous layer is dominated by graminoids, including a major component of *Danthonia intermedia* (40% cover) and a minor component of *Festuca idahoensis* (10% cover). Other common and well-represented species with 3 to 10% cover may include *Carex* sp., *Antennaria microphylla*, and *Eriogonum umbellatum*.

Global Vegetation: This association is a moderately open grassland with patchy moss ground cover. Scattered shrubs, especially *Artemisia tridentata ssp. vaseyana*, may be present. Total vegetation cover is around 50%. *Festuca idahoensis* and *Danthonia intermedia* are constant species and are usually dominant, with 30-40% and 10% cover, respectively. Other common species (that may be codominant) include *Phleum alpinum, Carex praticola, Potentilla diversifolia, Antennaria corymbosa, Antennaria microphylla, Eriogonum umbellatum*, and *Deschampsia caespitosa*. *Carex filifolia* is not present.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Antennaria microphylla	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Danthonia intermedia	Herb (field)	Graminoid	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Carex sp.	characteristic graminoid

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Danthonia intermedia	Herb (field)	Graminoid	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3?Q (1-Feb-1996). The global rank should remain G3 because this association is described from only one area on the Yellowstone Plateau of northwestern Wyoming and one in Grand Teton National Park. This association appears to be limited in distribution both geographically and to mesic meadow sites. However, its relationship to other *Festuca idahoensis* associations is very unclear, as it has similarities to several types described in the literature. Thus a "Q" has been added to the rank to indicate the uncertainty of its taxonomic status as a valid association.

RELATED CONCEPTS

Global Similar Associations:

- *Festuca idahoensis - Carex filifolia* Herbaceous Vegetation (CEGL001898)
- *Festuca idahoensis - Elymus trachycaulus* Herbaceous Vegetation (CEGL001614)

Global Related Concepts:
- *Festuca idahoensis - Antennaria corymbosa* Habitat Type (Mattson 1984) =
- *Festuca idahoensis-Danthonia intermedia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association is based on the description of the *Festuca idahoensis - Antennaria corymbosa* habitat type from wetland classification work done in Yellowstone National Park (Mattson 1984) and amended by plot data obtained from vegetation surveys in Grand Teton National Park. More survey is needed to clarify its validity, full distribution and relationships with other *Festuca idahoensis* associations. Whether or not this vegetation can be recognized as an association is open to question, and the characteristics that might set it apart from other *Festuca idahoensis* associations are unknown at present. One similar association, *~Festuca idahoensis - Carex filifolia* Herbaceous Vegetation (CEGL001898)$$, is described from the habitat type of the same name in Montana (Mueggler and Stewart 1980) and is similar compositionally to this association. It is composed of *Festuca idahoensis, Carex filifolia, Gentiana affinis, Geum triflorum,* and *Danthonia intermedia* as dominant (constant and abundant) species. It also lacks significant cover of *Pseudoroegneria spicata, Pascopyrum smithii, Deschampsia caespitosa,* or *Elymus caninus* and occurs on drier, windswept mountain slopes in or near mountain saddles, not in broad moist meadows.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs in The Potholes.
Global Range: The habitat type upon which this association is based has been described from the central plateau of Yellowstone National Park (Mattson 1984), an area of about 4144 square km (1600 square miles); one site has been documented from adjacent Grand Teton National Park.
Nations: US
States/Provinces: WY:S3?
TNC Ecoregions: 9:C, 10:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton, Yellowstone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A102
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G.P. Jones, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mattson 1984	.	X	X	X	X	.	.	.	.
Mueggler and Stewart 1980	.	.	.	.	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001618] *Festuca idahoensis - Geranium viscosissimum* Herbaceous Vegetation

Translated Name: **Idaho Fescue - Sticky Geranium Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): R.J. Rondeau

ELEMENT CONCEPT

Global Summary: This association has been documented as locally abundant across the southern White River Plateau in White River National Forest, Colorado, and two sites have been identified in Grand Teton National Park. Stands occur between 1830 and 2210 m (6000-7250 feet) elevation on relatively xeric upland ridges and summits of gentle inclination (2-7%) and variable exposures. Soils are deep, well-drained, and moderately permeable with a cobbly clay substratum. This medium-height, late-seral grassland is composed of moderately dense cover of *Festuca idahoensis*. Several graminoids of lesser importance occur with high constancy, including *Elymus trachycaulus, Festuca thurberi, Melica spectabilis, Melica bulbosa*, and *Achnatherum lettermanii (= Stipa lettermanii)*. Significant forbs found in the community include the dominant *Geranium viscosissimum* (15% canopy cover), as well as *Achillea millefolium var. occidentalis (= Achillea lanulosa), Agoseris glauca, Erigeron speciosus*, and *Hymenoxys hoopesii (= Helenium hoopesii)*. These sites are generally subject to wind exposure.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The sampled stands of this association occur on level terrain and on a moderate northwest-facing slope at elevations of 2210 and 2116 m (7249 and 6942 feet). One stand is located on clay loam soils, and the other stand's unvegetated ground surface is composed predominantly of litter and duff, with small quantities of rocks greater than 10 cm, gravel, bare soil, and basal vegetation also present.

Global Environment: This association has been documented as locally abundant across the southern White River Plateau in White River National Forest, Colorado, and two sites have been identified in Grand Teton National Park. Stands occur between 1830 and 2210 m (6000-7250 feet) elevation on relatively xeric upland ridges and high level positions of gentle inclination (2-7%) and variable exposures. Soils are deep, well-drained, and moderately permeable with a cobbly clay substratum.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous grassland community that occurs in subxeric to mesic areas. Shrubs may be present within the short- and/or dwarf-shrub strata in trace quantities and may include *Artemisia tridentata ssp. vaseyana, Mahonia repens*, and/or *Rosa woodsii*. The herbaceous layer may be dominated either by graminoids or forbs but always includes *Festuca idahoensis* (3 and 10% cover) and *Geranium viscosissimum* (3 and 30% cover). Other species present in both stands include *Achillea millefolium* (1 and 10% cover) and *Chamerion angustifolium* (3% cover). In one stand an abundance of *Potentilla pulcherrima* (30% cover) is present. Other well-represented species present in one stand and with 10% canopy cover each include *Carex hoodii, Melica bulbosa, Eurybia integrifolia*, and *Fragaria vesca*.

Global Vegetation: This medium-height, late-seral grassland is composed of moderately dense cover of *Festuca idahoensis* (3-25% cover). Several graminoids of lesser importance occur with high constancy, including *Elymus trachycaulus, Festuca thurberi, Melica spectabilis, Melica bulbosa, Carex hoodii*, and *Achnatherum lettermanii*. Significant forbs found in the community include the dominant *Geranium viscosissimum* (3-30% cover), as well as *Achillea millefolium, Agoseris glauca, Chamerion angustifolium, Erigeron speciosus, Eurybia integrifolia, Fragaria vesca*, and *Hymenoxys hoopesii*. Scattered shrubs may be present, including *Artemisia tridentata ssp. vaseyana, Mahonia repens*, and *Rosa woodsii*.

Global Dynamics: These sites are generally subject to wind exposure and, as such, experience less snow accumulation than more protected areas of the similar *~Festuca idahoensis - Festuca thurberi* Herbaceous Vegetation (CEGL001617)$$, that is dominated by *Festuca idahoensis* and *Festuca thurberi*. The similar *~Festuca idahoensis - Elymus trachycaulus* Herbaceous Vegetation (CEGL001614)$$ occupies a more mesic environment, usually at the base of a slope and adjacent to a wet meadow. *Elymus trachycaulus* may be present in both plant associations but usually has less than 2% cover in *~Festuca idahoensis - Geranium viscosissimum* Herbaceous Vegetation (CEGL001618)$$.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	.	X	.
Epilobium angustifolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Phleum pratense	-	P	exotic

Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (10-Dec-1999). This association has been documented on the White River National Forest in northwestern Colorado and in Grand Teton National Park and Bridger-Teton National Forest in northwestern Wyoming. Five stands were sampled in 1982, and the Colorado Natural Heritage Program mentions an occurrence near Deep Creek, Colorado (White River National Forest). The known stands should be revisited to determine if they meet the minimum criteria for an element occurrence. In addition, future surveys in northern Colorado and southern Wyoming should target this association.

RELATED CONCEPTS

Global Similar Associations:
- *Festuca idahoensis - Elymus trachycaulus* Herbaceous Vegetation (CEGL001614)
- *Festuca idahoensis - Festuca thurberi* Herbaceous Vegetation (CEGL001617)

Global Related Concepts:
- *Festuca idahoensis - Geranium viscosissimum* Habitat Type (Hess and Wasser 1982) =
- *Festuca idahoensis-Geranium viscosissimum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association is based on qualitative data from one classification study with 5 stands measured. Hess and Wasser (1982) describe occurrences of this association in White River National Forest.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands of this association occur on the north side of Two Ocean Lake and northeast of the Teton Science School in the Bridger-Teton National Forest.
Global Range: This association has been documented on the White River National Forest in northwestern Colorado and in Grand Teton National Park and Bridger-Teton National Forest in northwestern Wyoming.
Nations: US
States/Provinces: CO:S2S3, WY
TNC Ecoregions: 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, White River NF)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association. One stand is located in the Bridger-Teton National Forest.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202007
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407064

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): R.J. Rondeau, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hess and Wasser 1982	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[PARK SPECIAL GRTE-001] *Festuca idahoensis / Helianthella uniflora* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on moderate south- and west-facing slopes at elevations of 7241 and 7650 feet. The unvegetated ground surface in one stand is co-dominated by litter and duff and bare soil. Basal vegetation and gravel are well represented. The other stand's unvegetated ground surface is predominantly composed of litter and duff; basal vegetation and bare soil are well represented and gravel is present in trace quantities.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. Shrubs are present in one stand in either trace quantities or with 3% canopy cover; common shrubs include *Amelanchier alnifolia* and *Symphoricarpos* sp. The herbaceous layer in both stands is dominated by *Festuca idahoensis* (10 and 20% cover) and *Helianthella uniflora* (30 and 20% cover). In one stand *Balsamorhiza sagittata* is well represented with 20% cover. Although there are a variety of other forbs and graminoids with 1 or 3% cover, *Koeleria macrantha* (1% and 3% cover) is the only other species to occur in both stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
GRAMINOID	*Festuca idahoensis*
FORB	*Helianthella uniflora*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Festuca idahoensis, Koeleria macrantha, Helianthella uniflora

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur to the southeast and to the east of Teton Science School in the Bridger-Teton National Forest.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407030, BT-9407056

GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association. These stands occur in the Bridger-Teton National Forest and include little environmental data.

Classification Confidence: **Identifier:** New-GRTE-001
Local Author: Rob Massatti
Date: 27 April 2004
Local Editor: Klara Varga
Date: 3 May 2004

Global Author:

REFERENCES: None

A.3562 *Poa pratensis* Semi-natural Herbaceous Alliance

Kentucky Bluegrass Semi-natural Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This semi-natural grassland alliance is potentially widespread throughout the Great Plains and into the midwestern United States and Canada, depending on how the type is defined. Stands can occur in a wide variety of human-disturbed and native habitats. Stands are found on upland sites in the northwestern Great Plains and likely occur elsewhere in the western U.S. where *Poa pratensis* has invaded native western rangeland. The vegetation is characterized by a medium-tall (0.5-1 m), moderate to dense herbaceous canopy that is strongly dominated by the introduced perennial, sod-forming graminoid *Poa pratensis*. *Poa pratensis* is considered to be both a native and naturalized species from Eurasia. It is present to codominant in many other natural plant associations, but the diagnostic character in this alliance is that there is typically not enough of the native grassland left to classify it as a poor-condition natural type. Other native species may occur as well, but they are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Hesperostipa comata (= Stipa comata)*, as well as others. Associates are often those early-seral and weedy species that tolerate historic heavy livestock grazing or other disturbance well.
Environment: This semi-natural grassland alliance is potentially widespread throughout the Great Plains and into the midwestern United States and Canada, depending on how the type is defined. Stands can occur in a wide variety of human-disturbed and native habitats. Stands are found on upland sites in the northwestern Great Plains and likely occur elsewhere in the western U.S. where *Poa pratensis* has invaded native western rangeland. Stands in western North Dakota are found on deep, well-developed, fine-textured soils that are topographically situated as to receive supplemental moisture in the form of runoff from adjacent slopes. Such conditions exist in the toeslopes of upland draws and drainages, and in shallow depressions on north- and east-facing, nearly level slopes.
Vegetation: This perennial grassland alliance is characterized by a medium-tall (0.5-1 m), moderate to dense herbaceous canopy that is strongly dominated by the introduced, sod-forming graminoid *Poa pratensis*. *Poa pratensis* is considered to be both a native and naturalized species from Eurasia (Great Plains Flora Association 1986, Gleason and Cronquist 1991). It is present to codominant in many other natural plant associations, but the diagnostic character in this association is that there is typically not enough of the native grassland left to classify it as a poor-condition natural type. Other native species may occur as well, but they are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Hesperostipa comata (= Stipa*

comata), as well as others. Associates are often those early-seral and weedy species that tolerate historic heavy livestock grazing or other disturbance well.

Dynamics: *Poa pratensis* is widespread in the western U.S. where, following disturbance, its extensive rhizome system allows it to spread and establish, outcompeting many native graminoids. It is tolerant of heavy grazing and increases at the expense of less tolerant native species (Hansen et al. 1995, Volland 1978). It is also adapted to burning and quickly resprouts after fire, except when burned during growing periods (Volland and Dell 1981).

Similar Alliances:

- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1382)

Similar Alliance Comments: This alliance occurs on upland sites, whereas the similar alliance is found on seasonally flooded lowland sites.

ALLIANCE DISTRIBUTION

Range: This alliance is found in Montana, Wyoming, North and South Dakota, and Alberta, Canada, but is likely more widespread.
Nations: CA, US
Subnations: AB, CO, MT, ND, SD, WY
TNC Ecoregions: 7:C, 9:C, 20:C, 26:P, 33:P
USFS Ecoregions: 331F:CP, 332C:CP, M331D:CC, M332C:CC, M333C:CC
Federal Lands: BIA (Blackfeet); NPS (Badlands, Curecanti?, Glacier, Grand Teton, Rockefeller, Theodore Roosevelt, Wind Cave); PC (Waterton Lakes); USFS (Bridger-Teton); USFWS (Lacreek)

ALLIANCE SOURCES

Author(s): D. Faber-Langendoen
References: Gleason and Cronquist 1991, Great Plains Flora Association 1986, Hansen et al. 1995, Volland 1978, Volland and Dell 1981, Von Loh et al. 2000

[CEGL005874] *Phleum pratense - Poa pratensis - Bromus inermis* Semi-natural Herbaceous Vegetation

Translated Name: **Timothy - Kentucky Bluegrass - Smooth Brome Semi-natural Herbaceous Vegetation**
Common Name:
Ecological System(s):

- Northern Rocky Mountain Montane Grassland (CES306.836)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is a very common type of disturbed grassland and forest opening on the east side of Glacier National Park, within Waterton Lakes National Park, in the major valleys of Grand Teton National Park and on the Blackfeet Reservation. It is a mesic to dry association located mostly on flat to gentle toeslopes, lowslopes and valley bottoms at variable aspects, and can occur on moderately steep midslopes and on flat basin floors. Elevations range from 945 to 2250 m (3100-7300 feet). Soil texture is typically moderately well- to well-drained sandy loams, silt loams, poorly drained clay loams or sandy clay loams. These soils are also characterized as Orthic and Rego Black Chernozems and Orthic Humic Regosols within Waterton Lakes National Park. These are weakly to well-developed, medium- to coarse-textured soils that have developed on glacio-fluvial and morainal landforms that contain quartzite and argillite. Litter comprises 40-95% of the ground cover. The vegetation, dominated by both non-native grasses and native forbs, is a result of historic and current disturbance. Disturbance includes seeding of pasture grasses, light to intense grazing, and development of out buildings, corrals and housing. Typical herbaceous cover is 40-60%; however, cover can be as low as 20% or as high as 100%. *Phleum pratense* and *Poa pratensis*, both non-native grasses, dominate the vegetation, and *Bromus inermis* is occasionally abundant. Other common species include native forbs *Achillea millefolium, Potentilla gracilis, Galium boreale, Fragaria virginiana, Geranium viscosissimum, Perideridia gairdneri, Potentilla gracilis, Symphyotrichum laeve (= Aster laevis)*, and the exotic forb *Taraxacum officinale*. *Campanula rotundifolia, Cerastium arvense, Penstemon confertus, Lomatium triternatum*, and *Vicia americana* are often present. *Koeleria macrantha, Festuca campestris*, and *Festuca idahoensis* may be abundant within this association as well and may indicate this type's original composition in upland sites. Other herbaceous species that may have high cover include *Lupinus sericeus, Bromus carinatus, Lithospermum ruderale, Erigeron speciosus, Solidago missouriensis, Elymus repens, Monarda fistulosa, Cirsium arvense, Eurybia conspicua (= Aster conspicuus), Pseudoroegneria spicata, Hedysarum sulphurescens*, and *Hedysarum alpinum*. Shrub cover is low within this association, typically averaging <5%, but it can be as high as 15%. The most common shrubs, when they are present, include *Amelanchier alnifolia, Rosa woodsii*, and *Dasiphora fruticosa ssp. floribunda*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on level terrain and shallow slopes up to 29% on and around the valley floor. The elevations of the stands range from 1996 to 2225 m (6550-7300 feet). One stand occurs in a palustrine area that

is saturated during the growing season. Soils are moderately well-drained and are highly variable; textures are generally loam-based. The unvegetated ground surface is consistently dominated by litter and duff, ranging from 70 to 98% cover. Bare soil often composes the remainder of the ground cover, ranging from 0 to 20%. At least two stands' disturbance regimes include grazing and farming. Common adjacent vegetation may include one or several of the following: *Carex* spp. and forb meadows, *Salix* spp. riparian corridors, *Populus tremuloides* patches, and mixed coniferous forests (including *Pinus contorta* as the major component).

Global Environment: This semi-natural meadow association occurs on valley floors and gentle slopes with a 2-29% gradient. Elevations range from 945 to 2225 m (3100-7300 feet). Sites may be flooded for short periods during the early part of the growing season, usually as part of an irrigation regime. Soils are variable in texture and develop from a range of substrates, including glacial till, lake and stream deposits.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane grassland community that occurs on subxeric to mesic sites. Shrubs are generally absent but may include *Artemisia tridentata ssp. vaseyana* and *Dasiphora fruticosa ssp. floribunda* (up to 3% cover). Graminoids are either dominant or codominant with forbs. *Poa pratensis* (1 to 70% cover), *Phleum pratense* (1 to 50% cover), and *Carex* spp. (1 to 20% cover) are found in nearly all of the stands. The remaining graminoid composition is highly variable. *Bromus inermis* and *Poa compressa* are the dominant herbaceous species in separate stands, each composing 50% canopy cover. *Koeleria macrantha* is codominant in one stand with 20% canopy cover. Forbs may be present in high or low quantities. *Potentilla gracilis* is present in nearly every stand with 1 to 30% canopy cover. Other common forbs include *Perideridia gairdneri* (1 to 20% cover) and *Achillea millefolium* (1 to 10% canopy cover). Species that may compose high canopy cover but are not common include *Trifolium longipes* (3 to 20% cover), *Geranium viscosissimum* (1 to 30% cover), *Wyethia helianthoides* (30% cover), and *Lupinus argenteus* (20% cover).

Global Vegetation: The vegetation, dominated by both non-native grasses and native forbs, is a result of historic and current disturbance. Disturbance includes seeding of pasture grasses, light to intense grazing, and development of out buildings, corrals and housing. Typical herbaceous cover is 40-60%; however, cover can be as low as 20% or as high as 100%. *Phleum pratense* and *Poa pratensis*, both non-native grasses, dominate the vegetation, and *Bromus inermis* is occasionally abundant. Other common species include native forbs *Achillea millefolium, Potentilla gracilis, Galium boreale, Fragaria virginiana, Geranium viscosissimum, Symphyotrichum laeve (= Aster laevis), Perideridia gairdneri*, and the exotic forb *Taraxacum officinale*. *Campanula rotundifolia, Cerastium arvense, Penstemon confertus, Potentilla gracilis, Lomatium triternatum*, and *Vicia americana* are often present. *Koeleria macrantha, Festuca campestris*, and *Festuca idahoensis* are occasionally abundant within this association as well and may indicate this type's original composition in upland sites. Other herbaceous species that may have high cover include *Lupinus sericeus, Bromus carinatus, Lithospermum ruderale, Erigeron speciosus, Solidago missouriensis, Elymus repens, Monarda fistulosa, Cirsium arvense, Eurybia conspicua (= Aster conspicuus), Pseudoroegneria spicata, Hedysarum sulphurescens*, and *Hedysarum alpinum*. Shrub cover is low within this association, typically averaging <5%, but it can be as high as 15%. The most common shrubs, when they are present, include *Amelanchier alnifolia, Artemisia tridentata ssp. vaseyana, Rosa woodsii*, and *Dasiphora fruticosa ssp. floribunda*

Global Dynamics: This association has developed following human disturbance, e.g., heavy grazing, haying, and perhaps seeding, which has introduced and permitted establishment of non-native grasses (Achuff et al. 1997). Once the non-native species are established, native grasses will generally not re-invade these stands. If irrigation ceases, stands may convert to weedy annual forb communities.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Perideridia gairdneri	Herb (field)	Forb	X	X	.
Potentilla gracilis	Herb (field)	Forb	X	X	.
Trifolium longipes	Herb (field)	Forb	.	X	.
Bromus inermis	Herb (field)	Graminoid	.	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	X	X	.
Poa compressa	Herb (field)	Graminoid	.	.	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Carex spp.	dominant and characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	X	X	.
Bromus inermis	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Cirsium arvense	-	P	exotic
Linaria vulgaris	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Trifolium hybridum	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Centaurea biebersteinii	-	P	exotic
Cirsium arvense	-	P	exotic
Elymus repens	-	P	exotic
Hedysarum sulphurescens	-	P	exotic
Hypericum perforatum	-	P	exotic
Linaria vulgaris	-	P	exotic
Medicago sativa	-	P	exotic
Phleum pratense	-	P	exotic
Poa compressa	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Trifolium hybridum	-	P	exotic
Trifolium pratense	-	P	exotic
Trifolium repens	-	P	exotic

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (9-Feb-2004).

RELATED CONCEPTS

Global Similar Associations:

- *Poa pratensis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005265)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003081)
- *Poa pratensis* Sierran Seasonally Flooded Herbaceous Vegetation (CEGL003159)

Global Related Concepts:

- H24: *Bromus inermis - Phleum pratense* Vegetation Type (Achuff et al. 2002a) I

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association shares similarities with the Youngblood et al. (1985a) *Poa pratensis* Community Type. The species diversity is high as Youngblood et al. mention, stemming from the absence of other dominant and diagnostic species rather than relatively pure *Phleum pratense - Poa pratensis - Bromus inermis* stands. Whereas in the *Poa pratensis* Community Type *Poa pratensis* is the high-constancy and usually the highest cover species, Grand Teton National Park's association includes both *Poa pratensis* and *Phleum pratense* as the high-cover/constancy species; *Phleum pratense* is often present with higher canopy cover than *Poa pratensis*. Other graminoid species such as *Poa compressa* and *Bromus inermis* can also be dominant within the herbaceous layer. Associates common to both community types include *Potentilla gracilis* and *Achillea millefolium*. Youngblood et al. mention that grazing pressure from livestock is probably responsible for some of their stands; some of Grand Teton National Park's stands are certainly the result of grazing pressure, especially in the vicinity of kelly. Finally, Youngblood et al. hypothesize that once the *Poa pratensis* Community Type is established it may be difficult to remove but that, as water tables drop, the community may gradually be invaded by *Artemisia tridentata ssp. vaseyana*. There is clear evidence of this trend in several of Grand Teton National Park's stands that are located in non-palustrine areas.

Grand Teton National Park Other Comments:

Global Classification Comments: This type is defined by having non-native perennial grasses constituting ≥25% of the total graminoid cover. It is considered that these non-native species have permanently altered the ecosystem functioning of the original native fescue grasslands and, hence, are unlikely to ever be restorable to their original species composition and ecological functioning.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in the appropriate habitat throughout Grand Teton National Park. There are concentrations of stands in the John D. Rockefeller Jr. Memorial Parkway, in the vicinity of Two Ocean Lake and near kelly.
Global Range: This association has been documented from northern Montana and adjacent Alberta, as well as from northwestern Wyoming. It is widespread throughout the interior western United States as an irrigated hay-producing meadow, but few stands have been sampled, as most are on private lands.
Nations: CA, US
States/Provinces: AB, MT, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332C:CC, M333C:CC
Federal Lands: BIA (Blackfeet); NPS (Glacier, Grand Teton, Rockefeller); PC (Waterton Lakes); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A009, GT-03A014, GT-03A027, GT-03B097, GT-03C013, GT-03C015, GT-0201001
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: GT-GTREsrm_FabianRan, GT-tm2b, GT-tm2c, GT-tm3b, GT-tm3c, GT-tm5e
Other plots outside park boundaries, but within 2 miles: BT-9407028, BT-9407065

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 1997	.	.	.	X	.	.	.	.	.
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	.	.	.	.	.	.

A.1265 *Pseudoroegneria spicata* Herbaceous Alliance

Bluebunch Wheatgrass Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This widespread grassland alliance occurs across the western U.S. from the slopes of the Cascades, extending east to the Rocky Mountains and the northwestern Great Plains, and south to the Great Basin, Uinta Basin and the Colorado Rocky Mountains. Stands are found on valley bottoms, stream terraces, rolling uplands, canyons, hills, plateaus and badlands, expansive park meadow openings in montane forests, and glacial outwash plains. Sites may be xeric or mesic, on nearly level to steep slopes. Stands occur on all aspects, but often on the drier southern and western slopes. Substrates are also variable and range from shallow, lithic soils with a rocky surface to moderately deep soils with little rock. Grasslands included in this alliance are dominated or codominated by *Pseudoroegneria spicata*. There is typically sparse to moderate cover of perennial forbs and widely scattered shrubs and dwarf-shrubs. Annual grasses and forbs are seasonally present. Litter, moss and lichen are important ground cover in some stands. Species composition is variable over the range of this alliance and may include many other important species such as *Bouteloua curtipendula, Bouteloua gracilis, Carex* spp., *Danthonia intermedia, Eriogonum heracleoides, Festuca idahoensis, Festuca thurberi, Koeleria macrantha, Achnatherum hymenoides (= Oryzopsis hymenoides), Pascopyrum smithii, Poa fendleriana, Poa secunda*, and *Hesperostipa comata (= Stipa comata).* Scattered shrubs and dwarf-shrubs, including *Ericameria nauseosa (= Chrysothamnus nauseosus), Symphoricarpos albus, Rosa* spp. *Artemisia frigida*, may be present in some stands. Disturbed stands may be codominated by the exotics *Poa pratensis* and *Bromus tectorum*. Diagnostic of this grassland alliance is the dominance of *Pseudoroegneria spicata*.
Environment: These widespread grasslands are characteristic of the Palouse Prairie but occur across the Columbia Basin from the slopes of the Cascades, extending east to the Rocky Mountains and the northwestern Great Plains, and south to the Great Basin, Uinta

Basin and the Colorado Rocky Mountains. Elevations range from 200 m in eastern Washington to 3050 m in Colorado. Climate is temperate and mostly continental. Mean annual precipitation ranges from 33-60 cm. Season of precipitation varies geographically. In the Columbia Basin precipitation comes mainly in the winter as snow or rain. This moisture is stored in the soil profile and utilized throughout the typically dry summers. Stands in the Rocky Mountains and Great Plains may receive up to 75% of the annual precipitation during the growing season. Stands are found on valley bottoms, stream terraces, rolling uplands, canyon benches and slopes, hills, ridges, plateaus and buttes, badlands, foothills, expansive park meadow openings in montane forests, and glacial outwash plains. Sites may be xeric or mesic, on nearly level to steep slopes. The alliance occurs on all aspects, but often on the drier southern and western slopes. Substrates are also variable and range from shallow and lithic soils with a rocky surface of gravel, cobbles or scoria, to moderately deep soils with little rock. Soils are moderately to well-drained, sometimes calcareous, with pH of 6.8-7.7. Soil texture ranges from gravelly, sandy loams to clay. Parent material may include alluvium, colluvium, residuum, glacial deposits or loess derived from lava, basalt, granite, quartz diorite, calcareous sandstone, limestone, acid shale, bentonite, marlstone and other volcanic materials. Litter, moss and lichen are important groundcover in some stands.

Adjacent stands often include other grasslands dominated by *Festuca idahoensis, Poa secunda* or other perennial grasses, and shrublands dominated by *Artemisia tridentata* or *Purshia tridentata*. Other adjacent vegetation may include woodlands dominated by *Juniperus occidentalis, Pinus edulis, Pinus flexilis, Pinus ponderosa, Pseudotsuga menziesii*, or *Quercus gambelii*.
Vegetation: These grasslands occur east of the Cascade Range in the Palouse Prairie, the more arid intermountain steppe, in parks, on ridges in the montane zones in the Rocky Mountains, and into the western Great Plains. Stands have a sparse to dense cover of graminoids (<1 m tall) that is dominated or codominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata*. There is typically sparse to moderate cover of perennial forbs and widely scattered shrubs and dwarf-shrubs. Annual grasses and forbs are seasonally present. Litter, moss and lichen are important groundcover in some stands.

Species composition and structure varies somewhat with habitat, climate and geography. In the Intermountain Region codominant and associated species may include *Festuca idahoensis, Poa secunda, Koeleria macrantha, Eriogonum heracleoides* and on drier sites *Hesperostipa comata (= Stipa comata).* Scattered shrubs and dwarf-shrubs such as *Symphoricarpos albus, Rosa nutkana*, and *Rosa woodsii* are present in some stands. In the Rocky Mountains and northern Great Plains, species such as *Arenaria hookeri, Artemisia frigida, Artemisia ludoviciana, Bouteloua curtipendula, Bouteloua gracilis, Carex filifolia, Carex inops ssp. heliophila, Carex obtusata, Danthonia intermedia, Festuca thurberi, Gaura coccinea, Geranium caespitosum, Koeleria macrantha, Achnatherum hymenoides (= Oryzopsis hymenoides), Pascopyrum smithii, Poa fendleriana* or *Achnatherum richardsonii (= Stipa richardsonii)* are characteristic and may codominate. Disturbed stands may be codominated by *Ericameria nauseosa (= Chrysothamnus nauseosus)* and the exotics *Poa pratensis* and *Bromus tectorum* (on dry sites).
Dynamics: Fire has variable effects on *Pseudoroegneria spicata* bunchgrasses. Plants usually survive burning, and growth is often stimulated, except when fire occurs in the driest month when the crowns will burn because of low moisture in the vegetation, and the meristems are damaged (Johnson and Simon 1987). Grazing impacts are concentrated on the gentler slopes accessible to livestock. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris* (Mueggler and Stewart 1980). It tolerates dormant-period grazing well, but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring (Comer et al. 1999). The exotic species *Bromus tectorum* occurs in many stands of the alliance and contributes significant cover on sites disturbed by livestock.
Similar Alliances:
- *Artemisia rigida* Shrub Herbaceous Alliance (A.1574)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Pseudoroegneria spicata - Bouteloua gracilis* Herbaceous Alliance (A.1239)
- *Pseudoroegneria spicata* Sparsely Vegetated Alliance (A.1876)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)

Similar Alliance Comments: Two of the similar alliances have *Pseudoroegneria spicata* as a dominant or codominant in the alliance. The other similar alliances include grasslands that have associations where *Pseudoroegneria spicata* is a codominant species. *Pseudoroegneria spicata* is a widespread grassland species in the northern half of the western U.S. and is also a dominant understory species in many forests, woodlands and shrublands.

ALLIANCE DISTRIBUTION

Range: Grasslands included in this alliance are most characteristic of the Columbia Basin of eastern Washington and eastern Oregon and Idaho, but also extend east into the Rocky Mountains and northwestern Great Plains of Montana and Wyoming, and south into the Colorado Rocky Mountains and Colorado Plateau. The alliance likely occurs on the Modoc Plateau of California and may also extend into the Canadian provinces of British Columbia, Alberta and Saskatchewan.
Nations: CA, US
Subnations: AB, BC, CO, ID, MT, ND, OR, UT, WA, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 18:C, 20:C, 26:C

USFS Ecoregions: 331A:CC, 331D:CC, 331F:CC, 331G:CC, 342A:CC, 342B:CC, 342C:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M242C:??, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331G:CP, M331H:CP, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333C:CC, M341C:CC
Federal Lands: NPS (Dinosaur, Glacier, Grand Teton); PC (Waterton Lakes); USFS (Bighorn?, Bridger-Teton, Clearwater, Custer, Little Missouri?, Medicine Bow, Shoshone, Thunder Basin, Wallowa-Whitman)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Anderson 1956, Baker 1982b, Baker 1983b, Baker 1984a, Baker and Kennedy 1985, Bighorn Coal Mine n.d., Chappell et al. 1997, Christensen 1963, Christensen and Welsh 1963, Comer et al. 1999, Cooper et al. 1995, Cotter-Ferguson Project n.d., Daubenmire 1970, Daubenmire 1992, DeVelice 1992, DeVelice and Lesica 1993, DeVelice et al. 1995, Despain 1973a, Fisser et al. 1965, Francis 1983, Ganskopp 1979, Hall 1973, Hansen 1985, Hansen and Hoffman 1988, Hansen et al. 1988a, Holland 1986b, Hyde 1964, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Johnson and Simon 1987, Johnston 1987, Kleiner 1968, Lesica and DeVelice 1992, MTNHP unpubl. data, Mueggler and Stewart 1980, Poulton 1955, Price and Brotherson 1987, Prodgers 1978, Reid et al. 1994, Ross et al. 1973, Sawyer and Keeler-Wolf 1995, Seminoe II Mine Application n.d., Terwilliger and Tiedemann 1978, Terwilliger et al. 1979a, Tiedemann et al. 1987, Tisdale 1979, Tisdale 1986, Tweit and Houston 1980, Williams 1961

[CEGL001662] *Pseudoroegneria spicata - Balsamorhiza sagittata - Poa secunda* Herbaceous Vegetation

Translated Name: **Bluebunch Wheatgrass - Arrowleaf Balsamroot - Curly Bluegrass Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Columbia Basin Palouse Prairie (CES304.792)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.K. Rust

ELEMENT CONCEPT

Global Summary: This grassland association is described from the foothills and canyon slopes of northeastern Oregon, western Idaho, northwestern Wyoming and possibly Washington. Stands occur on steep, southeast- to southwest-facing slopes on mid- to upper-slope positions of major ridge systems in, typically, highly dissected terrain. Elevations range from 400-1500 m (1300-4900 feet), with outliers to 2256 m (7400 feet). Soils are often gravelly with abundant cobbles and stones. The plant association is characterized by a relatively open, tall bunchgrass canopy dominated by *Pseudoroegneria spicata*. *Poa secunda* is consistently present but typically is only common to well-represented. Annual bromes (*Bromus briziformis*, *Bromus japonicus*, and *Bromus tectorum*) and *Poa bulbosa* are often present and may occur with abundance in degraded stands. Associated herbaceous species include *Balsamorhiza sagittata*, *Lupinus* spp., *Crepis acuminata*, *Allium acuminatum*, *Achillea millefolium*, *Epilobium brachycarpum (= Epilobium paniculatum)*, *Penstemon deustus*, and *Collomia grandiflora*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on 38 to 40% slopes of various aspects at elevations ranging from 2210 to 2256 m (7250-7400 feet). The unvegetated ground surface for one stand is composed of 70% litter and duff and 20% basal vegetation; cobbles, bare soil and gravel form only minor components. The other stand's unvegetated ground cover is codominated by gravel (43% cover), litter and duff (20% cover), and bare soil (30% cover); cobbles and basal vegetation form only minor components.
Global Environment: This grassland association is described from foothills and canyon slopes and occurs in northeastern Oregon, western Idaho, northwestern Wyoming and possibly Washington. Stands occur on steep slopes with varying aspects on mid- to upper-slope positions of major ridge systems in highly dissected terrain. Elevations range from 400-1500 m (1300-4900 feet) in Oregon and Idaho, and extend up to 2256 m (7400 feet) in Wyoming. Soils are often gravelly with abundant cobbles and stones.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane grassland community that occurs on subxeric sites. The short-shrub layer may be composed of various shrubs; most shrubs are present only in trace quantities, but they can contribute up to 3% canopy cover. The herbaceous layer generally covers 20 to 40% of the ground surface and is dominated by *Pseudoroegneria spicata* (10 to 20% cover). No other graminoids are highly constant or common. *Balsamorhiza sagittata* is the only forb present in both stands (1 and 10% cover). *Helianthella uniflora* contributes 10% canopy cover in one stand; no other forbs are dominant or codominant.
Global Vegetation: This subxeric montane grassland association is characterized by a relatively open, tall bunchgrass canopy dominated by *Pseudoroegneria spicata* (10-20% cover). *Poa secunda* is consistently present and typically has 5-10% cover, although it may be absent from some stands. Exotic annual bromes (*Bromus briziformis*, *Bromus japonicus*, and *Bromus tectorum*) and *Poa bulbosa* are often present and may be abundant in degraded stands. Associated herbaceous species include *Balsamorhiza sagittata*,

Lupinus spp., *Crepis acuminata, Allium acuminatum, Achillea millefolium, Helianthella uniflora, Epilobium brachycarpum (= Epilobium paniculatum), Penstemon deustus,* and *Collomia grandiflora*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Poa secunda	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-Jan-2001). This regional endemic plant association is relatively common and widespread on suitable habitats within its range. Occurrences of the plant association are susceptible to the adverse effects of early season and excessive livestock use and altered fire disturbance regimes and are naturally prone to invasion by exotic annual grass species. Vulnerability to degradation is exacerbated by livestock grazing and fire disturbance. While the number and range of occurrences and rangewide acreage of the plant association appear relatively stable, nearly all of the stands treated by inventory data are degraded by the presence of exotic annual grass species. Pristine stands are extremely rare. Reversal of current trend toward the gradual erosion of the condition of stands will require widespread restoration of the landscape context of occurrences. Based on these considerations, the global rarity rank was changed from G3G4 to G3.

RELATED CONCEPTS

Global Similar Associations:
- *(Balsamorhiza serrata) - Poa secunda* Herbaceous Vegetation (CEGL001782)
- *Pseudoroegneria spicata - Poa secunda* Herbaceous Vegetation (CEGL001677)

Global Related Concepts:
- *Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata* Habitat Type (Tisdale 1986) ?
- *Pseudoroegneria spicata - Poa secunda* (Poulton 1955) ?
- *Pseudoroegneria spicata - Poa secunda* (Ganskopp 1979) ? *Pseudoroegneria spicata - Poa secunda* Association (Daubenmire 1970) ?
- *Pseudoroegneria spicata - Poa secunda* Habitat Type (Tisdale 1986) ?
- *Pseudoroegneria spicata - Poa secunda* Plant Association (Johnson and Simon 1987) B
- *Pseudoroegneria spicata - Poa secunda* Plant Association (Johnson and Clausnitzer 1992) ?
- *Pseudoroegneria spicata-Balsamorhiza sagittata-Poa secunda* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: *Poa secunda* is not present within either sampled stand.
Grand Teton National Park Other Comments:
Global Classification Comments: The plant association is described as *Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata* by Tisdale (1986) for the Hells Canyon region of Oregon and Idaho. Johnson and Simon (1987) describe a series of *Pseudoroegneria spicata - Poa secunda* associations that, in part, describe variants of the broader *Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata* described by Tisdale (1986). Rust (1997) prepared a crosswalk of the *Pseudoroegneria spicata*-dominated plant associations from the Hells Canyon region based on published data summaries. A comprehensive and quantitative review of the classification of these plant communities is needed to formally determine the relationships between *Pseudoroegneria spicata - Poa secunda* described by Johnson and Simon (1987), Johnson and Clausnitzer (1992), Tisdale (1986), Poulton (1955), Ganskopp (1979) and Daubenmire (1970). The more refined classification of Johnson and Simon (1987) will likely serve the needs of conservation of biological diversity.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs directly outside the park border in the Bridger-Teton National Forest southeast of Teton Science School.
Global Range: Improved understanding of the range of *Pseudoroegneria spicata - Poa secunda* communities requires resolution of questions regarding the classification of these communities. The association does, however, appear to be known primarily from the eastern and western portions, respectively, of the Blue Mountains and Idaho Batholith ecoregional sections, with an isolated stand reported from the Grand Teton Mountains of northwestern Wyoming.
Nations: US
States/Provinces: ID:S2S3, OR:S3, WA?, WY
TNC Ecoregions: 4:?, 6:C, 8:C, 9:C, 10:C
TNC Ecoregion Comments: ECO4 & ECO8 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331A:CC, 342B:CC, 342C:CC, 342H:CC, 342I:CC, M242C:??, M331D:CC, M332A:CC, M332F:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, Wallowa-Whitman)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: No stands of this association were sampled within Grand Teton National Park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407058, BT-9507047

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.K. Rust, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Daubenmire 1970	.	X	X	X	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Ganskopp 1979	.	X	X	X	X	.	.	.	.
Johnson and Clausnitzer 1992	.	.	X	X	X	.	.	.	.
Johnson and Simon 1985	.	X	.	X	.	.	.	.	.
Johnson and Simon 1987	.	.	X	X	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Poulton 1955	.	X	X	X	X	.	.	.	.
Rust 1997a	.	.	.	X	X	.	.	.	.
Tisdale 1986	.	.	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001677] *Pseudoroegneria spicata - Poa secunda* Herbaceous Vegetation

Translated Name: **Bluebunch Wheatgrass - Curly Bluegrass Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Columbia Basin Palouse Prairie (CES304.792)
- Western Great Plains Foothill and Piedmont Grassland (CES303.817)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association has been described from lower montane to subalpine elevations in British Columbia, Washington, Oregon, Idaho, Utah, Colorado, Wyoming, and Montana. Stands of this association occupy loamy, rocky, often shallow soils on slopes and ridges, generally around the edges of basins and in the foothills of the mountains. Sites usually are ridges and slopes, sometimes alluvial fans, scree slopes, sloped rocky cliff faces, and bedrock outcrops of any aspect, although southerly and westerly aspects are most common in the Northwest. Throughout its geographic range this is a bunch grassland with minor cover of forbs and, often, sparse shrubs. *Pseudoroegneria spicata* dominates or codominates the vegetation; *Poa secunda* and *Koeleria macrantha* usually are present in substantial amounts, and *Festuca idahoensis* is absent or present in very small amounts. The

common shrubs are *Ericameria nauseosa (= Chrysothamnus nauseosus), Chrysothamnus viscidiflorus*, and *Artemisia tridentata* (subspecies unknown). Associated forbs are highly variable, given the broad geographic and elevational range. This association was at one time common throughout its wide geographic range, but much of it in Washington and Oregon has been converted to agricultural fields. In many of the remaining stands, the cover of *Pseudoroegneria spicata* has decreased and the cover of *Hesperostipa comata (= Stipa comata)* and shrubs have increased, and exotics (especially *Bromus tectorum, Tragopogon* spp., and *Alyssum* spp.) have become common members of the vegetation; these changes are attributed in large part to livestock grazing.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The sampled stand of this association occurs on a steep southeast-facing footslope at an elevation of 2187 m (7174 feet). The soils are well-drained clay loams. The unvegetated and nonvascular ground surface is composed primarily of bare soil; gravel and litter and duff are well-represented, and rocks greater than 10 cm, wood, and lichens are present in small quantities. *Salix* and *Carex* species are found in a nearby drainage.

Global Environment: Stands of this association grow on well-drained, often shallow, and frequently gravelly or rocky soils generally of loam, clay loam, silt loam, or sandy loam textural classes. Sites usually are ridges and slopes, sometimes alluvial fans, scree slopes, sloped rocky cliff faces, and bedrock outcrops of any aspect, although southerly and westerly aspects are most common in the northwestern (British Columbia, Washington, Idaho) and northern (Montana) parts of the geographic range. In Wyoming and Colorado, many of the sites supporting this association are windswept slopes and ridges. This association grows over a very broad elevational range, from 213 to 854 m (700-2800 feet) in the northwestern part of the range, 915 to 2288 m (3000-7500 feet) in the north-central part, and 2867 to 3050 m (9400-10,000 feet) in central Colorado.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. Shrub, forb and graminoid species are present, but only *Pseudoroegneria spicata* and *Phlox* sp. are present in greater than trace quantities (3% cover each). *Poa secunda* is present only in scarce quantities.

Global Vegetation: As would be expected for an association whose geographic range includes such a broad range of climates and prehistoric grazing regimes, the composition of the vegetation varies, but a number of traits are constant. Throughout, this is a bunch grassland with minor cover of forbs and, often, sparse shrubs. *Pseudoroegneria spicata* dominates or codominates the vegetation; *Poa secunda* and *Koeleria macrantha* usually are present in substantial amounts, and *Festuca idahoensis* is absent or present in very small amounts. *Hesperostipa comata (= Stipa comata)* often is present in substantial amounts and may codominate, due (at least in part of the range) to prolonged grazing. *Bromus tectorum, Tragopogon* spp., and *Alyssum* spp. also are common members of the vegetation, due at least in part to disturbance. The common shrubs are *Ericameria nauseosa (= Chrysothamnus nauseosus), Chrysothamnus viscidiflorus*, and *Artemisia tridentata* (subspecies unknown). In southern British Columbia (Tisdale 1947), eastern Washington (Daubenmire 1988), and northeastern Oregon (Poulton 1955, Anderson 1956), the undisturbed vegetation of this type consists of *Pseudoroegneria spicata* and *Poa secunda*, with few other vascular plants (*Lomatium macrocarpum, Draba verna, Artemisia frigida, Gutierrezia sarothrae*, and a number of annuals), and substantial cover of epigeous cryptogams. *Hesperostipa comata* is present in most stands and may codominate with *Pseudoroegneria spicata*, as a result of heavy grazing. In western Idaho (Tisdale 1986), xeric sites support open vegetation with little *Poa secunda* and with *Opuntia polyacantha, Phacelia heterophylla*, and *Scutellaria angustifolia*. Stands on mesic sites are denser and usually contain *Balsamorhiza sagittata, Lomatium triternatum*, and *Lupinus sericeus*. In Utah (Christensen 1963, Christensen and Welsh 1963), *Gutierrezia sarothrae* is a common but minor species; *Hesperostipa comata* and *Achnatherum hymenoides (= Oryzopsis hymenoides)* are now common and often contribute substantial cover, apparently in stands disturbed by prolonged grazing. Montana stands (Mueggler and Stewart 1980, Cooper et al. 1995) often contain *Artemisia frigida, Gutierrezia sarothrae, Heuchera cylindrica, Achillea millefolium, Phlox hoodii, Eriogonum flavum, Stenotus acaulis (= Haplopappus acaulis)*, and a number of other forbs as well as the fern *Cryptogramma acrostichoides*; *Hesperostipa comata* or *Hesperostipa spartea (= Stipa spartea)* often codominate with *Pseudoroegneria spicata*, apparently even in stands that have not been markedly disturbed. *Calamagrostis purpurascens* and *Festuca occidentalis* may also be present. In northwestern Wyoming (Tweit and Houston 1980), the vegetation is much like that in Montana (but without *Hesperostipa spartea*), while in central Wyoming (Williams 1961, Fisser 1964) and northeastern Wyoming (Terwilliger et al. 1979a), nearer to the eastern edge of the geographic range, *Bouteloua gracilis, Rhus trilobata, Pascopyrum smithii*, and *Carex filifolia* may be present as minor species. In Colorado (Hess and Wasser 1982), species present in greater than trace amounts are *Achillea millefolium, Arenaria fendleri, Oxytropis lambertii, Potentilla gracilis*, and *Taraxacum officinale*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.
Grand Teton National Park Higher Taxa					
Phlox sp.	characteristic forb				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Koeleria macrantha	Herb (field)	Graminoid	X	.	.
Poa secunda	Herb (field)	Graminoid	X	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589)
- *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation (CEGL001662)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666)--contains a substantial amount of *Pseudoroegneria spicata* and often contains *Poa secunda*, but forbs generally provide more cover than do the grasses.
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675)--rhizomatous wheatgrasses (*Pascopyrum smithii* or *Elymus lanceolatus*) are subdominant or codominant and clearly contribute more cover than does *Poa secunda*.
- *Pseudoroegneria spicata* - *Poa fendleriana* Herbaceous Vegetation (CEGL001676)--relationship is unclear.
- *Pseudoroegneria spicata* - *Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678)

Global Related Concepts:

- *Agropyron* - *Poa* Grassland Zone, Climax Vegetation (Tisdale 1947) F
- *Agropyron* - *Poa* Zone, Climatic Climax (Poulton 1955) F
- *Agropyron spicatum* - *Poa secunda* Habitat Type (Daubenmire 1970) F
- *Agropyron spicatum / Opuntia polyacantha* Habitat Type (Tisdale 1986) F
- *Agropyron spicatum / Poa sandbergii / Balsamorhiza sagittata* Habitat Type (Tisdale 1986) F
- *Agropyron spicatum / Poa sandbergii* (MONT) Habitat Type (Mueggler and Stewart 1980) F
- *Agropyron spicatum / Poa sandbergii* Habitat Type (Tweit and Houston 1980) F
- *Agropyron spicatum / Poa sandbergii* Habitat Type (Hess and Wasser 1982) F
- *Agropyron spicatum / Poa secunda* Habitat Type (Terwilliger et al. 1979a) F
- *Pseudoroegneria spicata-Poa secunda* (Bourgeron and Engelking 1994) =
- *Roegneria spicata / Poa secunda* Plant Association (Johnston 1987) F
- Central Utah Foothill Bunchgrass Vegetation (Christensen 1963) F
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B
- Northern Utah Palouse Grassland Association (Stoddart 1941) F
- Upland Prairie (Christensen and Welsh 1963) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

Grand Teton National Park Other Comments:

Global Classification Comments: Relationships between this association and several others are unclear. ~*Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation (CEGL001662)$$ from Idaho and Oregon, apparently taken from Tisdale's (1986) *Agropyron spicatum / Poa secunda / Balsamorhiza sagittata* habitat type of western Idaho, is included here. ~*Pseudoroegneria spicata* - *Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678)$$ of Idaho, Oregon, and Washington may be based on the lithosolic phase of Daubenmire's (1988) habitat type; this association presently includes that vegetation. If these types are to be considered separate associations, clear distinctions must be made between them.

In ~*Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675)$$, rhizomatous wheatgrasses (*Pascopyrum smithii* or *Elymus lanceolatus*) are subdominant or codominant and clearly contribute more cover than does *Poa secunda*. Similarly, in ~*Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679)$$, *Hesperostipa comata* is subdominant or codominant and clearly contributes more cover than does *Poa secunda*. ~*Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666)$$ contains a substantial amount of *Pseudoroegneria spicata* and often contains *Poa secunda*, but forbs generally provide more cover than do the grasses. The relationship between this association and the ~*Pseudoroegneria spicata* - *Poa fendleriana* Herbaceous Vegetation (CEGL001676)$$ is unclear.

The examples of this type as found within the Waterton-Glacier International Peace Park (IPP) extend the known environmental range of the association. The fact that *Poa secunda* was not recorded for IPP plots does not contravene the concept of the type as described and defined by Mueggler and Stewart (1980). However, with further sampling in northwestern Montana, and the IPP in particular, it may prove that these stands in Glacier National Park represent a different association. All the plots initially identified by Achuff et al. (1997, 2002a) as the H42: *Agropyron spicatum* Vegetation Type in Waterton Lakes National Park were placed into other associations.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs south of Elk Ranch Reservoir.
Global Range: This association has been described from British Columbia, Washington, Oregon, Idaho, Utah, Colorado, Wyoming, and Montana.
Nations: CA, US
States/Provinces: BC, CO:S1S2, ID, MT:S4?, OR:S1, UT:S2S4, WA:S2, WY:S2
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 10:C, 18:C, 20:P, 26:C
TNC Ecoregion Comments: ECO20 & ECO26 added (mjr 7-05). ECO7, ECO8, ECO18 added and ECO6 changed from ? to C (MSR 2-04).
USFS Ecoregions: 331A:CC, 331F:CC, 331G:CP, 342A:CC, 342C:CC, 342F:CC, 342I:CC, M331A:CC, M331D:CC, M331G:CP, M331H:CP, M332A:CC, M332B:CP, M332C:CC, M332D:CP, M332E:CC, M332G:CC, M333C:CC, M341C:CC
Federal Lands: NPS (Glacier, Grand Teton); USFS (Custer?, Medicine Bow, Shoshone, Thunder Basin)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C006B
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): Western Ecology Group

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 1993	.	.	.	X	.	.	.	.	.
Achuff et al. 1997	.	X	.	.	.	.	.	.	.
Achuff et al. 2002a	.	.	.	X	.	.	.	.	.
Anderson 1956	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Christensen 1963	.	X	X	X	.	.	.	.	.
Christensen and Welsh 1963	.	X	X	X	.	.	.	.	.
Cooper et al. 1995	.	.	.	X	.	.	.	.	.
Daubenmire 1970	.	X	X	X	.	.	.	.	.
Daubenmire 1988	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Fisser 1964	.	.	.	X	.	.	.	.	.
Fisser et al. 1965	.	X	.	X	.	.	.	.	.
Hall 1973	.	X	.	X	.	.	.	.	.
Hess and Wasser 1982	.	.	X	X	.	.	.	.	.
Johnson and Simon 1985	.	X	.	X	.	.	.	.	.
Johnson and Simon 1987	.	X	.	X	.	.	.	.	.
Johnston 1987	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kleiner 1968	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mueggler and Stewart 1980	.	X	X	X	.	.	.	.	.
Poulton 1955	.	X	X	X	.	.	.	.	.
Price and Brotherson 1987	.	X	.	X	.	.	.	.	.

Stoddart 1941	.	.	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	X	X	.	.	.	.	.
Tisdale 1947	.	.	X	X	.	.	.	.	.
Tisdale 1986	.	X	X	X	.	.	.	.	.
Tweit and Houston 1980	.	.	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Williams 1961	.	X	.	X	.	.	.	.	.

[CEGL001660] *Pseudoroegneria spicata* Herbaceous Vegetation

Translated Name: **Bluebunch Wheatgrass Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Western Great Plains Foothill and Piedmont Grassland (CES303.817)
- Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): D. Zoellner

ELEMENT CONCEPT

Global Summary: This grassland association occurs on rock outcrops, talus, mesas, plateaus, windswept bluffs, ridgetops and mountains in northern Colorado, northeastern Utah and western Wyoming. It frequently occurs on moderately to steep, mid- to high-slope landforms, although gentle slopes are not uncommon. Sites are relatively xeric and are often found on southerly aspects at lower elevations or on harsh or on windswept areas at higher elevation sites. Substrates are typically shallow, often calcareous, rocky soils. Ground surface often has significant cover of bare ground, gravel and/or rock (10-90% cover). Stands are also reported east of the Continental Divide in Rocky Mountain National Park on a windward knoll and at Grand Teton National Park from a very steep northeast-facing high slope. The vegetation is characterized by an open herbaceous layer that is typically dominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata* with low to moderate cover (5-30%) and low-growing forbs. *Koeleria macrantha* is repeatedly present in low abundance. Other dry grasses may be present with low cover (less than half the cover of *Pseudoroegneria spicata*). A sparse dwarf-shrub layer (<10% cover) occurs with a variety of woody species of *Artemisia, Atriplex confertifolia, Cercocarpus, Eriogonum, Gutierrezia, Krascheninnikovia* or *Tetradymia* depending on elevation and substrate. There are several to many low-growing forbs (cushion plants) present with low cover, such as *Arenaria* spp., *Arenaria hookeri, Astragalus* spp., *Paronychia sessiliflora, Phlox* spp., *Stenotus acaulis, Tetraneuris acaulis (= Hymenoxys acaulis),* and *Townsendia incana*. There are no clear dominants in this list, and the percent cover of each species present will vary from site to site. A diverse and abundant forb layer probably indicates a degraded occurrence.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The sampled stand of this association occurs on a very steep northeast-facing shoulder at an elevation of 2234 m (7328 feet). The well-drained clay soils are very prone to erosion; 50% of the unvegetated ground surface is bare soil. The remaining ground surface is codominated by rocks greater than 10 cm and gravel. Bedrock, litter and duff, wood, and mosses are also present in small quantities.
Global Environment: This herbaceous association occurs in northern Colorado, northeastern Utah and western Wyoming (Hull and Hull 1974, Baker 1982b, Baker and Kennedy 1985). Stands occur on rock outcrops, talus, mesas, plateaus, windswept bluffs, ridgetops and mountains. It frequently occurs on moderately to steep, mid- to high-slope landforms, although gentle slopes are not uncommon. Elevation ranges between 1680-2840 m (5500-9310 feet) in Colorado and down to 1340-1590 m (4400-5200 feet) in Cache Valley of Utah. Sites are relatively xeric and are often found on southerly aspects at lower elevations or on harsh, steep or windswept areas at higher elevation sites. Substrates are typically shallow, often calcareous, rocky soils and include sandstone and marlstone of the Uinta and Green River formations, Madison limestone, Mancos shale, and Morgan/Round Valley and Lodore formations and granite. Ground surface often has significant cover of bare ground, gravel and/or rock (10-90% cover). Evidence of erosion is often present. Additionally, one stand is reported east of the Continental Divide in Rocky Mountain National Park at 2700 m (8870 feet) elevation on a windward knoll with rapidly drained loamy sand soil derived from granitic parent material. One stand is also reported at Grand Teton National Park from a very steep northeast-facing high slope at an elevation of 2234 m (7328 feet) on well-drained clay soils that are very prone to erosion.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. *Pseudoroegneria spicata* dominates the herbaceous layer with 20% cover. Only one other graminoid is present in scarce quantities. A variety of forbs are present, but only *Astragalus tenellus* and an unknown species are present in greater than trace quantities (3% cover each). Traces of several shrub species, including *Artemisia tridentata ssp. vaseyana, Ericameria nauseosa*, and *Rosa* sp., are also present.

Global Vegetation: This association is characterized by an open vegetation layer that is typically dominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata* with low to moderate cover (7-30%) and low-growing forbs. *Koeleria macrantha* is repeatedly present in low abundance. Other grasses may include *Achnatherum hymenoides, Hesperostipa comata, Leptodactylon pungens, Poa fendleriana, Poa secunda*; if present they have low cover (less than half the cover of *Pseudoroegneria spicata*). A sparse dwarf-shrub layer (<10% cover) may be present and includes a variety of woody species, such as *Artemisia frigida, Artemisia nova, Artemisia tridentata, Atriplex confertifolia, Cercocarpus intricatus, Cercocarpus montanus, Eriogonum corymbosum, Eriogonum microthecum, Gutierrezia sarothrae, Krascheninnikovia lanata, Chrysothamnus greenei, Chrysothamnus viscidiflorus, Heterotheca villosa, Rosa woodsii, Ribes cereum,* or *Tetradymia canescens*, depending on elevation and substrate. The several to many low-growing forbs (cushion plants) are present with low cover. Species may include *Arenaria fendleri, Arenaria hookeri, Astragalus spatulatus, Astragalus tenellus, Draba oligosperma, Eriogonum lonchophyllum, Lesquerella alpina, Machaeranthera grindelioides, Paronychia sessiliflora, Phlox austromontana, Phlox hoodii, Stenotus acaulis, Tetraneuris acaulis (= Hymenoxys acaulis)*, and *Townsendia incana*. There are no clear dominants in this list, and the percent cover of each species present will vary from site to site. A diverse and abundant forb layer probably indicates a degraded occurrence (R. Rondeau pers. comm. 1998).
Global Dynamics: Wind appears to be an important factor in many stands of this association.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Astragalus tenellus	Herb (field)	Forb	.	.	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Heterotheca villosa	Herb (field)	Forb	X	.	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	X
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (30-Nov-1998). This association is known only from northern Colorado and northwestern Wyoming but is expected to occur in Utah. Grazing has a negative effect on this association, and it is believed that it now occupies a very small portion of the original range. Baker (1982b) reports that *Pseudoroegneria spicata* does not tolerate grazing and will eventually convert to *Koeleria macrantha* or *Poa secunda* grassland if grazing pressures continue. Baker (1982b) also estimates that at least two-thirds of the original *Pseudoroegneria spicata* grassland community in the Piceance Basin has been replaced by *Koeleria macrantha* grasslands. The size of most occurrences is very small, five under 15 acres and two under 60 acres.

RELATED CONCEPTS

Global Similar Associations:
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666)--Both associations occur under similar environmental conditions and have cushion plants present to codominant; however, the species of cushion plants may vary.

Global Related Concepts:
- *Agropyron spicatum* var. *inerme* Western Slope Grassland (Baker 1982b) =
- *Pseudoroegneria spicata - Arenaria hookeri* Plant Association (Baker and Kennedy 1985) =
- *Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B
- Grassland (Hull and Hull 1974) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association needs to be compared with ~*Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666)$$ of Pryor Mountains and Bighorn Canyon in south-central Montana and the Tendoy Mountains in southwest Montana. Both associations have relatively sparse vegetation cover and may be codominated by cushion plants. The range of this association needs further review, especially disjunct stands, because the diagnostic grass in this association can be readily confused with awned *Elymus lanceolatus* (note if rhizomes are present, whereas *Pseudoroegneria spicata* has no rhizomes). Also *Pseudoroegneria spicata ssp. inermis* (awnless) is often confused with *Pascopyrum smithii* (note asymmetrical glume) or other wheatgrasses.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs near Eynon Draw within Grand Teton National Park.
Global Range: This association occurs in Piceance Basin and Dinosaur National Park in western Colorado and the Cache Valley of northeastern Utah. Stands are reported from Grand Teton National Park in Wyoming and Rocky Mountain National Park.
Nations: US
States/Provinces: CO:S2, UT, WY
TNC Ecoregions: 9:C, 10:C, 18:?, 20:C
TNC Ecoregion Comments: ECO18 added (KAS 11-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342G:??, M331D:CC, M331E:CC
Federal Lands: NPS (Dinosaur, Grand Teton); USFS (Bighorn?, Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B035
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): D. Zoellner, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1982b	.	X	X	X	X	.	.	.	.
Baker and Kennedy 1985	.	X	X	X	X	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hull and Hull 1974	.	.	X	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Rondeau pers. comm.	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

No Alliance Assigned-Park Special Medium-Tall bunch temperate or subpolar grassland

[PARK SPECIAL GRTE-008] *Hesperostipa comata* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on steep southeast-facing slopes at elevations of 6900 and 7409 feet. The unvegetated and non-vascular ground surface for one stand is dominated by litter and duff. Gravel and basal vegetation are well represented and bare soil is present in small quantities as well. Adjacent to one stand is an *Artemisia tridentata* ssp. *vaseyana/Pseudoroegneria spicata* shrubland.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. Both stands sampled have little total vegetation cover. Shrubs that occur in both stands include *Artemisia* spp. and

Chrysothamnus viscidiflorus. The herbaceous layer is dominated by *Hesperostipa comata* (3 and 7% cover). No other herbaceous species occurs in more than one of the sampled stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
GRAMINOID	*Hesperostipa comata*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Artemisia spp., *Chrysothamnus viscidiflorus, Hesperostipa comata*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Bromus tectorum*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand defining this association occurs very close to Lost Creek Ranch in the Bridger-Teton National Forest, and the other stand occurs between McAllister and Lost Creek Ranches.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04K024
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507009
GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association. One stand occurs in the Bridger-Teton National Forest and the plot sheet includes little environmental data.

Classification Confidence: **Identifier:** New-GRTE-008

Local Author: Rob Massatti
Date: 15 April 2004
Local Editor: Klara Varga
Date: 23 April 2004
Re-write: Mark Fain
Date: 26 October 2004
Re-edit: kelly McCloskey
Date: 21 December 2004

Global Author:

REFERENCES: None

V.A.5.N.e. Short sod temperate or subpolar grassland

A.2639 *Carex geyeri* Herbaceous Alliance

Geyer's Sedge Herbaceous Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is currently known from the Rocky Mountains of Montana and Wyoming and possibly Alberta, Canada.
Nations: CA?, US
Subnations: AB?, ID, MT, WY
TNC Ecoregions: 7:C, 9:C
USFS Ecoregions: M331D:CC, M332C:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes?); USFS (Caribou-Targhee)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL005864] *Carex geyeri* Herbaceous Vegetation

Translated Name: **Geyer's Sedge Herbaceous Vegetation**
Common Name:
Ecological System(s):
Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This small-patch vegetation type is found at lower alpine and mid to upper subalpine zones from 1770 to 2301 m (5800-7550 feet) elevation in Glacier National Park, Montana, and Grand Teton National Park in Wyoming. It occurs on gentle to steep slopes (1-65%) having predominantly southerly exposures. It is often found on gully slopes where streambeds are deeply incised in colluvium, resulting in unstable surfaces. In winter these gullies can fill with snow, which persists long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with bare gravel, scattered talus, as well as exposed bedrock. Because of persistent sheet erosion, soil development is restricted to the clumps or patches of grass and sedge. Vascular plant cover ranges from around 10% on the rockiest of southerly exposures to over 75% where soil is more extensive and litter mantles the surface. Shrubs may be absent or may include scattered individuals of *Spiraea betulifolia, Mahonia repens, Artemisia tridentata ssp. spiciformis, Amelanchier alnifolia, Symphoricarpos oreophilus*, and *Rubus parviflorus*, none with more than 5% cover. The diverse graminoid component is dominated by *Carex geyeri*; other common species include *Poa cusickii, Pseudoroegneria spicata, Elymus elymoides, Koeleria macrantha,* and *Festuca idahoensis*. The forb component is also diverse but often has low cover. In Glacier National Park, the forbs grow in tall clumps dominated by *Hieracium cynoglossoides (= Hieracium albertinum), Senecio megacephalus, Arnica rydbergii, Lomatium*

dissectum, Aquilegia flavescens, Potentilla diversifolia, Cirsium hookerianum, and *Symphyotrichum foliaceum (= Aster foliaceus).* Shorter and less conspicuous, but occurring with as much cover and constancy, are *Arenaria capillaris, Eriogonum flavum, Galium boreale, Antennaria rosea, Sedum stenopetalum,* and *Campanula rotundifolia*. In Grand Teton National Park, *Balsamorhiza sagittata* and *Eriogonum umbellatum* are the only species that occur regularly with more than trace cover. Combined moss and lichen cover does not exceed 20% and usually is less than 5%.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on the valley floor, terraces, interfluves, or slopes between 1 and 68% at elevations ranging from 6800 to 9600 feet. Where soil data are available the silt loam soils are cryumbrepts that are derived from local alluvium and/or colluvium from igneous rock and loess. Unvegetated and non-vascular ground cover data are available for one stand; gravel (50%) and litter and duff (40%) co-dominate with bare soil (10%) comprising a minor component of the ground cover. Several stands indicate rocky, bare ground present. The two stands on shallow slopes are grassy meadows with *Pinus contorta* surrounding them at least on three sides. Other adjacent vegetation includes *Pseudotsuga menziesii* forests, *Salix boothii*/Mesic Forbs association, *Spiraea splendens* shrublands, mixed forbs, mixed conifer forests, herbaceous avalanche chutes, *Pinus albicaulis* Krummholz, or *Abies lasiocarpa-Pinus albicaulis* stands. Some stands have disturbance of previous fire or are located below or in avalanche paths.

Global Environment: This small-patch vegetation type is found at lower alpine and mid to upper subalpine zones from 1770 to 2301 m (5800-7550 feet) elevation in Glacier National Park, Montana, and Grand Teton National Park in Wyoming. It occurs on gentle to steep slopes (1-65%) having predominantly southerly exposures. It is often found in the protected upper reaches of gullies where streambeds are deeply incised in colluvial slopes, resulting in unstable surfaces. In winter these gullies can fill with snow, which persists long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with scattered talus of red and green argillite and quartzite, bedrock that can cover up to 60% of the surface, and exposed soil that can comprise as much as 10-20% of the surface. Soils may be loess or derived from alluvium or colluvium. Due to sheet erosion, the organic and fine materials are eroded from these sites, and soil development is restricted to tussocks or patches of grass and sedge.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane grassland community that occurs on subxeric sites. Dwarf shrubs and/or short shrubs are generally present and can be diverse but do not compose significant canopy cover (less than 3%). Graminoids within the herbaceous layer are diverse and dominated by *Carex geyeri* (7 to 60% canopy cover). Other common graminoids, which have 25-40% constancy, include *Koeleria macrantha, Calamagrostis rubescens, Elymus* spp., *Melica* spp., and *Bromus* spp. Forb species within the herbaceous layer may be diverse and are co-dominant with the graminoids in about one-third of the stands. The most constant forbs are *Eriogonum umbellatum, Balsamorhiza sagittata, Achillea millefolium, Geranium viscosissimum,* and *Helianthella uniflora.*

Global Vegetation: This association is a sparse montane grassland community that occurs on subxeric sites. In Wyoming, stands may occur as openings in *Pinus contorta* stands. The vascular plant cover ranges from around 10% on the rockiest of southerly exposures to over 75% where soil is more extensive and litter mantles the surface. Shrubs are often completely absent and, of those that do occur, *Spiraea betulifolia, Mahonia repens, Artemisia tridentata ssp. spiciformis, Amelanchier alnifolia, Symphoricarpos oreophilus,* and *Rubus parviflorus*, none exhibit more than 1-5% cover. The diverse graminoid component is dominated by *Carex geyeri*, with 100% constancy and cover ranging between 10 and 60%; other common species include *Poa cusickii, Pseudoroegneria spicata, Elymus elymoides, Koeleria macrantha,* and *Festuca idahoensis*. The forb fraction is also diverse but often has low cover. In Glacier National Park, the forb component occurs in tall clumps dominated by *Hieracium cynoglossoides (= Hieracium albertinum), Senecio megacephalus, Arnica rydbergii, Lomatium dissectum, Aquilegia flavescens, Potentilla diversifolia, Cirsium hookerianum,* and *Symphyotrichum foliaceum (= Aster foliaceus).* Shorter and less conspicuous, but occurring with as much cover and constancy, are *Arenaria capillaris, Eriogonum flavum, Galium boreale, Antennaria rosea, Sedum stenopetalum,* and *Campanula rotundifolia*. In Grand Teton National Park, *Balsamorhiza sagittata* and *Eriogonum umbellatum* are the only species that occur regularly with more than trace cover. The combined moss and lichen cover does not exceed 20% and mostly is less than 5%.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Helianthella uniflora	Herb (field)	Forb	.	X	.
Calamagrostis rubescens	Herb (field)	Graminoid	.	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Elymus elymoides	Herb (field)	Graminoid	.	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Melica spp.	characteristic graminoids
Bromus spp.	characteristic graminoids
Melica spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex geyeri	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (3-Feb-2004).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Hieracio albertini* - *Caricetum geyeri* Association (Damm 2001) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Damm (2001) is the first to describe a vegetation type (*Hieracio albertini* - *Caricetum geyeri* Association) characterized by the dominance of *Carex geyeri* in the tallest layer**;** *Carex geyeri* has been employed as an indicator species many times in forest and woodland communities. *Hieracium cynoglossoides* has been dropped as an epithet as it has a very broad distribution, is only 70% constant, and not even the most abundant forb (equally good name might have been *Lomatium dissectum* or *Senecio megacephalus*). Should more *Carex geyeri* types from a wider geographic range be described, then a more appropriate and broadly considered forb component name could be considered. Two plots assigned by Damm (2001) to this type had bunchgrass cover considerably greater than that of *Carex geyeri*, which had less than 5% cover, and were reallocated to bunchgrass-dominated types.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs over a wide range throughout the park.

Global Range: This vegetation type is found at lower alpine and mid to upper subalpine zones in Montana, Wyoming, Idaho, and possibly Alberta, Canada.
Nations: CA?, US
States/Provinces: AB?, ID, MT, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332C:CC
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes?); USFS (Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A008, GT-0201012
Accuracy Assessment Points: 04R238, 04J171, 04J183, 04J188, 04K046, 04R024, 04R227, 04R237, 04X501, 04R259, 04R285, 04S025, 04S041, 04S044, 04X029, 04X315, 04X325, 04X450, 04R231

Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-96-KV-115, CT-96-KV-116

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Damm 2001	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

No Alliance Assigned—Park Special Short sod temperate or subpolar grassland

[PARK SPECIAL GRTE-021] *Carex hoodii* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on south- to east-facing slopes with gradients between 7 and 29%. The elevations for these stands are 7700 to 8700 feet. Soil data is available for one stand; the soils are sandy loams that contain a high amount of gravel with unvegetated ground cover consisting primarily of bare soil and gravel. Surrounding vegetation may include *Pinus contorta* forests, *Abies lasiocarpa-Picea engelmannii* forests, or willow stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane to subalpine herbaceous grassland community that occurs in mesic or sub-xeric areas. A variety of graminoids and forbs are present with approximately 50% cover in each sampled stand. *Carex hoodii* is the only species to occur in all stands. Species that occur in at least half of the stands include *Carex geyeri, Bromus carinatus, Elymus glaucus, Melica spectabilis, Geranium viscosissimum, Ligusticum filicinum, Delphinium* x *occidentale, Chamerion angustifolium, Eurybia integrifolia,* and *Heracleum maximum.* Conifer species occur in trace amounts in half the stands.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
GRAMINOID	*Carex hoodii*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Bromus carinatus, Carex hoodii, Carex geyeri, Elymus glaucus, Melica spectabilis, Chamerion angustifolium, Delphinium x *occidentale, Eurybia integrifolia, Geranium viscosissimum, Heracleum maximum, Ligusticum filicinum*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands of this association occur east of Marion Lake, east of Mink Lake, in Cascade Canyon, and west of Forellen Peak.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202059
Accuracy Assessment Points: 04X347, 04R111, 04J196
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-021
Local Author: Rob Massatti
Date: 16 April 2004
Local Editor: Klara Varga
Date: 30 April 2004
Re-write: Mark Fain
Date: 26 October 2004
Re-edit: kelly McCloskey
Date: 21 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-027] *Carex rossii* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stand of this association occurs on a shallow northeast-facing step-in-slope at an elevation of 7090 feet. The soils are sandy loams. Previously this stand and the surrounding area was a mature *Pinus contorta* forest. Due to a crown fire in 2000, there are only dead, burnt poles and an abundance of downed woody material left. At least 70% of the unvegetated ground surface is composed of bare soil.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane herbaceous grassland that occurs in subxeric areas. Seedlings and shrubs are present in trace amounts in the short and dwarf shrub strata and include *Pinus contorta, Populus tremuloides, Shepherdia canadensis,* and *Vaccinium scoparium*. The herbaceous layer is dominated by *Carex rossii* with 10% cover. Common forbs (3% cover) include *Chamerion angustifolium, Lupinus argenteus,* and *Solidago missouriensis*. A variety of other forbs and graminoids are present but only in trace quantities.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
GRAMINOID	*Carex rossii*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Carex rossii, Chamerion angustifolium, Lupinus argenteus, Solidago missouriensis

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Lactuca serriola*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand of this association occurs east of Glade Creek in the John D. Rockefeller, Jr. Memorial Parkway.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201050
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one stand defines this association.

Classification Confidence: **Identifier:** New-GRTE-027
Local Author: Rob Massatti
Date: 15 April 2004
Local Editor: Klara Varga
Date: 22 April 2004

Global Author:

REFERENCES: None

A.2640 *Carex paysonis* Herbaceous Alliance

Payson's Sedge Herbaceous Alliance

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is currently known from the Rocky Mountains of Montana and Wyoming.
Nations: US
Subnations: MT, WY
TNC Ecoregions: 7:C, 9:C
USFS Ecoregions: M331D:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton)

ALLIANCE SOURCES

Author(s): Western Ecology Group
References:

[CEGL005865] *Carex paysonis - Sibbaldia procumbens* Herbaceous Vegetation

Translated Name: **Payson's Sedge - Creeping Glow-wort Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine Fell-Field (CES306.811)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): S.V. Cooper and C. Damm

ELEMENT CONCEPT

Global Summary: This is a small-patch herbaceous association found in Glacier National Park, Montana, and Grand Teton National Park, Wyoming. It occurs on relatively exposed alpine ridgelines and flats from 2180 to 3120 m (7150-10,236 feet) elevation. Surface relief is smooth to moderately rolling with slopes not exceeding 18% and no particular slope aspect being preferred; however, sites are apparently aligned with microtopographic depressions, such as lee slopes, otherwise disposed to accumulate deep snowdrifts. Despite the high to very high wind exposure of the landscape, the drifted snow has a moderately long duration into summer. Meltwaters create an early-season soil saturation which is rapidly dried out due to well-drained soils and desiccating winds. This community is found on red and green argillite and quartzite. The ground surface is blanketed by a dense cover of mosses (10-50%

cover) and lichens (10-35% cover) with the remainder being litter. Being relatively stressful sites, the vascular cover is relatively low, ranging from 15 to 45%. *Salix arctica* and *Salix petrophila* are dwarf-shrubs present. *Carex paysonis*, ranging in cover from 10 to 25%, is the dominant herb; other graminoids of high constancy include *Carex phaeocephala, Carex pyrenaica, Agrostis variabilis, Juncus parryi, Luzula piperi*, and *Luzula spicata*. The forb component is relatively depauperate in species richness and cover; those with greater than 50% constancy include the chionophilous (snow-loving) species *Antennaria umbrinella, Arenaria capillaris, Sibbaldia procumbens*, and *Antennaria alpina*, and the high-elevation generalists *Erigeron peregrinus, Hieracium gracile*, and *Polygonum bistortoides*. Moss cover, ranging up to 45%, is important for soil formation and is dominated by *Polytrichum piliferum* followed by *Polytrichastrum alpinum* and *Tortula ruralis*. Snow cover persisting long into summer favors lichen development (10-30% cover), among which are the circumpolar species *Cladonia ecmocyna* and *Cladonia borealis*, and *Solorina crocea*, a colorful foliose soil lichen.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The single sampled stand of this association occurs on a flat step-in-slope at an elevation of 3120 m (10,236 feet). The soil is a well-drained silt loam.

Global Environment: It occurs on relatively exposed alpine ridgelines and flats from 2180 to 3120 m (7150-10,236 feet) elevation. Surface relief is smooth to moderately rolling with slopes not exceeding 18% and no particular slope aspect being preferred; however, sites are apparently aligned with microtopographic depressions, such as lee slopes, otherwise disposed to accumulate deep snowdrifts. Despite the high to very high wind exposure of the landscape, the drifted snow has a moderately long duration into summer. Meltwaters create an early-season soil saturation which is rapidly dried out due to well-drained soils and desiccating winds. This community is found on red and green argillite and quartzite.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is an alpine dwarf-shrubland community that occurs on mesic sites. *Picea engelmannii* and *Pinus albicaulis* seedlings occur in scarce amounts. *Salix petrophila* is well-represented in the dwarf-shrub layer with 10% cover. *Carex paysonis* is well-represented in the graminoid layer with 10% cover. Common graminoids with 3% cover each include *Carex pyrenaica, Juncus parryi*, and *Luzula piperi*. Well-represented forbs with 10% cover each include *Antennaria umbrinella, Erigeron peregrinus*, and *Sibbaldia procumbens*. Common forbs with 3% cover each include *Artemisia scopulorum, Hieracium gracile, Polygonum bistortoides, Potentilla diversifolia*, and *Silene acaulis*.

Global Vegetation: *Carex paysonis*, ranging in cover from 10 to 25%, is the dominant graminoid. The ground surface is blanketed by a dense cover of mosses (10-50% cover) and lichens (10-35% cover) with the remainder being litter. Being relatively stressful sites, the vascular cover is relatively low, ranging from 15 to 45%. *Salix arctica* and *Salix petrophila* are dwarf-shrubs present. Other graminoids of high constancy include *Carex phaeocephala, Carex pyrenaica, Agrostis variabilis, Juncus parryi, Luzula piperi*, and *Luzula spicata*. The forb component is relatively depauperate in species richness and cover and includes the chionophilous (snow-loving) species *Antennaria umbrinella, Arenaria capillaris, Sibbaldia procumbens*, and *Antennaria alpina*, and the high-elevation generalists *Erigeron peregrinus, Hieracium gracile, Artemisia scopulorum, Hieracium gracile, Polygonum bistortoides, Potentilla diversifolia, Silene acaulis*, and *Polygonum bistortoides*. Moss cover, ranging up to 45%, is important for soil formation and is dominated by *Polytrichum piliferum* followed by *Polytrichastrum alpinum* and *Tortula ruralis*. Snow cover persisting long into summer favors lichen development (10-30% cover), among which are the circumpolar species *Cladonia ecmocyna* and *Cladonia borealis*, and *Solorina crocea*, a colorful foliose soil lichen.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix petrophila	Short shrub/sapling	Dwarf-shrub	X	X	.
Antennaria umbrinella	Herb (field)	Forb	X	X	.
Artemisia scopulorum	Herb (field)	Forb	.	X	.
Erigeron peregrinus	Herb (field)	Forb	X	X	.
Hieracium gracile	Herb (field)	Forb	.	X	.
Polygonum bistortoides	Herb (field)	Forb	.	X	.
Potentilla diversifolia	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	X	X	.
Silene acaulis	Herb (field)	Forb	.	X	.
Carex paysonis	Herb (field)	Graminoid	.	X	.
Carex pyrenaica	Herb (field)	Graminoid	.	X	.
Juncus parryi	Herb (field)	Graminoid	.	X	.
Luzula piperi	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Salix arctica	Short shrub/sapling	Dwarf-shrub	.	X	.

Salix petrophila	Short shrub/sapling	Dwarf-shrub	.	X	.
Erigeron peregrinus	Herb (field)	Forb	.	X	.
Polygonum bistortoides	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	X	X	X
Carex paysonis	Herb (field)	Graminoid	X	X	X

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4? (3-Feb-2004).

RELATED CONCEPTS

Global Similar Associations:
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

Global Related Concepts:
- *Polytrichum piliferum - Carex paysonis* snow drift community (Damm 2001) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: The presence, with 10% cover, of *Cassiope mertensiana* or *Salix petrophila* characterizes this community.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs east of Paintbrush Divide.
Global Range: This alpine association is known from Glacier National Park in Montana and Grand Teton National Park in northwestern Wyoming.
Nations: US
States/Provinces: MT, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 & M331D added for Teton (GK 8-05).
USFS Ecoregions: M331D:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202080
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): S.V. Cooper, mod G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Damm 2001	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.A.5.N.f. Short bunch temperate or subpolar grassland

A.1291 *Poa secunda* Herbaceous Alliance

Curly Bluegrass Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This grassland alliance is found in the scablands east of the Cascade Range in the Columbia Basin and portions of the Snake River plain. Elevation ranges from 300-2120 m. Precipitation primarily occurs in the winter as snow or rain, and this moisture is stored in the soil profile and utilized during the typically dry summers. Stands occur on flat to undulating ridgetops, plateaus, plains, and benches on steep canyon slopes. Sites are flat to moderately steep slopes on all aspects, but most common on southern exposures. Stands also occur in soil pockets between rocks on cliffs lining the sides of ravines. Soils are typically shallow, moderately to well-drained, non-calcareous with a high percentage of rock fragments and exposed rock (lithic), and texture varies from sandy loam to clay loam. Rock and moss cover significant amounts of the ground surface often with over 40% cover of each. Vegetation included in this alliance is characterized by the dominance of *Poa secunda*. Codominant species may include mid grasses such as *Aristida purpurea var. longiseta, Danthonia unispicata*, and the forbs *Balsamorhiza serrata* and *Lomatium cous*. Other associated species may include *Elymus elymoides, Sporobolus cryptandrus, Hesperostipa comata (= Stipa comata), Achillea millefolium, Antennaria* spp., *Balsamorhiza incana, Erigeron* spp., *Phlox longifolia, Sedum* spp., *Trifolium macrocephalum*, and *Plantago patagonica*. Diagnostic of this alliance is the short graminoid layer dominated by *Poa secunda*.

Environment: These grasslands are characteristic of the scablands in the Columbia Basin and portions of the Snake River plain. Elevations range from 300-2120 m. Climate is temperate, continental. Mean annual precipitation ranges from 33-60 cm. Precipitation primarily occurs in the winter as snow or rain. This moisture is stored in the soil profile and utilized during the typically dry summers. These stands are found on flat to undulating ridgetops, plateaus, plains, and benches on steep canyon slopes. Sites are nearly level to moderately sloping (to 15%), but also occur in soil pockets between rocks on cliffs lining the sides of ravines. This grassland occurs on all aspects, but is more common on southern slopes. Soils are typically shallow with a high percentage of rock fragments and exposed rock (lithic), but also may be moderately deep on some sites. They are moderately to well-drained, non-calcareous, sandy to clay loams with pH of 5.8-7.2, and are derived from alluvium, colluvium, residuum or loess. Parent materials include basalt, andesite, rhyolite and tuff. Rock and moss cover significant amounts of the ground surface often with over 40% cover of each.

Adjacent stands are variable and may include other grasslands dominated by *Pseudoroegneria spicata, Festuca idahoensis* or other perennial grasses, shrublands dominated by *Artemisia tridentata*, or woodlands dominated by *Pinus ponderosa*.

Vegetation: These grasslands occur east of the Cascade Range in the Columbia Basin steppe and the Snake River plain. Stands have a sparse to dense graminoid layer less than 0.5 m tall and typically 0.2-0.3 m tall. It is dominated or codominated by the cool-season, perennial bunchgrass *Poa secunda*. Codominant species may include mid grasses, such as *Aristida purpurea var. longiseta, Danthonia unispicata*, and the forbs *Balsamorhiza serrata* and *Lomatium cous*. Other associated species may include graminoids, like *Elymus elymoides, Sporobolus cryptandrus, Hesperostipa comata (= Stipa comata)*, and *Pseudoroegneria spicata*, perennial forbs, such as *Achillea millefolium, Antennaria dimorpha, Antennaria luzuloides, Balsamorhiza incana, Erigeron chrysopsidis, Eriogonum caespitosum, Eriogonum heracleoides, Lomatium bicolor var. leptocarpum (= Lomatium leptocarpum), Phlox longifolia, Sedum lanceolatum, Sedum stenopetalum, Trifolium macrocephalum*; and the annual forbs *Blepharipappus scaber, Idahoa scapigera, Holosteum umbellatum, Plantago patagonica*, and *Polygonum* spp. Moss and lichen cover in undisturbed stands is often high and ranges from 5-60% cover.

Dynamics: These xeric grasslands usually have relatively shallow, rocky soils with limited water-holding capacity. The winter precipitation wets these soils, but they typically dry out completely to bedrock by midsummer (Ganskopp 1979). *Poa secunda* is well-adapted to these conditions because it starts growing early in the spring and completes its reproductive cycle early while there is still moisture in the soil (Daubenmire 1970). If there is late summer or fall precipitation, dominant *Poa secunda* can green up quickly again. Shrubs are uncommon. Daubenmire (1970) and Johnson and Simon (1987) suggest that bedrock present under these grasslands is not fractured enough to support deeper-rooted shrubs. In addition to drought tolerance, *Poa secunda* is also tolerant of grazing and trampling by livestock (Daubenmire 1970, Ganskopp 1979).

Stands in this alliance are generally considered to be late seral with species composition controlled by the harsh edaphic conditions of the site (Daubenmire 1970, Johnson and Simon 1987). However, some stands, especially those in the ~*Aristida purpurea var. longiseta - Poa secunda* Herbaceous Vegetation (CEGL001781)$$ that occur on deeper soils, may be early seral forms of a *Pseudoroegneria spicata* grassland, because *Poa secunda* increases under moderate grazing (Daubenmire 1970).

Other disturbances include frost heaving and exotic species invasion. Frost heaving causes local soil disturbance in the winter when these thin, saturated soils freeze and push soil and plants up out of the ground. Exotic plants have invaded many stands especially where disturbed. Common exotics include annual grasses such as *Bromus tectorum, Bromus japonicus*, and *Bromus briziformis*, that may dominate the herbaceous layer during wet years (Ganskopp 1979, Tisdale 1986). Other exotics include annual forbs like *Epilobium brachycarpum, Erodium cicutarium, Lactuca serriola, Tragopogon dubius*, and the perennial forb *Hypericum perforatum*. Fire is thought to be unimportant because it is unlikely that the sparse vegetation in these stands could carry a fire.

Similar Alliances:

- *Artemisia rigida* Shrub Herbaceous Alliance (A.1574)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)

Similar Alliance Comments: The similar alliances have *Poa secunda* as a dominant or diagnostic species in the alliance. *Poa secunda* is a widespread grassland species in the northern half of the western United States and is also a dominant understory species in woodland and shrubland stands dominated by *Juniperus occidentalis, Artemisia tridentata, Artemisia arbuscula, Artemisia nova, Grayia spinosa* or *Purshia tridentata*. It is also codominant in stands in other grassland alliances that are dominated by *Leymus triticoides, Pseudoroegneria spicata, Sporobolus cryptandrus* or *Hesperostipa comata*.

ALLIANCE DISTRIBUTION

Range: Grasslands included in this alliance are most characteristic of the Columbia Basin of eastern Washington, eastern Oregon, Idaho and northeastern California. It is also reported from Wyoming.
Nations: US
Subnations: CA, ID, OR, WA, WY
TNC Ecoregions: 6:C, 9:C, 10:C
USFS Ecoregions: 342A:CC, 342B:CC, 342F:CC, 342H:CC, 342I:CC, M242C:CC, M331D:CC, M332G:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Chappell et al. 1997, Copeland 1980a, Daubenmire 1970, Daubenmire 1992, Ganskopp 1979, Hall 1973, Holland 1986b, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Kartesz 1999, Manning and Padgett 1992, Poulton 1955, Sawyer and Keeler-Wolf 1995, Tisdale 1986, Volland 1976, Winward and Youtie 1976

[CEGL001782] *(Balsamorhiza serrata) - Poa secunda* Herbaceous Vegetation

Translated Name: **(Serrate Balsamroot) - Curly Bluegrass Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Columbia Basin Palouse Prairie (CES304.792)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): J.S. Kagan

ELEMENT CONCEPT

Global Summary: This is a sparse grassland, found on shallow, cobbly soils in the Columbia Basin of Oregon and the Grand Teton Mountains of northwestern Wyoming. Most sites are fairly flat (less than 20% slope), but include all aspects, with elevations ranging from 670 to 1465 m (2200-4800 feet) in elevation. The type is considered an herbaceous grassland, although bare or lichen-covered rock occupies almost 40% of the total cover, and in some sites, forb species may have higher cover than graminoids. *Poa secunda (= Poa sandbergii)* in its dwarf, scabland form (generally only 2 dm tall, blooming very early in the spring) dominates the vegetation (25-75% cover). *Balsamorhiza serrata* or *Balsamorhiza sagittata* is always present, although often at low cover (1-25% cover). The association has both perennial forbs (*Trifolium macrocephalum, Eriogonum umbellatum, Phlox longifolia, Lomatium bicolor var. leptocarpum*) and annual forbs (*Blepharipappus scaber, Idahoa scapigera, Holosteum umbellatum, Polygonum* spp.). This association is similar to *~Lomatium cous - Poa secunda* Herbaceous Vegetation (CEGL001790)$$ and various *Poa secunda - Eriogonum* low shrubland associations, but is fairly easily distinguished by the presence of *Balsamorhiza* spp. and the lack of *Eriogonum* spp. or *Lomatium cous*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on the east side of the valley floor and on westerly slopes of Shadow Mountain. No other environmental data are available for this association.
Global Environment: This is a sparse grassland, found on shallow, cobbly soils in the Columbia Basin of Oregon and the Grand Teton Mountains of northwestern Wyoming. Most sites are level to moderately sloping (less than 20% slope) and include valley floors and toeslopes. Stands may be oriented to any aspect, with elevations ranging from 670 to 1460 m (2200-4800 feet) in Oregon to around 2135 m (7000 feet) in Wyoming. Soils are well-drained and may be derived from alluvium or colluvium. Bare ground, gravel and rock may cover up to 70% of the unvegetated surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forb community that occurs in subxeric areas. Shrubs are generally absent but may include a trace of *Artemisia tridentata ssp. vaseyana*. The herbaceous layer provides 70% of the cover and is dominated by graminoids. *Poa secunda* is the dominant graminoid, composing 30 to 50% of the canopy cover. *Festuca idahoensis* is present in all of the stands with 3 to 10% cover. *Poa pratensis* and *Achnatherum nelsonii* may be present with canopy cover up to 10%. *Balsamorhiza sagittata* (10 to 20% canopy cover) and *Eriogonum umbellatum* (3 to 10% canopy cover) are the dominant forbs in all stands. Forbs that are present in two out of three stands include *Perideridia gairdneri, Geranium viscosissimum, Potentilla gracilis*, and *Symphyotrichum campestre*.

Global Vegetation: The type is considered an herbaceous grassland, although bare or lichen-covered rock may occupy almost 40% of the ground surface, and in a few sites, forb species may actually have higher cover than graminoids. *Poa secunda* usually dominates the vegetation with 25-50% cover. Other graminoids present include *Festuca idahoensis, Achnatherum nelsonii*, and *Pseudoroegneria spicata*. *Balsamorhiza serrata* is always present in Oregon stands, but is replaced by *Balsamorhiza sagittata* in Wyoming. Cover is often low (1-25% cover) for both species of balsamroot. The association also supports a mix of perennial forbs (*Trifolium macrocephalum, Eriogonum niveum, Eriogonum nudum, Eriogonum umbellatum, Perideridia gairdneri, Geranium viscosissimum, Phlox longifolia, Lomatium bicolor var. leptocarpum, Symphyotrichum campestre*) and annual forbs (*Blepharipappus scaber, Idahoa scapigera, Holosteum umbellatum, Polygonum* spp.).
Global Dynamics: This association has drier, coarser, shallower soils than adjacent *Artemisia*-dominated shrublands.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Perideridia gairdneri	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Symphyotrichum campestre	Herb (field)	Forb	.	X	.
Festuca idahoensis	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Poa secunda	Herb (field)	Graminoid	X	X	.
Stipa nelsonii	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Balsamorhiza serrata	Herb (field)	Forb	X	X	.
Poa secunda	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (30-Nov-1998). This type is known from four sites along the southern edge of the Columbia Basin in Oregon. Most occurrences are small and isolated; it is estimated that there are between 10 to 20 occurrences. This association is currently very rare. It is known from four occurrences, none of which are protected, all of which are found on private lands. Additional sites are likely to be found, although they will certainly be small. The limited numbers of very small sites are the primary ranking factors. The type would probably be ranked higher (G1), were it not for the relative lack of threats. The type has marginal forage value and is not very susceptible to invasion by non-native species.

RELATED CONCEPTS

Global Similar Associations:
- *Lomatium cous - Poa secunda* Herbaceous Vegetation (CEGL001790)
- *Pseudoroegneria spicata - Balsamorhiza sagittata - Poa secunda* Herbaceous Vegetation (CEGL001662)

Global Related Concepts:
- *(Balsamorhiza serrata)-Poa secunda* (Bourgeron and Engelking 1994) =
- *Poa - Eriogonum* Habitat Type (Poulton 1955) =
- DRISCOLL FORMATION CODE:V.C.5.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: *Balsamorhiza sagittata* takes the place of *Balsamorhiza serrata* in Grand Teton National Park's association.
Grand Teton National Park Other Comments:
Global Classification Comments: This association is similar to ~*Lomatium cous - Poa secunda* Herbaceous Vegetation (CEGL001790)$$ and various *Poa secunda - Eriogonum* low shrubland associations, but is fairly easily distinguished by the presence of *Balsamorhiza serrata* and the lack of *Eriogonum* spp. or *Lomatium cous*. *Balsamorhiza sagittata* takes the place of *Balsamorhiza serrata* in Grand Teton National Park stands.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs between Teton Science School and Shadow Mountain in the Bridger-Teton National Forest and to the west of Teton Science School on Antelope Flats.
Global Range: The range of this type is currently the southern edge of the Columbia Basin in Oregon, although similar habitat occurs in southeastern Washington.
Nations: US
States/Provinces: OR:S2, WA?, WY
TNC Ecoregions: 4:C, 6:C, 9:C
TNC Ecoregion Comments: ECO4 added (mjr 8-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342H:CC, 342I:CC, M242C:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The three sampled stands of this association include species lists and associated canopy covers but no environmental data.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: GT-tm3d, GT-tm3e, GT-tm5d
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): J.S. Kagan, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Poulton 1955	.	X	X	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

No Alliance Assigned—Park Special Short Bunch temperate or subpolar grassland

[PARK SPECIAL GRTE-025] *Danthonia spicata* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stand of this association occurs on a shallow southeast-facing slope at an elevation of 7099 feet. The unvegetated ground surface is dominated by litter and duff and basal vegetation; bare soil and wood are also present in small quantities.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane herbaceous grassland that occurs in subxeric areas. Shrubs are incidental but may include *Artemisia tridentata* ssp. *vaseyana*. The herbaceous layer is dominated by *Danthonia spicata* (20% cover). Other common and well represented species (3 to 10% cover) include *Achillea millefolium*, *Carex praticola*, *Geum triflorum*, *Poa pratensis*, and *Potentilla arguta*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
GRAMINOID	*Danthonia spicata*
FORB	*Geum triflorum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Carex praticola, Danthonia spicata, Poa pratensis, Achillea millefolium, Geum triflorum, Potentilla arguta

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand defining this association occurs just east of Carpenter Draw in the Bridger-Teton National Forest.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407074

GRAND TETON NATIONAL PARK Inventory Notes: Only one stand defines this association. This stand is located in the Bridger-Teton National Forest and includes little environmental data.

Classification Confidence: **Identifier:** New-GRTE-025
Local Author: Rob Massatti
Date: 15 April 2004
Local Editor: Klara Varga
Date: 23 April 2004

Global Author:

REFERENCES: None

V.A.5.N.g. Short alpine or subalpine sod grassland

A.1299 *Carex nardina* Herbaceous Alliance

Nard Sedge Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant associations within this short grassland alliance occur on windy, exposed ridges in subalpine and alpine regions. Elevations range from 2200-2600 m in the Cascade Range and 3000-3900 m in Colorado. Sites are typically gently sloping (2-25%), sparsely vegetated, stabilized scree slopes. Winter snow cover is thin, due to the exposed slopes, thus snowmelt is relatively early (late April to early May). Soils are rocky and shallow with high pH value, 5.5-7.1. *Carex nardina* is calciphilous throughout its range, and it dominates the graminoid stratum. In the Colorado stands, *Festuca brachyphylla, Poa lettermanii*, and *Festuca minutiflora* are associates in the graminoid stratum. *Besseya alpina* is typically a codominant in the forb layer. Other forbs in the Colorado stands include *Erigeron grandiflorus, Silene acaulis, Packera werneriifolia (= Senecio werneriifolius)*, and *Chionophila jamesii*. The fern layer is dominated by *Selaginella densa*. The moss layer is well-developed with *Cladonia pyxidata, Hypnum revolutum*, and *Polytrichum piliferum*. Common associates in the Cascade Range stands include *Festuca ovina, Minuartia obtusiloba (= Arenaria obtusiloba)*, and *Smelowskia ovalis*. Important cryptograms are *Tortula ruralis, Thamnolia subuliformis*, and *Cornicularia aculeata*. Information on adjacent communities is not available.
Environment: Plant associations within this alliance occur on windy, exposed ridges in subalpine and alpine regions. Elevations range from 2200-2600 m in the Cascade Range and 3000-3900 m in Colorado. Sites are typically gently sloping (2-25%), sparsely vegetated, stabilized scree slopes. Winter snow cover is thin, due to the exposed slopes, thus snowmelt is relatively early (late April to early May). Soils are rocky and shallow with high pH value, 5.5-7.1. Komarkova (1976) states *Carex nardina* is calciphilous throughout its range. Information on adjacent communities is not available.
Vegetation: Vegetation types within this alliance are classified as short alpine or subalpine sod grasslands. *Carex nardina* dominates the graminoid stratum. In the Colorado stands, *Festuca brachyphylla, Poa lettermanii*, and *Festuca minutiflora* are associates in the graminoid stratum. *Besseya alpina* is typically a codominant in the forb layer. Other forbs in the Colorado stands include *Erigeron grandiflorus, Silene acaulis, Packera werneriifolia (= Senecio werneriifolius)*, and *Chionophila jamesii*. The fern layer is dominated by *Selaginella densa*. The moss layer is well-developed with *Cladonia pyxidata, Hypnum revolutum*, and *Polytrichum piliferum* (Komarkova 1976, 1986).

Douglas and Bliss (1977) report that common associates in the Cascade Range stands include *Festuca ovina, Minuartia obtusiloba (= Arenaria obtusiloba)*, and *Smelowskia ovalis*. Important cryptograms are *Tortula ruralis, Thamnolia subuliformis*, and *Cornicularia aculeata*.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described for Colorado, Wyoming and the Cascade Range in Washington. *Carex nardina* is circumboreal, extending south into southern Washington, northern Nevada, and southern Utah. It is likely that this alliance is more widespread.
Nations: US
Subnations: CO, WA, WY
TNC Ecoregions: 4:C, 9:C
USFS Ecoregions: M242C:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Culver
References: Del Moral 1979, Douglas and Bliss 1977, Hermann 1970, Johnston 1987, Komarkova 1976, Komarkova 1986

[CEGL001812] *Carex nardina* Scree Herbaceous Vegetation

Translated Name: **Nard Sedge Scree Herbaceous Vegetation**
Common Name:
Ecological System(s):
- North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow (CES204.862)

- Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association occupies windy, rocky, high-alpine slopes that are free of snow by early May. Slopes range from moderate to steep, and elevations vary depending on the location. In Washington, stands occur at around 2100 m (6900 feet); in Wyoming, the documented stand is at 3254 m (10,676 feet), and the stands in Colorado are located around 3800 m (12,467 feet). Soils are well-drained and gravelly with high rock cover. Total vegetation cover is around 40%. The community is strongly dominated by the tufted sedge *Carex nardina*. Other graminoids present include *Calamagrostis purpurascens*, *Festuca brachyphylla*, and *Carex albonigra*. The forb element is variable depending on location; in the northwestern part of the range (Washington), *Minuartia obtusiloba* and *Smelowskia ovalis* are the most common associated species. In the middle part of the range (Wyoming), *Silene acaulis*, *Astragalus kentrophyta*, and *Phlox pulvinata* are common. In Colorado, *Silene acaulis*, *Erigeron grandiflorus*, and *Besseya alpina* are the most constant species. The moss layer is often high in cover and diversity.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: The single sampled stand of this association occurs on a steep southwest-facing slope at an elevation of 3254 m (10,676 feet). The soil is a well-drained sandy loam. The unvegetated and nonvascular ground surface is composed of large rocks greater than 10 cm (30% cover), gravel (30% cover), lichen (20% cover), moss (10% cover), litter and duff (5% cover), and bare soil (5% cover).

Global Environment: This association occupies dry, rocky alpine slopes. Stands tend to occur on upper slopes where little snow accumulates and what snow does collect melts by early May (Douglas and Bliss 1977). Slopes range from moderate to steep, and elevations vary depending on the location. In Washington, stands occur at around 2100 m (6900 feet).; in Wyoming, the documented stand is at 3254 m (10,676 feet), and the stands in Colorado are located around 3800 m (12,467 feet). Soils are well-drained and gravelly with high rock cover.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is an alpine graminoid community that occurs on mesic sites. *Carex nardina* is the abundant graminoid (30% cover). Common graminoids with 3% cover include *Calamagrostis purpurascens* and *Carex albonigra*. Forbs with 3 to 10% cover include *Silene acaulis*, *Astragalus kentrophyta*, and *Phlox pulvinata*. A few other forbs are present in trace quantities.

Global Vegetation: This sedge turf association is characteristic of dry, rocky alpine slopes. Total vegetation cover is around 40%, because most of the ground surface is covered by rock. The community is strongly dominated by the tufted sedge *Carex nardina*. Other graminoids present include *Calamagrostis purpurascens*, *Festuca brachyphylla*, and *Carex albonigra*. The forb element is variable depending on location; in the northwestern part of the range (Washington), *Minuartia obtusiloba* and *Smelowskia ovalis* are the most common associated species. In the middle part of the range (Wyoming), *Silene acaulis*, *Astragalus kentrophyta*, and *Phlox pulvinata* are common. In Colorado, *Silene acaulis*, *Erigeron grandiflorus*, and *Besseya alpina* are the most constant species. The moss layer is often high in cover and diversity.

Global Dynamics: This association may be restricted to sites with calcareous soils (Komarkova 1979).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Astragalus kentrophyta	Herb (field)	Forb	.	X	.
Phlox pulvinata	Herb (field)	Forb	.	X	.
Silene acaulis	Herb (field)	Forb	.	X	.
Calamagrostis purpurascens	Herb (field)	Graminoid	.	X	.
Carex albonigra	Herb (field)	Graminoid	.	X	.
Carex nardina	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex nardina	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (23-Feb-1994). Although widespread, this association is never common, occurring in small patches on dry alpine slopes. It is likely to occur in the high mountains of Idaho and Montana, and possibly in Utah.

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Carex nardina* (Bourgeron and Engelking 1994) =
- *Carex nardina* Community (Douglas and Bliss 1977) =
- *Carex nardina* ssp. *hepburnii* - *Besseya alpina* Habitat Type/Association (Komarkova 1986) =
- *Carex nardina* ssp. *hepburnii* - *Besseya alpina* Habitat Type/Association (Komarkova 1979) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs just below Paintbrush Divide.
Global Range: This association has been reported from the north Cascade Mountains in Washington, the Grand Teton Mountains of northwestern Wyoming, and several mountain ranges in Colorado.
Nations: US
States/Provinces: CO:SU, WA, WY
TNC Ecoregions: 4:C, 9:C
TNC Ecoregion Comments: ECO4 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M242C:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A088
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Del Moral 1979	.	X	.	X	.	.	.	.	.
Douglas and Bliss 1977	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Komarkova 1979	.	X	X	X	.	.	.	.	.
Komarkova 1986	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.A.5.N.h. Short alpine or subalpine dry bunch grassland

A.1324 *Juncus drummondii* Herbaceous Alliance

Drummond's Rush Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant associations within this alliance are found at upper elevations in the Rocky Mountains. Elevations range from 2520-3420 m. In alpine areas they occur on solifluction terraces where soil moisture is abundant. In the lower elevations associations are found in meadows, wooded slopes, and adjacent to streams. The *Juncus drummondii* association was found on rocky, inclined (2-10% slope), southeast-oriented sites which are subxeric to mesic. Snow cover typically occurs for 8.5-9.5 months. The parent material in

the Front Range is metamorphic. Soils are skeletal with coarse fragments. Average pH is acidic, 4.9. The soil becomes dry and hard by fall if no summer precipitation occurs. Plant associations within this alliance are classified as short alpine or subalpine, dry bunch grasslands. *Juncus drummondii* dominates the graminoid stratum. Other graminoids typically include *Carex nigricans, Carex pyrenaica* in the alpine stands, or *Hordeum brachyantherum, Deschampsia caespitosa*, and *Muhlenbergia richardsonis* in the lower elevations. The forb layer typically is codominant and can include *Antennaria lanata, Erigeron melanocephalus, Caltha leptosepala, Sibbaldia procumbens, Antennaria alpina*, and *Epilobium anagallidifolium*. Typical forbs from lower elevations include *Iris missouriensis* and *Machaeranthera bigelovii (= Aster rubrotinctus). Polytrichum piliferum* can dominate the moss layer in the more xeric stands. Adjacent community information was not available.
Environment: Plant associations within this alliance are found at upper elevations in the Rocky Mountains. Elevations range from 2520-3420 m. In alpine areas they occur on solifluction terraces where soil moisture is abundant (Scott-Williams 1965). In the lower elevations associations are found in meadows, wooded slopes, and adjacent to streams (Cronquist et al. 1977). Komarkova (1976) found the *Juncus drummondii* association on rocky, inclined (2-10% slope), southeast-oriented sites which are subxeric to mesic. Snow cover typically occurs for 8.5-9.5 months (Scott-Williams 1965). The parent material in the Front Range is metamorphic (Willard 1963).

Soils are skeletal with coarse fragments. Average pH is acidic, 4.9 (Komarkova 1976). Willard (1963) states that the soil becomes dry and hard by fall if no summer precipitation occurs. Adjacent community information was not available.
Vegetation: Plant associations within this alliance are classified as short alpine or subalpine dry bunch grasslands. *Juncus drummondii* dominates the graminoid stratum. Other graminoids typically include *Carex nigricans, Carex pyrenaica* in the alpine stands (Willard 1963, Komarkova 1976) or *Hordeum brachyantherum, Deschampsia caespitosa*, and *Muhlenbergia richardsonis* in the lower elevations (Shepherd 1975 and Schlatterer 1972 as cited in Johnston 1987). The forb layer typically is codominant and can include *Antennaria lanata, Erigeron melanocephalus, Caltha leptosepala, Sibbaldia procumbens, Antennaria alpina*, and *Epilobium anagallidifolium* (Willard 1963, Komarkova 1976). Typical forbs from lower elevations include *Iris missouriensis* and *Machaeranthera bigelovii (= Aster rubrotinctus)* (Shepherd 1975 and Schlatterer 1972 as cited in Johnston 1987). Komarkova (1976) states that *Polytrichum piliferum* can dominate the moss layer in the more xeric stands.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has only been described for Colorado, Montana, Wyoming, and central Idaho. However, *Juncus drummondii* is a cordilleran species from Alaska south to the mountains of New Mexico, Utah, and Nevada (Cronquist et al. 1977).
Nations: US
Subnations: CO, ID, MT, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 20:C
USFS Ecoregions: M331A:C?, M331D:CC, M331I:CC, M332A:CC, M332B:C?, M332C:C?, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333D:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ALLIANCE SOURCES

Author(s): D. Culver
References: Benedict 1977b, Cooper and Lesica 1992, Cronquist et al. 1977, Johnston 1987, Komarkova 1976, Komarkova and Webber 1978, Marr and Willard 1970, Olmsted and Taylor 1977a, Osburn 1963, Schlatterer 1972, Scott-Williams 1965, Shepherd 1975, Spencer 1975, Willard 1963, Willard 1979

[CEGL001904] *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation

Translated Name: **Drummond's Rush - Woolly Pussytoes Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): S.V. Cooper

ELEMENT CONCEPT

Global Summary: This upper subalpine to alpine wetland community has been described from the southern Madison Range in southwestern Montana and the Grand Teton Mountains of northwestern Wyoming. Elevations range from 2743-3050 m. The community occurs regularly as small patches (much less than one acre in extent) in valley depressions, swales and cirque basins in association with late-persisting snowbeds. Slopes are gentle to moderate (3-41% slope) with various aspects, and the association often occurs as a mosaic with other snowbed communities. Soils are typically shallow, well-drained and have a sandy clay texture derived from gneiss and granite parent materials. Gravel and bare ground cover up to 50% of the soil surface. Diagnostic of this relatively

sparse alpine association is the codominance of *Juncus drummondii* and *Antennaria lanata*. The major graminoids are *Juncus drummondii, Poa fendleriana*, and *Carex paysonis*. The most common forb species are *Antennaria lanata, Sibbaldia procumbens*, and *Erigeron peregrinus*. The dwarf-shrub *Vaccinium scoparium* and *Carex paysonis* are important (10% cover each), and mosses and lichens have relatively low cover. Scattered shrubs and trees may also be present.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

Grand Teton National Park Environment: This association occurs on slopes varying from 3 to 41% at elevations ranging from 2743 to 3002 m (9000-9850 feet). The aspects of the slopes are all generally east-facing. The soils are moderately well- to well-drained and are predominantly silty clay loams; clay loam and sandy clay soils are each present on one site. The unvegetated ground cover is composed mainly of litter and duff (60-90% ground cover). The remainder of the unvegetated surface is codominated by rocks greater than 10 cm, gravel, bare soil, mosses, and lichens. At least two stands are located in avalanche-prone areas. Adjacent vegetation may include patches of *Abies lasiocarpa - Pinus albicaulis*, various graminoid meadows, *Salix* species, and riparian communities.

Global Environment: This upper subalpine to alpine wetland community has been described from the Madison Range in southwestern Montana and the Grand Teton Mountains of northwestern Wyoming. Stands are small patches much less than one acre in extent, occurring where snow collects in depressions, swales and cirque basins, often in a mosaic with other snowbed communities. Elevations range from 2743 to 3050 m (9000-10,000 feet), and slopes range from gentle to moderately steep (3-41% slope). Soils are typically shallow, well-drained, have sandy clay texture are derived from gneiss and granite parent materials. Gravel, rocks and bare ground cover 10-50% of the soil surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a subalpine to alpine herbaceous community. The shrub layer is generally absent but can include small amounts of *Vaccinium scoparium* and/or *Phyllodoce empetriformis*. Herbaceous cover ranges from 60 to 90% and is dominated by graminoids including *Juncus drummondii* (20 to 60% cover), *Carex paysonis* (6 out of 7 stands, 1 to 10% cover), and other *Carex* species (5 stands, 1 to 10% cover). Dominant forbs include *Oreostemma alpigenum* (5 stands, 1 to 10% cover) and *Polygonum bistortoides* (5 stands, 1% cover). Other species present in at least 4 stands with 1 to 10% cover include *Poa cusickii, Phleum alpinum, Deschampsia caespitosa, Sibbaldia procumbens, Castilleja* species, *Arnica* species, and *Hieracium gracile*. Forbs that may codominate in one stand each with 20% cover include *Antennaria umbrinella, Erigeron peregrinus*, and *Antennaria media*. *Pinus albicaulis* and *Abies lasiocarpa* are each present in one stand, occupying the tree subcanopy stratum in trace quantities.

Global Vegetation: This association is a subalpine to alpine wetland community. The diagnostic stratum is a mixture of graminoids (20-60% cover) and forbs (10-40% cover) with graminoids generally dominant. The major graminoids are *Juncus drummondii, Deschampsia caespitosa, Poa fendleriana*, and *Carex paysonis*. The most common forb species are *Antennaria lanata, Hieracium gracile, Oreostemma alpigenum, Sibbaldia procumbens*, and *Erigeron peregrinus*. Mosses and lichens have relatively low cover. A shrub layer is generally absent, but the community can include small amounts of *Vaccinium scoparium* and/or *Phyllodoce empetriformis*. *Pinus albicaulis* and *Abies lasiocarpa* may be present as dwarfed trees.

Global Dynamics: This association appears to depend on areas of snow accumulation and late snowmelt.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Hieracium gracile	Herb (field)	Forb	.	X	.
Oreostemma alpigenum	Herb (field)	Forb	X	X	.
Polygonum bistortoides	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Carex paysonis	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Juncus drummondii	Herb (field)	Graminoid	X	X	.
Phleum alpinum	Herb (field)	Graminoid	.	X	.
Poa cusickii	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Arnica spp.	characteristic forbs
Carex spp.	characteristic graminoids
Castilleja spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Antennaria lanata	Herb (field)	Forb	X	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Carex paysonis	Herb (field)	Graminoid	X	X	.

Juncus drummondii	Herb (field)	Graminoid	X	X	.

Higher Taxon Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (14-Nov-1997). This association is under no particular threat, and the snowbed environment characterized by its presence is in no way unusual. Apparently relatively rare, this association is recorded from the southern portion of the Madison Range of southwestern Montana (Cooper et al. 1997) and the Grand Teton Mountains of western Wyoming, but inventory of alpine areas in Montana and Wyoming is far from complete, so this association may be represented in other ranges. Snowbed environments dominated by *Juncus drummondii* are described from Colorado alpine, and *Antennaria lanata*-dominated snowbeds are documented for the North Cascades of Washington and the Canadian Rocky Mountains; the association treated here is somewhat of a floristic hybrid.

RELATED CONCEPTS

Global Similar Associations:
- *Juncus drummondii - Carex* spp. Herbaceous Vegetation (CEGL001905)
- *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906)
- *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation (CEGL005871)

Global Related Concepts:
- *Juncus drummondii-Antennaria lanata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Macro- and mesoclimatic factors and substrates are not significantly different than those of surrounding ranges and do not explain why this vegetation community is restricted to the southern portion of the Madison Range of southwestern Montana (Cooper et al. 1997) and the mountains of Grand Teton National Park. Inventory of alpine areas in Montana is far from complete, so this association may be represented in other ranges. Snowbed environments dominated by *Juncus drummondii* are described from Colorado alpine, and *Antennaria lanata*-dominated snowbeds are documented for the North Cascades of Washington and the Canadian Rocky Mountains; this association maybe somewhat of a floristic hybrid. Cooper et al. (1997, 1999) contain detailed classification discussions with references.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in alpine and subalpine areas throughout Grand Teton National Park. The sampled stands are located at Lake Solitude, Amphitheater Lake, between North Cascade and Leigh canyons, and near the headwaters of North Moran Creek in the South Fork of Snowshoe Canyon.
Global Range: This community has been described from the southern Madison Range, i.e., Beaverhead Mountains Section (Nesser et al. 1997) of Bailey's (1995) Middle Rocky Mountain Province, where it occurs regularly. Macro- and mesoclimatic factors and substrates differ in no significant way from those of surrounding ranges; the uniqueness of these communities may be attributable to historical vagaries of floristic distribution. It has also been described from alpine and subalpine areas throughout Grand Teton National Park.
Nations: US
States/Provinces: MT:S2, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:C?, M331D:CC, M332B:C?, M332C:C?, M332D:CC, M332E:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A059, GT-03A062, GT-03A064, GT-03A066, GT-03A089, GT-03B073, GT-0202132
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): S.V. Cooper, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Cooper and Lesica 1992	.	X	.	X	.	.	.	.	.
Cooper et al. 1997	.	X	.	X	X	.	.	.	.
Cooper et al. 1999	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1325 *Juncus parryi* Herbaceous Alliance

Parry's Rush Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance includes an alpine snowbed community that was described from the Rocky Mountains of southwestern Montana. Elevations range from 2900-3000 m. Stands were common near the base of gentle alpine slopes where deep snow accumulates in the winter. Sites are flat to gently sloping often with southern aspects on the lee slide of knolls or ridges away from the prevailing southwest and west wind. The growing season is short because the deep snow cover often lasts to midsummer resulting in cold wet soils. Soils are shallow, poorly developed clays with the soil surface having high cover of gravel and bare ground (50%). Vegetation in this alliance has a moderately dense herbaceous layer codominated by the perennial graminoid *Juncus parryi* and the perennial forb *Erigeron ursinus*. Common associates include the perennial grasses *Festuca idahoensis* and *Poa glauca*, and the forbs *Erigeron peregrinus*, *Erigeron simplex*, *Antennaria umbrinella*, and *Lewisia pygmaea*. There is also sparse moss and lichen cover. Adjacent vegetation is typically grasslands dominated by *Festuca idahoensis* and *Potentilla diversifolia*.
Environment: This alliance includes an alpine snowbed community that was described from the Rocky Mountains of southwestern Montana. Elevations range from 2900-3000 m. Stands were common near the base of gentle alpine slopes where deep snow accumulates in the winter. Sites are flat to gently sloping often with southern aspects on the lee slide of knolls or ridges away from the prevailing southwest and west wind. The growing season is short because the deep snow cover often lasts to midsummer resulting in cold wet soils. The soil surface has high cover of gravel and bare ground (50%). Soils are shallow, poorly developed clays with mean organic matter and coarse rock fraction, 20% and 25%, respectively. Mean pH was 5.6. Parent materials are andesite and quartzite. Adjacent vegetation are typically grasslands dominated by *Festuca idahoensis* and *Potentilla diversifolia*.
Vegetation: The southwestern Montana alpine snowbed vegetation included in this alliance has a moderately dense herbaceous layer codominated by the perennial graminoid *Juncus parryi* and the perennial forb *Erigeron ursinus*. Common associates include the perennial grasses *Festuca idahoensis* and *Poa glauca*, and the forbs *Erigeron peregrinus*, *Erigeron simplex*, *Antennaria umbrinella*, and *Lewisia pygmaea*. There is also sparse moss and lichen cover.
Dynamics: Terrain, substrate and snow depths control where this vegetation can occur. Variation in these factors creates a mosaic of several vegetation types (Cooper et al. 1997).
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alpine vegetation alliance is described from the Gravelly Mountains in southwestern Montana and the Rocky Mountains of Colorado and Wyoming but likely occurs more widely. It is also reported for California and Alberta, Canada.
Nations: CA, US
Subnations: AB, CA, CO, MT, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 12:C, 20:C
USFS Ecoregions: M261E:CC, M331A:C?, M331D:CC, M331I:CC, M332B:C?, M332C:CC, M332D:CC, M332E:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Yosemite); PC (Waterton Lakes)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Cooper and Lesica 1992, Cooper et al. 1997

[CEGL005871] *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation

Translated Name: **Parry's Rush / Creeping Glow-wort Herbaceous Vegetation**
Common Name:

Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 3 - Weak
Concept Author(s): S.V. Cooper and C. Damm

ELEMENT CONCEPT

Global Summary: This alpine association has been described from northwestern Montana in Glacier National Park and adjacent Waterton Lakes National Park, Alberta, Grand Teton National Park in northwestern Wyoming, and Rocky Mountain National Park in Colorado in high subalpine and low alpine zones. It occurs predominantly on gently rolling to moderately steep glaciated terrain, often associated with depressions and broad saddles. Where it occurs on moderate to steep slopes, it is associated with areas where snow collects during the winter (lee slopes). Moderately well-drained to rapidly drained soils are derived from a wide variety of sedimentary parent materials. Ground cover is variable, with northern Rocky Mountain stands being mostly rock-free with an average of about 4% exposed soil, and litter cover varies widely with a modal value around 45 to 50%. Lichen and bryophyte cover is also highly variable, ranging from nil to 85%. Central and southern Rocky Mountain stands are mostly open and rocky, with exposed bare soil accounting for 5-20% of the ground surface and an additional 15-30% covered with large and small rock. Moss and lichen, when present, can cover up to 15% of the ground surface. The vegetation cover is characterized by a moderately dense to dense herbaceous layer dominated by *Juncus parryi* and *Sibbaldia procumbens*. Other important species include *Antennaria parvifolia, Carex paysonis, Carex rupestris var. drummondiana, Danthonia intermedia, Poa cusickii ssp. epilis,* and *Viola labradorica*, though none of these species is consistently found with high cover.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on mountain slopes with gradients varying from 7 to 76% with one occurring each on a terrace, a step-n-slope, and an interfluve. The elevations of the stands range from 8700 to 10200 feet, with one occurring at 6800 feet. Where soil data are available, no characteristic soil texture predominates; soils can be well or poorly drained and range from sandy loams to silty clays. Litter and duff is the major component of the unvegetated ground surface covering 80 to 90%. Gravel and rocks greater than 10cm can each compose up to 10% of the ground cover. Almost all other plots contain a large amount of unvegetated ground surface dominated by rocks, usually larger than 10cm. Typical disturbance is noted as most plots being snow affected, with some plots below or in avalanche chutes, and many plots have drainages bordering or running through them. Adjacent vegetation is usually composed of alpine graminoid meadows, *Salix eastwoodiae, Salix petrophila,* and/or mixed *Pinus albicaulis – Abies lasiocarpa* stands.

Global Environment: This snowfield-supported wetland association has been described from northwestern Montana and north-central Colorado in high subalpine and alpine zones. Elevation ranges from 2010 to 2350 m (6590-7710 feet) in the northern part of the range and 3240-3480 m (10,640-11,420 feet) in the south. Central Rocky Mountain stands occur at intermediate elevations, between 2652 and 3063 m (8700-10,050 feet). It occurs predominantly on gentle to moderately steep glaciated terrain, on slopes, depressions and broad saddles. Stands occurring on moderate to steep slopes (to 50%) are in positions that collect wind-driven snow. Moderately well-drained to rapidly drained soils are derived from a wide variety of sedimentary parent materials. Northern Rocky Mountain stands have a ground surface that is mostly rock-free with an average of about 4% exposed soil, and litter cover varies widely, from 10 to 85%, with a modal value around 45 to 50%. Lichen and bryophyte cover is also highly variable, ranging from nil to 85%. Central and southern Rocky Mountain stands are open and rocky, with exposed bare soil accounting for 5-20% of the ground surface and an additional 10-30% covered with large and small rock. Moss and lichen, when present, can cover up to 15% of the ground surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an alpine graminoid-dominated community. Trees, short shrubs, and dwarf shrubs are generally absent, the most constant being *Vaccinium scoparium,* all occurring in low densities except for the low elevation stand, which has 7% cover of *Artemisia tridentata* ssp. *vaseyana*. Herbaceous cover ranges from 20 to 100% and is generally dominated by *Juncus parryii,* occupying 3 to 40% canopy cover. Herbaceous species that may co-dominate, though are not necessarily constant include *Carex paysonis, Carex nigricans, Deschampsia caespitosa, Erigeron peregrinus,* and *Sibbaldia procumbens. Pinus albicaulis, Abies lasiocarpa,* and *Picea engelmannii* seedlings may be present.

Global Vegetation: This high subalpine / low alpine association is characterized by a moderately dense to dense herbaceous layer dominated by *Juncus parryi*. *Sibbaldia procumbens* is often codominant. Other important species are *Antennaria parvifolia, Carex paysonis, Carex nigricans, Carex microptera, Carex rupestris var. drummondiana, Danthonia intermedia, Deschampsia caespitosa, Phleum alpinum, Poa cusickii ssp. epilis,* or *Viola labradorica,* though none of these species is consistently found with high cover. Constant species with low cover include *Antennaria alpina, Antennaria rosea, Arenaria capillaris, Erigeron peregrinus, Hieracium gracile, Packera streptanthifolia (= Senecio cymbalarioides), Phleum alpinum, Polygonum bistortoides, Potentilla diversifolia,* or *Trifolium parryi*. Short shrubs and dwarf-shrubs are generally absent but can include *Vaccinium caespitosum, Artemisia arctica ssp. arctica, Phyllodoce empetriformis,* and *Salix petrophila* in low densities. Low cover of moss and lichen is also common.
Global Dynamics: This community is restricted to areas kept moist by melting snowbanks.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Erigeron peregrinus	Herb (field)	Forb	.	X	.
Polygonum bistortoides	Herb (field)	Forb	.	.	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Carex paysonis	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.
Juncus parryi	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Sibbaldia procumbens	Herb (field)	Forb	X	X	.
Juncus drummondii	Herb (field)	Graminoid	X	.	.
Juncus parryi	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Antennaria aromatica	-	P	rare
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (9-Feb-2004).

RELATED CONCEPTS

Global Similar Associations:

- *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904)
- *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

Global Related Concepts:

- *Juncus parryi* (Holway and Ward 1963) ?
- *Leprario caesioalbae - Salicetum arcticae* Association (Damm 2001) I
- *Polytricho piliferi - Arenarietum capillaris* Association (Damm 2001) I
- *Sibbaldio - Juncetum parryi* Association (Damm 2001) I
- Association *Juncetum drummondii* (Willard 1963) (Willard 1979) B Association *Juncetum drummondii* (Willard 1963) (Komarkova 1979) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:

Grand Teton National Park Other Comments:

Global Classification Comments: Plots used to validate this type have come from three of C. Damm's (2001) associations: *Sibbaldio - Juncetum parryi*, *Polytricho piliferi - Arenarietum capillaris*, and *Leprario caesioalbae - Salicetum arcticae*. This type is environmentally very similar to both ~*Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906)$$ and ~*Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904)$$ of southwestern Montana (Cooper et al. 1997, 1999) but has a somewhat unique floristic composition for which it has been recognized in this treatment. Plots from Rocky Mountain and Grand Teton national parks do not contain *Erigeron ursinus* but do contain *Sibbaldia procumbens* as a codominant and seem to fit well with the concept of this type described from the northern Rocky Mountains. Central and southern stands lack a few of the northern species, and *Juncus drummondii* and *Festuca idahoensis* appear to more important in northern stands. Relatively little is known about this type, and more alpine survey and classification work are needed to improve classification confidence.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs in alpine areas. The sampled stands are near Amphitheater Lake, Lake Solitude, Leigh Canyon NW of Paintbrush divide, near the base of Mt. Bannon, Death Canyon, Open Canyon, west of Mink Lake, west of the outside road, south fork of Cascade Canyon, Snowdrift Lake, Mt. Forellen, and upper Paintbrush Canyon.

Global Range: This alpine association has been described from northwestern Montana in Glacier National Park and adjacent Waterton Lakes National Park, Alberta, and Rocky Mountain Park in Colorado. More survey and classification work are needed to determine the full range of distribution.

Nations: CA, US

States/Provinces: AB, CO, MT:S3?, WY
TNC Ecoregions: 7:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331I:CC, M332C:CC, M333C:CC
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A086, GT-03B071, GT-03B072, GT-0202074, GT-0202079
Accuracy Assessment Points: 04J181, 04X338, 04R293, 04R256, 04R248, 04R243, 04R030, 04J199, 04X497, 04J192, 04J179, 04R175, 04R162, 04J193
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): K.A. Schulz, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	.	X	.	.	.	.	.
Cooper and Lesica 1992	.	.	.	X	.	.	.	.	.
Cooper et al. 1997	.	X	.	X	.	.	.	.	.
Cooper et al. 1999	.	X	.	.	.	.	.	.	.
Damm 2001	.	X	X	X	.	.	.	.	.
Holway and Ward 1963	.	X	X	.	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Komarkova 1979	.	X	X	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Willard 1963	.	.	.	X	.	.	.	.	.
Willard 1979	.	X	X	X	.	.	.	.	.

A.1323 *Leucopoa kingii* Herbaceous Alliance

Spike Fescue Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alpine grassland alliance occurs in the central Rocky Mountains of southwestern Montana, the adjacent Bitterroot Range in east-central Idaho, and the Grand Teton Mountains of northwestern Wyoming. Elevations range from 2900-3600 m. Stands are found in parks in the upper subalpine zone and undulating alpine meadows and turf. Sparse stands dominated by *Leucopoa kingii (= Festuca kingii)* may occur on the rocky transition zones with fell-fields. Sites are dry, with nearly level to steep slopes. Aspect is typically on the warmer, drier southeastern to western slopes, but can include north-facing slopes. Sites generally have only moderate wind exposure. Soils are shallow to moderately deep, gravelly, well-drained and often with rock outcrops. The vegetation is characterized by a moderate to dense herbaceous layer dominated by *Leucopoa kingii*. *Carex elynoides* is codominant in some stands. Other characteristic species include *Agoseris glauca, Cymopterus nivalis (= Cymopterus bipinnatus), Oxytropis campestris, Phlox pulvinata, Poa fendleriana ssp. fendleriana, Poa secunda*, and *Pseudoroegneria spicata*. Mosses and lichens have low cover. Shrubs and dwarf-shrubs may include scattered *Artemisia frigida, Artemisia tridentata*, and *Chrysothamnus viscidiflorus* at lower elevations. Diagnostic of this alliance is the dominance of *Leucopoa kingii* in the herbaceous layer.
Environment: Grasslands included in this alpine alliance occur in the central Rocky Mountains in the Beaverhead and Tendoy mountains of southwestern Montana, and adjacent Bitterroot and White Knob mountains, Pioneer and Lost River ranges in east-central Idaho, and Grand Teton Mountains of northwestern Wyoming. Elevations range from 2900-3600 m. The climate is temperate, continental, with cold winters and cool summers, and mean annual precipitation estimated at 75 cm. Precipitation primarily occurs in the fall, winter and spring as snow or rain. Summers are dry. Moisture is stored in the soil profile and utilized throughout the typically dry summers. Stands are found in parks in the upper subalpine zone and undulating alpine meadows and turf. Sparse stands dominated by *Leucopoa kingii* may occur on the rocky transition zones with fell-fields. Sites are dry, with nearly level to steep slopes. Aspect is typically on the warmer, drier southeastern to western slopes, but can include north-facing slopes. Sites generally have only moderate wind exposure. Soils are shallow to moderately deep, gravelly, well-drained and often with rock outcrops. Soil texture includes sandy clay loams with pH of 7.4 for calcareous soils. Some stands have relatively high rock cover. Parent materials are

diverse and consist of alluvium, colluvium and residuum derived mostly from White Knob limestone, Challis Volcanics, and quartzite. Other rock types may include siliceous shale, sandstone, mudstone, calcareous conglomerate, dolomite and granite. Adjacent stands include herbaceous types dominated by cushion plants on drier, fell-field sites, *Carex* spp. or *Festuca idahoensis* on wetter sites, and small groves of subalpine forests dominated by *Abies lasiocarpa*, *Pinus albicaulis*, or *Pinus flexilis*.
Vegetation: Vegetation included in this alliance occurs in the central Rocky Mountains. Stands have moderate to dense cover of perennial graminoids dominated by the bunchgrass *Leucopoa kingii (= Festuca kingii)*. *Carex elynoides* is codominant is some stands. Other characteristic species include *Agoseris glauca, Cymopterus nivalis (= Cymopterus bipinnatus), Oxytropis campestris, Phlox pulvinata, Poa fendleriana ssp. fendleriana, Poa secunda*, and *Pseudoroegneria spicata*. Mosses and lichens have low cover. Shrubs and dwarf-shrubs may include scattered *Artemisia frigida, Artemisia tridentata*, and *Chrysothamnus viscidiflorus* at lower elevations.
Dynamics: Alpine vegetation is controlled mostly by a moisture-exposure gradient with soil movement and geologic substrate also important (Moseley 1987). Turf communities are associated with sites with relatively gentle terrain where the wind scours the winter snow. Where wind exposure increases, the soils are shallow, rocky, less developed and support cushion plant communities (Cooper et al. 1997).
Similar Alliances:
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Phlox pulvinata* Herbaceous Alliance (A.1651)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)

Similar Alliance Comments: The two *Festuca idahoensis* alliances may be very similar in structure and composition to the ~*Leucopoa kingii* Herbaceous Alliance (A.1323)$$. One association in the ~*Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)$$ is codominated by *Festuca idahoensis* and *Leucopoa kingii*. The other similar alliances include woodlands or shrublands that have at least one association where *Leucopoa kingii* is a codominant species.

ALLIANCE DISTRIBUTION

Range: These alpine grasslands occur in the central Rocky Mountains of southwestern Montana, western Wyoming, and east-central Idaho.
Nations: US
Subnations: ID, MT, WY
TNC Ecoregions: 6:C, 8:C, 9:C
USFS Ecoregions: 342B:CC, M331A:C?, M331D:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Challis, Lolo, Salmon)

ALLIANCE SOURCES

Author(s): K.A. Schulz, mod. J. Coles
References: Comer et al. 1999, Cooper and Lesica 1992, Cooper et al. 1997, MTNHP unpubl. data, Moseley 1987a, Nesser et al. 1997, Ream 1964

[CEGL001913] *Leucopoa kingii - Phlox pulvinata* Herbaceous Vegetation

Translated Name: **Spike Fescue - Cushion Phlox Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Dry Tundra (CES306.816)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): S.K. Rust

ELEMENT CONCEPT

Global Summary: This plant association occurs on broad, gentle, low-alpine ridges of east-central Idaho and similar high-subalpine sites in northwestern Wyoming. The association occurs on gentle to moderately steep, convex ridgetops oriented to any aspect. Sites are often on windward exposures at 2990-3140 m (9800-10,300 feet) elevation. Moderately deep, moderately unstable, very gravelly soils are derived from limestone, siliceous volcanic rocks, and quartzite. *Leucopoa kingii (= Festuca kingii)* is the dominant species in this open, low-growing bunchgrass vegetation. Associated species include *Carex elynoides, Minuartia obtusiloba, Phlox pulvinata, Lupinus argenteus, Poa secunda*, and *Agoseris glauca*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occurs on a shallow interfluve at an elevation of 10207 feet and the other occurs on a steep, south-facing slope at an elevation of 9100 feet. The soil for the stand on the

interfluve is a well-drained loamy sand. The unvegetated and non-vascular ground surface for the stand on the interfluve is composed of bare soil (50% cover), litter and duff (20% cover), rocks greater than 10 cm (10% cover), and gravel (10 % cover). The other stand has a large amount of large rocks and some bare ground showing. Adjacent vegetation includes various alpine communities and *Pinus albicaulis* clumps.

Global Environment: This plant association occurs on broad, gentle alpine ridges of the Challis Volcanics and Beaverhead Mountains ecoregional sections in east-central Idaho, as well as the Grand Teton Mountains of northwestern Wyoming. The association occurs on gentle to moderately steep, convex, southwest- to north-facing ridgetops near treeline or in the low alpine zone. Sites are often on windward exposures at 2990-3140 m (9800-10,300 feet) elevation. Moderately deep, moderately unstable, sandy or gravelly soils are derived from limestone, siliceous volcanic rocks, and quartzite. Bare soil, rocks and gravel cover most of the unvegetated ground surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is an alpine herbaceous community that occurs on mesic sites. The herbaceous layer is forb dominated and contributes 40 to 50% cover. *Leucopoa kingii* (10 and 12% cover) is the only species present in both stands. Species that occur in only one stand with 10% or more cover include *Phlox pulvinata*, *Linum lewisii*, *Balsamorhiza sagittata*, and *Lupinus argenteus*. A few other forbs and graminoids are present with trace to 3% cover.

Global Vegetation: *Leucopoa kingii (= Festuca kingii)* is the dominant species in this open, low-growing bunchgrass vegetation. *Carex elynoides* may be codominant. Associated species include *Phlox pulvinata*, *Lupinus argenteus*, *Minuartia obtusiloba*, *Phlox pulvinata*, *Poa secunda*, *Solidago multiradiata*, and *Agoseris glauca*. If *Achillea millefolium* is present, it is with low cover. Total vegetation cover is generally greater than 50%.
Global Dynamics: The presence of species such as *Phlox pulvinata* indicate a relatively stable substrate, as opposed to *Leucopoa kingii* stands on steep, unstable or eroding slopes, which tend to have lower vegetative cover, higher cover of bare ground, lack mat species such as *Phlox pulvinata*, and instead include disturbance indicators such as *Achillea millefolium*, *Penstemon attenuatus*, and *Poa secunda (= Poa scabrella)* (Moseley 1987a).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Leucopoa kingii	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Phlox pulvinata	Herb (field)	Forb	.	X	.
Festuca (Leucopoa) kingii	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (26-Jan-2001). This regionally endemic plant association is known from relatively few, dispersed occurrences that are located within isolated, alpine environments. The range, number, and size of occurrences appear stable. Threats are present and pose potential extreme adverse impacts on the extent of the association. After reviewing the available information, the global rarity rank is changed from G3? to G3.

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Leucopoa kingii-Phlox pulvinata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B
- Stable Spike Fescue Cover Type (Moseley 1987a) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: The association is described by Caicco (1983), Moseley (1985), and Urbanczyk (1993) from 18 plots located in the Beaverhead Mountains, Lemhi Range, White Knob Mountains, and Pioneer Mountains. The association is not specifically named by any of these authors.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur near Mt. Meek and on the south side of Granite Canyon.

Global Range: The association is known only from alpine habitats of the Challis Volcanics and Beaverhead Mountains ecoregional sections in east-central Idaho.
Nations: US
States/Provinces: ID:S3, MT, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Challis, Lolo, Salmon)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A029
Accuracy Assessment Points: 04X314
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None
GRAND TETON NATIONAL PARK Inventory Notes:

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): S.K. Rust, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Caicco 1983	.	.	.	.	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Moseley 1985	.	.	.	.	X	.	.	.	.
Moseley 1987a	.	X	X	X	.	.	.	.	.
Urbanczyk 1993	.	.	.	.	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

A.1400 *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance

Bluejoint Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found throughout the northern states of the United States, excluding the Great Plains states. It is a wide-ranging alliance with much variability in species composition and habitat. Stands of this alliance have a dense graminoid cover, generally over 1 m tall, with either a flat or tussocky microtopography. Tall shrubs may occupy as much as 25% cover. *Calamagrostis canadensis* is the characteristic dominant but can be associated with *Phalaris arundinacea* or a variety of Carices. Other associates include, in the Northeast, shrubs such as *Viburnum nudum*, *Alnus incana*, or *Alnus serrulata*, *Viburnum dentatum*, *Spiraea alba*, and graminoids such as *Agrostis gigantea (= Agrostis alba)*. In the Midwest, typical associates include several Carices, such as *Carex stricta*, *Carex rostrata*, or *Carex lacustris*, and occasionally *Poa palustris* or *Glyceria grandis* (Harris et al. 1996). The ground layer can be a heavy mat of grass stems and leaves, with patches of bare soil present in wetter locations.

The habitat of this alliance is typically mineral soil or well-decomposed peat, usually held together by a dense root mat. Stands are found in floodplains of small streams, beaver meadows, and lakeshores. The hydrology is typically seasonally flooded (Harris et al. 1996). In the southern Appalachians of Tennessee and Virginia, this vegetation occurs in depression meadows and occasionally in beaver ponds.
Environment: This is a very wide-ranging alliance, found from coast to coast of the conterminous United States. Stands are found in wet meadows, basins, moist forest openings, broad glaciated valleys, floodplains of small streams, silted-in beaver ponds, on alluvial benches, terraces, or point bars, and on lake- or pondshores. If along streams, they are typically small and low-gradient, and if found in depressions or meadows, slopes are flat to gentle. The elevation range is large, from near sea level in the eastern part of its range to well over 3500 m in the Rocky Mountains, where it occurs from mid-montane into lower alpine zones.

The hydrology is typically seasonally flooded (Harris et al. 1996), with spring flooding common. Soils commonly remain moist throughout the growing season. Parent materials include coarse-textured alluvium or sediments, or well-decomposed peat, usually held together by a dense root mat. Soil textures range from clay loam to sands, and sometimes are over subhorizons of coarse fragment-rich buried streambeds (Hansen et al. 1995, Crowe and Clausnitzer 1997). There is usually an organic surface horizon.
Vegetation: This alliance is found throughout the northern states of the United States, excluding the Great Plains states. Stands of this alliance have a dense graminoid cover, generally over 1 m tall, with either a flat or tussocky microtopography. Tall shrubs may occupy as much as 25% cover. *Calamagrostis canadensis* is the characteristic dominant, in some stands forming a near monoculture. It can also be associated with *Phalaris arundinacea* or a variety of *Carex* species. In the northeast of its range, other associates include shrubs such as *Viburnum nudum, Alnus incana*, or *Alnus serrulata, Viburnum dentatum, Spiraea alba* and graminoids such as *Agrostis gigantea (= Agrostis alba)*. In the Midwest, typical associates include several Carices, such as *Carex stricta, Carex rostrata*, or *Carex lacustris*, and occasionally *Poa palustris* or *Glyceria grandis* (Harris et al. 1996). The ground layer can be a heavy mat of grass stems and leaves, with patches of bare soil present in wetter locations.

In the Rocky Mountains, this alliance is characterized by a dense cover of *Calamagrostis canadensis*. One or more of several *Carex* species can be present, including *Carex aquatilis, Carex scopulorum*, or *Carex utriculata*. Other graminoids that may be abundant in some stands include *Deschampsia caespitosa, Scirpus microcarpus, Glyceria* spp., *Elymus glaucus*, and *Poa* spp. Forb cover is typically minor, but may include *Cardamine cordifolia, Senecio triangularis, Epilobium* spp., *Achillea millefolium, Heracleum maximum (= Heracleum lanatum), Ligusticum* spp., Asteraceae spp., *Mertensia ciliata*, or *Veronica* spp. Woody species are uncommon, although species of *Salix, Lonicera involucrata, Rubus idaeus*, or *Cornus sericea* may be present.
Dynamics: Prescribed burning of stands of this alliance may increase the cover of rhizomatous species, such as *Calamagrostis canadensis*, an aggressive invader of burned sites, while reducing the abundance of other associated species. However, with repeated burning, non-native, rhizomatous *Poa pratensis* may be favored. Burning should be postponed if livestock grazing is necessary in the area. This is because of the high palatability of young *Calamagrostis canadensis* shoots which revegetate burned sites (Hansen et al. 1995).

Calamagrostis canadensis and the associated *Carex* species are effective streambank stabilizers due to their rhizomatous growth habit. Many *Carex* species tend to form a dense, thick sod highly resistant to erosion. *Deschampsia caespitosa*, another associated species, is not an effective streambank stabilizer due to its weak, fibrous root system (Hansen et al. 1995).

Calamagrostis canadensis is an aggressive invader of recently burned sites. In the Rocky Mountains, *Calamagrostis canadensis* meadows appear to be long-lived, mid-seral vegetation types. In Utah and Colorado, stands of this alliance often occur adjacent to *Pinus contorta*-dominated communities. When there is tree mortality due to bark beetle infestations, the water table rises as a result of less evapotranspiration. Increased available soil moisture allows for the expansion of *Calamagrostis canadensis*-dominated communities at the meadow/forest ecotone (Padgett et al. 1989).
Similar Alliances:
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance ranges over much of the northern and western United States. In the eastern United States, it is found from Vermont south and west through the New England states into West Virginia, and possibly Virginia. It also occurs in the Upper Midwest in Michigan, Minnesota, and Wisconsin. In the western United States, it is reported from almost all western states, from Montana south into Colorado, and west into Washington, Oregon and California. It has not been reported from New Mexico, Arizona or Nevada. In Canada it is reported from Ontario, but undoubtedly occurs elsewhere.
Nations: CA, US
Subnations: AB, BC, CA, CO, CT, DE, ID, MA, MD, ME, MI, MN, MT, ND, NH, NJ, NY, ON, OR, PA, RI, SD, UT, VA?, VT, WA, WI, WV, WY
TNC Ecoregions: 2:C, 3:?, 4:C, 5:C, 7:C, 8:C, 9:C, 10:C, 12:C, 20:C, 25:C, 26:C, 35:C, 45:C, 47:P, 48:C, 51:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C,
68:C, 81:?
USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CC?, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Ea:CPP, 212Eb:CPP, 212Ec:CPP, 212Ed:CP?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hj:CCC, 212Hs:CCC, 212Hx:CCC, 212Ib:CCC, 212La:CPP, 212Na:CPP, 221Aa:CCP, 221Ab:CCC, 221Ac:CC?, 221Ad:CC?, 221Ae:CCP, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CC?, 221Al:CCC, 221Am:CCP, 221Ba:CCP,

221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:CCP, 221Db:CCP, 221Ea:CPP, 221Eb:CPP, 221Fa:CPP, 221Fb:CPP, 222Ia:CPP, 222Ib:CPP, 222Ic:CPP, 222Id:CPP, 222Ie:CPP, 222If:CPP, 222Jg:CCC, 222Na:CCC, 231Al:PPP, 232Ac:CCP, 232Ad:CCP, 242A:CC, 251Aa:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CC?, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CC?, M212Cb:CCC, M212Cc:CC?, M212Cd:CCP, M212Da:CPP, M212Db:CPP, M212Dc:CPP, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CPP, M221Ab:CPP, M221Ba:CPP, M221Bb:CPP, M221Bc:CPP, M221Bd:CPP, M221Be:CPP, M221Bf:CPP, M221Ca:CPP, M221Cb:CPP, M221Da:CCP, M221Db:CCP, M221Dc:CC?, M221Dd:CCC, M242B:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331A:CC, M331D:C?, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Acadia, Cape Cod, Glacier, Isle Royale, Minute Man, Rocky Mountain, Saint-Gaudens, Valley Forge, Voyageurs, Yosemite); PC (Waterton Lakes); USFS (Bighorn, Black Hills, Medicine Bow, Shoshone); USFWS (Assabet River, Great Meadows, Oxbow)

ALLIANCE SOURCES

Author(s): Midwestern Ecology Group/Eastern Ecology Group/Southeastern Ecology Group 6-96, mod. M.S. Reid
References: Carsey et al. 2003a, Carsey et al. 2003b, Cooper 1986a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Eggers and Reed 1987, Faber-Langendoen et al. 1996, Girard et al. 1997, Gysel 1960, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Harris et al. 1996, Johnston 1987, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1993, MNNHP 1993, Mattson 1984, Mutel 1976, Mutel and Marr 1973, Mutz and Queiroz 1983, Padgett et al. 1989, Wilson 1969

[CEGL001559] *Calamagrostis canadensis* Western Herbaceous Vegetation

Translated Name: **Bluejoint Western Herbaceous Vegetation**
Common Name: **Bluejoint Western Wet Meadow**
Ecological System(s):
- Boreal Wet Meadow (CES103.873)
- North American Arid West Emergent Marsh (CES300.729)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): D. Faber-Langendoen

ELEMENT CONCEPT

Global Summary: This wet grassland association occurs widely throughout mountainous areas of the western United States and Canada. These grasslands are a relatively small, meadow association that occurs in broad glaciated valleys, openings in moist forests, silted-in beaver ponds, and narrow floodplains of lower montane canyons. Elevations range from 670 to 3415 m (2200-11,200 feet). Parent material is generally coarse alluvium or fine glacial tills. Soils are Inceptisols, Entisols, and occasionally Mollisols. Textures range from clay loam, silty clay and silt loam to sand. Occurrences may have an organic layer on the surface as well as significant amounts of sand and rock in the lower layers, and are poorly to moderately well-drained. Stands generally stay relatively wet to moist throughout the growing season, are often flooded in the spring, and the water table drops 50-80 cm from the surface by late summer. This association is typically a dense sward of graminoid cover dominated by *Calamagrostis canadensis*. Other graminoid species usually present include *Carex aquatilis* and *Glyceria* spp. Other *Carex* spp. that can be present in low amounts, depending on geographic location, include *Carex utriculata, Carex nebrascensis, Carex canescens* and *Carex saxatilis*. Forb cover is variable, from nearly absent to over 25%. Species include *Caltha leptosepala, Senecio triangularis, Heracleum maximum, Mentha arvensis, Geum macrophyllum, Epilobium* spp., plus many other species, depending on location. Shrubs may be present with 1-5% cover and may include *Alnus incana, Symphoricarpos* spp., and *Salix* spp. Trees are rare but can include 1-3% cover of *Pinus contorta, Abies lasiocarpa*, and *Picea engelmannii*. GRTE information not incorporated to Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Global Environment: These grasslands are a relatively small, meadow association that occurs in broad glaciated valleys, openings in moist forests, silted-in beaver ponds, and narrow floodplains of lower montane canyons. Elevations range from 670 to 3400 m (2200-11,200 feet). Sites are flat to gently sloping. Parent material is generally coarse alluvium or fine glacial tills. Soils are Inceptisols, Entisols, and occasionally Mollisols. Textures range from clay loam, silty clay and silt loam to sand. Stands may have an organic layer on the surface as well as significant amounts of sand and rock in the lower layers. Stands are poorly to moderately well-drained. Stands generally stay relatively wet to moist throughout the growing season, are often flooded in the spring, and the water table drops 50-80 cm from the surface by late summer.
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a step-in-slope of a north-facing hillside and on north-facing slopes with gradients of 10 and 30%. The elevation for these stands ranges from 7000 to 8300 feet. One stand is at the base of an avalanche chute and another has been affected by recent fire. Adjacent vegetation includes *Pinus*

contorta regeneration, a *Pinus contorta/Calamagrostis rubescens* community, and an *Abies lasiocarpa-Picea engelmannii/Calamagrostis canadensis* community.

VEGETATION DESCRIPTION

Global Vegetation: This association is typically a dense sward of graminoid cover dominated by *Calamagrostis canadensis*. Other graminoid species usually present include *Carex aquatilis* and *Glyceria* spp. Other *Carex* spp. that can be present in low amounts, depending on location, include *Carex utriculata, Carex microptera, Carex nebrascensis, Carex canescens* and *Carex saxatilis*. Forb cover is variable, from nearly absent to over 25%. Species include *Caltha leptosepala, Senecio triangularis, Heracleum maximum, Mentha arvensis, Geum macrophyllum,* and *Epilobium* spp. Shrubs may be present with 1-5% cover and may include *Alnus incana* and *Salix* spp. Trees are rare but can include *Pinus contorta, Abies lasiocarpa,* and *Picea engelmannii*. *Chamerion angustifolium* may be abundant (10%) reflecting recent disturbance (fire).
GRAND TETON NATIONAL PARK Vegetation: This association is a montane grassland that occurs on mesic sites. *Abies lasiocarpa* contributes a small amount of cover to all stands either in the tree canopy, subcanopy, or as regeneration. *Picea engelmannii* occurs in the tree canopy or subcanopy of two stands. Seedlings of *Pinus contorta, Pinus albicaulis,* and/or *Populus tremuloides* may be present in small amounts. *Lonicera involucrata* occurs with 1 and 3% cover in two stands. Total herbaceous cover for the sampled stands ranges from 40 to 70%. *Calamagrostis canadensis* (20 to 30% cover) dominates all stands. Species that occur in at least two of the four stands include *Poa pratensis* (averaging 4% cover), *Carex microptera* (averaging 3% cover) *Elymus glaucus* (averaging 3% cover), *Cirsium arvense* (averaging 5% cover), *Eucephalus engelmannii*(averaging 3% cover), *Aconitum columbianum*(averaging 1% cover), and *Chamerion angustifolium* (averaging 1% cover).

Global Dynamics: Moderate to heavy grazing reduces the vigor of *Calamagrostis canadensis*, and other mostly non-native graminoids and forbs will dominate the site. Species include *Poa pratensis, Agrostis stolonifera, Juncus balticus,* and *Achillea millefolium*. Prescribed burning may increase the cover of rhizomatous species, such as *Calamagrostis canadensis*, an aggressive invader of burned sites, while reducing the abundance of other associated species. However, with repeated burning, non-native, rhizomatous *Poa pratensis* may be favored. Burning should be postponed if livestock grazing is necessary in the area. This is because of the high palatability of young *Calamagrostis canadensis* shoots which revegetate burned sites (Hansen et al. 1995).

Calamagrostis canadensis and the associated *Carex* species are effective streambank stabilizers due to their rhizomatous growth habit. Many *Carex* species tend to form a dense, thick sod highly resistant to erosion. *Deschampsia caespitosa*, another associated species, is not an effective streambank stabilizer due to its weak, fibrous root system (Hansen et al. 1995).

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Geum macrophyllum	Herb (field)	Forb	X	.	.
Mentha arvensis	Herb (field)	Forb	X	.	.
Calamagrostis canadensis	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note
Epilobium spp.	dominant forbs

GRAND TETON NATIONAL PARK Most abundant species:

Stratum	**Species**
GRAMINOID	*Calamagrostis canadensis*

GRAND TETON NATIONAL PARK Characteristic species:

Calamagrostis canadensis, Carex spp., *Elymus* spp., *Aconitum columbianum, Chamerion angustifolium, Eucephalus engelmannii*

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Non-Native Species: *Poa pratensis*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (26-Apr-2000).

RELATED CONCEPTS

Global Similar Associations:
- *Calamagrostis canadensis - Carex scopulorum - Mertensia ciliata* Herbaceous Vegetation (CEGL001560)--is closely related.

- *Calamagrostis canadensis - Senecio triangularis* Herbaceous Vegetation (CEGL001561)
- *Calamagrostis canadensis* Sierran Herbaceous Vegetation (CEGL003484)

Global Related Concepts:
- *Calamagrostis canadensis - C. canadensis* Habitat Type (Mattson 1984) =
- *Calamagrostis canadensis - Carex scopulorum / Mertensia ciliata* Plant Association (Johnston 1987) B
- *Calamagrostis canadensis - Deschampsia cespitosa* Habitat Type (Mattson 1984) F
- *Calamagrostis canadensis* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- *Calamagrostis canadensis* Association (Kovalchik 1993) =
- *Calamagrostis canadensis* Association (Crowe and Clausnitzer 1997) =
- *Calamagrostis canadensis* Community (Cooper and Cottrell 1990) =
- *Calamagrostis canadensis* Community (Cooper 1986a) =
- *Calamagrostis canadensis* Community Type (Padgett et al. 1989) =
- *Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) B
- *Calamagrostis canadensis* Herbaceous Vegetation (Cooper et al. 1999) =
- *Calamagrostis canadensis* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Calamagrostis canadensis* Western Herbaceous Vegetation (Carsey et al. 2003b) =
- *Calamagrostis canadensis* association (Kovalchik 1987) =
- Association: *Agropyro trachycauli - Calamagrostietum canadensis* (Komarkova 1976) (Komarkova 1979) I
- DRISCOLL FORMATION CODE:V.B.4.a. (Driscoll et al. 1984) B
- Mesic Grass Meadow (Bierly 1972) B
- Montane meadow Habitat (Sawyer and Keeler-Wolf 1995) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in Death Canyon, in the north fork of Cascade Canyon, near the Valley Trail NW of Sky Ranch, and near Sheffield Creek in the John D. Rockefeller, Jr. Memorial Parkway.

Global Range: This type occurs widely throughout mountainous areas of the western United States and probably into Canada.
Nations: CA, US
States/Provinces: AB, BC:S3S4, CA, CO:S4, ID:S4, MT:S4, ND, OR:S3S4, SD, UT:S2S3, WA:S3S4, WY:S2
TNC Ecoregions: 2:C, 3:?, 4:C, 5:C, 7:C, 8:C, 9:C, 10:C, 12:C, 20:C, 25:C, 26:C, 68:C, 81:?
TNC Ecoregion Comments: ECO3, ECO68, ECO81 added (mjr 8-05). ECO7:C, ECO4:C, ECO5:C, ECO12:C, ECO9:C, ECO8:C added (MSR 2-04).
USFS Ecoregions: 242A:CC, M242B:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331A:CC, M331D:C?, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes); USFS (Bighorn, Black Hills, Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J107, 04J185, 04J168, 04J241
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Local Author: Mark Fain
Date: 04 November 2004
Local Editor: Klara Varga
Date: 15 December 2004

Global Description Author(s): D. Faber-Langendoen, mod. G. Kittel and K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bierly 1972	.	X	X	.	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.

CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	.	.	.	.	.	.
Carsey et al. 2003b	.	X	X	.	.	.	.	.	.
Cooper 1986a	.	X	X	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	X	X	.	.	.	.	.
Cooper et al. 1999	.	X	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Gysel 1960	.	X	.	X	.	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	.	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	X	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1999b	.	X	X	.	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Komarkova 1979	.	X	X	X	.	.	.	.	.
Kovalchik 1987	.	X	X	.	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mattson 1984	.	X	X	X	.	.	.	.	.
Mutel 1976	.	X	.	X	.	.	.	.	.
Mutel and Marr 1973	.	X	.	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	.	X	.	.	.	.	.
NDNHI unpubl. data	.	.	.	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Sawyer and Keeler-Wolf 1995	.	X	X	.	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Wilson 1969	.	X	.	X	.	.	.	.	.

A.1424 *Carex (lachenalii, capillaris, illota)* Seasonally Flooded Herbaceous Alliance

(Arctic Harefoot Sedge, Hair Sedge, Small-head Sedge) Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this alliance range from upper montane to the alpine belts in the mountains. Elevation ranges from 2300-3600 m. Occurrences are restricted to flooded marsh or lake margins, swamps, wet meadows, around frost boils and on hummocks. The sites are typically flat or slightly inclined, mesic to saturated, snow-covered in winter, and cool to cold in the summer. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. Soils from stands in Colorado are loess, with accumulations of organic matter. The average pH of the surface horizon is 5.2. The pH increases with depth; clay and organic matter, moisture retention capacity and available water decrease sharply with depth. Vegetation types within this alliance are classified as seasonally flooded subpolar grasslands. They are dominated by *Carex lachenalii (= Carex bipartita), Carex capillaris*, and *Carex illota* with at least 60% cover. Other graminoids can include *Juncus biglumis, Juncus triglumis*, and *Carex misandra*. The forb stratum, when present, is dominated by *Polygonum viviparum*. Other forbs can include *Geum rossii (= Acomastylis rossii), Lloydia serotina*, and *Gentiana algida*. The moss layer can be equally important in some stands in Colorado. Species include *Cladonia pyxidata, Paraleucobryum enerve*, and *Tortella arctica*. Information on adjacent vegetation is unavailable.

Environment: Vegetation types within this alliance range from upper montane to the alpine and subnival belts in the mountains. Elevation ranges from 2300 to 3600 m. Occurrences are restricted to flooded marsh or lake margins, swamps, wet meadows, around frost boils and on hummocks. The sites are typically flat or slightly inclined, mesic to saturated, snow covered in winter, and cool to cold in the summer. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years.

Komarkova (1976) reports that soils in Colorado are loess, with accumulations of organic matter. The average pH of the surface horizon is 5.2. The pH increases with depth; clay and organic matter, moisture retention capacity and available water decrease sharply with depth. Information on adjacent vegetation is unavailable.

Vegetation: Vegetation types within this alliance are classified as seasonally flooded subpolar grasslands. They are dominated by *Carex lachenalii (= Carex bipartita), Carex capillaris*, and *Carex illota* with at least 60% cover. Other graminoids can include *Juncus biglumis, Juncus triglumis*, and *Carex misandra*. The forb stratum, when present, is dominated by *Polygonum viviparum*. Other forbs can include *Geum rossii (= Acomastylis rossii), Lloydia serotina*, and *Gentiana algida*. The moss layer can be equally important in some stands in Colorado. Species include *Cladonia pyxidata, Paraleucobryum enerve*, and *Tortella arctica*.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described for the Indian Peaks Wilderness and the Gunnison National Forest in Colorado and Grand Teton National Park in Wyoming. *Carex lachenalii* is circumboreal at high latitudes. Communities likely extend south at increasing elevation to northern Montana, the Uinta Mountains in Utah, and Summit County in Colorado. *Carex capillaris* is also circumboreal; communities could occur in northeastern Nevada, northeastern Oregon, and southwestern Utah. *Carex illota* communities could possibly occur in Washington, northwestern Montana, and Nevada (Cronquist et al. 1977).
Nations: US
Subnations: CO, OR, WY
TNC Ecoregions: 9:C, 10:C, 20:C
USFS Ecoregions: M331D:CC, M331G:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Gunnison)

ALLIANCE SOURCES

Author(s): D. Culver
References: Carsey et al. 2003a, Carsey et al. 2003b, Cronquist et al. 1977, Hermann 1970, Johnston 1987, Komarkova 1976, Komarkova 1986

[CEGL001876] *Carex illota* Herbaceous Vegetation

Translated Name: **Small-head Sedge Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is found in small patches on lakeshores, near springs, and below snowpatches in the lower alpine and on mountain valley floors in the subalpine Rocky Mountains of Colorado and northwestern Wyoming. Sites are flat to gently sloping, stable and snow-covered in winter. Aspect is variable. Surface water is present for extended periods during the growing season but is absent by the end of the growing season in most years. Substrates vary from loess, with accumulations of organic matter, to moderately well-drained silty clay soils predominantly covered by litter and duff and rocks greater than 10 cm. Soil surface may have significant cover of bare soil, gravel, mosses, and lichens. The vegetation is characterized by a dense to moderately dense herbaceous layer dominated by *Carex illota* (alpine stands are often nearly a monoculture) with 20-70% cover (typically >50%). *Antennaria umbrinella, Caltha leptosepala, Castilleja rhexiifolia, Deschampsia caespitosa, Eleocharis quinqueflora, Packera dimorphophylla, Primula parryi, Pedicularis groenlandica, Phleum alpinum*, or *Saxifraga odontoloma* may have significant cover (1-30%), but often the cover of other graminoids and forbs is low (usually less than 1%). The shrub *Salix planifolia* may also be present with less than 1% cover. The nonvascular layer is highly developed and almost equally as abundant as the vascular cover. *Picea engelmannii* seedlings (subalpine stands) and *Vaccinium scoparium* may be present within the dwarf-shrub stratum in trace quantities (<1% cover). Adjacent wetter sites may be dominated by *Carex aquatilis, Carex scopulorum, Caltha leptosepala*, or *Eleocharis palustris*. Adjacent upland vegetation is dominated by *Deschampsia caespitosa, Salix planifolia*, or *Abies lasiocarpa - Pinus albicaulis* forest (subalpine stands).

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The sampled stand of this association occurs on a valley floor in the mountains at an elevation of 2919 m (9578 feet). The moderately well-drained silty clay soils are covered predominantly by litter and duff; rocks greater than 10 cm, bare soil, gravel, mosses, and lichens are also present in small quantities. Adjacent vegetation includes an *Abies lasiocarpa - Pinus albicaulis* forest with *Vaccinium scoparium* dominating the understory.
Global Environment: This association is found in small patches on lakeshores, near springs, and below snowpatches in the lower alpine and on mountain valley floors in the subalpine Rocky Mountains of Colorado and northwestern Wyoming. Elevation ranges from 2919 to 3750 m (9578-12,300 feet). Sites are flat to gently sloping, stable and snow-covered in winter (Komarkova 1979).

Aspect is variable. Surface water is present for extended periods during the growing season but is absent by the end of the growing season in most years. Substrates vary from loess, with accumulations of organic matter, to moderately well-drained silty clay soils predominantly covered by litter and duff and rocks greater than 10 cm. In some Colorado stands, average pH of the surface horizon is 5.2. The pH increases with depth, and percent clay and organic matter, moisture-retention capacity and available water decrease sharply with depth (Carsey et al. 2003a, 2003b). Soils are often Cryaquents and may have significant cover of bare soil, gravel, mosses, and lichens.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an alpine herbaceous grassland community that occurs in mesic areas. The herbaceous layer is dominated by graminoids, particularly *Carex illota* (20% cover). Other common and well-represented graminoids (3-10% cover) include *Bromus* sp., *Carex nigricans*, *Carex paysonis*, *Deschampsia caespitosa*, and *Juncus* sp. Common and well-represented forbs (3-10% cover) include *Antennaria umbrinella*, *Pedicularis groenlandica*, and *Sibbaldia procumbens*. *Picea engelmannii* seedlings and *Vaccinium scoparium* are present within the dwarf-shrub stratum in trace quantities.

Global Vegetation: This association is characterized by a dense to moderately dense herbaceous layer dominated by *Carex illota* (alpine stands are often nearly a monoculture) with 20-70% cover (typically >50%). *Antennaria umbrinella*, *Caltha leptosepala*, *Castilleja rhexiifolia*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Packera dimorphophylla*, *Primula parryi*, *Pedicularis groenlandica*, *Phleum alpinum*, or *Saxifraga odontoloma* may have significant cover (1-30%), but often the cover of other graminoids and forbs is low (usually with less than 1%). Other associated species cover include *Bromus* sp., *Carex aquatilis*, *Carex nigricans*, *Carex paysonis*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Juncus drummondii*, *Rhodiola rhodantha*, and *Sibbaldia procumbens*. The shrub *Salix planifolia* may also be present with less than 1% cover. The nonvascular layer is highly developed and almost equally as abundant as the vascular cover. The moss *Philonotis fontana var. pumila (= Philonotis tomentella)* predominates in some stands, with *Warnstorfia exannulata (= Drepanocladus exannulatus)* constant and *Sphagnum warnstorfii* abundant (Komarkova 1979). *Picea engelmannii* seedlings (subalpine stands) and *Vaccinium scoparium* may be present within the dwarf-shrub stratum in trace quantities (<1% cover). Adjacent wetter sites may be dominated by *Carex aquatilis*, *Carex scopulorum*, *Caltha leptosepala*, or *Eleocharis palustris*. Adjacent upland vegetation is dominated by *Deschampsia caespitosa*, *Salix planifolia*, or *Abies lasiocarpa* - *Pinus albicaulis* forest (subalpine stands).

Global Dynamics: This association usually occurs in pristine, undisturbed, stable hydric sites (Komarkova 1979). *Carex illota* is considered of moderate palatability to cattle and sheep (Hermann 1970, as cited by Carsey et al. 2003b). Grazing value of this type, however, is limited by short summer seasons and wet soil conditions. In the alpine, growing under saturated conditions makes this community very susceptible to trampling and damage by livestock and heavy equipment (Hansen et al. 1988b). However, because of the very wet conditions, livestock usually avoid these sites and graze drier sites (Manning and Padgett 1995, as cited in Carsey et al. 2003b).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Antennaria umbrinella	Herb (field)	Forb	.	X	.
Pedicularis groenlandica	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Carex illota	Herb (field)	Graminoid	X	X	.
Carex nigricans	Herb (field)	Graminoid	X	X	.
Carex paysonis	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa	
Bromus sp.	dominant and characteristic graminoid
Juncus sp.	characteristic graminoid

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Antennaria umbrinella	Herb (field)	Forb	.	X	.
Pedicularis groenlandica	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Carex illota	Herb (field)	Graminoid	X	X	.
Carex nigricans	Herb (field)	Graminoid	.	X	.
Carex paysonis	Herb (field)	Graminoid	.	X	.
Carex scopulorum	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Eleocharis quinqueflora	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note
Bromus sp.	characteristic graminoid
Juncus sp.	characteristic graminoid

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GUQ (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Carex illota* (Bourgeron and Engelking 1994) =
- *Carex illota* (Campbell 1973) ?
- *Carex illota* Dominance Type (Hansen et al. 1988b) B
- *Carex illota* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex illota* Herbaceous Vegetation (Carsey et al. 2003b) =
- Association *Philonotido tomentellae - Caricetum illotae* (Komarkova 1976) (Komarkova 1979) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: Although *Carex illota* occurs widely in the western U.S., there are few reports of *Carex illota*-dominated communities. More survey work is needed to fully document its extent and relationship with other sedge communities.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs in a meadow near Surprise Lake.
Global Range: This plant association has been described from the southern and central Rocky Mountains but is likely to be more widespread since *Carex illota* is fairly common in the western U.S. and Canada.
Nations: US
States/Provinces: CO:SU, OR:S3, WY
TNC Ecoregions: 9:C, 10:C, 20:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331G:CC, M331H:CC, M331I:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B075
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Campbell 1973	.	X	X	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1988b	.	X	X	X	.	.	.	.	.
Hermann 1970	.	.	.	X	.	.	.	X	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Komarkova 1979	.	X	X	X	.	.	.	.	.
Manning and Padgett 1989	.	.	.	X	.	.	.	X	.

Scott 1966	.	.	.	X	X	.	.	.	.
Scott 1995	.	.	.	.	.	.	.	X	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1403 *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance

(Swollen-beak Sedge, Beaked Sedge) Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the upper midwestern United States and most western states as well as several Canadian provinces. Stands usually occur on wet mineral soil, muck, or shallow peat (<0.5 m). Standing water (generally stagnant) is present in the spring and after heavy rains, but the water table is generally below the surface for most of the growing season. This permits the breakdown of dead organic matter and the release of nutrients. Where stands are found along stream courses or lake margins, water levels may be more constant relative to stands in depressions or basins. This vegetation is dominated by tall wider-leaved sedges, with a mixture of forbs. Typical dominants include *Carex rostrata* or *Carex utriculata (= Carex rostrata var. utriculata)*, as well as *Carex vesicaria*. Further study is needed to clarify the floristic characteristics of this alliance.

Environment: Vegetation types within this alliance are commonly wet meadow communities that occur around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range from near sea level in California to 3230 m in Colorado. Occurrences are either adjacent to low-gradient streams in wide valley bottoms or associated with perennial seeps. The vegetation occurs in standing water or on sites that become relatively dry during the latter part of the growing season. Many sites are located in old beaver ponds that have filled with sediment. The surface may occasionally be mounded. Mounds result from a build-up of *Carex* spp. sod and downcutting of small channels by overland flow during spring runoff (Hansen et al. 1995).

A wide range of soils are associated with this alliance. Histosols are most common and often have organic accumulations greater than 1 m thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam. Mottling often occurs within a few centimeters of the surface. Water tables are typically at or above the soil surface throughout the growing season. Soil reaction is slightly acid to neutral (pH 6.5-7.0).

Communities are often part of a wetland mosaic, with *Salix monticola, Salix drummondiana*, and *Salix geyeriana* shrublands. Communities also occur adjacent to and intergrade with *Carex aquatilis* or *Eleocharis palustris* meadows. *Populus angustifolia* and *Picea pungens* riparian forests occur on adjacent stream terraces in narrower valleys. *Abies lasiocarpa - Picea engelmannii* forests and *Populus tremuloides* woodlands occur on adjacent hillslopes at higher elevations; *Pinus ponderosa* and *Populus tremuloides* forests and *Quercus gambelii* shrublands occur at lower elevations (Kittel et al. 1999b).

Vegetation: Vegetation types within this alliance are classified as seasonally flooded temperate grasslands. The vegetation is often characterized by nearly pure stands of *Carex utriculata* (20-98%). Other *Carex* species present include *Carex aquatilis, Carex vesicaria, Carex lenticularis, Carex atherodes*, and *Carex microptera*. Other graminoid species present are *Juncus balticus, Deschampsia caespitosa, Glyceria striata*, and *Calamagrostis canadensis*. Forb cover ranges from 0-40%. Species include *Epilobium ciliatum, Polygonum amphibium, Comarum palustre (= Potentilla palustris)*, and *Ranunculus gmelinii*. The layer of fern allies is typically dominated by either *Equisetum fluviatile* or *Equisetum arvense* with percent cover up to 80%. Willow carrs are often adjacent, and a few scattered willows can occur within a *Carex utriculata* stand, such as *Salix monticola, Salix drummondiana, Salix geyeriana*, or *Salix planifolia*.

Dynamics: *Carex utriculata* vegetation types occur on the wettest sites of the riparian or wetland area, such as low-lying swales, and shallow margins of lakes and ponds, often in standing water. The community is early seral and is known to invade margins of newly formed beaver ponds, as well as the freshly exposed silt beds of drained beaver ponds (Padgett et al. 1989). With time, these types will grade into *Carex aquatilis* and *Calamagrostis canadensis* types. *Calamagrostis canadensis* dominates the driest sites with the lowest water tables and colonizes drying stands of *Carex utriculata* and *Carex aquatilis* (Cooper 1986a).

Successional shifts in species composition is often initiated by a change in the physical environment of the riparian area. Flooding events result in sediments deposited on the floodplain, raising the surface higher above the water table (Cooper 1986a). As aggradation, or build up, of the floodplain proceeds, the site becomes drier and the dominant graminoid cover changes.

Abandoned beaver ponds also go through a similar succession. With time, ponds fill in with silt, and *Carex utriculata* establishes on the new, saturated substrate. As the site becomes firm and raised above the old pond level, *Carex aquatilis* and *Calamagrostis canadensis* become established in the undergrowth. Depending on site characteristics, various willow species may become established in the overstory as well, creating the ~*Salix monticola / Carex utriculata* Shrubland (CEGL002657)$$ and the ~*Salix geyeriana / Calamagrostis canadensis* Shrubland (CEGL001205)$$, for example.

Distance from the stream channel can also differentiate the graminoid spatially within the riparian mosaic. *Carex utriculata* commonly occurs at the stream channel edge where the water table is close to or at the surface. As the floodplain surface becomes higher with increased distance from the channel edge, the ground becomes slightly less saturated and shifts to mesic meadows of *Carex aquatilis*, or on higher surfaces, to slightly drier meadows of *Calamagrostis canadensis* (Kittel et al. 1999b).

Similar Alliances:
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is circumboreal and widely distributed throughout the midwestern and western United States. In the Midwest, the alliance is found in Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin. In the West, the alliance occurs from Washington to Montana and south to Nevada, Arizona, and New Mexico. It also is reported from Alberta, Canada.

Nations: CA, US

Subnations: AB, AZ?, CA, CO, IA, ID, MB, ME, MI, MN, MT, ND, NM, NV, ON, OR, SD, UT, WA, WI, WY

TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 26:C, 34:C, 35:C, 46:C, 47:C, 48:C, 68:P, 81:P

USFS Ecoregions: 212Ha:CCP, 212Hb:CCP, 212He:CCP, 212Hh:CCP, 212Hi:CCP, 212Hj:CCC, 212Hk:CCP, 212Hn:CCP, 212Ho:CCP, 212Hq:CCP, 212Hr:CCP, 212Hs:CCP, 212Ht:CCP, 212Hu:CCC, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ib:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Jd:CCC, 212Je:CC?, 212Jf:CCP, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCP, 212Jo:CCP, 212Jr:CCP, 212Ka:CCC, 212La:CPP, 212Lb:CPP, 212Lc:CPP, 212Ld:CPP, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 222Lb:CCC, 251Ab:CCC, 251B:CC, 331D:CC, 331G:CC, 332:?, 341B:CC, 342B:CC, 342D:CC, 342I:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:C?, M341B:CC, M341C:CC

Federal Lands: NPS (Curecanti, Florissant Fossil Beds, Glacier, Grand Teton, Isle Royale, Rocky Mountain, Sequoia, Voyageurs, Yosemite, Zion); PC (Waterton Lakes); USFS (Bighorn, Inyo, Medicine Bow, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver

References: Andrews 1983, Baker 1983a, Benedict 1983, Brown 1982, Carsey et al. 2003a, Carsey et al. 2003b, Cooper 1986a, Cronquist et al. 1977, Faber-Langendoen et al. 1996, Franklin and Dyrness 1973, Gleason and Cronquist 1991, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hermann 1970, Hess and Wasser 1982, Johnston 1987, Kartesz 1994a, Kartesz 1999, Kearney et al. 1969, Kerr and Henderson 1979, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Looman 1982, MNNHP 1993, Mattson 1984, Mutel 1973, Mutel 1976, Mutel and Marr 1973, Mutz and Graham 1982, Mutz and Queiroz 1983, Nachlinger 1985, Norton et al. 1981, Ownbey and Morley 1991, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley and Robbins 1909, Sawyer and Keeler-Wolf 1995, Schlatterer 1972, Seyer 1979, Tuhy 1981, Tuhy and Jensen 1982, Voss 1972, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001562] *Carex utriculata* Herbaceous Vegetation

Translated Name: **Beaked Sedge Herbaceous Vegetation**

Common Name: **Beaked Sedge Wet Meadow**

Ecological System(s):
- Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
- Boreal Wet Meadow (CES103.873)
- North American Arid West Emergent Marsh (CES300.729)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Northern Columbia Plateau Basalt Pothole Ponds [Provisional] (CES304.058)
- Rocky Mountain Subalpine-Montane Fen (CES306.831)
- Temperate Pacific Freshwater Emergent Marsh (CES200.877)

Status: Standard **Circumscription Confidence:** 1 - Strong

Concept Author(s): K.A. Schulz, mod. G. Kittel

ELEMENT CONCEPT

Global Summary: This wetland association is found throughout much of the western U.S. Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. Sites are flat to undulating, often with a hummocky microtopography. The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association. The vegetation is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis*, *Carex canescens*, *Carex lenticularis*, *Carex aquatilis*, and *Carex*

microptera, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis, Eriophorum angustifolium, Glyceria striata*, and *Juncus balticus*. The sparse forb cover can include *Geum macrophyllum, Fragaria virginiana, Mentha arvensis*, and *Mimulus guttatus*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. This association is distinguished from ~*Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803)$$ by the dominance of *Carex utriculata*. *Carex aquatilis*, if present, is not more than one-third of the total cover.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: This association occurs in palustrine areas on the valley floor, including channels or terraces; the elevations of the stands range from 6800 to 7000 feet. These stands are situated in hydrologic regimes ranging from temporarily flooded to permanently flooded. One stand has a small stream running through it. Where data are available, soils vary between clay loams and silt loams; the soil texture of one permanently flooded stand could not be determined because of a deep layer of organic matter. If standing water is not present, the nonvegetated ground cover is composed primarily of litter and duff. Adjacent vegetation is generally comprised of *Salix* spp., mixed graminoid/forb meadows, *Nuphar lutea* wetlands, *Populus tremuloides* woodlands, *Pinus contorta* forests, mixed coniferous forests, or *Artemisia tridentata* shrublands.

Global Environment: This wetland association is found throughout much of the western U.S. Elevation ranges from 1060 to 3230 m (3500-10,600 feet). Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains (Kittel et al. 1999b). Sites are flat to undulating, often with a hummocky microtopography (Kovalchik 1993). The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association ranging from saturated organics or fine silty clays to clays over cobbles and alluvium to fine-loamy and sandy-skeletal, with an organic surface layer. Many stands occur on organic muck or peat soils. Mottling and gleying often occur near the surface because of the high water table.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane riparian community. Trees and shrubs are generally absent from these stands, usually occurring in trace amounts as encroachment from adjacent stands. *Carex utriculata* is the dominant species in the herbaceous layer, generally composing 50 to 99% of the canopy cover, although occasionally with 30% canopy cover or less. No other species occur in more than 25 percent of the sampled stands.

Global Vegetation: This plant association is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis, Carex canescens, Carex lenticularis, Carex microptera, Carex nebrascensis*, and *Carex scopulorum*, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis, Deschampsia caespitosa, Eriophorum angustifolium, Glyceria striata*, and *Juncus balticus*. Sparse forb cover may include *Epilobium* spp., *Geum macrophyllum, Fragaria virginiana, Mentha arvensis, Mimulus guttatus*, and *Polemonium occidentale*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. *Salix monticola, Salix drummondiana, Salix geyeriana, Salix planifolia, Salix wolfii*, and *Salix exigua* are common species.

Global Dynamics: *Carex utriculata* is a widespread species that colonizes recently formed pond edges and seasonally flooded areas near streams. Once established it is long-lived and will dominate sites unless disturbed with changes in site hydrology. Soil development (over time) may decrease soil moisture and allow other species to replace it (Manning and Padgett 1995).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex utriculata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex utriculata	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Juncus spp.	Characteristic

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Linaria vulgaris	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)

Global Related Concepts:
- *Carex aquatilis* - *Carex utriculata* Vegetation Type (Achuff et al. 2002a) I
- *Carex rossii* Community (Franklin and Dyrness 1973) =
- *Carex rostrata* - *Carex aquatilis* Community Type (Tuhy and Jensen 1982) B
- *Carex rostrata* (Bourgeron and Engelking 1994) =
- *Carex rostrata* Association (Benedict 1983) =
- *Carex rostrata* Community Type (Manning and Padgett 1995) =
- *Carex rostrata* Community Type (Youngblood et al. 1985b) ?
- *Carex rostrata* Community Type (Mutel 1973) ?
- *Carex rostrata* Community Type (Youngblood et al. 1985a) ?
- *Carex rostrata* Community Type (Norton et al. 1981) ?
- *Carex rostrata* Community Type (Padgett et al. 1989) =
- *Carex rostrata* Community Type (Padgett et al. 1988b) =
- *Carex rostrata* Habitat Type (Hall and Hansen 1997) B
- *Carex rostrata* Habitat Type (Hansen et al. 1995) B
- *Carex rostrata* Habitat Type, *Carex rostrata* Phase (Mattson 1984) =
- *Carex rostrata* Transitions Community Type (Mutz and Graham 1982) B
- *Carex utriculata* Association (Kovalchik 1993) =
- *Carex utriculata* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Carisetum rostratae* Association (Nachlinger 1985) =
- Beaked Sedge Association (Kovalchik 1987) =
- DRISCOLL FORMATION CODE:V.B.4.a. (Driscoll et al. 1984) B
- Natural Wet Meadows (Mutel 1976) B
- Wet Meadows (Andrews 1983) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) description extremely well.

Grand Teton National Park Other Comments:

Global Classification Comments: *Carex rostrata var. utriculata* (Boott) Bailey was recognized as a distinct species from *Carex rostrata* Stokes and named *Carex utriculata* Boott (Kartesz 1999). This taxonomic change has led to confusion in some of the earlier vegetation classification literature where no distinction was made between the subspecies. ~*Carex utriculata* Herbaceous Vegetation (CEGL001562)$$ is known only from the western U.S., and for now, *Carex rostrata* communities are known only from the midwestern U.S. and Canada. According to Kartesz (1999), *Carex rostrata* is reported from most of Canada, some Great Lakes states, and Montana, Idaho, and Washington in the western U.S. There is significant overlap in the species ranges, and additional survey work is needed to help clarify this.

This association (CEGL001562) is distinguished from the mixed ~*Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)$$ and ~*Carex aquatilis* Herbaceous Vegetation (CEGL001802)$$ by having a clear dominance of *Carex utriculata*. *Carex aquatilis* can be present but can have no more than one-third the cover of *Carex utriculata*. ~*Carex aquatilis* Herbaceous Vegetation (CEGL001802)$$ can have up to one-third the cover by *Carex utriculata*; in both cases the dominant sedge is at least two-thirds the total cover in the stand. In ~*Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)$$, there is an even mix, such that the two species have even abundance and distribution throughout the stand, so that it is difficult to say one is more dominant over the other. In addition, *Carex utriculata* occurs on wetter sites than *Carex aquatilis*-dominated stands and often, but not exclusively, occupies organic soils.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association can be found in the appropriate habitat throughout the park.
Global Range: This wetland association in found at montane and subalpine elevations throughout much of the western U.S.
Nations: CA, US

States/Provinces: AB, AZ?, CA:S4, CO:S4, ID:S4, MT:S5, NM:S3, NV, OR:S4, UT:S3S4, WA:S3S4, WY:S3
TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:P, 81:P
TNC Ecoregion Comments: ECO7:C, ECO8:C, ECO9:C, ECO26:C, ECO4:C, ECO5:C, ECO19:C, ECO68:P, ECO81:P added (MSR 2-04). ECO12 added (mjr 2-03). ECO18 added (KAS 6-01).
USFS Ecoregions: 331D:CC, 331G:CC, 341B:CC, 342B:CC, 342I:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:C?, M341B:CC, M341C:CC
Federal Lands: NPS (Curecanti, Florissant Fossil Beds, Glacier, Grand Teton, Rocky Mountain, Sequoia, Yosemite, Zion); PC (Waterton Lakes); USFS (Bighorn, Inyo, Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C011, GT-0202100, GT-0203001
Accuracy Assessment Points: 04J100, 04J233, 04R062, 04R127, 04R155, 04R156, 04R157, 04R223, 04R335, 04X404, 04X408, 04X455, 04X506, 04X522, 04X527
Other plots within park boundaries, from other projects: GT-tm1b, GT-GRTEsrm_BeaverCre
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): K.A. Schulz, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Andrews 1983	.	X	X	X	.	.	.	.	.
Baker 1983a	.	X	.	X	.	.	.	.	.
Benedict 1983	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Franklin and Dyrness 1973	.	X	X	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	.	.	.	.	.
Halpern 1986	.	.	.	X	X	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Hess and Wasser 1982	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kartesz 1999	.	.	.	X	.	.	.	.	.
Kerr and Henderson 1979	.	X	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	.	.	.	.	.	.
Kovalchik 1987	.	X	X	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
Looman 1982	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	X	.	.	.	.	.
Mattson 1984	.	X	X	X	.	.	.	.	.
Mutel 1973	.	X	X	X	.	.	.	.	.
Mutel 1976	.	X	X	X	.	.	.	.	.
Mutel and Marr 1973	.	X	.	X	.	.	.	.	.
Mutz and Graham 1982	.	X	X	X	.	.	.	.	.

Mutz and Queiroz 1983	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Nachlinger 1985	.	X	X	X	.	.	.	.	.
Norton et al. 1981	.	X	X	X	.	.	.	.	.
Padgett 1982	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	X	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Ramaley 1919a	.	X	.	X	.	.	.	.	.
Ramaley and Robbins 1909	.	X	.	X	.	.	.	.	.
Schlatterer 1972	.	X	.	X	.	.	.	.	.
Seyer 1979	.	X	.	X	.	.	.	.	.
Taylor 1984	.	.	.	X	X	.	.	.	.
Tuhy 1981	.	X	.	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Wohl and Hammack 1995	.	.	.	X	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	X	X	.	.	.	.	.

A.1404 *Carex aquatilis* Seasonally Flooded Herbaceous Alliance

Aquatic Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found from the western Great Lakes to the western United States. This description is based on the one community that occurs in the Midwest. Stands typically occur in depressions or around ponds or lakes, although they sometimes can be found adjacent to streams or rivers. The sites on which it develops are flooded for some time during the growing season in most years. *Carex aquatilis*-dominated stands were found in the northern Great Plains on mostly mineral soils in fresh or slightly saline shallow marshes. The vegetation is dominated by graminoids approximately 0.4-0.7 m tall. *Carex* spp. predominate, especially *Carex aquatilis*, and often include *Carex rostrata, Carex lacustris*, and *Carex stricta*. *Eleocharis palustris, Polygonum amphibium, Scirpus* spp., and *Typha* spp. may all be found in stands of this alliance. *Scolochloa festucacea* may be found in drier stands. Woody species are rare. If present, they are shrubs such as *Salix* spp.

Environment: Vegetation types within this common, widespread alliance occur as large meadows in high montane valleys or as narrow strips bordering ponds and streams at lower elevations. Elevations range from near sea level in California to 3500 m in Colorado. Stands occur in a variety of landforms, but the largest expanses occur in broad, low-gradient valleys where large snowmelt-fed swales and slopes dominate the landscape. Stands also occur in fine sediments at the margins of lakes, silted-in beaver ponds, or depressions left by migrating stream channels. Looman (1981a, 1982) found *Carex aquatilis*-dominated stands in the northern Great Plains on mostly mineral soils in fresh or slightly saline shallow marshes. Soils are typically Histosols. Mollisols are less frequently associated with this alliance. Soil texture varies from clay to sandy loam. Water tables are at or near the soil surface throughout the year. Soil pH ranges from 6.0-7.0 (Hansen et al. 1995).

Vegetation in the alliance usually occurs in a mosaic of riparian plant associations, such as *Salix planifolia, Salix wolfii*, and *Salix monticola - Salix geyeriana* shrublands and *Carex utriculata* wetlands in adjacent standing water. *Abies lasiocarpa - Picea engelmannii* forests and alpine fellfields occur on adjacent hillslopes at higher elevations (Kittel et al. 1999b).

Vegetation: Vegetation types within this alliance are classified as seasonally flooded temperate grasslands. Vegetation types are characterized by a dense, rhizomatous meadow of *Carex aquatilis* (50-80%), usually accompanied a few other graminoids species such as *Calamagrostis canadensis* or *Deschampsia caespitosa*. *Carex utriculata* is often present with 10-30% cover. A few forbs are commonly present, with percent cover ranging from 10-25%. Forb species include *Pedicularis groenlandica, Caltha leptosepala, Symphyotrichum foliaceum (= Aster foliaceus), Urtica dioica*, and *Epilobium ciliatum*. The fern layer is typically dominated by *Equisetum variegatum* with percent cover up to 40%. Willow carrs are often adjacent. A few scattered willows occur within the *Carex aquatilis* stand, such as *Salix monticola, Salix drummondiana, Salix geyeriana*, and *Salix planifolia*. In the subalpine stands *Abies lasiocarpa* and *Picea engelmannii* occur with up to 10% cover (Hansen et al. 1995, Kittel et al. 1999b).

Dynamics: Presence of *Carex utriculata* may indicate the site has progressed from the more wet *Carex utriculata* type to the current more mesic conditions, and may become dominated by *Salix planifolia* or *Salix wolfii* (Youngblood et al. 1985b). Wilson (1969) reports that *Carex aquatilis* associations trap sediment from overbank flows which forms a clay pan, eventually raising the water table. This process drives retrogressive succession and a plant association dominated by *Carex utriculata* often takes over on these sites (Wilson 1969).

Similar Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex aquatilis* var. *dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is circumboreal widely ranging throughout the midwestern and western United States. This alliance is found in the Midwest in Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin. In the West, the alliance occurs from Washington to Montana and south to Nevada, Arizona, and New Mexico. It also occurs in Alberta, Canada.
Nations: CA, US
Subnations: AB, AZ?, CA, CO, ID, MB?, MI, MN, MT, NB?, ND, NM, NV, ON, OR, SD, UT, WA, WY
TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 20:C, 26:C, 34:C, 35:C, 48:C, 68:C
USFS Ecoregions: 222Jf:CCC, 222Jh:CCC, 222Na:C??, 251Aa:CCP, 251Ab:CC?, 331D:CC, 331E:CC, 331F:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC
Federal Lands: NPS (Florissant Fossil Beds, Glacier, Grand Teton, Rocky Mountain, Yosemite); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Gunnison, Medicine Bow, Pike-San Isabel, San Juan, Shoshone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Andrews 1983, Baker 1983a, Baker 1983c, Baker 1984a, Baker and Kennedy 1985, Bierly 1972, Briggs and MacMahon 1983, Bunin 1975c, Carsey et al. 2003a, Carsey et al. 2003b, Cox 1933, Cronquist et al. 1977, Faber-Langendoen et al. 1996, Giese 1975, Hall 1971, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hermann 1970, Hess 1981, Hess and Wasser 1982, Hickman 1993, Johnson 1932a, Johnson 1932b, Johnson 1936, Johnson 1939, Johnston 1987, Kartesz 1999, Kearney et al. 1969, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Langenheim 1962, Lewis 1970, Looman 1981a, Looman 1982, Mattson 1984, Mutel 1976, Norton et al. 1981, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1920, Robbins 1918, Sanderson and Kettler 1996, Terwilliger et al. 1979a, Tuhy 1981, Tuhy and Jensen 1982, Wilson 1969, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001802] *Carex aquatilis* Herbaceous Vegetation

Translated Name: **Aquatic Sedge Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Boreal Wet Meadow (CES103.873)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This common, widespread herbaceous vegetation occurs as large, mesic meadows in high montane valleys or as narrow strips bordering ponds and streams at lower elevations throughout the western U.S. It occurs in a variety of environmental settings in the montane and subalpine zones. Some of the largest expanses occur in broad, low-gradient valleys where large snowmelt-fed swales and slopes dominate the landscape. It can also grow in fine sediments at the margins of lakes and beaver ponds. Presence of *Carex aquatilis* typically indicates wet soils with high organic matter or histic epipedons. This plant association is characterized by a dense rhizomatous meadow of *Carex aquatilis* (10-80% cover), usually accompanied by a few other graminoids species such as *Calamagrostis canadensis, Deschampsia caespitosa, Juncus balticus,* and *Poa palustris*. *Eleocharis quinqueflora* can be abundant on organic substrates at high elevations. Woody species rarely occur in these sites. A clear dominance by *Carex aquatilis* and low cover of *Carex utriculata* or *Pedicularis groenlandica* set this plant association apart from closely related types.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: One sampled stand representing this association occurs on a level flood plain at an elevation of approximately 6800 feet, and four occur in seasonally-flooded depressions on the valley floor at elevations of 6900 to 7400 feet. Soil data is available for one stand; the soils are very deep and poorly-drained Cryaquolls that formed in alluvium. All environmental data for this stand were determined by use of the Soil Survey of Teton County, Wyoming, Grand Teton National Park Area (Young, 1982). Unspecified forests surround two stands, and a willow shrubland surrounds another stand.

Global Environment: This plant association occurs in a variety of valley types, but the largest expanses occur in broad, low-gradient valleys where large snowmelt-fed swales and slopes dominate the landscape. It can also grow in fine sediments at the margins of lakes and beaver ponds. These palustrine wetlands have a range of hydrologic regimes, though all stands are saturated for a significant enough period during the growing season to cause a build up of organic material in the soil. Soils are organic mucks and peats and are poorly to very poorly drained.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane herbaceous wetland that occurs in mesic areas. Only graminoids are present within the four of the five stands. *Carex aquatilis* is dominant with 40 to 70% canopy cover. *Carex utriculata* (7 to 12 % cover) and *Deschampsia caespitosa* (1 to 20%cover) are found in the majority of the stands.

Global Vegetation: This plant association is characterized by a dense rhizomatous meadow of *Carex aquatilis* (10-80% cover), usually accompanied by a few other graminoids species such as *Calamagrostis canadensis* (1-40%) or *Deschampsia caespitosa* (1-16%), *Juncus balticus*, and *Poa palustris*. *Eleocharis quinqueflora* can be abundant on organic substrates (1-49% cover) at high elevations. *Carex utriculata* (1-20% cover) may be present. When present, *Carex utriculata* is usually not more than one-third the cover of *Carex aquatilis* cover. If it is more than that, the stand may be classified as ~*Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)$$ or ~*Carex utriculata* Herbaceous Vegetation (CEGL001562)$$. Forbs are often present, although sometimes inconspicuous (generally <10%, but can be as high as 40%). Species include *Epilobium* spp., *Pedicularis groenlandica, Caltha leptosepala, Menyanthes trifoliata, Cardamine cordifolia*, and *Mertensia ciliata*. Shrubs and trees have been observed invading the wetland from surrounding areas, including *Betula nana, Salix maccalliana*, and *Picea engelmannii*.

Global Dynamics: Overgrazing by livestock can dry the site, increase non-native grass cover, and reduce the vigor of root structure. The wet and often saturated soils of this plant association are also vulnerable to compaction by livestock and heavy equipment. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen et al. 1995). Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing is not recommended because if there are adjacent willows, they are vulnerable to pruning damage due to limited regrowth before the end of the growing season (Kovalchik and Elmore 1992, Hansen et al. 1995).

Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams aid in controlling channel downcutting, streambank erosion, and downstream movement of sediment. Beaver dams raise the water table and provide water for hydrophytic plants including willows and sedges. The trapping of sediment behind beaver dams, along with plant reproduction, raises the channel bed and creates a wetland environment. Land managers should consider maintaining beaver activity in an area versus their removal (Hansen et al. 1995).

Burning of this plant association temporarily increases the productivity of *Carex utriculata* and *Carex aquatilis*. However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after burning. This is necessary in order to keep livestock from damaging young, palatable regrowth and to allow for root reserve build up. Prescribed burning is also an effective method of rejuvenating decadent clumps of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow-burning fires can actually damage the plants (Hansen et al. 1995).

Presence of *Carex utriculata* may indicate the site has progressed from the more wet *Carex utriculata* community to the current less mesic conditions, and may become dominated by *Salix planifolia* or *Salix wolfii* (Youngblood et al. 1985a). Wilson (1969) reports that *Carex aquatilis* associations trap sediment from overbank flows which forms a clay pan, eventually raising the water table. This process drives retrogressive succession, and a plant association dominated by *Carex utriculata* takes over on these sites (Wilson 1969).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex aquatilis	Herb (field)	Graminoid	X	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex aquatilis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Epilobium spp.	Dominant and diagnostic forbs

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803)
- *Carex aquatilis - Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826)
- *Carex limosa* Herbaceous Vegetation (CEGL001811)
- *Carex praegracilis - Carex aquatilis* Herbaceous Vegetation (CEGL001821)

Global Related Concepts:
- *Carex aquatilis - Carex utriculata* Vegetation Type (Achuff et al. 2002a) I
- *Carex aquatilis* (Bourgeron and Engelking 1994) =
- *Carex aquatilis* Association (Kovalchik 1993) =
- *Carex aquatilis* Association (Crowe and Clausnitzer 1997) =
- *Carex aquatilis* Community Type (Manning and Padgett 1995) =
- *Carex aquatilis* Community Type (Cooper and Cottrell 1990) =
- *Carex aquatilis* Community Type (Girard et al. 1997) =
- *Carex aquatilis* Community Type (Youngblood et al. 1985a) =
- *Carex aquatilis* Community Type (Padgett et al. 1989) =
- *Carex aquatilis* Habitat Type (Hansen et al. 1995) =
- *Carex aquatilis* Habitat Type (Hansen et al. 1988b) =
- *Carex aquatilis* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Carex aquatilis* Plant Association (Sanderson and Kettler 1996) =
- *Carex aquatilis* Plant Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex aquatilis* Plant Herbaceous Vegetation (Carsey et al. 2003b) =
- *Carex aquatilis-Carex aquatilis* Habitat Type (Mattson 1984) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Carex aquatilis* Community Type very well.
Grand Teton National Park Other Comments:
Global Classification Comments: This association (CEGL001802) is distinguished from ~*Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803)$$ and ~*Carex aquatilis - Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804)$$ by the dominance of *Carex aquatilis*. If *Carex utriculata* is present, it is no more than one-third of the total cover.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand of this association occurs east of Pilgrim Creek near Willow Flats, two occur north of the String Lake Road/Junction, and two occur in the John D. Rockefeller Parkway.

Global Range: This association is common and located in mountainous areas throughout the western U.S. and Canada.
Nations: CA, US
States/Provinces: AB, AZ?, CA:S3, CO:S4, ID:S4, MT:S4, NM:S4, NV, OR:S4, UT:S3?, WA:S3, WY:S3
TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:C
TNC Ecoregion Comments: ECO5, RECO18, ECO19 added (mjr 7-05). ECO7:C, ECO8:C, ECO9:C, ECO68:C, ECO4:C, ECO12:C added (MSR 2-04).
USFS Ecoregions: 331D:CC, 331E:CC, 331F:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC
Federal Lands: NPS (Florissant Fossil Beds, Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:
GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: None
Accuracy Assessment Points: 04R216, 04J229, 04J230, 04J093
Other plots within park boundaries, from other projects: GT-tm1a
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Achuff et al. 2002a	.	X	X	.	.	.	.	.	.
Baker 1983c	.	X	.	X	.	.	.	.	.
Baker 1984a	.	X	.	X	.	.	.	.	.
Baker and Kennedy 1985	.	X	.	X	.	.	.	.	.
Bierly 1972	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Briggs and MacMahon 1983	.	X	.	X	.	.	.	.	.
Bunin 1975c	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	X	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	X	.	.	.	.	.	.
Cox 1933	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Giese 1975	.	X	.	X	.	.	.	.	.
Girard et al. 1997	.	X	X	.	.	.	.	.	.
Hall 1971	.	X	.	X	.	.	.	.	.
Hansen et al. 1988b	.	.	X	.	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Hess and Wasser 1982	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnson 1932a	.	X	.	X	.	.	.	.	.
Johnson 1932b	.	X	.	X	.	.	.	.	.
Johnson 1936	.	X	.	X	.	.	.	.	.
Johnson 1939	.	X	.	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Komarkova 1976	.	X	.	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
Kovalchik and Elmore 1992	.	.	.	X	.	.	.	.	.
Lewis 1970	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	X	X	X	.	.	.	.	.
Mattson 1984	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Norton et al. 1981	.	X	.	X	.	.	.	.	.
Padgett and Manning 1988	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Ramaley 1919a	.	X	.	X	.	.	.	.	.
Ramaley 1920	.	X	.	X	.	.	.	.	.
Robbins 1918	.	X	.	X	.	.	.	.	.
Sanderson and Kettler 1996	.	X	X	X	.	.	.	.	.
Terwilliger et al. 1979a	.	X	.	X	.	.	.	.	.
Tuhy 1981	.	X	.	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	.	X	.	.	.	.	.

WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Wilson 1969	.	.	.	X	.	.	.	.	.
Young 1982	.	.	.	X	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

A.1413 *Carex buxbaumii* Seasonally Flooded Herbaceous Alliance

Brown Bog Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within these seasonally flooded, temperate or subpolar grasslands are found in peat bogs, marshes, and wet meadows from near sea level in the Pacific Northwest to moderately high (3200 m) elevations in the Rocky Mountains. Types occur in moderately broad valley bottoms in wet meadows or fens. Soils are mineral with accumulations of well-decomposed organic matter throughout the upper soil horizon. Wet stands may have accumulations of organic matter 20-35 cm thick overlying clayey mineral soils, resulting in a perched water table. Occurrences are widespread but uncommon. Vegetation types within this alliance are dominated by *Carex buxbaumii* with greater than 25% cover in the graminoid stratum. *Carex aquatilis*, *Carex saxatilis*, and *Carex utriculata* are present and occasionally codominant. *Deschampsia caespitosa*, *Caltha leptosepala*, *Pedicularis groenlandica*, and *Ligusticum tenuifolium* are among the common associates typically present in minor cover. Adjacent wetlands are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. Adjacent upland communities are *Pinus contorta* or *Picea engelmannii* forests.
Environment: Vegetation types within this alliance are found in peat bogs, marshes, and wet meadows from near sea level in the Pacific Northwest to moderately high (3200 m) elevations in the Rocky Mountains. Occurrences are widespread but uncommon. Types occur in moderately broad valley bottoms in wet meadows or fens. Soils are mineral with accumulations of well-decomposed organic matter throughout the upper soil horizon. Wet stands may have accumulations of organic matter 20-35 cm thick overlying clayey mineral soils, resulting in a perched water table (Mattson 1984). Adjacent wetlands are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. Adjacent upland communities are *Pinus contorta* or *Picea engelmannii* forests.
Vegetation: Vegetation types within this alliance are classified as seasonally flooded, temperate or subpolar grasslands. Vegetation types are dominated by *Carex buxbaumii* with greater than 25% cover in the graminoid stratum. *Carex aquatilis*, *Carex saxatilis*, and *Carex utriculata* are present and occasionally codominant. *Deschampsia caespitosa*, *Caltha leptosepala*, *Pedicularis groenlandica*, and *Ligusticum tenuifolium* are among the common associates typically present in minor cover (Padgett et al. 1989).
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described for Idaho, Montana, northwestern Wyoming, and Utah. The species is circumboreal and widespread throughout the western United States, however, it is relatively uncommon (Cronquist et al. 1977). This alliance likely occurs in Colorado, California, Oregon, and Washington, and possibly Alberta, Canada.
Nations: CA?, US
Subnations: AB?, CO, ID, MT, UT, WY
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 68:P
USFS Ecoregions: 342C:CC, 342D:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Yellowstone)

ALLIANCE SOURCES

Author(s): D. Culver
References: Cronquist et al. 1997, Hansen et al. 1988b, Mattson 1984, Moseley et al. 1991, Moseley et al. 1994, Padgett et al. 1989, Pierce 1986, Pierce and Johnson 1986, Tuhy 1981

[CEGL001806] *Carex buxbaumii* Herbaceous Vegetation

Translated Name: **Brown Bog Sedge Herbaceous Vegetation**
Common Name: **Buxbaum's Sedge Wet Meadow**
Ecological System(s):
- Rocky Mountain Subalpine-Montane Fen (CES306.831)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): K.A. Schulz

ELEMENT CONCEPT

Global Summary: This vegetation has been found in fens and wet meadows in the mountains of Utah, Idaho, Montana, and western Wyoming at elevations 1700-3200 m. Sites are flat and range from moderately broad valley bottoms to forest openings. Size of wetland is dependent on the presence of permanently saturated soils and it often occurs along streams and in the wettest portion of the wetland complex. Soils are mineral from alluvium with accumulations of well-decomposed organic matter throughout the upper soil horizon (20-50 cm deep). Stands have a dense perennial graminoid layer characterized by 25% or more cover of *Carex buxbaumii*. *Carex aquatilis, Carex saxatilis* and *Carex utriculata* are usually present and occasionally codominant. Other common species include *Deschampsia caespitosa, Caltha leptosepala, Pedicularis groenlandica*, and *Ligusticum tenuifolium*. Occasional shrubs such as *Salix planifolia (= Salix phylicifolia), Vaccinium uliginosum (= Vaccinium occidentale),* and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)* may be scattered in the stand. Adjacent stands are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. This vegetation is separated from adjacent wetlands by the dominance or codominance of *Carex buxbaumii*. GRTE information not added to Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Global Environment: This vegetation has been found in fens and wet meadows in the mountains of Utah, Idaho, Montana, and western Wyoming at elevations of 1046-3200 m (3430-10,500 feet). Sites are flat and range from moderately broad valley bottoms to forest openings. Size of wetland is dependent on the presence of permanently saturated soils, and it often occurs along streams and in the wettest portion of the wetland complex. Soils are mineral from alluvium with accumulations of well-decomposed organic matter throughout the upper soil horizon (20-50 cm deep).

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur close together in a channel at an elevation of 6900 feet. All stands occur in or near streams where standing water occurs. Recent fire disturbance has occurred to all stands and surrounding areas. *Pinus contorta* regeneration occurs adjacent to one stand.

VEGETATION DESCRIPTION

Global Vegetation: Stands have a dense perennial graminoid layer characterized by 25% or more cover of *Carex buxbaumii*. *Carex aquatilis, Carex saxatilis*, and *Carex utriculata* are usually present and occasionally codominant. Other common species include *Deschampsia caespitosa, Caltha leptosepala, Pedicularis groenlandica*, and *Ligusticum tenuifolium*. Occasional shrubs, such as *Salix planifolia (= Salix phylicifolia), Salix drummondiana, Vaccinium uliginosum (= Vaccinium occidentale),* and *Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda),* may be scattered in the stand. Adjacent areas are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. This vegetation is separated from adjacent wetlands by the dominance or codominance of *Carex buxbaumii*.

GRAND TETON NATIONAL PARK Vegetation: This association is a montane wet herbaceous meadow that occurs on permanently flooded sites. Two stands have a small shrub component dominated by *Vaccinium uliginosum* (3% cover). Total herbaceous cover ranges from 40 to 50%. Graminoids dominate all stands with forbs only being documented in a single stand. *Carex buxbaumii*, occurring, in shallow water, dominates with 30 to 50% cover. Where water is deeper *Carex lasiocarpa* dominates with 1 to 12 % cover. *Deschampsia caespitosa* occurs in all stands and *Calamagrostis canadensis, Carex aquatilis, Carex vesicaria,* and *Carex utriculata* occur in two of three stands.

Global Dynamics:

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex buxbaumii	Herb (field)	Graminoid	X	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK MOST ABUNDANT SPECIES

Stratum	Species
GRAMINOID	*Carex buxbaumii, Carex lasiocarpa*

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: N/A

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (3-Jan-2000). This naturally rare wetland vegetation is found in mountains of Utah, Idaho, Montana, and western Wyoming. Although it occurs over relatively wide range, stands are uncommon. Stands typically occur on valley bottoms were the water table is at or near the surface. Soil have a surface organic layer and are saturated seasonally. Habitats are similar to those of the more common *Carex aquatilis* wetland. These wetlands are threatened by presence of invasive non-native plants, and human activity which results in alterations of natural wetland processes, such as diversions, pumping ground water, roads, and clear cutting. Soils are usually too wet for livestock, but alteration of hydrology causing dewatering may result in increased cattle use and invasion of introduces forage species from pastures.

RELATED CONCEPTS

Global Similar Associations:
- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)

Global Related Concepts:
- *Carex buxbaumii* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association all occur adjacent to the Taggart Lake drainage.

Global Range: This wetland is found in mountains of Utah, Idaho, Montana, western Wyoming, and possibly western Alberta. Occurrences have a relatively broad range, but are uncommon. *Carex buxbaumii* is a circumboreal species, and this association possibly occurs in other western states and further north in Canada.
Nations: CA?, US
States/Provinces: AB?, CO, ID:S1, MT:S3, UT:S2?, WY:S2?
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 68:P
TNC Ecoregion Comments: ECO7:C, ECO9:C, ECO8:C, ECO68:P added (MSR 2-04).
USFS Ecoregions: 342D:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Glacier, Yellowstone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R093, 04R094, 04R095
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Local Author: Mark Fain
Date: 04 November 2004
Local Editor: Klara Varga
Date: 15 December 2004

Global Description Author(s): K.A. Schulz, mod. Western Ecology Group

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1988b	.	X	.	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mattson 1984	.	X	.	X	X	.	.	.	.
Moseley et al. 1991	.	X	.	X	.	.	.	.	.
Moseley et al. 1994	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	.	X	X	.	.	.	.

Pierce 1986	.	X	.	X	X	.	.	.	.
Pierce and Johnson 1986	.	X	.	X	.	.	.	.	.
Tuhy 1981	.	.	.	.	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1411 *Carex microptera* Seasonally Flooded Herbaceous Alliance

Small-wing Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation in this seasonally flooded, temperate or subpolar grassland alliance occurs in mountainous regions adjacent to streams on alluvial terraces, old beaver ponds, and seeps. Elevations range from 1920-2900 m. The communities occur on gentle slopes; however, some stands in Utah are located on subirrigated sites with slopes greater than 5%. Soils are mineral with little development, and range from sands to silts and clays, although clayey surface horizons are common. Stands with sandy soils are typically subirrigated. Thin organic surface horizons may exist in stands near seeps. Water tables generally remain within the rooting zone throughout the growing season, but may be more than 1 m below the surface on drier sites. *Carex microptera* is the dominant graminoid. *Carex utriculata* and *Carex aquatilis* are often present on wetter sites. Other graminoids present include *Carex praegracilis, Carex pellita (= Carex lanuginosa)*, and *Juncus hallii*. On drier sites, *Deschampsia caespitosa* and *Phleum alpinum* are present and may codominate. Common forb species include *Symphyotrichum foliaceum (= Aster foliaceus), Fragaria virginiana*, and *Geum macrophyllum*. *Salix wolfii* is common in the short-shrub layer, but generally has a sparse cover. Adjacent riparian communities are *Carex aquatilis, Carex utriculata*, and *Salix wolfii*. Drier, upland communities typically are dominated by *Deschampsia caespitosa* or mesic forbs.

Environment: Vegetation in this alliance occurs in mountainous regions adjacent to streams on alluvial terraces, old beaver ponds, and seeps. Elevations range from 1920-2900 m. The communities occur on gentle slopes, however, some stands in Utah are located on subirrigated sites with slopes greater than 5% (Padgett et al. 1989). Soils are mineral with little development, and range from sands to silts and clays, although clayey surface horizons are common (Youngblood et al. 1985b). Stands with sandy soils are typically subirrigated. Thin organic surface horizons may exist in stands near seeps. Water tables generally remain within the rooting zone throughout the growing season, but may be more than 1 m below the surface on drier sites (Hansen et al. 1988).

Adjacent riparian communities are *Carex aquatilis, Carex utriculata* and *Salix wolfii*. Drier, upland communities typically are dominated by *Deschampsia caespitosa* or mesic forbs.

Vegetation: Vegetation within this alliance is classified as seasonally flooded, temperate or subpolar grasslands. *Carex microptera* is the dominant graminoid. *Carex utriculata* and *Carex aquatilis* are often present on wetter sites. Other graminoids present include *Carex praegracilis, Carex pellita (= Carex lanuginosa)*, and *Juncus hallii*. On drier sites, *Deschampsia caespitosa* and *Phleum alpinum* are present and may codominate. Common forb species include *Symphyotrichum foliaceum (= Aster foliaceus), Fragaria virginiana*, and *Geum macrophyllum*. *Salix wolfii* is common in the short-shrub layer, but generally has a sparse cover.

Dynamics: *Carex microptera* functions as an increaser under grazing. When present in large amounts, the species may indicate various degrees of past grazing disturbance (Youngblood et al. 1985b).

Similar Alliances:

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in eastern Idaho, western and central Montana, western Wyoming, and central Utah. *Carex microptera* is a common and often abundant species in mountainous regions from Saskatchewan to British Columbia, Canada, south to South Dakota, Arizona, and California (Hermann 1970). Stands of this alliance may occur throughout the western United States.

Nations: CA?, US

Subnations: CO, ID, OR?, UT, WY

TNC Ecoregions: 6:C, 9:C, 11:C, 19:C, 20:C

USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331I:CC, M332A:CC, M332E:CC, M332G:CC, M333A:CC

Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): D. Culver

References: Hansen et al. 1988b, Hermann 1970, Johnston 1987, Kittel 1994, Mattson 1984, Padgett et al. 1988b, Padgett et al. 1989, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001792] *Carex microptera* Herbaceous Vegetation

Translated Name: **Small-wing Sedge Herbaceous Vegetation**

Common Name:

Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This wet meadow community occurs on gently sloping stream benches and terraces on small streams. All reported stands occur on alluvial surfaces. Elevation ranges from 1920 to 3570 m (6300-11,700 feet). Soils are mineral with fine textures ranging from sandy to silts to clayey. Some soils have an organic layer. This herbaceous meadow type is dominated by *Carex microptera*. Other sedges are typically present in lower abundances and include *Carex aquatilis, Carex utriculata, Carex praegracilis*, and *Carex pellita (= Carex lanuginosa)*. Other graminoids that can have significant cover include *Juncus hallii, Juncus longistylis, Deschampsia caespitosa, Festuca idahoensis*, and *Poa pratensis*. Forbs are few and include *Symphyotrichum foliaceum (= Aster foliaceus), Fragaria virginiana, Geum macrophyllum, Argentina anserina, Arnica chamissonis var. andina, Eurybia integrifolia*, and *Hymenoxys hoopesii (= Helenium hoopesii)*. Disturbed stands can have *Agrostis scabra, Phleum pratense*, and *Taraxacum officinale*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs on flat terrain or shallow slopes less than 8% at elevations ranging from 2057 to 2347 m (6750-7700 feet). The soils range from well-drained loamy sand to poorly drained silty clay and may have of up to 10% gravel. The ground cover for one stand is described as 40% litter and duff, 10% bare soil, and 50% basal vegetation. The hydrologic regime generally involves seasonal flooding but can be drier. Adjacent vegetation within the immediate area of this association includes other riparian communities that usually include *Salix* spp.
Global Environment: This wet meadow community occurs on gently sloping stream benches and terraces on small streams. All reported stands occur on alluvial surfaces. Elevation ranges from 1920 to 3570 m (6300-11,700 feet). Soils are mineral with fine textures ranging from sandy to silts to clayey. Some soils have an organic layer.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous wetland. Herbaceous cover ranges from 50 to 98%. *Carex microptera* is either codominant or dominant within the herbaceous canopy layer, composing 20 to 40% canopy cover. Graminoids that may codominate include *Carex* spp., *Deschampsia caespitosa, Festuca idahoensis*, and *Phleum pratense*. Forb species are usually diverse and in low abundance; forbs that may compose up to 10% canopy cover include *Argentina anserina, Arnica chamissonis var. andina, Eurybia integrifolia*, and *Taraxacum* sp. Other common or high-constancy forbs include *Perideridia* sp. and *Potentilla* spp.
Global Vegetation: This herbaceous meadow type is dominated by *Carex microptera*. Other sedges are typically present in lower abundances and include *Carex aquatilis, Carex utriculata, Carex praegracilis*, and *Carex pellita (= Carex lanuginosa)*. Other graminoids that can have significant cover include *Juncus hallii, Juncus longistylis, Deschampsia caespitosa, Festuca idahoensis*, and *Poa pratensis*. Forbs are few and include *Symphyotrichum foliaceum (= Aster foliaceus), Fragaria virginiana, Geum macrophyllum, Argentina anserina, Arnica chamissonis var. andina, Eurybia integrifolia*, and *Hymenoxys hoopesii (= Helenium hoopesii)*. Disturbed stands can have *Agrostis scabra, Phleum pratense*, and *Taraxacum officinale*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Argentina anserina	Herb (field)	Forb	.	X	.
Arnica chamissonis var. *andina*	Herb (field)	Forb	.	X	.
Eurybia integrifolia	Herb (field)	Forb	.	X	.
Carex microptera	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Festuca idahoensis	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Grand Teton National Park Higher Taxa					
Carex spp.	characteristic graminoids				
Perideridia sp.	characteristic forb				
Potentilla spp.	characteristic forbs				
Taraxacum sp.	characteristic forb				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Carex microptera	Herb (field)	Graminoid	X	X	X
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Trifolium hybridum	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Carex microptera* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.5.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) description well.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in riparian areas throughout the park. The stands sampled are in the Willow Flats and Emma Matilda Lake area as well as in the Bridger-Teton National Forest southeast of the Teton Science School.
Global Range: This small wetland meadow is known from Colorado, Montana, Wyoming, Utah, Idaho and possibly Oregon.
Nations: US
States/Provinces: CO:S2?, ID, OR?, UT:S2S3, WY:S3
TNC Ecoregions: 6:C, 8:C, 9:C, 11:C, 19:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331I:CC, M332E:CC, M332G:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201015, GT-0202099
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407054

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kittel 1994	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

A.1417 *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance

Nebraska Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this seasonally flooded, temperate or subpolar grassland alliance occur on saturated soils of flat floodplains bordering ponds or pools adjacent to stream channels. Stands also occur on flat marshy areas surrounding springs or wet meadows. Elevations range from sea level in California to 2400 m in Colorado. The alluvial soils are heavy clays and silty clay loams with high organic matter content. Soils are alkaline in some sites. Anoxic conditions often occur within 20 cm of the surface either in the form of a gleyed layer or abundant mottling. Soils often remain saturated throughout the summer, but water tables occasionally drop below 1 m of the soil surface by the end of the growing season. This alliance is dominated by 30-98% cover of *Carex nebrascensis*. *Carex nebrascensis* typically occurs on sites where water flows over the surface but does not pond. Other graminoids include *Eleocharis palustris, Carex praegracilis, Catabrosa aquatica, Calamagrostis stricta, Triglochin maritima*, and *Schoenoplectus pungens (= Scirpus pungens)*. Forb cover is generally low. Adjacent riparian vegetation includes *Populus angustifolia* and *Populus balsamifera ssp. trichocarpa (= Populus trichocarpa)* forests, *Salix exigua, Salix lucida*, and *Salix boothii* shrublands, and *Carex praegracilis, Carex utriculata*, and *Schoenoplectus tabernaemontani*? (= *Scirpus lacustris*) meadows. *Pinus edulis - Juniperus* spp. and *Quercus gambelii* woodlands, *Sarcobatus vermiculatus* and *Artemisia tridentata* shrublands, and *Bouteloua gracilis* shortgrass prairies occur on adjacent hillslopes.

Environment: Vegetation types within this alliance occur on saturated soils of flat floodplains bordering ponds or pools adjacent to stream channels. Stands also occur on flat marshy areas surrounding springs or wet meadows. Elevations range from sea level in California to 2400 m in Colorado.

The alluvial soils are heavy clays and silty clay loams with high organic matter content. Soils are alkaline in some sites. Anoxic conditions often occur within 20 cm of the surface either in the form of a gleyed layer or abundant mottling. Soils often remain saturated throughout the summer, but water tables occasionally drop below 1 m of the soil surface by the end of the growing season. *Carex nebrascensis* typically occurs on sites where water flows over the surface but does not pond (Ratliff and Westfall 1988).

Adjacent riparian vegetation includes *Populus angustifolia* and *Populus balsamifera ssp. trichocarpa* forests, *Salix exigua, Salix lucida*, and *Salix boothii* shrublands, and *Carex praegracilis, Carex utriculata*, and *Schoenoplectus tabernaemontani* meadows. *Pinus edulis - Juniperus* spp. and *Quercus gambelii* woodlands, *Sarcobatus vermiculatus* and *Artemisia tridentata* shrublands, and *Bouteloua gracilis* shortgrass prairies occur on adjacent hillslopes.

Vegetation: Vegetation types within this alliance are classified as seasonally flooded temperate or subpolar grasslands. This alliance is dominated by 30-98% cover of *Carex nebrascensis*. Other graminoids include *Eleocharis palustris, Carex praegracilis, Catabrosa aquatica, Calamagrostis stricta, Triglochin maritima*, and *Schoenoplectus pungens (= Scirpus pungens)*. Forb cover is generally low.

Dynamics: In Montana, the *Carex nebrascensis* type is considered a grazing-disclimax. Under season-long grazing, *Carex nebrascensis* increases in abundance, replacing former dominant species (Hansen et al. 1995). However, under extreme grazing conditions and a resulting drop in the water table, *Juncus balticus* or *Poa pratensis* can eventually replace *Carex nebrascensis*. In Nevada, sites dominated by *Carex nebrascensis* are considered the Potential Natural Community (Manning and Padgett 1995), which appears to be the case in undisturbed stands in Colorado.

Unlike other moisture-loving species of sedges, *Carex nebrascensis* readily tolerates dry air and intense insolation, so long as its roots are wet (Cronquist et al. 1977).

Similar Alliances:

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance occurs from Washington to Montana, and south to California and northern New Mexico and Arizona. *Carex nebrascensis* is found throughout the western United States and Great Plains. Stands of the alliance may occur in this larger area.

Nations: US

Subnations: AZ, CA, CO, ID, MT, NE, NM?, NV?, OR, SD, UT, WA?, WY

TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 27:C, 33:P

USFS Ecoregions: 313A:CC, 331A:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 332C:CP, 341D:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC, M341C:CC

Federal Lands: NPS (Florissant Fossil Beds, Fort Laramie, Yosemite, Zion); USFS (Black Hills, Umatilla); USFWS (Lacreek)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1982b, Cooper and Cottrell 1990, Cronquist et al. 1977, Durkin et al. 1994b, Durkin et al. 1995a, Hall 1973, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hermann 1970, Johnston 1987, Jones and Walford 1995, Kearney et al.

1969, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1999a, Kovalchik 1987, Manning and Padgett 1995, Martin and Hutchins 1980, Mutz and Queiroz 1983, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Ratliff and Westfall 1988, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001813] *Carex nebrascensis* Herbaceous Vegetation

Translated Name: **Nebraska Sedge Herbaceous Vegetation**
Common Name: **Nebraska Sedge Wet Meadow**
Ecological System(s):

- Boreal Wet Meadow (CES103.873)
- North American Arid West Emergent Marsh (CES300.729)
- Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
- Northwestern Great Plains Floodplain (CES303.676)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Western Great Plains Floodplain (CES303.678)
- Western Great Plains Wooded Draw and Ravine (CES303.680)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): J. Drake, mod. D. Faber-Langendoen, mod. K.A. Schulz

ELEMENT CONCEPT

Global Summary: These minor wetlands occur on the western Great Plains and throughout much of the western U.S. Elevation ranges from 1000-2800 m (3300-9200 feet). Stands form open meadows that occur along the margins of streambanks, flat floodplains, and lakes often forming a band along the alluvial terrace, or on marshy areas surrounding springs and below seeps on lower hillslopes. This association is often found on well-developed soil, but occurs on a wide variety of soil types that tend to be fine-textured alluvium, or clay to organic and are typically gleyed and mottled near the surface because of the high water table most of the growing season. The vegetation is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex nebrascensis*. Other graminoid species may be present such as *Carex praegracilis, Calamagrostis stricta, Deschampsia caespitosa, Eleocharis palustris, Glyceria striata, Juncus balticus, Schoenoplectus pungens (= Scirpus pungens)*, or *Triglochin maritima*. Forb cover is generally low, but can be high in moist locations. GRTE information not incorporated to Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Global Environment: This wetland plant association occurs on the western Great Plains and throughout much of the western U.S. Elevation ranges from 1000-2800 m (3300-9200 feet). Stands form open meadows that occur along the margins of streambanks, flat floodplains, and lakes often forming a band along the alluvial terrace. Stands have also been sampled from marshy areas surrounding springs and below seeps on lower hillslopes. This association is often found on well-developed soil, but occurs on a wide variety of soil types ranging from saturated organics to Mollisols to Entisols. Soils tend to be fine-textured alluvium, ranging from sandy, silty loam, clay loam, or clay to organic and are typically gleyed and mottled near the surface because of the high water table most of the growing season.
GRAND TETON NATIONAL PARK Environment: Two of the three sampled stands for this association occur on the valley floor at elevations of 6700 and 6780 feet. One stand is located on a west-facing shoulder with a slope of 15% at 10700 feet. Both of the lower elevation stands have wet areas where *Carex nebrascensis* is more prominent and occur near or in grazing pastures. The higher elevation stand had 50% ground cover of snow at the time of evaluation.

VEGETATION DESCRIPTION

Global Vegetation: These wetlands are characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex nebrascensis* (25-99% cover), that generally forms small- to medium-sized meadows. Stands often are nearly pure *Carex nebrascensis*, but a variety of other graminoid species may be present such as *Carex praegracilis, Calamagrostis stricta, Calamagrostis canadensis, Deschampsia caespitosa, Eleocharis palustris, Glyceria striata, Juncus balticus, Schoenoplectus pungens (= Scirpus pungens)*, or *Triglochin maritima*. Forb cover is generally low, but can be high in moist locations. Common forbs include *Eurybia integrifolia (= Aster integrifolius), Geum macrophyllum, Mentha arvensis, Mimulus glabratus, Heracleum maximum*, and *Ranunculus cymbalaria*. Introduced species *Poa pratensis, Poa palustris, Cirsium arvense*, and *Melilotus officinalis* may also be common.

In Nebraska, common species include *Agrostis stolonifera, Carex hystericina, Carex pellita (= Carex lanuginosa), Eleocharis erythropoda, Equisetum* spp., *Juncus balticus, Schoenoplectus pungens (= Scirpus pungens)*, and *Triglochin* spp. (Steinauer and Rolfsmeier 2000).

GRAND TETON NATIONAL PARK Vegetation: This association is a montane to subalpine herbaceous wet meadow that occurs on mesic sites. *Salix arctica* occurs with 3% cover in the high elevation stand and no shrubs occur in the lower stands. *Carex nebrascensis* is dominant in all plots with 7% cover in the high elevation stand and 50% cover in the low elevation stands. No other species occurs with more than 1% cover in the high elevation stand, which has 12% herbaceous cover. In the lower stands total herbaceous cover is 80 and 98%. Species or genera common to both stands are *Phleum pratense* and *Juncus* spp. Herbaceous species that contribute 7% or more cover to one stand include *Poa compressa, Poa pratensis, Juncus balticus, Cirsium arvense,* and *Geum macrophyllum.*

Global Dynamics: In Montana, the *Carex nebrascensis* Community Type is considered a grazing-disclimax. Under season-long grazing, *Carex nebrascensis* increases in abundance, replacing former dominant species (Hansen et al. 1995). However, under extreme grazing conditions and a resulting drop in the water table, *Juncus balticus* or *Poa pratensis* can eventually replace *Carex nebrascensis*. In Nevada, sites dominated by *Carex nebrascensis* are considered the Potential Natural Community (Manning and Padgett 1995), which appears to be the case in undisturbed stands in Colorado.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex nebrascensis	Herb (field)	Graminoid	X	X	.

GRTE MOST ABUNDANT SPECIES

Stratum	***Species***
GRAMINOID	*Carex nebrascensis*

GRTE CHARACTERISTIC SPECIES

Carex nebrascensis, Juncus spp., *Phleum pratense*
GRTE

GRTE OTHER NOTEWORTHY SPECIES

Non-Native Species: *Bromus inermis, Phleum pratense, Poa compressa, Poa pratensis, Cirsium arvense, Thlaspi arvense*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996). This type is widely distributed, but many examples have been heavily grazed by cattle, lowering their floristic quality.

RELATED CONCEPTS

Global Similar Associations:
- *Carex nebrascensis* - *Carex microptera* Herbaceous Vegetation (CEGL001815)
- *Deschampsia caespitosa* - *Carex nebrascensis* Herbaceous Vegetation (CEGL001601)

Global Related Concepts:
- *Carex nebrascensis-Catabrosa aquatica-Juncus arcticus ssp. ater* Spring Wetland (Baker 1982b) =
- *Carex nebrascensis* (Bourgeron and Engelking 1994) =
- *Carex nebrascensis* Association (Cooper and Cottrell 1990) = *Carex nebrascensis* Community Type (Manning and Padgett 1995) =
- *Carex nebrascensis* Community Type (Youngblood et al. 1985b) ?
- *Carex nebrascensis* Community Type (Hall and Hansen 1997) ?
- *Carex nebrascensis* Community Type (Hansen et al. 1995) ?
- *Carex nebrascensis* Community Type (Youngblood et al. 1985a) =
- *Carex nebrascensis* Community Type (Padgett et al. 1989) =
- *Carex nebrascensis* Community Type (Padgett et al. 1988b) ?
- *Carex nebrascensis* Herbaceous Vegetation (Marriott and Faber-Langendoen 2000) =
- *Carex nebrascensis* Herbaceous Vegetation (Kittel et al. 1994) ?
- *Carex nebrascensis* Herbaceous Vegetation (Kittel et al. 1999a) =
- *Carex nebrascensis* Herbaceous Vegetation (Kittel et al. 1996) ?
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Nebraska Sedge (*Carex nebrascensis*) Community (Jones and Walford 1995) =
- Nebraska Sedge Community Type (Kovalchik 1987) =
- Wet Meadow (Hall 1973) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: The lower elevation stands fit the Youngblood et al. (1985) *Carex nebrascensis* ct. very well. The higher elevation stand differs from the Youngblood description due to the presence of *Salix arctica* and the high elevation. Youngblood intimates that this habitat type occurs at elevations less than 7900 feet.

Global Classification Comments: In the Black Hills, classification of stands was problematic due to identification problems with *Carex nebrascensis* and *Carex aquatilis*. The two are difficult to distinguish based on available keys and written descriptions (Marriott and Faber-Langendoen 2000).

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the Wolff Ridge pasture, near the Elk Ranch cabins, and west of Paintbrush Divide.

Global Range: This sedge meadow type is widely distributed from the western Great Plains into the western mountains of the United States, ranging from South Dakota and Montana to possibly as far west as Washington, south to California and east to New Mexico.
Nations: US
States/Provinces: AZ:S2, CA:S3, CO:S3, ID:S3, MT:S4, NE:S2, NM?, NV?, OR:S3?, SD, UT:S3?, WA?, WY:S3
TNC Ecoregions: 4:C, 5:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 27:C, 33:P
TNC Ecoregion Comments: ECO4, ECO5, ECO7, ECO8, ECO20, ECO21 added (mjr 7-05). ECO9 added (mjr 8-04). ECO12 added (mjr 2-03). ECO33 added (SM 3-02). ECO18 & ECO19 added (KAS 6-01).
USFS Ecoregions: 313A:CC, 331A:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 332C:CP, 341D:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M331A:C?, M331B:CC, M331D:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC, M341C:CC
Federal Lands: NPS (Florissant Fossil Beds, Fort Laramie, Yosemite, Zion); USFS (Black Hills); USFWS (Lacreek)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J189, 04M032, 04X530
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Local Author: Mark Fain
Date: 04 November 2004
Local Editor: Klara Varga
Date: 17 December 2004

Global Description Author(s): J. Drake, mod. D. Faber-Langendoen, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1982b	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Butler et al. 2002	.	.	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Cooper and Cottrell 1990	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jones 1992b	.	.	.	X	.	.	.	.	.
Jones and Walford 1995	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1994	.	X	X	X	.	.	.	.	.
Kittel et al. 1996	.	X	X	X	.	.	.	.	.

Kittel et al. 1999a	.	X	X	X	.	.	.	.	.
Kovalchik 1987	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	X	X	X	.	.	.	.	.
Marriott and Faber-Langendoen 2000	.	X	X	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	X	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Steinauer and Rolfsmeier 2000	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	X	X	.	.	.	.	.

A.1414 *Carex pellita* Seasonally Flooded Herbaceous Alliance

Woolly Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this seasonally flooded grassland alliance occur in wet meadows, basins, and sometimes shallow standing water. They are found from the plains (<300 m) and lowlands (1050 m) to moderate (2700 m) elevations in the mountains in low-gradient, trough-shaped, moderately wide valleys with gentle to moderately steep sideslopes. Stands occur in depressions and swales at the saturated edge of stream channels or in standing water. Sites are poorly drained, often flooded during spring runoff, and water levels normally remain in the rooting zone throughout the growing season. Soils are variable, but most commonly mineral with large amounts of organic matter or, more rarely, with thick accumulations of partially decomposed sedges. Streambanks have alluvial soils composed of sand, silt, and clay deposits. This alliance is often characterized by a nearly monotypic cover of 40-90% *Carex pellita (= Carex lanuginosa)*. Other graminoid cover is minor, but includes *Carex microptera, Phalaris arundinacea, Calamagrostis stricta, Carex nebrascensis, Juncus balticus, Scirpus microcarpus, Schoenoplectus acutus (= Scirpus acutus)*, and *Schoenoplectus pungens (= Scirpus pungens)*. Scattered forbs include *Geum macrophyllum, Mentha arvensis, Prunella vulgaris*, and *Potentilla gracilis*.

Environment: Vegetation types within this alliance occur in wet meadows, basins, and sometimes shallow water. They are found from the plains (<300 m) and lowlands (1050 m) to moderate (2700 m) elevations in the mountains in low-gradient (1-2% slope), trough-shaped, moderately wide valleys with gentle to moderately steep sideslopes. Stands occur in depressions and swales at the saturated edge of stream channels or in standing water. Soils are variable, but most commonly mineral with large amounts of organic matter or more rarely, with thick accumulations of partially decomposed sedges. Stands are poorly drained, and water may persist on the soil surface through the summer. Streambanks have alluvial soils composed of sand, silt, and clay deposits. These stands are often flooded during spring runoff, and water levels normally remain in the rooting zone throughout the growing season (Hansen et al. 1988a). Mottling often occurs throughout the profile.

Adjacent vegetation along foothill streams includes *Salix amygdaloides, Populus balsamifera ssp. trichocarpa*, and *Populus angustifolia* woodlands. *Populus deltoides* woodlands occur along streams on the eastern Great Plains. Adjacent communities at higher elevations are typically *Artemisia* spp. shrublands or *Pinus contorta* forests.

Vegetation: This grassland alliance is characterized by a nearly monotypic stand of 40-90% cover of *Carex pellita (= Carex lanuginosa)*. Other graminoid cover is minor (0-20%), but includes *Carex microptera, Phalaris arundinacea, Calamagrostis stricta, Carex nebrascensis, Juncus balticus, Scirpus microcarpus, Schoenoplectus acutus (= Scirpus acutus)*, and *Schoenoplectus pungens (= Scirpus pungens)*. Scattered forbs include 0-40% cover of *Geum macrophyllum, Mentha arvensis, Prunella vulgaris*, and *Potentilla gracilis*. In the plains, the most abundant species are *Calamagrostis stricta, Carex pellita, Carex sartwellii, Anemone canadensis, Apocynum cannabinum, Symphyotrichum lanceolatum (= Aster lanceolatus), Eleocharis compressa, Juncus balticus, Phalaris arundinacea, Polygonum amphibium*, and *Schoenoplectus americanus (= Scirpus americanus)*. *Carex buxbaumii* can be common (Nelson et al. 1981, Dix and Smeins 1967).

Dynamics: The *Carex pellita* plant association appears to be a fairly stable community due to the dominant species' rhizomatous roots (Padgett et al. 1989). In Montana, the *Carex pellita* plant association can include communities dominated by *Carex lasiocarpa*. With season-long grazing, *Carex pellita* decreases in abundance, shifting dominance towards *Poa pratensis*. In Colorado, stands of *Carex pellita* that occur on streambanks with a consistent water table depth and heavy, cohesive clay soils, appear stable as long as the water table remains constant.

Similar Alliances:

- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described in the western United States in scattered locations of the northern and central Rocky Mountains, and in the central/northern parts of the Great Plains, ranging from northern Iowa, western Minnesota, and the Dakotas to parts of the Canadian prairie provinces. *Carex pellita* is a common sedge that occurs throughout the northern, central and western United States. This alliance likely occurs elsewhere than currently reported.
Nations: CA, US
Subnations: BC, CO, IA, ID, MB, MN, MO, MT, ND, NE, NM, OR, SD, SK, UT, WA, WY
TNC Ecoregions: 6:C, 9:C, 12:C, 19:C, 20:C, 26:C, 34:C, 35:C, 36:C
USFS Ecoregions: 222:P, 251Aa:CCC, 251Ab:CCC, 251C:CC, 342B:CC, 342C:CC, 342D:CC, M242C:CC, M261E:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Dinosaur, Grand Teton, Mount Rushmore, Yosemite)

ALLIANCE SOURCES

Author(s): D. Culver, mod. D. Faber-Langendoen
References: Cronquist et al. 1977, Dix and Smeins 1967, Drake and Faber-Langendoen 1997, Hansen et al. 1988a, Hansen et al. 1988b, Hermann 1970, Hickman 1993, Kittel et al. 1995, Kovalchik 1987, Nelson et al. 1981, Padgett et al. 1988b, Padgett et al. 1989

[CEGL001809] *Carex pellita* Herbaceous Vegetation

Translated Name: **Woolly Sedge Herbaceous Vegetation**
Common Name:
Ecological System(s):
- North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow (CES204.862)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): M. Jankovsky-Jones

ELEMENT CONCEPT

Global Summary: This groundwater-supported plant association occurs in small patches along stream channels and in seasonally wet depressions and swales at low to moderate elevations in the western U.S. from Washington to Montana south to Oregon, Utah, Wyoming and Colorado. It has also been reported from British Columbia, Canada. These wetlands form small to medium-sized meadows. *Carex pellita (= Carex lanuginosa)*, a distinctive wetland-indicator species, clearly dominates stands with 30-80% cover. Low species diversity, with few associates having high constancy, is characteristic. *Deschampsia caespitosa, Carex microptera, Carex nebrascensis, Carex simulata, Carex praegracilis, Elymus glaucus, Juncus balticus, Schoenoplectus pungens (= Scirpus pungens), Equisetum arvense*, and *Equisetum hyemale* are sometimes present with low cover. On the eastern plains of Colorado, it can occur under a canopy of cottonwood trees, forming ~*Populus deltoides / Carex pellita* Woodland (CEGL002649)$$.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The sampled stand representing this association occurs on a level floodplain at an elevation of approximately 2073 m (6800 feet). The soils are very deep and poorly drained Cryaquolls that formed in alluvium. All environmental data for this stand was determined by use of the Soil Survey of Teton County, Wyoming, Grand Teton National Park Area (Young 1982).
Global Environment: This groundwater-supported plant association occurs in small patches along stream channels and in seasonally wet depressions and swales at low to moderate elevations in the western U.S. from Washington to Montana south to Oregon, Utah, Wyoming and Colorado. It has also been reported from British Columbia, Canada. These wetlands form small to medium-sized meadows on valley bottoms. Soils are alluvial and remain saturated through at least part of the growing season.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous wetland that occurs in mesic areas. *Carex pellita* dominates the herbaceous stratum with 70% canopy cover. *Carex utriculata* is well-represented with 10% cover. *Deschampsia caespitosa* and *Poa pratensis* each compose 3% cover. *Potentilla gracilis* is scarce and is the only forb present.
Global Vegetation: *Carex pellita*, a distinctive wetland-indicator species, clearly dominates stands of this association with 30-80% cover. Low species diversity is characteristic. *Deschampsia caespitosa, Carex microptera, Carex nebrascensis, Carex simulata, Carex praegracilis, Carex utriculata, Elymus glaucus, Juncus balticus, Schoenoplectus pungens (= Scirpus pungens), Equisetum arvense*, and *Equisetum hyemale* are sometimes present with low cover. Stands that have been degraded by grazing may have high cover by the exotic species *Agrostis stolonifera* or *Poa pratensis* or the native rush *Juncus balticus* (Jankovsky-Jones et al. 2001).
Global Dynamics: *Carex pellita* is a mycorrhizal species, which allows it to thrive in low-nutrient environments (Muthukumar et al. 2004). On the eastern plains of Colorado, this association can occur under a canopy of mature cottonwood trees, forming ~*Populus deltoides / Carex pellita* Woodland (CEGL002649)$$.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex pellita	Herb (field)	Graminoid	X	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex pellita	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-Oct-2000). This association has been documented in small stands throughout much of the western United States and Canada. High-quality stands are uncommon due to improper grazing by livestock, hydrologic alterations, and ground-disturbing activities. The diagnostic species in this association is very palatable to livestock when young. Stands may be dry at the surface as early as July allowing season-long livestock utilization. Overuse by livestock can result in introduction of non-native species such as *Poa pratensis* and *Taraxacum officinale* or an increase in less palatable species such as *Carex nebrascensis* and *Juncus balticus*. Overuse by livestock can also result in stream downcutting that may permanently change the site potential from a wet to a dry meadow. *Phalaris arundinacea*, an additional non-native species, may become established due to alteration of hydrology or sediment inputs. Meadows that support stands of *Carex pellita* are often used for hay pasture and may be drained, ditched and flood irrigated, or seeded with pasture grasses to increase hay production.

RELATED CONCEPTS

Global Similar Associations:
- *Carex pellita - Calamagrostis stricta* Herbaceous Vegetation (CEGL002254)
- *Populus deltoides / Carex pellita* Woodland (CEGL002649)

Global Related Concepts:
- *Carex lanuginosa* (Bourgeron and Engelking 1994) =
- *Carex lanuginosa* Association (Crowe and Clausnitzer 1997) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This plant association has been described in recent classifications throughout its range (Kovalchik 1987, Padgett et al. 1989, Evenden 1990, Crowe and Clausnitzer 1997, Manning and Padgett 1995, Kittel et al. 1999a). Hansen et al. (1995) included all combinations of *Carex pellita (= Carex lanuginosa), Carex lasiocarpa*, and *Carex buxbaumii* in the *Carex lasiocarpa* habitat type. There may be some similarities between sites supporting *Carex pellita, Carex lasiocarpa*, and *Carex buxbaumii* plant associations. However, *Carex pellita* stands typically occur on mineral soils in seasonally saturated floodplains along runoff-dominated stream channels or headwater basins, while *Carex lasiocarpa* and *Carex buxbaumii* occur on organic soils in association with semipermanently saturated spring-fed or groundwater-driven wetlands. From a biodiversity conservation standpoint, the three associations should be recognized as distinct types. Identification of this association is complicated when shrubs are present and when *Carex pellita* is not clearly dominant.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs in Willow Flats south of Jackson Lake Lodge.
Global Range: This plant association is a minor type in Colorado, Utah, Idaho, Montana, Washington, Oregon, and British Columbia, Canada. *Carex pellita* is a common sedge that occurs throughout the northern and western United States. It is likely that this or a closely related association occurs in Wyoming, California, and New Mexico.
Nations: CA, US
States/Provinces: BC:S2, CO:S3, ID:S2, MT?, NM, OR:S5, UT:S2S3, WA:S1, WY

TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 19:C, 20:C
TNC Ecoregion Comments: ECO4, ECO7, ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342B:CC, M242C:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Dinosaur, Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association. This stand has no associated environmental data.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: GT-tm2a
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): M. Jankovsky-Jones, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Evenden 1990	.	.	.	X	X	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	.	.	X	X	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jankovsky-Jones et al. 2001	.	.	.	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1995	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	.	.	X	X	.	.	.	.
Kovalchik 1987	.	X	.	X	X	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	.	X	X	.	.	.	.
Muthukumar et al. 2004	.	.	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	.	X	X	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Young 1982	.	.	.	X	.	.	.	.	.

A.2501 *Carex vesicaria* Seasonally Flooded Herbaceous Alliance

Inflated Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in several western states and is likely more widespread in the western U.S. Stands commonly occur as wet meadow communities that are found around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. Stands are either adjacent to low-gradient streams in wide valley bottoms or associated with perennial seeps and may occur in subalpine environments. They can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment. The vegetation is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus, Deschampsia caespitosa, Carex nebrascensis, Carex utriculata, Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include species of *Epilobium, Galium trifidum, Camassia quamash, Symphyotrichum foliaceum (= Aster foliaceus), Equisetum arvense*, and *Mentha arvensis*.

Environment: Vegetation types within this alliance are commonly wet meadow communities that occur around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range up to 2900 m in Colorado. Occurrences are either adjacent to low-gradient streams in wide valley bottoms or associated with perennial seeps. They can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment.

A wide range of soils are associated with this alliance. Histosols are most common and often have organic accumulations greater than 1 m thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam. Mottling often occurs within a few centimeters of the surface. Water tables are typically at or above the soil surface throughout the growing season. Soil reaction is slightly acid to neutral (pH 6.5 to 7.0).
Vegetation: This alliance is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus, Deschampsia caespitosa, Carex nebrascensis, Carex utriculata, Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include species of *Epilobium, Galium trifidum, Camassia quamash, Symphyotrichum foliaceum (= Aster foliaceus), Equisetum arvense*, and *Mentha arvensis*.
Dynamics: *Carex vesicaria* vegetation types occur on the wettest sites of the riparian or wetland area, such as low-lying swales, and shallow margins of lakes and ponds, often in standing water. *Carex vesicaria* is an effective streambank stabilizer and slows overland flows. Where it occurs along streams, it encourages the formation of deep, narrow stream channels which provide good habitat for fish (Hansen et al. 1988a).
Similar Alliances:
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: Vegetation types in this alliance have been described from Colorado, Idaho, Montana, California, Oregon, and Washington. The alliance probably occurs elsewhere in the West.
Nations: US
Subnations: CA, CO, ID, MT, NV?, OR, WA
TNC Ecoregions: 7:C, 8:P, 9:P, 11:P, 12:C, 20:C, 26:P, 27:C
USFS Ecoregions: 331I:CC, M261E:CC, M331G:CC, M331H:CC, M333C:CC
Federal Lands: NPS (Glacier, Yosemite)

ALLIANCE SOURCES

Author(s): M.S. Reid
References: Christy and Cornelius 1980, Crowe and Clausnitzer 1997, Hansen et al. 1988a, Henderson and Mcallister 1983, Hermann 1970, Kittel et al. 1999a, Kovalchik 1987, Manning and Padgett 1995

[CEGL002661] *Carex vesicaria* Herbaceous Vegetation

Translated Name: **Inflated Sedge Herbaceous Vegetation**
Common Name: **Lesser Bladder Sedge**
Ecological System(s):
- North American Arid West Emergent Marsh (CES300.729)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: Stands of this vegetation type are commonly found in wet meadows, around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range from 1075-2900 m (3525-9500 feet). These communities can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment. A wide range of soils are associated with this association. Histosols are most common and often have organic accumulations greater than 1 meter thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam. This association is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus, Deschampsia caespitosa, Carex nebrascensis, Carex utriculata, Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include *Epilobium* sp., *Galium trifidum, Camassia quamash, Symphyotrichum foliaceum (= Aster foliaceus), Equisetum arvense*, and *Mentha arvensis*. GRTE information not incorporated to Global Summary at this time.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Global Environment: Stands of this vegetation type are commonly found in wet meadows, around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range from 1075-2900 m (3525-9500 feet). They can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment. A wide range of soils are associated with this association. Histosols are most common and often have organic accumulations greater than 1 meter thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam.

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevations of 6800 to 7000 feet. Two stands occur in depressions and one stand occurs along a lake shore. Large rocks, small rocks, and downed woody debris occur in the lake shore stand. Standing water occurs in one of the depressions. Adjacent vegetation may include *Nuphar lutea*, *Pinus contorta* forests, and/or *Pinus contorta* regeneration stands.

VEGETATION DESCRIPTION

Global Vegetation: This association is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus, Deschampsia caespitosa, Carex nebrascensis, Carex utriculata, Calamagrostis stricta, Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include *Epilobium* sp., *Galium trifidum, Camassia quamash, Symphyotrichum foliaceum (= Aster foliaceus), Equisetum arvense*, and *Mentha arvensis*.

GRAND TETON NATIONAL PARK Vegetation: This association is a montane wet herbaceous meadow that occurs on mesic sites. Total herbaceous cover for the sampled stands ranges from 50 to 98%. *Carex vesicaria* dominates all stands with 30 to 80% cover. No other graminoids occur in more than one stand, but they may contribute high cover to the individual stands. *Cirsium vulgare* is the only forb to occur in more than one stand and no forb contributes more than 3% cover.

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	Species
GRAMINOID	*Carex vesicaria*

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Carex vesicaria

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: *Cirsium vulgare, Rumex crispus*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4Q (2-Dec-1998).

RELATED CONCEPTS

Global Similar Associations:

Global Related Concepts:

- *Carex rostrata* (*Deschampsia cespitosa* Phase) (Hansen et al. 1995) I
- *Carex vesicaria* (Bourgeron and Engelking 1994) =

CLASSIFICATION & OTHER COMMENTS

Global Classification Comments: The association needs crosswalking between stands in the Pacific Northwest states and Colorado to determine if this is the same type, thus the G4Q rank. This type appears to be a simple dominance type with *Carex vesicaria* and occasionally *Carex utriculata* as the only species of significance. Some authors have treated communities dominated by *Carex vesicaria* as being analogous to *Carex utriculata* (example Hansen et al. (1995) for Montana). Further work is needed to clarify the distribution of this type due to this treatment.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near Burnt Ridge, near Spalding Bay, and on the Jackson Lake shore.

Global Range: This association is known from stands throughout the montane western United States.
Nations: US
States/Provinces: CA, CO:S1, ID:S3, MT, NV?, OR:S4, WA
TNC Ecoregions: 7:C, 8:P, 9:P, 11:P, 12:C, 20:C, 26:P, 27:C
TNC Ecoregion Comments: ECO27 added (mjr 8-05). ECO7:C, ECO20:C, ECO26:P, ECO11:P, ECO8:P, ECO9:P added (MSR 2-04). ECO12 added for Yosemite (mjr 4-03).
USFS Ecoregions: 331I:CC, M261E:CC, M331G:CC, M331H:CC, M333C:CC
Federal Lands: NPS (Glacier, Yosemite)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R023, 04R131, 04R190
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Local Author: Mark Fain
Date: 04 November 2004
Local Editor: Klara Varga
Date: 17 December 2004

Global Description Author(s): T. Keeler-Wolf, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Christy and Cornelius 1980	.	X	.	X	.	.	.	.	.
Cooper and Severn 1992	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Henderson and Mcallister 1983	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kittel et al. 1999b	.	.	.	X	.	.	.	.	.
Kovalchik 1993	.	X	.	X	.	.	.	.	.
Manning and Padgett 1991	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Sanderson and Kettler 1996	.	X	.	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1408 *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance

Tufted Hairgrass Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant associations included in this alliance are circumboreal and are common in alpine, wet meadows and wetland margin habitats. Stands are found in moist, low-gradient valley bottoms and along streams throughout the mountainous areas of the western U.S. Typically, communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. Communities occur in the alpine tundra in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils throughout most of the growing season. Soils are variable. Fine-textured soils retain soil moisture longer in areas of seasonal drought, and coarse substrates allow aeration in areas with perennial high water tables. This vegetation is characterized by a moderately dense to dense herbaceous layer dominated by the perennial bunchgrass *Deschampsia caespitosa*. Commonly associated graminoid species include *Carex nebrascensis, Carex microptera, Carex aquatilis, Juncus balticus, Phleum alpinum, Danthonia intermedia,* and *Agrostis scabra*. Common forbs include *Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides,* and *Caltha leptosepala*. Diagnostic of this herbaceous alliance is the dominance or codominance of *Deschampsia caespitosa* and the presence of surface water for extended periods during the growing season.

Environment: Plant associations within this alliance are circumboreal and occur in moist, low-gradient valley bottoms throughout the mountainous areas of the western United States at elevations ranging from 800-3500 m. *Deschampsia caespitosa* associations require relatively cool, moist conditions. Typically, communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. The vegetation occurs at higher elevations in the southern part of its range and in dry interior locations. Communities occur in the alpine tundra in Utah and Colorado where stands grow in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils through most of the growing season. Soils are diverse. In perennially wet soils, stands of this alliance occur on sand or gravel lenses which allow adequate aeration of roots. In sites with seasonal drought, the vegetation generally occurs on finer-textured soils which drain slowly and retain moisture.
Vegetation: Associations within this alliance are common alpine wet meadow or wetland margin types in mountain habitats of the west (Padgett et al. 1989). The vegetation is typified by a lush growth of *Deschampsia caespitosa*, a perennial bunchgrass which forms an open canopy of culms and nodding panicles. Commonly associated graminoid species include *Carex nebrascensis, Carex microptera, Carex aquatilis, Juncus balticus, Phleum alpinum, Danthonia intermedia*, and *Agrostis scabra* (Hess and Wasser 1982, Johnson and Simon 1987, Padgett et al. 1989). Common forbs include *Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides*, and *Caltha leptosepala*. The vegetation often occurs adjacent to perennially saturated sedge wetlands dominated by *Carex utriculata, Carex aquatilis, Carex simulata*, and others. Associations of this alliance generally grade into drier meadows of forbs (*Senecio integerrimus, Achillea millefolium*, and others) and grasses (*Festuca, Muhlenbergia, Poa* spp.).
Dynamics: Associations within this alliance are adapted to moist and wet soils which are seasonally flooded by snowmelt and retain moisture throughout the growing season. However, stands usually occur on sites without permanent surface water. Stands appear to be tolerant of moderate intensity ground fires and late season livestock grazing (Kovalchik 1987).
Similar Alliances:
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)

Similar Alliance Comments: Examples of this alliance occupy an intermediate flooding regime with respect to other *Deschampsia* alliances. In communities of the ~*Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)$$, water levels are above the soil surface early in the growing season, and drop to 0.25 to 1 m below the surface by late summer. Soils drain during the growing season, but remain moist, distinguishing this alliance from wetter 'saturated' and drier 'temporarily flooded' *Deschampsia caespitosa* alliances.

ALLIANCE DISTRIBUTION

Range: This alliance is found in wet, cold-winter habitats throughout the western United States. It is typically a moderate- to high-elevation type in the western United States but occurs at lower elevations in humid regions of the Pacific Northwest. This montane forest alliance occurs in California's Central Coast, Transverse and Peninsular ranges.
Nations: CA, MX, US
Subnations: AB, AZ, CA, CO, ID, MT, NJ, NM, NV, OR, UT, WA, WY
TNC Ecoregions: 1:C, 4:C, 5:P, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 15:C, 18:P, 20:C, 21:C, 26:C, 68:C, 81:P
USFS Ecoregions: 261A:CC, 331A:CC, 331D:CC, 331E:C?, 331G:CC, 341D:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, M242A:CC, M242C:CC, M261C:CC, M261D:CC, M261E:CC, M262B:CC, M313A:CC, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341:C
Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain, Sequoia, Yosemite); PC (Waterton Lakes); USFS (Bighorn?, Medicine Bow, Shoshone?)

ALLIANCE SOURCES

Author(s): D. Sarr
References: Bonham and Ward 1970, Briggs and MacMahon 1983, Buckner 1977, Carsey et al. 2003a, Carsey et al. 2003b, Cooper et al. 1995, Crowe and Clausnitzer 1997, Daubenmire and Daubenmire 1968, Fike 1999, Franklin and Dyrness 1973, Hall 1971, Hall 1973, Hamann 1972, Hansen et al. 1995, Hess and Wasser 1982, Johnson 1961b, Johnson and Simon 1985, Johnson and Simon 1987, Kittel et al. 1999b, Kovalchik 1987, Mutz and Queiroz 1983, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Sanderson and Kettler 1996, Smith 1991, Soil Conservation Service 1978, Terwilliger et al. 1979b, Tiedemann 1972, Tuhy and Jensen 1982, Walford et al. 1997, Youngblood et al. 1985a, Youngblood et al. 1985b

[CEGL001883] *Deschampsia caespitosa - Carex microptera* Herbaceous Vegetation

Translated Name: **Tufted Hairgrass - Small-wing Sedge Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): G.P. Jones

ELEMENT CONCEPT

Global Summary: This association occurs throughout the mountains of north-central and western Wyoming on mesic stream terraces and in mesic meadows. Sites supporting this association may be found over a broad range of elevations, from about 1950 to 2925 m (6400-9600 feet), on subirrigated, well-drained soils developed in alluvium from granite or sedimentary rocks. The vegetation is an herbaceous meadow, usually dense, without shrubs or with only scattered shrubs. Graminoids usually dominate the vegetation, and forbs are secondary, although in some stands, forbs contribute almost as much cover as do the graminoids. *Deschampsia caespitosa* dominates or codominates the vegetation, and *Carex microptera* is present, often as a codominant. Common forbs are *Symphyotrichum foliaceum (= Aster foliaceus), Potentilla gracilis, Polygonum bistortoides*, and *Caltha leptosepala*. *Carex aquatilis* and *Carex utriculata* may be present, but they contribute relatively little cover.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The sampled stand of this association occurs on a step-in-slope at an elevation of 2583 m (8473 feet). It is situated in a depression, allowing water to seasonally collect and causing the soil to be saturated throughout much of the growing season. The soils are poorly drained silty clays that are covered predominantly by litter and duff. Bedrock, gravel, wood, bare soil, mosses, and fungi are present and cover small quantities of the ground surface. The area surrounding this stand is dominated by *Pinus albicaulis, Abies lasiocarpa*, and *Picea engelmannii* in the overstory and *Vaccinium scoparium* in the understory.

Global Environment: This subalpine wet meadow association occurs throughout the mountains of the north-central and western Wyoming, on mesic stream terraces, in mesic meadows, and occasionally in depressions in upland sites. Sites supporting this association occur between 1950 and 2925 m (6400-9600 feet) elevation, on subirrigated, well-drained soils developed in alluvium.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to upper montane herbaceous wetland that occurs in mesic areas. *Carex microptera* (50% cover) and *Deschampsia caespitosa* (40% cover) codominate the herbaceous layer. *Carex utriculata* is the only other species present within the stand and is scarce.

Global Vegetation: The association is an herbaceous wet meadow community, usually densely vegetated, with few or no shrubs. Graminoids usually dominate the vegetation, and forbs are secondary, although in some stands, forbs contribute almost as much cover as do the graminoids. *Deschampsia caespitosa* dominates or codominates the vegetation, and *Carex microptera* is present, often as a codominant. Other species are generally present but have low total cover and include *Symphyotrichum foliaceum (= Aster foliaceus), Potentilla gracilis, Polygonum bistortoides, Caltha leptosepala, Carex aquatilis*, and *Carex utriculata*.

Global Dynamics: *Deschampsia caespitosa* indicates a stable community, usually without significant gopher, grazing or other disturbance. The abundance of *Carex microptera* indicates that this type is at the wet end of the *Deschampsia caespitosa* meadow continuum.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex microptera	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex microptera	Herb (field)	Graminoid	X	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	.	.

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (30-Nov-1998). The global rank of G2G3 reflects a balance between two types of information about this association. On the one hand, it extends over a large geographic range and occupies a general, common habitat, both of which suggest that this association is represented by many stands. On the other hand, the literature suggests that stands of this association are both attractive and easily accessible to cattle (because of their productivity and the topographic positions in which they grow), and therefore many stands have been highly altered by prolonged heavy cattle grazing.

RELATED CONCEPTS

Global Similar Associations:

- *Deschampsia caespitosa - Caltha leptosepala* Herbaceous Vegetation (CEGL001882)
- *Deschampsia caespitosa - Carex nebrascensis* Herbaceous Vegetation (CEGL001601)
- *Deschampsia caespitosa - Geum rossii* Herbaceous Vegetation (CEGL001884)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599)

Global Related Concepts:
- *Deschampsia cespitosa-Carex microptera* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs near a drainage that runs into Berry Creek near the Upper Berry Patrol Cabin.
Global Range: This association is widespread in Wyoming, and may occur in adjacent areas of Idaho and Montana, but has not been reported for either state.
Nations: US
States/Provinces: ID?, OR:SU, WY:S2S3
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:C?, M331D:CC, M331J:C?
Federal Lands: NPS (Grand Teton); USFS (Bighorn?, Medicine Bow?, Shoshone?)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C085
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G.P. Jones, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Girard et al. 1997	.	X	.	X	X	.	.	.	.
Hansen et al. 1995	.	.	.	.	X	.	.	.	.
Johnson 1961b	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2004	.	X	.	.	.	.	.	.	.
Padgett et al. 1989	.	.	.	.	X	.	.	.	.
Walford et al. 1997	.	X	.	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	X	.	.	.	.

[CEGL001599] *Deschampsia caespitosa* Herbaceous Vegetation

Translated Name: **Tufted Hairgrass Herbaceous Vegetation**
Common Name: **Tufted Hairgrass Meadow**
Ecological System(s):
- Boreal Wet Meadow (CES103.873)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)
- Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This herbaceous vegetation is dominated by a circumboreal species which is common in alpine wet meadows and wetland margin habitats. Stands are found in moist, low-gradient valley bottoms and along streams throughout the mountainous areas of the western U.S. at elevations ranging from 800 to 3550 m (2625-11,650 feet). Typically, these communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. In the alpine tundra, this association is commonly found in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils throughout most of the growing season. Soils are variable. Fine-textured soils retain soil moisture longer in areas of seasonal drought, and coarse substrates allow aeration in areas with perennial high water tables. This vegetation is characterized by a moderately dense to dense herbaceous layer dominated by the perennial bunchgrass *Deschampsia caespitosa*. Commonly associated graminoid species include *Agrostis scabra, Carex aquatilis, Carex nebrascensis, Carex microptera, Carex utriculata, Carex vesicaria, Danthonia intermedia, Elymus trachycaulus, Juncus balticus, Juncus alpinoarticulatus, Phleum alpinum, Poa* spp., *Trisetum spicatum*, and *Trisetum wolfii*. Common forbs include *Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides, Ranunculus flammula*, and low cover of *Caltha leptosepala*. Diagnostic of this herbaceous association is the dominance or codominance of *Deschampsia caespitosa* and the presence of surface water for extended periods during the growing season.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: This association occurs on level terrain or shallow slopes (less than 4%) in riparian corridors on the valley floor. The elevations of the stands range from 2073 to 2179 m (6800-7150 feet). The stands can be situated either upland or in palustrine areas; the sampled palustrine stand is seasonally flooded. Soils range from silt loams to clay loams and are moderately well-drained. The unvegetated and nonvascular ground cover is primarily composed of two components: litter and duff (covering 60-90% of the ground surface) and mosses (covering 5-40% of the ground surface). The adjacent vegetation to two stands includes *Salix* spp. and graminoid meadows.

Global Environment: This plant association occurs in moist, low-gradient valley bottoms throughout the mountainous areas of the western United States at elevations ranging from 800 to 3550 m (2625-11,650 feet).*Deschampsia caespitosa* requires relatively cool, moist conditions. Typically, stands occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. The vegetation occurs at higher elevations in the southern part of its range and in dry interior locations. Communities occur in the alpine tundra where stands grow in snowmelt basins and around the edges of alpine wetlands. At lower elevations, it occurs as wetlands, requiring wet or moist soils throughout most of the growing season. Soils are diverse. In perennially wet soils, stands of this association occur on sand or gravel lenses which allow adequate aeration of roots. In sites with seasonal drought, the vegetation generally occurs on finer-textured soils which drain slowly and retain moisture. Ground cover is variable, with litter and duff ranging from 1-90% cover. Stands in rocky alpine areas can contain up to 50% exposed large and small rock, and many stands have between 1-50% bare soil. Moss is also variable and can have up to 40% cover in wet meadow stands.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane grassland community that occurs in mesic areas. The herbaceous layer is composed of a variety of graminoids; *Deschampsia caespitosa* dominates, composing 30 to 50% of the canopy cover. Codominant species may include *Carex aquatilis, Carex utriculata, Poa pratensis, Elymus trachycaulus, Trisetum wolfii*, and *Trisetum spicatum* (10-30% canopy cover each). Forbs are present in varying quantities and abundances. Common or high-constancy species include *Potentilla gracilis, Geum macrophyllum, Perideridia* spp., and *Trifolium longipes*.

Global Vegetation: This association is typified by a lush growth of *Deschampsia caespitosa*, a perennial bunchgrass which forms an open canopy of culms and nodding panicles. Typically *Deschampsia caespitosa* strongly dominates the herbaceous layer without significant codominants. Commonly associated graminoid species include *Agrostis scabra, Carex aquatilis, Carex nebrascensis, Carex microptera, Carex utriculata, Carex vesicaria, Danthonia intermedia, Eleocharis quinqueflora, Elymus trachycaulus, Juncus balticus, Juncus alpinoarticulatus, Luzula campestris, Phleum alpinum, Poa* spp., *Trisetum spicatum*, and *Trisetum wolfii*. Common forbs include *Castilleja cusickii, Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides, Ranunculus flammula*, and low cover of *Caltha leptosepala*. The vegetation often occurs adjacent to perennially saturated sedge wetlands dominated by *Carex aquatilis, Carex simulata, Carex utriculata*, and others. Stands also generally grade into drier meadows of forbs (*Senecio integerrimus, Achillea millefolium*, and others) and grasses (*Festuca, Muhlenbergia, Poa* spp.). *Poa pratensis* may be codominant in disturbed stands.

Global Dynamics: This association is adapted to moist and wet soils which are seasonally flooded by snowmelt and retain moisture throughout the growing season. However, stands usually occur on sites without permanent surface water. Stands appear to be tolerant of moderate-intensity ground fires and late-season livestock grazing.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Geum macrophyllum	Herb (field)	Forb	.	X	.
Potentilla gracilis	Herb (field)	Forb	.	X	.
Trifolium longipes	Herb (field)	Forb	.	X	.
Carex aquatilis	Herb (field)	Graminoid	X	X	.
Carex utriculata	Herb (field)	Graminoid	X	X	.

Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.
Elymus trachycaulus	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Trisetum spicatum	Herb (field)	Graminoid	X	X	.
Trisetum wolfii	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Perideridia spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Deschampsia caespitosa	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (9-Apr-1998).

RELATED CONCEPTS

Global Similar Associations:

- *Deschampsia caespitosa* - *Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880)
- *Deschampsia caespitosa* - *Artemisia lindleyana* Herbaceous Vegetation (CEGL003425)
- *Deschampsia caespitosa* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001882)
- *Deschampsia caespitosa* - *Carex douglasii* Herbaceous Vegetation (CEGL001602)
- *Deschampsia caespitosa* - *Carex microptera* Herbaceous Vegetation (CEGL001883)
- *Deschampsia caespitosa* - *Carex nebrascensis* Herbaceous Vegetation (CEGL001601)
- *Deschampsia caespitosa* - *Carex* spp. Herbaceous Vegetation (CEGL001603)
- *Deschampsia caespitosa* - *Danthonia californica* Herbaceous Vegetation (CEGL001604)
- *Deschampsia caespitosa* - *Geum rossii* Herbaceous Vegetation (CEGL001884)
- *Deschampsia caespitosa* - *Horkelia marinensis* Herbaceous Vegetation (CEGL003461)
- *Deschampsia caespitosa* - *Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885)
- *Deschampsia caespitosa* - *Luzula multiflora* Herbaceous Vegetation (CEGL001886)
- *Deschampsia caespitosa* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001887)
- *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888)
- *Deschampsia caespitosa* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL003485)
- *Deschampsia caespitosa* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001889)
- *Deschampsia caespitosa* - *Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881)

Global Related Concepts:

- *Carex* - *Isoetes* Plant Community (Hall 1971) =
- *Deschampsia cespitosa* (Bourgeron and Engelking 1994) =
- *Deschampsia cespitosa* Community Type (Manning and Padgett 1995) =
- *Deschampsia cespitosa* Community Type (Tuhy and Jensen 1982) =
- *Deschampsia cespitosa* Community Type (Youngblood et al. 1985a) =
- *Deschampsia cespitosa* Community Type (Padgett et al. 1989) =
- *Deschampsia cespitosa* Habitat Type (Hall and Hansen 1997) =
- *Deschampsia cespitosa* Habitat Type (Hansen et al. 1995) =
- *Deschampsia cespitosa* Herbaceous Vegetation (Cooper et al. 1999) =
- *Deschampsia cespitosa* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Deschampsia cespitosa* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Deschampsia cespitosa* Moist Sedge (Johnson and Simon 1987) B
- *Deschampsia cespitosa* Plant Association (Kittel et al. 1999b) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B
- Tufted Hairgrass Association (Kovalchik 1987) =
- Tufted Hairgrass Plant Association (Crowe and Clausnitzer 1997) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) description extremely well.

Grand Teton National Park Other Comments:

Global Classification Comments: The temporarily flooded, seasonally flooded, and saturated *Deschampsia caespitosa* alliances are weakly separated hydrologically. Descriptions in the literature for the associations in these three alliances are poorly differentiated with respect to soils, hydrology, and vegetation. Further review of the classification of *Deschampsia caespitosa* communities is required to clarify their differences. Stands with over 10% *Phleum alpinum* are similar to ~*Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888)$$ described from Wyoming and may need further review.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in the appropriate habitat throughout Grand Teton National Park. The sampled stands occur in the vast riparian area west of Flagg Ranch and south of Grassy Lake Road and near the Colter Bay / Jackson Lake Lodge area.

Global Range: This association is known from throughout the western U.S. and Alberta, Canada.

Nations: CA, US

States/Provinces: AB, AZ:S2?, CA?, CO:S4, ID:S3, MT:S4, NM, NV?, OR:S2, UT:S3S4, WA, WY

TNC Ecoregions: 1:?, 4:C, 5:P, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:C, 15:C, 16:C, 18:P, 20:C, 21:C, 26:C, 68:C, 81:P

TNC Ecoregion Comments: ECO1, ECO16 added (mjr 8-05). ECO4:C, ECO5:P, ECO7:C, ECO8:C, ECO9:C, ECO68:C, ECO21:C, ECO15:C, ECO12:C, ECO18:P, ECO81:P added (MSR 2-04).

USFS Ecoregions: 261A:CC, 331A:CC, 331D:CC, 331E:C?, 331G:CC, 341D:CC, 342B:CC, M242A:C?, M242C:CC, M261C:CC, M261D:CC, M261E:CC, M262B:CC, M313A:CC, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341:C

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:

Full Plots: GT-03B077, GT-03C010

Accuracy Assessment Points: None

Other plots within park boundaries, from other projects: GT-tm1c, GT-tm2e

Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga

Global Description Author(s): G. Kittel, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bonham and Ward 1970	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Briggs and MacMahon 1983	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Cooper et al. 1999	.	.	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	X	X	.	.	.	.	.
Daubenmire and Daubenmire 1968	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Franklin and Dyrness 1973	.	X	.	X	.	.	.	.	.
Hall 1971	.	X	X	X	.	.	.	.	.
Hall 1973	.	X	.	X	.	.	.	.	.
Hall and Hansen 1997	.	.	X	X	.	.	.	.	.
Hamann 1972	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnson and Simon 1985	.	X	.	X	.	.	.	.	.
Johnson and Simon 1987	.	X	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.

Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Kovalchik 1987	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning and Padgett 1995	.	.	X	X	.	.	.	.	.
Mutz and Queiroz 1983	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
Sanderson and Kettler 1996	.	X	.	X	.	.	.	.	.
Tiedemann 1972	.	X	.	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.
Youngblood et al. 1985b	.	X	.	X	.	.	.	.	.

A.1421 *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance

Needle Spikerush Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this seasonally flooded, temperate or subpolar grassland alliance occur in marshes, muddy shores, and other wet places from the lowlands to high elevations in the western United States (specific information on elevation range is not available). Types typically occur in wet basins, exposed pond bottoms, or concave areas in meadows. Sites have water during the first third of the growing season but eventually dry out. Widely fluctuating water tables are typical. Soils are often fine-textured mineral soils. Texture ranges from silt loam to sandy clay loam with thick, dark soil profiles. Soil pH is strongly acidic, 5.4. *Eleocharis acicularis*, an obligate wetland plant, dominates the graminoid stratum with dense tufts. Percent cover ranges from 25-99%. *Muhlenbergia filiformis* and *Equisetum fluviatile* can occur occasionally in the graminoid layer. The forb layer can include *Trifolium longipes* and *Sagittaria cuneata*. This plant association's species diversity is normally low. Adjacent drier communities are typically *Deschampsia caespitosa* or *Poa palustris* grasslands.

Environment: Vegetation types within this alliance occur in marshes, muddy shores, and other wet places from the lowlands to high elevations in the western United States (specific information on elevation range is not available). Types typically occur in wet basins, exposed pond bottoms, or concave areas in meadows. Sites have water during the first third of the growing season but eventually dry out. Widely fluctuating water tables are typical (Hansen et al. 1988).

Soils are often fine-textured mineral soils. Texture ranges from silt loam to sandy clay loam with thick, dark soil profiles. Soil pH is strongly acidic, 5.4 (Nachlinger 1985).

Adjacent drier communities typically are *Deschampsia caespitosa* or *Poa palustris* grasslands (Hansen et al. 1988).

Vegetation: Vegetation types within this alliance are classified as seasonally flooded, temperate or subpolar grasslands. *Eleocharis acicularis*, an obligate wetland plant, dominants the graminoid stratum with dense tufts. Percent cover ranges from 25-99%. *Muhlenbergia filiformis* and *Equisetum fluviatile* can occur occasionally in the graminoid layer. The forb layer can include *Trifolium longipes* and *Sagittaria cuneata*. Hansen et al. (1988) state that this plant association's species diversity is normally low.

Dynamics:

Similar Alliances:

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described for Montana, Wyoming, the Lake Tahoe region in California and Nevada, and cienegas in the American Southwest. *Eleocharis acicularis* is circumboreal, ranging throughout the western United States, south to Mexico.

Nations: MX?, US

Subnations: CA, CO, ID, NV, OR, WY

TNC Ecoregions: 6:C, 9:C, 11:C, 19:C

USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M341A:??

Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Culver

References: Brown 1982, Cronquist et al. 1977, Hansen et al. 1988b, Hendrickson and Minckley 1984, Nachlinger 1985

[CEGL001832] *Eleocharis acicularis* Herbaceous Vegetation

Translated Name: **Needle Spikerush Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Nachlinger (1985)

ELEMENT CONCEPT

Global Summary: This is a small-statured, small-patch herbaceous wetland community that is common but rarely sampled and is generally overlooked. Stands occur on edges of marshes, on muddy shores, wet basins, exposed pond bottoms or concave areas in meadows or grasslands. This description is based on 14 plots from California, Colorado and Wyoming. Known occurrences are found at elevations between 1460 and 3350 m (4800-11,000 feet). Soils are fine silty clay, loam to sandy loam, and even muck, often over alluvium. Soils are generally saturated throughout the growing season, but the water table may drop to 36 cm by late August. It is typically a low-diversity herbaceous association. The diminutive, rhizomatous, slender perennial graminoid *Eleocharis acicularis* characterizes sites with its dense tufts. The canopy can be open (10%) or nearly closed (85%). Stands are low in species richness (average of 7 in both California and in Colorado plots). Other graminoid species that may be present include *Eleocharis palustris, Pascopyrum smithii, Muhlenbergia filiformis, Carex vesicaria, Bromus japonicus, Echinochloa crus-galli*, and *Glyceria borealis*. Forbs may also be present and include *Rorippa sinuata, Marsilea vestita, Ambrosia tomentosa, Trifolium longipes, Sium suave*, and *Ranunculus flammula*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: The sampled stand of this association occurs in a permanently flooded lacustrine area at an elevation of 2090 m (6857 feet). The silty clay soils contain no gravel. The vegetation of this area is divided into two zones based on the amount of time and the degree to which each is flooded. The two zones together cover about five hectares; the first zone is the pond proper dominated by *Nuphar lutea ssp. polysepala (= Nuphar polysepala)*. Zone two is the zone that was sampled and encircles zone one; the pond (zone one and two) is entirely surrounded by *Salix* species.
Global Environment: Stands occur on edges of marshes, on muddy shores, wet basins, exposed pond bottoms or concave areas in meadows or grasslands. Known occurrences are found at elevations between 1460 and 3350 m (4800-11,000 feet). Soils are fine silty clay, loam to sandy loam, and even muck, often over alluvial. Soils are generally saturated throughout the growing season, but the water table may drop to 36 cm by late August.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous wetland that occurs in and around the edges of permanently flooded areas. Graminoids dominate the stand; abundant species with 20 to 30% cover include *Eleocharis acicularis, Beckmannia syzigachne*, and *Alopecurus aequalis*. *Carex vesicaria, Eleocharis palustris*, and *Glyceria borealis* are common with 3% cover each. *Sium suave* (10% cover) is the only well-represented forb, and *Ranunculus flammula* (3% cover) is common. A few other forb species occur in scarce quantities.
Global Vegetation: This description is based on 14 plots from California, Colorado and Wyoming. This is typically a low-diversity herbaceous association. The diminutive, rhizomatous, slender perennial graminoid *Eleocharis acicularis* characterizes sites with its dense tufts. The canopy can be open (10%) or nearly closed (85%). Stands are low in species richness (average of 7 in California and in Colorado plots). Other graminoid species that may be present include *Eleocharis palustris, Pascopyrum smithii, Muhlenbergia filiformis, Carex vesicaria, Bromus japonicus, Echinochloa crus-galli*, and *Glyceria borealis*. Forbs may also be present and include *Rorippa sinuata, Marsilea vestita, Ambrosia tomentosa,, Trifolium longipes, Sium suave*, and *Ranunculus flammula*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Ranunculus flammula	Herb (field)	Forb	.	.	.
Sium suave	Herb (field)	Forb	.	X	.
Alopecurus aequalis	Herb (field)	Graminoid	X	X	.
Beckmannia syzigachne	Herb (field)	Graminoid	X	X	.
Carex vesicaria	Herb (field)	Graminoid	.	X	.
Eleocharis acicularis	Herb (field)	Graminoid	X	X	.
Eleocharis palustris	Herb (field)	Graminoid	.	X	.
Glyceria borealis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Eleocharis acicularis	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Rumex crispus	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Eleocharis acicularis* (Bourgeron and Engelking 1994) =
- *Eleocharis acicularis* Association (Nachlinger 1985) =
- *Eleocharis acicularis* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Eleocharis acicularis* Herbaceous Vegetation (Carsey et al. 2003b) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand of this association occurs south of Jackson Lake Dam.
Global Range: This wet meadow type is know from California, Oregon, Colorado, Idaho, Nevada and Wyoming.
Nations: US
States/Provinces: CA:S2?, CO, ID:S4, NV:S3?, OR:S4, WY:S2
TNC Ecoregions: 6:?, 8:C, 9:C, 11:C, 19:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M332A:CC, M341A:??
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201087
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Nachlinger 1985*	.	X	X	X	.	.	.	.	.

Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

A.1422 *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance

Marsh Spikerush Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This herbaceous wetland alliance occurs in shallow, mostly still water throughout much of the western United States and central Great Plains, from sea level to alpine. Stands occur on a variety of landforms, including lake margins, stream terraces, floodplains, gravel bars, and wet basins (cienegas). Sites are flat to gently sloping on any aspect. Soils and parent materials are variable, but often highly organic and derived from alluvium. Surface water is typically present for an extended period during the growing season, and the high water table remains high most of the year. The vegetation is characterized by a sparse to dense herbaceous layer that is dominated or codominated by *Eleocharis palustris*, a facultative wetland species. Because of the variety of habitats where this alliance occurs, associated species are diverse. Characteristic associates include several species of *Carex*, *Juncus*, and *Scirpus*, most notably *Carex praegracilis* and *Juncus balticus*. Other important graminoids are *Phalaris arundinacea (= Phalaroides arundinacea), Spartina pectinata, Panicum virgatum, Deschampsia caespitosa, Distichlis spicata*, and *Muhlenbergia asperifolia*. Forb cover is also variable, and may include *Sparganium angustifolium, Lemna* spp., *Potamogeton* spp., *Berula erecta, Rorippa nasturtium-aquaticum, Pedicularis groenlandica, Rhodiola integrifolia, Caltha leptosepala, Mentha arvensis, Rumex crispus, Iris missouriensis*, and *Ranunculus cymbalaria*. Diagnostic of this herbaceous wetland alliance is the dominance or codominance of *Eleocharis palustris* and the presence of surface water for extended periods during the growing season.

Environment: Plant associations included in this alliance are conspicuous, common emergent associations that occur in shallow, mostly still water throughout the western United States. Elevation ranges from sea level in California to 3050 m in Colorado. Stands occur on a variety of landforms including lake margins, stream terraces, floodplains, gravel bars, and wet basins (cienegas). Stands occur on sites that are flat, 1% slope with all aspects (Crowe and Clausnitzer 1997). Soils vary from Histosols to Entisols. High-elevation stands consistently occur on organic (highly sapric) soils, or on a thick organic horizon that overlays fine to coarse alluvial material. Lower elevation stands occur on fresh alluvial deposits of fine-textured loamy sands, clays, and sandy clays (Kittel et al. 1999). Soil reaction is often alkaline (Hansen et al. 1988). All sites are saturated throughout much of the growing season. Oregon stands are located on soils derived from volcanic (andesite, basalt) or sedimentary parent materials (Crowe and Clausnitzer 1997).

At higher elevation, *Carex aquatilis* or *Carex utriculata* meadows and *Salix wolfii* or *Salix planifolia* shrublands occur within the riparian mosaic. At lower elevation, *Schoenoplectus pungens* often occurs within the stream channel while wet meadow prairies of *Panicum virgatum* and *Sorghastrum nutans* occupy the immediate streambanks and low floodplains.

Vegetation: Plant associations within this alliance are classified as seasonally flooded, temperate or subpolar grasslands. *Eleocharis palustris*, a facultative wetland species, dominates the graminoid stratum. Cover ranges from sparse to quite dense (10-80%). *Eleocharis palustris* plant associations occur within a wide elevational range, and the species composition can be quite variable. In the Great Plains stands, co-occurring species often include *Phalaris arundinacea (= Phalaroides arundinacea), Juncus balticus, Carex praegracilis, Schoenoplectus pungens (= Scirpus pungens), Panicum virgatum, Carex pellita (= Carex lanuginosa), Spartina pectinata*, and *Schoenoplectus americanus (= Scirpus americanus)*. Forb cover can also include *Sparganium angustifolium, Lemna* spp., and *Potamogeton* spp. (Kittel et al. 1999). *Distichlis spicata* and *Muhlenbergia asperifolia* codominate the graminoid layer in cienegas (Arizona and New Mexico). Forb cover is composed of *Berula erecta* and *Rorippa nasturtium-aquaticum*, especially in stands with deep water (Cross 1991).

At higher, montane elevations other graminoids present include *Carex aquatilis, Carex utriculata, Carex buxbaumii, Eleocharis rostellata*, and *Deschampsia caespitosa*. Forb cover is typically low, but can be up to 25% in some stands. Common forb species include *Pedicularis groenlandica, Rhodiola integrifolia*, and *Caltha leptosepala* (Hansen et al. 1995, Kittel et al. 1999).

Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is an aggressive species, typically excluding other species from establishing. In the Oregon stands, associated forbs include *Mentha arvensis, Rumex crispus, Iris missouriensis*, and *Ranunculus cymbalaria*.

Dynamics: At lower elevations *Eleocharis palustris* plant associations occur well within the active channel and are inundated annually. These early seral communities colonize backwater eddies and shallow edges of slow moving reaches of small and larger rivers. The stands are probably ephemeral, as the eddies and river edges are scoured out each year during high spring flows (Kittel et al. 1999). These communities have also been described as early seral stages by Padgett et al. (1989). Padgett et al. (1989) describe light colored soils for the sites, indicating an early phase of soil development. Kovalchik (1987) reports that the lower elevation plant associations within this alliance frequently form seral communities in ponded sites between stream rehabilitation structures such as loose rock check dams.

In the montane zone, associations within this alliance occur in ponded sites on faster moving streams. If siltation occurs, sites may become dominated by *Carex utriculata*. At higher elevations, the associations appear to be stable. Stands occur near seeps on soils with deep organic layers, often sapric, and are saturated throughout the growing season.

Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is of little to no forage value to livestock and wild ungulates. On seasonally drier sites, ungulate trampling may cause this species to increase (Snyder 1992 as cited in Crowe and Clausnitzer 1997). However, this species does provide seed forage and cover to ducks and geese (Kovalchik 1987).

Similar Alliances:

- *Eleocharis palustris* Temporarily Flooded Herbaceous Alliance (A.1342)

Similar Alliance Comments: The temporarily flooded alliances differ from the seasonally flooded alliances mainly due to the duration of surface water. Temporarily flooded alliances have surface water present briefly during the growing season. Seasonally flooded alliances have surface water present throughout the growing season.

ALLIANCE DISTRIBUTION

Range: This alliance occurs from Oregon to Montana and Alberta, Canada, south to California, Arizona, and New Mexico. The alliance is expected to occur in eastern Washington.

Nations: CA, MX, US

Subnations: AB, AZ, BC, CA?, CO, ID, MT, MXSO, NE, NM, NV?, OR, SD, SK, UT, WA, WY

TNC Ecoregions: 2:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 27:P, 68:P

USFS Ecoregions: 242A:CC, 321A:CC, 331D:CC, 331F:CC, 331G:CC, 341A:CC, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342G:CC, 342I:C?, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC

Federal Lands: NPS (Badlands, Capitol Reef, Dinosaur, Fossil Butte, Glacier, Grand Teton, Wind Cave); PC (Waterton Lakes); USFS (Black Hills); USFWS (Ouray)

ALLIANCE SOURCES

Author(s): D. Culver

References: Baker 1983c, Baker and Kennedy 1985, Brotherson 1987, Brotherson and Barnes 1984, Brown 1982, Bunin 1985, Cronquist et al. 1977, Cross 1991, Crowe and Clausnitzer 1997, Durkin et al. 1995a, Ellis et al. 1979, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hendrickson and Minckley 1984, Johnston 1987, Kartesz 1994a, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Muldavin et al. 2000a, Mutel 1973, Mutel and Marr 1973, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1942, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Shupe et al. 1986, Stearns-Roger, Inc. 1978, Stewart 1940, Sturges 1968, Youngblood et al. 1985a

[CEGL001833] *Eleocharis palustris* Herbaceous Vegetation

Translated Name: **Marsh Spikerush Herbaceous Vegetation**

Common Name: **Marsh Spikerush Wet Meadow**

Ecological System(s):

- Inter-Mountain Basins Greasewood Flat (CES304.780)
- Boreal Wet Meadow (CES103.873)
- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Western Great Plains Closed Depression Wetland (CES303.666)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)
- Willamette Valley Wet Prairie (CES204.874)

Status: Standard **Circumscription Confidence:** 1 - Strong

Concept Author(s): D. Faber-Langendoen, mod. K. Schulz, M.S. Reid, G. Kittel

ELEMENT CONCEPT

Global Summary: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and in the western United States. Elevations range from near sea level to 3050 m (0-10,000 feet). Stands occur in small depressions in intermittent streambeds or depression ponds that flood early in the season and may dry out by summer. Soils are generally fine-textured. Stands are composed of submersed and emergent rooted vegetation under 1 m tall that is dominated by *Eleocharis palustris*, often in nearly pure stands. Vegetative cover can be sparse to dense (10-90%), but *Eleocharis palustris* is the dominant species, and the only species with 100% constancy. Other species, when present, can contribute as much as 40% cover, but never exceed that of the *Eleocharis palustris* cover.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

Grand Teton National Park Environment: The sampled stands of this association occur on basin floors at elevations of 2109 and 2072 m (6919 and 6798 feet). One stand is classified as being periodically flooded. The soils of the stands are clays and silty clay loams. Both stands are specifically noted as being situated in depressions. Adjacent vegetation may include *Salix* species. There is evidence of livestock grazing in one stand.

Global Environment: This wetland occurs across the central and northwestern Great Plains and western United States. Elevations range from near sea level to 3050 m (0-10,000 feet). In the western mountains it occurs in valleys and canyon bottoms on the banks and in the overflow channels of low-gradient streams, as well as along the margins of ponds and lakes. On the Great Plains, this community occurs in small depressions in intermittent streambeds, depression ponds that flood early in the season and dry out by summer, and small prairie potholes. It can also occur in the bottom of ephemeral ponds or playas on floodplain terraces of large rivers. In wet years, stands may remain ponded throughout the growing season. Soils range from organic to silty clay to fine loam formed from weathered siltstone and shale. Soils are reported as slightly alkaline.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane herbaceous wetland that occurs in mesic areas. *Eleocharis palustris* dominates the canopy in both stands with 60 and 70% cover. The stands hold no other species in common. Graminoids and forbs that are well-represented in one stand each include *Sium suave, Carex athrostachya, Porterella carnosula*, and two unknown species.

Global Vegetation: This wetland association is dominated by submersed and emergent rooted vegetation under 1 m tall and occurs across the northwestern Great Plains and western U.S. within a wide elevational range. The species composition can be quite variable, but this community is easy to recognized by the bright green, nearly pure stands of *Eleocharis palustris*. Vegetation cover can be sparse to dense (10-90%), but *Eleocharis palustris* is the dominant species, and the only species with 100% constancy. Other species, when present, can contribute as much as 40% cover, but never exceed that of the *Eleocharis palustris* cover. Some of this variation is described from Colorado (Baker and Kennedy 1985, Kittel et al. 1999b). Co-occurring species in low-elevation stands on the western slope can include *Phalaris arundinacea (= Phalaroides arundinacea), Juncus balticus, Hordeum jubatum, Pascopyrum smithii, Schoenoplectus americanus (= Scirpus americanus), Sparganium angustifolium*, species of *Lemna* and *Potamogeton*, as well as the introduced *Melilotus officinalis* and *Bromus inermis*. On the eastern plains of Colorado co-occurring species can include *Leersia oryzoides, Schoenoplectus pungens (= Scirpus pungens), Panicum virgatum, Carex pellita (= Carex lanuginosa)*, and *Spartina pectinata*. At montane elevations, other graminoids, such as *Carex aquatilis, Carex utriculata*, and *Deschampsia caespitosa* are present. Forb cover is typically low, but can be occasionally abundant (30%) in some stands. Forb species include *Pedicularis groenlandica, Rhodiola integrifolia*, and *Caltha leptosepala*.

In stands from eastern Washington, associates include *Carex utriculata, Cicuta douglasii*, and species of *Glyceria* and *Potamogeton*. In northwestern Nebraska, stands are dominated *Eleocharis acicularis* and *Eleocharis palustris* which commonly cover the bottoms of the pools and emerge above the water as the pools dry out. Ephemeral submersed aquatics, such as *Callitriche palustris (= Callitriche verna), Potamogeton diversifolius* and *Marsilea vestita*, may be present. As the pools dry out in mid-summer, ephemeral annual forbs, such as *Limosella aquatica* and *Plagiobothrys scouleri*, may appear. By late summer *Amaranthus californicus* and *Gnaphalium palustre* may dominate in the lowest parts of the depression (Steinauer and Rolfsmeier 2000). In southwestern South Dakota, vegetation is composed of nearly homogeneous stands of *Eleocharis palustris*. Other emergents, such as *Polygonum amphibium, Marsilea vestita*, and *Eleocharis ovata*, are occasionally found. Herbaceous cover is greater than 75% except in areas of deeper open water where floating and submerged aquatic plants occur, including *Bacopa rotundifolia* and *Heteranthera limosa* (H. Marriott pers. comm. 1999). In lower elevation Utah stands *Glaux maritima, Distichlis spicata*, and *Juncus balticus* were important associates (Brotherson and Barnes 1984).

Few stand data are available for Colorado examples. Generally, it appears that this community is dominated by *Eleocharis palustris*, forming a scattered to dense overstory, often with few associated species. Commonly associated graminoids include *Hordeum jubatum* and *Pascopyrum smithii*. Forbs present may include *Atriplex argentea, Polygonum aviculare*, and *Rorippa sinuata* (Baker and Kennedy 1985). The higher elevation stands may include a slightly different suite of species, but no stand data are available. Ramaley (1942) described a *Distichlis spicata*-dominated salt meadow on a lakeshore in the San Luis Valley, which was ringed by *Eleocharis palustris*. Communities in Utah include *Eleocharis acicularis* and *Alopecurus aequalis* as likely associates (Padgett et al. 1989).

Global Dynamics: The hydrological regime is critically important to this association. Most stands are seasonally to permanently flooded, although some in the Great Plains occur under intermittently to temporarily flooded conditions. Baker and Kennedy (1985) suggest that domestic livestock grazing may tend to result in increases in *Hordeum jubatum, Bassia scoparia*, and *Polygonum aviculare*. However, Hansen et al. (1988a) suggest that palatability of *Eleocharis palustris* is low for both domestic and wild animals, but that heavy grazing may increase this rhizomatous species and spread it onto adjacent sites. Trampling damage (especially soil compaction) may occur to this type when animals heavily use the sites supporting it, particularly during drought years (Hansen et al. 1988a). Water level fluctuations over a year of greater than 1 m will not support this type (Hansen et al. 1988a).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Eleocharis palustris	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Eleocharis palustris	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Polygonum aviculare	-	P	exotic
Porterella carnosula	-	P	rare
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Eleocharis palustris - (Eleocharis compressa) - Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259)
- *Eleocharis palustris - Distichlis spicata* Herbaceous Vegetation (CEGL001834)
- *Eleocharis palustris - Juncus balticus* Herbaceous Vegetation (CEGL001835)

Global Related Concepts:
- *Eleocharis palustris* (Bourgeron and Engelking 1994) =
- *Eleocharis palustris* (Hansen et al. 1995) =
- *Eleocharis palustris* Community Type (Padgett et al. 1989) =
- *Eleocharis palustris* Habitat Type (Hall and Hansen 1997) ?
- *Eleocharis palustris* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Eleocharis palustris* Wetland (Baker and Kennedy 1985) =
- Creeping Spikerush Association (Kovalchik 1993) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Spikerush Community (Brotherson and Barnes 1984) =
- Zone of Spikerush of the Vegetation surrounding San Luis Lakes (Ramaley 1942) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands of this association occur near Hedrick Pond and near a pond between Emma Matilda Lake and Pacific Creek.
Global Range: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and in the western United States.
Nations: CA, US
States/Provinces: AB, BC:S4, CA?, CO:S4, ID:S3, MT:S5, NE, NM, NV?, OR:S5, SD, SK, UT:S3?, WA:S3?, WY:S3
TNC Ecoregions: 2:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 27:P, 68:P
TNC Ecoregion Comments: ECO27:P, ECO11:C, ECO7:C, ECO8:C, ECO9:C, ECO4:C, ECO18:C, ECO21:P, ECO12:P, ECO68:P added (MSR 2-04).
USFS Ecoregions: 242A:CC, 331D:CC, 331F:CC, 331G:CC, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342G:CC, 342I:C?, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC
Federal Lands: NPS (Badlands, Capitol Reef, Dinosaur, Fossil Butte, Grand Teton, Wind Cave); PC (Waterton Lakes); USFS (Black Hills); USFWS (Ouray)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201096, GT-0203004
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): D. Faber-Langendoen, mod. K. Schulz, M.S. Reid, G. Kittel, J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1983c	.	X	.	X	.	.	.	.	.
Baker and Kennedy 1985	.	X	X	X	.	.	.	.	.
Billings 1945	.	.	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Brotherson and Barnes 1984	.	X	X	X	.	.	.	.	.
Bunin 1985	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Ellis et al. 1979	.	X	.	X	.	.	.	.	.
Flowers 1962	.	X	.	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1988a	.	.	.	X	.	.	.	.	.
Hansen et al. 1988b	.	X	.	X	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kettler and McMullen 1996	.	X	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1994	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	.	.	X	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Kovalchik 1987	.	X	.	X	.	.	.	.	.
Kovalchik 1993	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Marriott pers. comm.	.	.	.	X	.	.	.	.	.
Mutel 1973	.	X	.	X	.	.	.	.	.
Mutel and Marr 1973	.	X	.	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Penfound 1953	.	.	.	X	.	.	.	.	.
Ramaley 1919a	.	X	.	X	.	.	.	.	.
Ramaley 1942	.	X	X	X	.	.	.	.	.
Stearns-Roger, Inc. 1978	.	X	.	X	.	.	.	.	.
Steinauer and Rolfsmeier 2000	.	.	.	X	.	.	.	.	.
Stewart 1940	.	X	.	X	.	.	.	.	.
Von Loh 2000	.	X	.	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	X	.	.	.	.	.

A.1374 *Juncus balticus* Seasonally Flooded Herbaceous Alliance

Baltic Rush Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance often occupies seasonally flooded swales and wet, low- to mid-elevation sites. Habitats are often alkaline. It is a wide-ranging alliance, occurring from the plains to montane regions, and has much variability. Elevations range from sea level in California to 3500 m in Colorado. Montane plant associations can occur on alluvial terraces, floodplains, overflow channels, seeps, meadows, and near springs. Sites are typically gently sloping (1-3%) on all aspects. An association was documented in northern California coastal salt marshes. Soils are mineral with dark surface horizons containing large amounts of well-decomposed organic matter. Soils are Mollisols, or rarely Entisols. Soil texture ranges from silt to sandy loam. Water tables are often at or near the soil surface in early summer but may drop below 50 cm by late August. Soil reaction ranges from neutral to mildly alkaline (pH 7.0-8.0). The graminoid layer is dense with up to 98% cover and dominated by *Juncus balticus*, a creeping, often sod-forming, rhizomatous perennial. Other graminoid cover is minor but can include *Carex pellita (= Carex lanuginosa), Carex aquatilis, Carex canescens, Leymus cinereus, Deschampsia caespitosa, Hordeum jubatum*, or *Sporobolus airoides*. Forb cover is typically minor and may include *Achillea millefolium, Iris missouriensis*, or *Geum macrophyllum*. The plant association from California is composed of *Distichlis spicata, Carex lyngbyei, Carex obnupta*, and *Schoenoplectus robustus (= Scirpus robustus)*. Occasionally, a few tree or shrub seedlings are present, including *Populus angustifolia, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and *Salix exigua*. *Salix exigua* shrublands, *Distichlis spicata* marshes, or *Carex* spp. meadows occur in adjacent riparian areas. *Abies lasiocarpa - Picea engelmannii, Pseudotsuga menziesii*, and *Populus tremuloides* forests, *Pinus edulis - Juniperus* spp. woodlands, and *Ericameria nauseosa (= Chrysothamnus nauseosus), Sarcobatus vermiculatus*, and *Artemisia tridentata* shrublands occur on adjacent hillslopes. In low-disturbance areas, *Juncus balticus* plant associations appear to be a stable, climax community. However, in some areas, this association is considered to be grazing-induced. *Juncus balticus* is considered an increaser due to its low forage value and high tolerance to grazing. It usually increases in abundance on sites formerly dominated by *Deschampsia caespitosa* or *Calamagrostis canadensis*. Nearly pure stands of *Juncus balticus* indicate that the site may have been heavily grazed in the past. *Juncus balticus* is listed as a facultative wetland species.

Environment: Plant associations within this alliance are widely distributed in wet, often alkaline places, from the plains to mountains. Elevation ranges from sea level in California to 3500 m in Colorado. Montane plant associations can occur on alluvial terraces, floodplains, overflow channels, seeps, meadows, and near springs. Sites are typically gentle (1-3%) slope on all aspects. Barbour and Major (1977) state that *Juncus balticus* occurs in northern California coastal salt marshes.

Soils are mineral with dark surface horizons containing large amounts of well-decomposed organic matter (Tuhy and Jensen 1982). Soils are Mollisols, or rarely Entisols. Soil texture ranges from silt to sandy loam. Water tables are often at or near the soil surface in early summer, but may drop below 50 cm by late August. Soil reaction ranges from neutral to mildly alkaline (pH 7.0-8.0) (Hansen et al. 1995).

Salix exigua shrublands, *Distichlis spicata* marshes, or *Carex* spp. meadows occur in adjacent wet riparian areas. *Sarcobatus vermiculatus* and *Artemisia tridentata* shrublands occur on drier alluvial terraces and adjacent hillslopes. *Abies lasiocarpa - Picea engelmannii, Pseudotsuga menziesii*, and *Populus tremuloides* forests, *Pinus edulis - Juniperus* spp. woodlands, and *Ericameria nauseosa* shrublands occur on adjacent hillslopes.

Vegetation: Plant associations within this alliance are classified as seasonally flooded, temperate or subpolar grasslands. They are dominated by a thick stand of 10-98% cover of *Juncus balticus*, a facultative wetland species. Other graminoid cover is minor, but can include *Carex pellita (= Carex lanuginosa), Carex aquatilis, Carex canescens, Leymus cinereus, Deschampsia caespitosa, Hordeum jubatum*, or *Sporobolus airoides*. Forb cover is typically minor and may include *Achillea millefolium, Iris missouriensis*, or *Geum macrophyllum*. The plant association from California is composed of *Distichlis spicata, Carex lyngbyei, Carex obnupta*, and *Schoenoplectus robustus (= Scirpus robustus)*. Occasionally, a few tree or shrub seedlings are present including *Populus angustifolia, Dasiphora fruticosa ssp. floribunda (= Pentaphylloides floribunda)*, and *Salix exigua*. Stands often contain adventive species, e.g., *Poa pratensis* and *Phleum pratense*.

Dynamics: In low-disturbance areas, the *Juncus balticus* stands of this alliance appear to be a stable, late seral communities. They occupy frequently inundated swales and wet, low- to mid-elevation sites (Kittel and Lederer 1993). However, in some areas, stands of this alliance may be considered to be grazing-induced (Padgett et al. 1989). *Juncus balticus* is considered an increaser due to its low forage value and high tolerance to grazing (USFS 1937, as cited in Kittel et al. 1999b, Hansen et al. 1995). It usually increases in abundance on sites formerly dominated by *Deschampsia caespitosa* or *Calamagrostis canadensis*. Nearly pure stands of *Juncus balticus* indicate that the site may have been heavily grazed in the past (Hansen et al. 1995).

Similar Alliances:

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from California, the Pacific Northwest, Rocky Mountains, Great Basin, Southwest, and the Great Plains. The species *Juncus balticus* is widespread throughout the United States and the Northern Hemisphere, and the alliance may prove more widespread than presently described.

Nations: CA, US

Subnations: BC, CA, CO, ID, MT, NE, NM, NV, OR, PA, SD, UT, WA, WY

TNC Ecoregions: 2:C, 6:C, 9:C, 10:C, 11:C, 12:C, 17:C, 18:C, 19:C, 20:C, 25:C, 26:C, 27:C, 33:P, 50:P, 51:P, 59:C
USFS Ecoregions: 242A:CC, 313A:CC, 322A:CP, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 332C:CP, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:C?, M261E:CC, M261G:CC, M262:C, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC, M341C:CC
Federal Lands: NPS (Agate Fossil Beds, Bryce Canyon, Colorado, Curecanti, Dinosaur, Florissant Fossil Beds, Grand Teton, Rocky Mountain, Yosemite, Zion); USFS (Black Hills); USFWS (Lacreek, Ouray)

ALLIANCE SOURCES

Author(s): Eastern Ecology Group 96, mod. D. Culver
References: Barbour and Major 1977, Blackburn et al. 1971, Brooks and Clemants 2000, Brotherson and Barnes 1984, Brown 1982, Bunin 1985, Carsey et al. 2003a, Carsey et al. 2003b, Crowe and Clausnitzer 1997, Flowers 1962, Grossman et al. 1994, Hansen et al. 1995, Hess 1981, Johnston 1987, Jones and Walford 1995, Kartesz 1994a, Kittel and Lederer 1993, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1987, Kunze 1994, Manning 1988, Manning and Padgett 1995, Mutel 1973, Mutz and Graham 1982, Olson and Gerhart 1982, Padgett 1982, Padgett et al. 1989, Rector 1979, Richard et al. 1996, Roberts et al. 1992, Sawyer and Keeler-Wolf 1995, Shupe et al. 1986, Sneddon et al. 1996, Stewart 1940, Tuhy and Jensen 1982, Wasser and Hess 1982, Youngblood et al. 1985a

[CEGL001838] *Juncus balticus* Herbaceous Vegetation

Translated Name: **Baltic Rush Herbaceous Vegetation**
Common Name: **Baltic Rush Wet Meadow**
Ecological System(s):
- Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
- Boreal Wet Meadow (CES103.873)
- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Northern Columbia Plateau Basalt Pothole Ponds [Provisional] (CES304.058)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): J. Drake, mod. D. Faber-Langendoen, mod. K. Schulz

ELEMENT CONCEPT

Global Summary: This Baltic rush wet meadow community is found widely throughout the western United States. This wet meadow vegetation occurs as small, dense patches on flat stream benches, along overflow channels, and near springs. Soils are variable and range from poorly to well-drained, sandy clay loam to fine sand-textured and are usually mottled or gleyed. Stands are characterized by a dense sward of *Juncus balticus* and often minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex nebrascensis*, or *Carex utriculata*. Other common species include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum jubatum, Muhlenbergia asperifolia, Phleum alpinum*, and *Sporobolus airoides*. The introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera* codominate some stands. Forb cover is generally low and includes wetland species such as *Caltha leptosepala, Rumex aquaticus*, and *Dodecatheon pulchellum*. *Iris missouriensis* can be common in heavily grazed stands. Shrubs are not common. This association is often considered to be a grazing-induced community since it increases with disturbance.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occurs on the valley floor at an elevation of 6768 feet and the other stand occurs in a small, 20-foot wide channel at an elevation of 6600 feet. Soil data is available for the stand located on the valley floor; the moderately well-drained clay loam soils are covered predominantly by litter and duff with a trace of moss. The meadow in which this plot is situated is surrounded by *Pinus contorta*-dominated and *Pinus contorta – Populus tremuloides* forests. The stand situated in the channel is surrounded by *Populus angustifolia, Picea pungens*, and *Salix* sp. Insect disturbance is noted in one stand.

Global Environment: This widespread herbaceous wetland community is found throughout western North America. Elevation ranges from 1420 to 3500 m (4655-11,475 feet). Stands usually occur as small, dense patches on flat to gently sloping sites near seeps and streams. Stream channels are highly variable in size and type, ranging from narrow to moderately wide, and deeply entrenched to very sinuous (Kittel et al. 1999b). Soils are also variable and range from alluvial sandy and well-drained to poorly drained silty clay loam to organic; however, soils tend to be finer-textured, alkaline and may be saline (Brotherson and Barnes 1984, Padgett et al. 1989, Kittel et al. 1999b). Cobbles and gravel are common on many sites, and gleyed and mottled horizons are often present because of flooding or high water tables (Kittel et al. 1999b).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane herbaceous grassland that occurs in mesic areas. Graminoids dominate the herbaceous layer with 60 and 98% total cover in the two samples. Graminoids that occur in both stands are *Juncus balticus* (20 and 30% cover), *Poa pratensis* (30 and 50% cover), and *Deschampsia caespitosa* (1% cover). A variety of other graminoids and forbs are present with trace to 3% cover, but none occur in both stands.

Global Vegetation: This association is characterized by a low (<50 cm), dense graminoid layer dominated by the rhizomatous perennial *Juncus balticus*. Minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex microptera, Carex nebrascensis,* or *Carex utriculata*, is often present. Other common graminoids include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum jubatum, Muhlenbergia asperifolia, Poa nemoralis ssp. interior, Phleum alpinum,* and *Sporobolus airoides*. Forb cover is generally low but may include *Caltha leptosepala, Glaux maritima, Maianthemum stellatum, Rumex aquaticus, Cirsium scariosum (= Cirsium tioganum), Achillea millefolium, Artemisia ludoviciana, Potentilla plattensis, Polygonum bistortoides, Dodecatheon pulchellum*, and *Iris missouriensis*. Shrubs and dwarf-shrubs are not common; however, *Artemisia frigida* cover may be significant in some stands, and occasional *Dasiphora fruticosa ssp. floribunda* or *Salix* spp. shrubs may occur. Some stands may be codominated by the introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera*. Other introduced species, such as *Taraxacum officinale, Trifolium* spp., *Cirsium arvense, Lactuca serriola, Phleum pratense*, and *Thinopyrum intermedium*, may occur in disturbed stands.

Global Dynamics: This association is considered by some to be a grazing-induced community because *Juncus balticus* is tolerant of grazing (low palatability when mature) and increases with grazing disturbance (Padgett et al. 1989, Hansen et al. 1995). Nearly pure stands of *Juncus balticus* may indicate that the site was heavily grazed in the past (Hansen et al. 1995). However, this association also occurs as a stable, late-seral community in areas with low disturbance (Kittel and Lederer 1993).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Juncus balticus	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.
Grand Teton National Park Higher Taxa					
Arnica sp.	characteristic forb				
Erigeron sp.	characteristic forb				
Potentilla sp.	characteristic forb				
Asteraceae sp.	characteristic forb				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Juncus balticus	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Eleocharis palustris - Juncus balticus* Herbaceous Vegetation (CEGL001835)
- *Juncus balticus - Carex rossii* Herbaceous Vegetation (CEGL001839)

Global Related Concepts:
- *Juncus arcticus / Carex* spp. Plant Association (Johnston 1987) =
- *Juncus balticus / Carex* spp. Habitat Subtype (Olson and Gerhart 1982) =
- *Juncus balticus / Carex* spp. Habitat Type (Wasser and Hess 1982) ?
- *Juncus balticus* (Bourgeron and Engelking 1994) =
- *Juncus balticus* Community Type (Hall and Hansen 1997) =
- *Juncus balticus* Community Type (Tuhy and Jensen 1982) ?
- *Juncus balticus* Community Type (Hansen et al. 1995) = *Juncus balticus* Community Type (Youngblood et al. 1985a) =

- *Juncus balticus* Community Type (Padgett et al. 1989) =
- *Juncus balticus* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Juncus balticus* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Juncus balticus* Herbaceous Vegetation Association (Kittel et al. 1999a) =
- *Juncus balticus* Plant Association (Jankovsky-Jones et al. 2001) =
- *Juncus balticus* Vegetation Type (Mutz and Graham 1982) =
- *Juncus balticus* Wetland Plant Association (Baker 1984a) =
- *Juncus balticus* dominated (Zone 3) (Shupe et al. 1986) =
- Baltic Rush (*Juncus balticus)* Dominance Type (Jones and Walford 1995) =
- Baltic Rush Alliance (Muldavin et al. 2000a) B
- Baltic Rush Plant Community Type (Crowe and Clausnitzer 1997) =
- DRISCOLL FORMATION CODE: V.C.6.a. (Driscoll et al. 1984) B
- Palustrine (Cowardin et al. 1979) B
- Saline Meadow (Brotherson and Barnes 1984) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This association fits the Youngblood et al. (1985a) *Juncus balticus* Community Type well.
Grand Teton National Park Other Comments:
Global Classification Comments: This association is often considered to be a grazing-induced community since it increases with grazing disturbance.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand of this association occurs east of Oxbow Bend and the other occurs west of the Teton Point turnout in the Snake River Channel.

Global Range: This Baltic rush wet meadow community is found widely throughout the western United States, ranging from South Dakota and Montana west to Washington, south to possibly California, and east to New Mexico.
Nations: CA, US
States/Provinces: BC:S3, CA?, CO:S5, ID:S5, MT:S5, NE, NM:S4, NV, OR:S5, SD, UT:S3S4, WA:S3S4, WY:S3
TNC Ecoregions: 2:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 17:C, 18:C, 19:C, 20:C, 25:C, 26:C, 27:C, 33:P, 68:C
TNC Ecoregion Comments: ECO4, ECO7, ECO8, ECO68 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04). ECO33 added (SM 3-02). ECO18 added (KAS 6-01).
USFS Ecoregions: 242A:CC, 313A:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 332C:CP, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:C?, M261G:CC, M262:C, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC, M341C:CC
Federal Lands: NPS (Agate Fossil Beds, Colorado, Curecanti, Dinosaur, Florissant Fossil Beds, Grand Teton, Rocky Mountain, Zion); USFS (Black Hills); USFWS (Lacreek, Ouray)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B022
Accuracy Assessment Points: 04R078
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): J. Drake, mod. D. Faber-Langendoen, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Baker 1984a	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Brotherson and Barnes 1984	.	X	X	X	.	.	.	.	.
Bunin 1985	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.

Cogan et al. 2004	.	.	.	X	.	.	.	.	.
Cowardin et al. 1979	.	.	X	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	.	X	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Faber-Langendoen 2001	.	X	.	X	.	.	.	.	.
Flowers 1962	.	X	.	X	.	.	.	.	.
Hall and Hansen 1997	.	X	X	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Jankovsky-Jones et al. 2001	.	.	X	.	.	.	.	.	.
Johnston 1987	.	X	X	X	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Jones and Walford 1995	.	.	X	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Kartesz 1994a	.	.	.	X	.	.	.	.	.
Kittel and Lederer 1993	.	X	.	X	.	.	.	.	.
Kittel et al. 1999a	.	.	X	.	.	.	.	.	.
Kittel et al. 1999b	.	X	.	X	.	.	.	.	.
Komarkova 1986	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Manning 1988	.	X	.	X	.	.	.	.	.
Muldavin et al. 2000a	.	X	X	X	.	.	.	.	.
Mutel 1973	.	X	.	X	.	.	.	.	.
Mutz and Graham 1982	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Olson and Gerhart 1982	.	X	X	X	.	.	.	.	.
Padgett 1982	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Rector 1979	.	X	.	X	.	.	.	.	.
Richard et al. 1996	.	X	.	X	.	.	.	.	.
Shupe et al. 1986	.	X	X	X	.	.	.	.	.
Stewart 1940	.	X	.	X	.	.	.	.	.
Tuhy and Jensen 1982	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Wasser and Hess 1982	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

A.1409 *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance

Fowl Bluegrass Semi-natural Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance includes grasslands dominated by an introduced perennial sod grass native to Europe. Stands have been described from Montana and South Dakota, but the alliances is likely more widespread. Sites include more mesic areas such as riparian floodplains and seasonally flooded wetlands. Soils are alluvial.
Environment: This grassland alliance has been described from Montana and South Dakota, but the alliances is likely more widespread. Sites include more mesic areas such as riparian floodplains and seasonally flooded wetlands. Soils are alluvial.
Vegetation: This alliance includes grasslands dominated by an introduced perennial sod grass native to Europe. Other native species may occur as well, but they are generally less than 10% cover.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance is found in Montana, Wyoming and South Dakota but is likely more widespread.
Nations: US
Subnations: MT, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 25:C, 26:C

USFS Ecoregions: 331D:CC, 331G:CC, M331A:CC, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): M.S. Reid, mod. K. Schulz
References: Hansen et al. 1991, Hansen et al. 1995, Kartesz 1999

[CEGL001659] *Poa palustris* Herbaceous Vegetation

Translated Name: **Fowl Bluegrass Herbaceous Vegetation**
Common Name: **Fowl Bluegrass Mixedgrass Prairie**
Ecological System(s):
- Central Mixedgrass Prairie (CES303.659)
- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This minor wet meadow association occurs in small patches in Idaho, Montana and northwestern Wyoming. *Poa palustris* colonizes and stabilizes wet sandy alluvial point bars, islands and streambanks at or below the high water line at elevations from 927 to 1829 m (3040-6000 feet), with a few stands occurring up to 2044 m (6700 feet). Soils alternate layers of silty clays with sands and cobbles. The water table tends to be near the surface early in the growing season, gradually falling through the summer. Intact examples appear as dense near-monocultures of *Poa palustris*, with scattered shrubs such as *Salix boothii, Salix geyeriana*, and *Alnus incana*. *Poa pratensis, Phleum pratense*, and *Agrostis stolonifera* are minor species in high-quality stands but may become dominant as domestic livestock grazing increases. Other native constituents of the community include *Juncus balticus, Deschampsia caespitosa, Carex aquatilis*, and *Pedicularis groenlandica*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor at elevations of 6596 to 6800 feet. One stand is situated in a palustrine area and has saturated and poorly-drained silty clay loam soils. The soils for this stand are covered almost exclusively by litter and duff, with mosses, lichens, and fungi present only in trace amounts. Adjacent vegetation for these stands may include *Picea pungens* and *Populus angustifolia* stands, *Pinus contorta* stands, willow shrublands, and/or sagebrush shrublands. Ungulate use is evident in all sampled stands.

Global Environment: This minor wet meadow association occurs in small patches in Idaho, Montana and northwestern Wyoming. *Poa palustris* colonizes and stabilizes wet sandy alluvial point bars, islands and streambanks at or below the high water line (Jankovsky-Jones et al. 2001). Established stands occur on toeslopes, alluvial terraces and flat meadows, from 927 to 1829 m (3040-6000 feet) elevation, with a few stands occurring up to 2044 m (6700 feet). Soils alternate layers of silty clays with sands and cobbles. The water table tends to be near the surface early in the growing season, gradually falling through the summer.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane, herbaceous grassland that occurs in mesic areas. The herbaceous layer is primarily composed of a variety of graminoids and forbs occurring in small quantities, combining to produce 70% or more total vegetation cover in the sampled stands. The only species to occur in all three stands include *Poa palustris* (30 to 70% cover) and *Carex aquatilis* (3 to 12% cover). Species that occur in two of three stands include *Agrostis scabra, Poa pratensis*, and *Cirsium vulgare*.

Global Vegetation: This montane wet meadow association occurs primarily in riparian areas. Intact examples appear as dense near-monocultures of *Poa palustris*, with scattered shrubs such as *Salix boothii, Salix geyeriana*, and *Alnus incana*. *Poa pratensis, Phleum pratense*, and *Agrostis stolonifera* are minor species in high-quality stands but may become dominant as domestic livestock grazing increases. Other native constituents of the community include *Juncus balticus, Deschampsia caespitosa, Carex aquatilis*, and *Pedicularis groenlandica*.
Global Dynamics: *Poa palustris* is an early colonizer of wet disturbed sites and may act as the primary stabilizer of streambanks in some situations. Most stands of this association have received varying amounts of grazing pressure and hydrologic alteration and have been invaded to a greater or lesser degree by exotic species. In severe cases of degradation, *Poa palustris* is largely replaced by *Poa pratensis, Agrostis stolonifera, Phleum pratense*, and/or *Bromus inermis* (Jankovsky-Jones et al. 2001).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Cirsium vulgare	Herb (field)	Forb	.	X	.

Agrostis scabra	Herb (field)	Graminoid	.	X	.
Carex aquatilis	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Carex aquatilis	Herb (field)	Graminoid	.	X	.
Deschampsia caespitosa	Herb (field)	Graminoid	.	X	.
Juncus balticus	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa palustris	Herb (field)	Graminoid	X	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cerastium fontanum	-	P	exotic
Cirsium vulgare	-	P	exotic
Medicago lupulina	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Trifolium repens	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (3-Dec-1998).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

- *Poa palustris* (Bourgeron and Engelking 1994) =
- *Poa palustris* Community Type (Hansen et al. 1985) =
- *Poa palustris* Community Type (Hansen et al. 1995) =
- *Poa palustris* Community Type (Youngblood et al. 1985a) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: The sampled stand of this association fits the Youngblood et al. (1985) description well. The only deviation occurs in the elevation of the GTNP stands. All of the stands in the Youngblood study occur below 6000 feet while the GTNP stands have elevations from 6596 to 6800 feet.

Grand Teton National Park Other Comments:
Global Classification Comments: Some authors assert that *Poa palustris* is a naturalized, introduced species. However, it is categorized as native by Kartesz (1999).

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand of this association occurs adjacent to the Snake River east of Timbered Island, and two occur south of Triangle X Ranch.

Global Range: This association has been documented on the Owyhee Plateau of southwestern Idaho (Jankovsky-Jones et al. 2001), eastern Idaho (Youngblood et al. 1985a), and northwestern Wyoming.
Nations: US
States/Provinces: MT:S4, WY
TNC Ecoregions: 7:C, 8:C, 9:C, 26:C, 68:C
TNC Ecoregion Comments: ECO68 added (mjr 8-05). ECO7 & ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 331D:CC, 331G:CC, M331A:CC, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B027
Accuracy Assessment Points: 04R323, 04R324
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, and K. Varga
Global Description Author(s): J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hansen et al. 1985	.	.	X	.	.	.	.	.	.
Hansen et al. 1991	.	X	.	X	.	.	.	.	.
Hansen et al. 1995	.	X	X	X	.	.	.	.	.
Jankovsky-Jones et al. 2001	.	.	.	X	X	.	.	.	.
Kartesz 1999	.	X	.	.	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	.	X	.	.	.	.

V.A.7.N.e. Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer

A.1566 *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance

Dwarf Sagebrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This widespread shrub herbaceous alliance is known from cold, dry areas of the Intermountain West, as well as in dry alpine and subalpine habitats of the Sierra Nevada. Perennial grasses are prominent with *Artemisia arbuscula ssp. arbuscula* dominating the open to moderately dense low-shrub layer. Stands typically occur on shallow, rocky, poorly drained soils on a variety of landforms; from flats and depressions to slopes, ridges or alpine fell-fields. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Poor drainage often leads to perched water tables in the spring, which may control the distribution of the vegetation in this alliance and explain its patchy distribution. The vegetation is characterized by a moderate to dense herbaceous layer dominated by perennial graminoids. Dominant to common grass species include *Achnatherum thurberianum (= Stipa thurberiana), Festuca idahoensis, Leymus salinus ssp. salmonis, Pascopyrum smithii, Poa secunda, Pseudoroegneria spicata*, and *Elymus elymoides* (in areas in poor condition). *Agoseris glauca, Allium* spp., *Antennaria rosea, Balsamorhiza sagittata, Castilleja angustifolia, Phlox hoodii*, and *Phlox longifolia* are common forbs species. Shrub associates include *Artemisia tridentata ssp. wyomingensis, Artemisia tridentata ssp. vaseyana, Artemisia nova, Chrysothamnus* spp., *Ephedra viridis, Gutierrezia sarothrae, Juniperus occidentalis, Juniperus osteosperma, Purshia tridentata*, and *Tetradymia canescens*. Diagnostic of this alliance is a moderate (>20% cover) perennial graminoid layer with an *Artemisia arbuscula ssp. arbuscula*-dominated low-shrub layer that has 10-40% cover. At least 40% of the total shrub cover is *Artemisia arbuscula ssp. arbuscula*.

Environment: This alliance is widespread in the Intermountain West, as well as in dry alpine habitats of the Sierra Nevada between 1500 and 3800 m in elevation. Precipitation ranges from 15-50 (-150) cm annually, with a large proportion falling as winter snow. Sawyer and Keeler-Wolf (1995) report *Artemisia arbuscula* shrublands to be associated with flats, depressions, slopes, and ridges, and that soils are either very shallow or quite poorly drained. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Poor drainage often leads to elevated water tables in the spring, which may control the distribution of the vegetation in this alliance. Poor drainage may explain the occurrence of patches of *Artemisia arbuscula* shrublands in *Pinus ponderosa* woodlands or *Artemisia tridentata* shrublands. In alpine settings, the vegetation often occurs in xeric sites where snow cover is blown off or lost to sublimation. This low-shrub alliance may also be adjacent to *Juniperus* or *Pinus* woodlands, *Artemisia nova* shrublands, *Cercocarpus ledifolius* woodlands, or alpine fell-fields. Beetle and Johnson (1982) report that *Artemisia arbuscula ssp. arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage), and that *Artemisia arbuscula ssp. longiloba* grows in clay soils, often alkaline, that contain no gravels.

Vegetation: This widespread shrub herbaceous alliance is known from cold, dry areas of the Intermountain West, as well as in dry alpine and subalpine habitats of the Sierra Nevada. The vegetation is characterized by a moderate to dense herbaceous layer dominated by perennial graminoids with *Artemisia arbuscula ssp. arbuscula* dominating the open to moderately dense low-shrub layer. Dominant to common grass species include *Achnatherum thurberianum (= Stipa thurberiana), Danthonia californica, Festuca idahoensis, Leymus salinus ssp. salmonis, Pascopyrum smithii, Poa secunda, Pseudoroegneria spicata*, and *Elymus elymoides* (in areas in poor condition). Other grass species may include *Achnatherum hymenoides (= Oryzopsis hymenoides), Bromus carinatus, Danthonia unispicata, Hesperostipa comata (= Stipa comata), Leymus ambiguus*, and *Koeleria macrantha*. Forbs are generally much less important, but occasionally frequent. Common species include *Achillea millefolium, Agoseris glauca, Allium* spp., *Antennaria rosea, Balsamorhiza sagittata, Castilleja angustifolia, Lupinus caespitosus, Penstemon speciosus, Phlox hoodii, Phlox longifolia, Polygonum* spp., and *Stenotus acaulis (= Haplopappus acaulis)*. Shrub associates include *Artemisia tridentata ssp. wyomingensis, Artemisia tridentata ssp. vaseyana, Artemisia nova, Chrysothamnus viscidiflorus, Ephedra viridis, Ericameria* spp., *Gutierrezia sarothrae, Juniperus occidentalis, Juniperus osteosperma, Leptodactylon pungens, Purshia tridentata*, and *Tetradymia canescens*. Diagnostic of this alliance is a moderate (>20% cover) perennial graminoid layer with an *Artemisia arbuscula ssp. arbuscula*-dominated low-shrub layer that has 10-40% cover. At least 40% of the total shrub cover is *Artemisia arbuscula ssp. arbuscula*.
Dynamics: Due to the low-shrub stature of *Artemisia arbuscula*, this dwarf-shrubland alliance is less susceptible to natural fire than taller *Artemisia* spp. shrublands. Grazing appears to have little effect on shrub densities, but tends to decrease the importance of tall bunch grasses and increase the cover of *Chrysothamnus* spp., forbs, and non-native grasses (*Poa bulbosa* and *Poa pratensis*). Heavy livestock grazing may deplete the perennial graminoid layer and convert stands of this alliance into stands of *~Artemisia arbuscula ssp. arbuscula* Shrubland Alliance (A.2547)$$.
Similar Alliances:
- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance (A.2548)
- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)
- *Artemisia arbuscula* ssp. *thermopola* Shrub Herbaceous Alliance (A.2553)

Similar Alliance Comments: This alliance is distinguished from vegetation in other *Artemisia arbuscula* alliances by the nominal subspecies of *Artemisia arbuscula* and by the importance of the perennial graminoid layer (>20% cover) in the shrub herbaceous alliances. The *Artemisia arbuscula* subspecies are distinguished by the nominal subspecies taxonomically and by different environments which they occupy. *~Artemisia arbuscula ssp. longicaulis* Shrubland Alliance (A.2548)$$ occurs in more alkali and less stony settings than *~Artemisia arbuscula ssp. arbuscula* Shrubland Alliance (A.2547)$$. *~Artemisia arbuscula ssp. thermopola* Shrub Herbaceous Alliance (A.2553)$$ occurs in more calcareous soils and has a restricted distribution. Beetle and Johnson (1982) report that *Artemisia arbuscula ssp. arbuscula* grows in soils with a high volume of gravel (even though soil may be in clay textural class, or contain a clay-rich layer that impedes drainage), and that *Artemisia arbuscula ssp. longiloba* grows in clay soils, often alkaline, that contain no gravels.

ALLIANCE DISTRIBUTION

Range: The vegetation in this alliance is presently reported from the northern half of the Intermountain West, from northern California, Nevada, Utah, Wyoming north to Oregon, Idaho, and Montana. It is likely that stands of the alliance occur nearly throughout the range of *Artemisia arbuscula ssp. arbuscula*, but not likely in Colorado, New Mexico, and Washington.
Nations: US
Subnations: CA, CO, ID, MT, NM?, NV, OR, UT?, WA, WY
TNC Ecoregions: 6:C, 9:C, 10:C, 11:C, 20:C
USFS Ecoregions: 313B:C?, 341:C, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342G:CP, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:C?, M331F:C?, M332A:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Sarr, mod. D. Sarr, C. Jean, J. Kagan, P. Lyon, E. Peterson
References: Barbour and Major 1988, Beetle and Johnson 1982, Blackburn et al. 1968a, Blackburn et al. 1968b, Blackburn et al. 1969a, Blackburn et al. 1969b, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Bowerman et al. 1997, Caicco and Wellner 1983c, Caicco and Wellner 1983h, Chappell et al. 1997, Dealy 1971, Franklin and Dyrness 1973, Hall 1973, Heinze et al. 1962, Hess and Wasser 1982, Hironaka 1978, Hironaka et al. 1983, Jensen et al. 1988a, Lewis 1975a, McArthur and Welch 1986, Mozingo 1987, Mueggler and Stewart 1980, Nelson and Jensen 1987, Savage 1968, Schlatterer 1972, Schuller and Evans 1986, Shiflet 1994, Soil Conservation Service 1978, Terwilliger and Smith 1978, Thilenius et al. 1995, Tiedemann and Klock 1977, Tisdale et al. 1965, Tweit and Houston 1980, Winward 1980a, Zamora and Tueller 1973

[CEGL001409] *Artemisia arbuscula* ssp. *arbuscula / Festuca idahoensis* Shrub Herbaceous Vegetation

Translated Name: **Dwarf Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation**
Common Name: **Dwarf Sagebrush / Idaho Fescue**

Ecological System(s):
- Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774)
- Columbia Plateau Low Sagebrush Steppe (CES304.080)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This dwarf sagebrush shrub herbaceous association occurs from 1525 to 2775 m (5000-9100 feet) elevation. It occurs on dry, exposed moderate slopes, on undulating to rolling topography, lower mountain toeslopes, inaccessible ridges, and on very steep canyon talus slopes. Soils are shallow or moderately deep, from well- to moderately well-developed. *Artemisia arbuscula* is the characteristic and predominant low shrub, although it can be obscured by the grass cover. Cover of the low shrub is scattered and open (8-30%). *Festuca idahoensis* is the dominant understory grass (3-36% cover), with *Pseudoroegneria spicata* usually present, but can often be absent (0-25%). *Koeleria macrantha (= Koeleria cristata), Poa secunda (= Poa sandbergii), Achnatherum thurberianum (= Stipa thurberiana),* and *Elymus elymoides (= Sitanion hystrix)* are typical co-occurring grasses. Common forbs include *Phlox hoodii, Phlox longifolia, Antennaria rosea, Crepis acuminata, Senecio integerrimus, Balsamorhiza* ssp., *Eriogonum* spp., and *Erigeron compositus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor at elevations of 6800 to 6988 feet. Soil data is available for only one stand; the sandy loam soils have a high percent of cobbles and gravels. Other non-vascular ground cover for one stand is almost entirely dense pebbles and another stand is almost exclusively moss and lichens. Adjacent vegetation may include *Artemisia tridentata* ssp. *vaseyana* shrublands.

Global Environment: This dwarf sagebrush shrub herbaceous association occurs from 1525 to 2800 m (5000-9100 feet) elevation. It occurs on dry, exposed moderate slopes, on undulating to rolling topography, lower mountain toeslopes, inaccessible ridges, and on very steep canyon talus slopes. Slope ranges from 2 to 70%. Soils are shallow or moderately deep, from well- to moderately well-developed. Textures range from silt loam to gravel loams. Often there is a claypan limiting the rooting depth to 15-61 cm (6-24 inches).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane, dwarf-shrub steppe. *Artemisia arbuscula* has 20 to 30% canopy cover and *Festuca idahoensis* is the dominant graminoid with 3 to 12% cover. *Eriogonum umbellatum* is the dominant forb with 1 to 12% cover. Other high constancy herbaceous species include *Koeleria macrantha, Melica spectabilis, Poa secunda, Balsamorhiza sagittata, Polygonum* sp., and *Sedum lanceolatum.*

Global Vegetation: *Artemisia arbuscula* is the characteristic and predominant low shrub, although it can be obscured by the grass cover. Cover of the low shrub is scattered and open (8-30%). *Festuca idahoensis* is the dominant understory grass (3-36% cover), with *Pseudoroegneria spicata* usually present, but can often be absent (0-25%). *Koeleria macrantha (= Koeleria cristata), Poa secunda (= Poa sandbergii), Achnatherum thurberianum (= Stipa thurberiana),* and *Elymus elymoides (= Sitanion hystrix)* are typical co-occurring grasses. Common forbs include *Phlox hoodii, Phlox longifolia, Antennaria rosea, Crepis acuminata, Senecio integerrimus, Balsamorhiza* ssp., *Eriogonum* spp., and *Erigeron compositus.*

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia arbuscula	Short shrub/sapling	Dwarf-shrub	X	X	.
Arenaria congesta	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Sedum lanceolatum	Herb (field)	Forb	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	X	X	.
Melica spectabilis	Herb (field)	Graminoid	X	X	.
Poa secunda	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Polygonum sp.	dominant forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia arbuscula	Short shrub/sapling	Dwarf-shrub	X	X	.

Festuca idahoensis	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Phlox spp.	dominant forbs
Antennaria spp.	dominant forbs
Balsamorhiza spp.	dominant forbs
Eriogonum spp.	dominant forbs

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive,Animal,or Other*)
Poa pratensis	-	P	Exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Artemisia arbuscula* ssp. *arbuscula / Poa secunda* Shrub Herbaceous Vegetation (CEGL001411)

Global Related Concepts:
- *Artemisia arbuscula / Festuca idahoensis* Community (Blackburn et al. 1968b) =
- *Artemisia arbuscula / Festuca idahoensis* Habitat Type (Tweit and Houston 1980) =
- *Artemisia arbuscula / Festuca idahoensis* Habitat Type (Hironaka et al. 1983) =
- *Artemisia arbuscula / Festuca idahoensis* Habitat Type (Mueggler and Stewart 1980) = *Artemisia arbuscula arbuscula / Festuca idahoensis* Habitat Type (Lewis 1975a) =
- *Artemisia arbuscula/Festuca idahoensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IV.A.3.a. (Driscoll et al. 1984) B
- Low sagebrush complex (Lewis 1971) =
- Low sagebrush-Bunchgrass SD-19-11(*Artemisia arbuscula* - *Agropyron* - *Festuca*) (4a) (Hall 1973) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: A *Pseudotsuga menziesii* var. *glauca* sapling along with scattered seedlings was found in one plot. This species is usually not associated with *Artemisia arbuscula*.

Global Classification Comments: Physiognomy ranges from a grassland to a shrubland.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs southwest of the Pilgrim Creek trail head, one occurs north of the Pilgrim Creek Road junction, one occurs in Lupine Meadows, and one occurs in Baseline Flat off the RKO road.

Global Range: This association is common and widespread in the western United States and is documented in Colorado, Idaho, Wyoming, Montana, Nevada, Utah, Oregon, and Washington and possibly California.
Nations: US
States/Provinces: CA?, CO:S2?, ID:S4?, MT:S3, NV:S4S5, OR:S4, UT?, WA:S2?, WY:S3?
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 11:C
TNC Ecoregion Comments: ECO4 & ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 341:C, 342B:CC, 342C:CC, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M332A:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202035
Accuracy Assessment Points: 04J002, 04X009, 04X418
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Blackburn et al. 1968b	.	X	X	X	.	.	.	.	.
Blackburn et al. 1969a	.	X	.	.	.	.	.	.	.
Blackburn et al. 1969c	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	.	.	.	.	.	.
Jones 1992b	.	X	.	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Lewis 1971	.	X	X	.	.	.	.	.	.
Lewis 1975a	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mueggler and Stewart 1980	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Sabinske 1978	.	X	.	X	.	.	.	.	.
Tweit and Houston 1980	.	X	X	X	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Zamora and Tueller 1973	.	X	.	X	.	.	.	.	.

[CEGL001412] *Artemisia arbuscula* ssp. *arbuscula / Pseudoroegneria spicata* Shrub Herbaceous Vegetation

Translated Name: **Dwarf Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation**
Common Name: **Dwarf Sagebrush / Bluebunch Wheatgrass**
Ecological System(s):
- Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774)
- Columbia Plateau Low Sagebrush Steppe (CES304.080)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This dwarf-shrubland occurs on foothills and open steep slopes from 1370 to 2930 m (4500-9600 feet) in elevation. Slopes are generally quite steep, 24% average, 37% maximum. Soils often have a hard layer constricting drainage. The soil surface is generally gravelly with up to 50% open bare gravelly soils. This montane dwarf-shrub steppe association is dominated by *Artemisia arbuscula*. *Artemisia nova* and *Artemisia tridentata* may also be present, adding to the shrubby aspect of this type. Shrubs can be widely spaced, and there is generally equal to sometimes greater cover provided by the herbaceous cover. Shrub cover ranges from 7 to 20%. Herbaceous cover ranges from 20 to 30% cover. *Pseudoroegneria spicata* is the dominant grass. *Koeleria macrantha (= Koeleria cristata)* and *Poa secunda* are commonly also present. Forbs are less abundant but can include *Phlox hoodii, Linum perenne, Sedum lanceolatum, Eriogonum umbellatum*, and *Arenaria congesta*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: This association occurs on flat glacial outwash plains of the valley floor. Elevations of sampled stands range from 6675-7040 feet. The soils are generally extremely gravelly. Textures range from sandy loam to loam, though a sandy clay loam was found at one site. Soils are moderately well- to well-drained. Despite the well-drained soils, these sites tend to have water perched on the soil surface for a few days each spring during the annual snowmelt. The unvegetated soil surface is usually dominated by small rocks less than 10 cm in diameter and litter and duff. A few sites have moss covering up to 40% of the ground surface. Adjacent vegetation is usually *Artemisia tridentata* ssp. *vaseyana*, mixed conifers, or *Populus angustifolia.*

Global Environment: This dwarf-shrubland occurs on foothills and open steep slopes from 1400 to 2926 m (4500-9599 feet) in elevation. Slopes are generally quite steep, 24% average, 37% maximum. Sites are generally drier and warmer than sites occupied by other dwarf sagebrush associations, often on southern and western aspects. Soils derived from limestone can be quite stony and often have a calcareous cemented layer that inhibits drainage. Soils derived from rhyolitic or basalt can have high clay contents that can form a claypan, that also inhibits internal drainage. Soil depths range from 47-99 cm with an average of 73 cm in one study from northeastern Nevada. The soil surface is generally gravelly with up to 50% open bare gravelly soils. Soils have been classified as Argixerolls, Typic Haploxerolls and Millic Haplargids. With increased moisture, this association will grade into ~*Artemisia arbuscula ssp. arbuscula / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001409)$$.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane dwarf-shrub steppe that occurs on subxeric sites. The shrub layer is dominated by *Artemisia arbuscula*, which provides 20-40% cover. Occasionally *Artemisia tridentata* ssp. *vaseyana* is present, providing up to 10% cover. The generally sparse herbaceous layer is dominated by *Eriogonum umbellatum*, which generally has 10-30% cover. *Koeleria macrantha*, and *Melica spectabilis*, and *Poa pratensis* are the graminoids with the highest constancy, occurring in at least half of the stands, with 1-10% cover. *Pseudoroegneria spicata* occurs in one third of the stands and averages 2% cover when present. The only other high constancy forb is *Sedum lanceolatum*, occurring in just under half of the stands with covers ranging from 1-3%. There are numerous graminoids and forbs that have in low cover and low constancy, making this community that looks very depauperate, with just two dominant species, actually a floristically diverse one.

Global Vegetation: This is a montane dwarf-shrub steppe association dominated by *Artemisia arbuscula*. *Artemisia nova, Artemisia tridentata*, or *Chrysothamnus viscidiflorus* may also be present, adding to the shrubby aspect of this type. Shrubs can be widely spaced, and there is equal to greater cover provided by the herbaceous layer. Shrub cover ranges from 7-20%. Herbaceous cover ranges from 20-30%. *Pseudoroegneria spicata* is the dominant grass. *Koeleria macrantha (= Koeleria cristata), Poa secunda*, and *Poa fendleriana* are also commonly present. *Poa secunda* and *Poa fendleriana* can even replace *Pseudoroegneria spicata* in some sites. Forbs are less abundant but can include *Phlox hoodii, Linum perenne, Sedum lanceolatum, Eriogonum umbellatum*, and *Arenaria congesta*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia arbuscula	Short shrub/sapling	Dwarf-shrub	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Sedum lanceolatum	Herb (field)	Forb	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	X	X	.
Melica spectabilis	Herb (field)	Graminoid	X	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia arbuscula	Short shrub/sapling	Broad-leaved evergreen shrub	X	.	.
Phlox hoodii	Herb (field)	Forb	X	.	.
Poa secunda	Herb (field)	Graminoid	X	.	.
Pseudoroegneria spicata	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Artemisia arbuscula* ssp. *thermopola / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001519)

Global Related Concepts:

- *Artemisia arbuscula - Agropyron - Festuca* SD-19-11 (Hall 1973) =
- *Artemisia arbuscula - Agropyron spicatum* Habitat Type (Zamora and Tueller 1973) =
- *Artemisia arbuscula / Agropyron spicatum* Community Type (Jensen et al. 1988a) =
- *Artemisia arbuscula / Agropyron spicatum* Community Type (Jensen et al. 1988b) =
- *Artemisia arbuscula / Agropyron spicatum* Habitat Type (Lewis 1975a) =
- *Artemisia arbuscula / Agropyron spicatum* Habitat Type (Hironaka et al. 1983) =
- *Artemisia arbuscula / Agropyron spicatum* Habitat Type (Mueggler and Stewart 1980) =

- *Artemisia arbuscula / Poa secunda* Community Type (Blackburn et al. 1971) =
- *Artemisia arbuscula/Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IV.A.3.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: Within the park, *Pseudoroegneria spicata* rarely occurs in this community. Most of the sampled stands are dominated by *Eriogonum umbellatum*. The reason for this is poorly understood. One hypothesis is that *Eriogonum umbellatum* dominates sites that had heavy disturbance during the valley's homesteading era. These sites have less native grass cover than the areas with a history of less livestock grazing.

Global Classification Comments: This association includes dwarf-shrublands to grasslands and needs to be reviewed. Of the references listed below, only two (Tiedemann and Klock 1977, Schuller and Evans 1986) were not available to the Global description author. Available literature indicates this is an herbaceous shrubland, and no reference indicated these were grasslands.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This vegetation occurs on the west side of the valley, near the foothills of the Teton Mountains, and also at the northern end of the valley in the Pacific Creek drainage. *Pseudoroegneria spicata* occurs in the sampled stands located in the Potholes, at Leeks Marina turnoff, and near the Pilgrim Creek Road junction.

Global Range: This association is known from central Oregon, southeastern Washington, northeastern Nevada, southeastern Idaho, western Wyoming and southeastern Montana. It may also occur in New Mexico.
Nations: US
States/Provinces: ID:S3, MT:S3, NM?, NV:S4S5, OR:S3, WA:S2, WY
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:?, 20:C, 21:C
TNC Ecoregion Comments: ECO4, ECO8, ECO19 added (mjr 7-05). ECO21 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: 313B:C?, 341:C, 342B:CC, 342C:CC, 342H:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:C?, M331F:C?, M332E:CC, M332G:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Inventory Notes: This is the most common *Artemisia arbuscula*- dominated plant association in the park.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201029, GT-0202049, GT-0201006, GT-03A016, GT-03A098, GT-03A126, GT-03B111
Accuracy Assessment Points: 04X471, 04X475
Other plots within park boundaries, from other projects: GT-tm6d, GT-tm6c
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): K. Varga and G. Kittel
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Blackburn et al. 1971	.	X	X	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	.	.	.	.	.	.
Jensen et al. 1988a	.	X	X	X	.	.	.	.	.
Jensen et al. 1988b	.	X	X	.	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Lewis 1975a	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mueggler and Stewart 1980	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Schuller and Evans 1986	.	X	.	X	.	.	.	.	.
Tiedemann and Klock 1977	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

Zamora and Tueller 1973	.	X	X	X	.	.	.	.	.

A.2555 *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance

Spiked Big Sagebrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant communities meeting the diagnostic criteria for the ~*Artemisia tridentata ssp. spiciformis* Shrub Herbaceous Alliance (A.2555)$$ have been documented in the Gros Ventre and Wind River mountains of western Wyoming. This alliance consists of sagebrush communities dominated or codominated by *Artemisia tridentata ssp. spiciformis*, with little or no *Artemisia cana* present. *Artemisia tridentata ssp. spiciformis* makes up at least 40% of the total sagebrush cover. The alliance is found at elevations ranging from 2590 to 3205 m (8500-10,500 feet), but is most common from 2745 to 3050 m (9000-10,000 feet). The alliance occurs mostly on Mollisols with a cryic soil temperature regime. The shrub layer ranges from 0.5-1 m tall, and shrub canopy cover is 10-45%. *Artemisia tridentata ssp. spiciformis* averages about 25% canopy cover. Other shrubs present may include *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula, Dasiphora fruticosa ssp. floribunda (= Potentilla fruticosa), Symphoricarpos oreophilus*, and *Chrysothamnus viscidiflorus*. Graminoid canopy cover ranges from 15-65%. Forbs range from 5-75% canopy cover. Herbaceous associates include *Festuca idahoensis, Elymus trachycaulus, Potentilla gracilis, Trisetum spicatum, Geranium viscosissimum, Melica spectabilis, Carex raynoldsii, Achnatherum nelsonii*, and *Achillea millefolium*. Common exotic associates include *Poa pratensis* and *Taraxacum officinale*.

Environment: This alliance is found at elevations ranging from 2590 to 3205 m (8500-10,500 feet), but is most common from 2745 to 3050 m (9000-10,000 feet). Mean annual precipitation is typically 64 to 89 cm (25-35 inches), falling mostly as snow. In western Wyoming this alliance occurs mostly on Mollisols with a cryic soil temperature regime (Tart 1996). Depth to a root-restricting layer ranges from 13 to over 236 cm (5-93 inches).

In western Wyoming, adjacent vegetation includes mostly forested communities, but this alliance is also associated with other shrublands, grasslands, and tall forb communities (Tart 1996). Associated forests are dominated by *Abies lasiocarpa, Picea engelmannii, Pinus albicaulis*, and *Populus tremuloides*. Adjacent shrublands are dominated by *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula*, or *Salix boothii*. Adjacent herbaceous communities are dominated by *Festuca idahoensis, Elymus trachycaulus, Juncus drummondii, Hymenoxys hoopesii*, or *Antennaria microphylla*.

Vegetation: The shrub layer ranges from 0.5-1 m tall, and shrub canopy cover is 10-45%. *Artemisia tridentata ssp. spiciformis* averages about 25% canopy cover. Other shrubs present may include *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula, Dasiphora fruticosa ssp. floribunda (= Potentilla fruticosa), Symphoricarpos oreophilus*, and *Chrysothamnus viscidiflorus*. Graminoid canopy cover ranges from 15-65%. Forbs range from 5-75% canopy cover. Herbaceous associates include *Festuca idahoensis, Elymus trachycaulus, Potentilla gracilis, Trisetum spicatum, Geranium viscosissimum, Melica spectabilis, Carex raynoldsii, Achnatherum nelsonii*, and *Achillea millefolium*. Common exotic associates include *Poa pratensis* and *Taraxacum officinale*.

Dynamics: *Artemisia tridentata ssp. spiciformis* communities have a natural fire frequency averaging between 20 and 40 years. Presettlement fires burned unevenly, resulting in an ever-changing mosaic of different densities and ages of sagebrush plants (Winward 1991). However, *Artemisia tridentata ssp. spiciformis* resprouts vigorously after fire (Goodrich et al. 1985) and can return to pre-burn canopy cover very quickly (Winward 1991).

Similar Alliances:
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* ssp. *spiciformis* Shrubland Alliance (A.2550)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)

Similar Alliance Comments: The distinction between these alliances is made by estimating the relative cover of the particular *Artemisia tridentata* subtaxa and total cover of perennial graminoids. Greater than roughly 20% cover of the perennial graminoids places the stand into one of the Shrub Herbaceous alliances, while more than 40% relative cover of either *Artemisia tridentata ssp. spiciformis* or *Artemisia tridentata ssp. vaseyana* places the stand into the respective alliance for that subtaxa.

ALLIANCE DISTRIBUTION

Range: Plant communities in this alliance have been documented in the Gros Ventre and Wind River mountains of western Wyoming (Bramble-Brodahl 1978, Tart 1996). *Artemisia tridentata ssp. spiciformis* is likely to dominate communities throughout its range because of its ability to resprout after fire. Therefore, this alliance is likely to occur in Colorado, Utah, Idaho, and Montana.

Nations: US

Subnations: WY

TNC Ecoregions: 9:C

USFS Ecoregions: M331A:CC, M331D:CC, M331E:CP, M331I:CC, M331J:CC, M332A:??, M332D:??, M332E:??, M332F:??, M341C:??
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): D. Tart, M.S. Reid
References: Beetle and Johnson 1982, Bramble-Brodahl 1978, Goodrich et al. 1985, Hironaka et al. 1983, Tart 1996, Winward 1980b, Winward 1991

[CEGL002993] *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Vegetation [Provisional]

Translated Name: **Spiked Big Sagebrush Shrub Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Provisional **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This shrubland concept is based on stands entirely from Wyoming and contains stands dominated by *Artemisia tridentata ssp. spiciformis* with *Festuca idahoensis* and other grasses dominant in the undergrowth (30 plots), and stands dominated by *Balsamorhiza sagittata* and other forbs, with very little cover by graminoids in the undergrowth (6 plots). Further inventory and data collection may warrant creation of two separate associations.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: This association occurs mainly on southeast-facing slopes. One sampled stand faces southwest. The slopes vary from 10 to 70%, with the median being 40.5%. The elevations of the stands range from 6500 to 8600 feet. Where soil data are available soils are derived from local alluvium and/or colluvium from loess and mainly igneous rock. Soil textures are coarse and well drained, ranging from sandy loams to loamy sands. The unvegetated ground surface is generally composed of up to 40% bare soil and up to 50% litter and duff. Gravel and rocks greater than 10cm generally compose less than 20% of the total unvegetated ground cover. Adjacent vegetation for many stands are *Pseudotsuga menziesii* forests, *Abies lasiocarpa* forests, or mixed forests composed mostly of these two species. Other adjacent communities documented include *Pinus contorta* forests, *Populus tremuloides* regeneration or *P. tremuloides* avalanche chutes, *Alnus incana* shrublands, and/or *Ceanothus velutinus* shrublands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane community dominated by herbaceous vegetation and shrubs. *Pseudotsuga menziesii* and *Populus tremuloides* occur in approximately half of the stands and *Abies lasiocarpa* occurs in approximately one-third of the stands, usually contributing trace or 1% cover, though occasionally cover may be higher. *Artemisia tridentata* ssp. *spiciformis* is the dominant species composing the short shrub layer with 3 to 30% canopy cover. *Symphoricarpos oreophilus, Prunus virginiana, Amelanchier alnifolia, Ceanothus velutinus,* and *Mahonia repens* may be co-dominant, though *C. velutinus* occurs in less than half of the stands. Herbaceous cover ranges from 7 to 70%. The most constant species are *Carex geyeri, Eriogonum umbellatum, Balsamorhiza sagittata, Agastache urticifolia,* and *Helianthella uniflora.*

Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	.	X	.
Artemisia tridentata ssp. *spiciformis*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Symphoricarpos oreophilus	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Agastache urticifolia	Herb (field)	Forb	.	X	.
Balsamorhiza sagittata	Herb (field)	Forb	X	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	.	.
Helianthella uniflora	Herb (field)	Forb	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.

Grand Teton National Park Higher Taxa

Melica spp.	characteristic graminoids

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (22-Apr-2002).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: GK 1-05: I think there are two types here: *Artemisia tridentata ssp. spiciformis / Festuca idahoensis* (Bramble-Brodahl 1978, n=4; Tart 1996, n=26) and *Artemisia tridentata ssp. spiciformis / Balsamorhiza sagittata* (Teton NP, n=6). I would change ~*Artemisia tridentata ssp. spiciformis* Shrub Herbaceous Vegetation [Provisional] (CEGL002993)$$ to *Artemisia tridentata ssp. spiciformis / Festuca idahoensis* Shrub Herbaceous Vegetation and drop Provisional or create a new type. Bramble-Brodahl (1978) describes an *Artemisia tridentata ssp. spiciformis* / Mountain Forb Habitat Type that is dominated by *Festuca idahoensis* and has *Geum triflorum* and *Lupinus argenteus*. Tart (1996) describes two *Artemisia tridentata ssp. spiciformis* plant associations, both dominated by *Festuca idahoensis* with *Elymus trachycaulus* as most abundant and with the highest cover. The 6 plots from Teton National Park fit neither of these descriptions and are dominated by forbs such as *Balsamorhiza sagittata, Eriogonum umbellatum*, and *Lupinus argenteus*. *Elymus trachycaulus* is present in 4 of 6 plots.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on the eastern slopes of the Teton Range south of Mt. Moran as well as in the northern half of the Jedediah Smith Wilderness.

Global Range: This association is known only from Wyoming.
Nations: US
States/Provinces: WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO20 added (mjr 7-05). ECO9 added for Grand Teton (mjr 6-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331E:CP, M331I:CP, M331J:CP
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A011, GT-03A022, GT-0201036
Accuracy Assessment Points: 04J037, 04J045, 04J049, 04J061, 04J071, 04J072, 04J082, 04J146, 04J156, 04J163, 04K032, 04K033, 04K036, 04K049, 04K050, 04K058, 04S001, 04S003, 04S006, 04S007, 04S008, 04X010, 04X433, 04X434, 04X523, 04X525
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-96-KV-114, CT-95-JD-021, CT-96-KV-118

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bramble-Brodahl 1978	.	X	.	X	.	.	.	.	.
Tart 1996	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1528 *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance

Threetip Sagebrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is distributed from the Columbia Basin east to the northern Rockies. Climates range from semi-arid in intermountain basins to subhumid in higher elevations of the Rocky Mountains. Stands occur on flat to steeply sloping upland sites. Soil texture is loam, sandy loam, or clay loam, but is highly variable. Vegetation is characterized by an open, conspicuous shrub layer with herbaceous species having equal or greater coverage. *Artemisia tripartita* typically has 10-25% cover. *Artemisia frigida, Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. vaseyana, Chrysothamnus viscidiflorus, Krascheninnikovia lanata, Purshia tridentata,* or *Tetradymia canescens* may also be common. The herbaceous stratum is typically dominated by graminoids and of moderate to moderately high cover (25-70%). *Pseudoroegneria spicata* and *Festuca idahoensis* are the most common associates. Other locally abundant graminoid species include *Hesperostipa comata (= Stipa comata), Festuca campestris, Carex filifolia, Bouteloua curtipendula, Bouteloua gracilis*, and *Koeleria macrantha*. Forbs form a minor and highly variable portion of this vegetation. Recurrent species include *Achillea millefolium, Camelina microcarpa, Balsamorhiza sagittata, Sphaeralcea coccinea, Erigeron* spp., *Opuntia* spp., and *Phlox* spp.

Environment: This alliance is distributed from the Columbia Basin east to the northern Rockies. Climates range from semi-arid in intermountain basins to subhumid in higher elevations of the Rocky Mountains. The amount and reliability of growing-season moisture increases eastward and with increasing altitude, generally averaging 25-35 cm annually. These communities occur from elevations of less than 1000 m in the Columbia Basin to over 2500 m in the Rocky Mountains. The alliance occurs on flat to steeply sloping upland sites. Sites with little slope tend to have deeper soils while those with steeper slopes have shallow to moderately deep soils. Soil texture is loam, sandy loam, or clay loam, but is highly variable (Hironaka et al. 1983).

Artemisia cana or *Artemisia tridentata ssp. wyomingensis* shrublands often occupy lower elevations, and *Artemisia tridentata ssp. vaseyana* occupies cooler, moister upland sites at higher elevation. Other adjacent vegetation types across the range of this alliance include *Atriplex confertifolia, Chrysothamnus* spp., or *Artemisia nova* shrublands, *Populus tremuloides, Pinus ponderosa, Pinus contorta, Abies grandis*, or *Pseudotsuga menziesii* forests, *Pinus - Juniperus* woodlands, shortgrass and mixed-grass prairie, or mesic montane meadow communities.

Vegetation: Vegetation in this alliance is sporadically distributed around the north and western rims of the Columbia Basin, throughout the Blue Mountains, to the northern Rocky Mountains (Hironaka et al. 1983), through the upper Snake River. Shrubs may be conspicuous in this vegetation, but herbaceous species have equal or greater coverage. *Artemisia tripartita ssp. tripartita* typically occupies 5-15% cover, and contributes at least 40% to the total shrub cover. *Artemisia frigida, Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. wyomingensis, Artemisia tridentata ssp. vaseyana, Chrysothamnus viscidiflorus, Purshia tridentata*, or *Tetradymia canescens* may also be common. The herbaceous stratum is typically dominated by graminoids and of moderate to moderately high cover (25-70%). *Festuca idahoensis* and *Pseudoroegneria spicata* are the most common associates. Other locally abundant graminoid species include *Hesperostipa comata (= Stipa comata), Festuca campestris, Leymus cinereus, Carex filifolia*, and *Koeleria macrantha*. Forbs form a major and highly variable component of this vegetation type. Recurrent species include *Achillea millefolium, Camelina microcarpa, Balsamorhiza sagittata, Crepis* spp., *Lupinus* spp., *Erigeron* spp., and *Phlox* spp.

Dynamics: *Artemisia tripartita* is able to resprout following fire, and dominance by the shrub is favored in overgrazed ranges (Hironaka et al. 1983). Populations may have variation in this ability (Hironaka et al. 1983). *Artemisia tripartita ssp. tripartita* occurs from the Continental Divide of Wyoming to the Columbia Basin of Washington. This subspecies has an erect growth form and may reach 2 m in height. *Artemisia tripartita ssp. rupicola* occurs east of the Continental Divide in Wyoming and forms low, layered shrubs less than 0.3 m in height (Fisser 1962). Growth trials of the two subspecies under similar conditions have shown that these morphological characteristics are genetic rather than environmentally controlled (Fisser 1962).

Similar Alliances:

- *Artemisia tripartita* ssp. *rupicola* Shrub Herbaceous Alliance (A.2556)

Similar Alliance Comments: *Artemisia tripartita ssp. rupicola* only occurs east of the Continental Divide in Wyoming.

ALLIANCE DISTRIBUTION

Range: This alliance occurs from eastern Washington and British Columbia, across the upper Columbia Basin to dry habitats of the Rocky Mountains of Montana, Wyoming, and Colorado.

Nations: CA, US

Subnations: BC, CO, ID, MT, OR, WA, WY

TNC Ecoregions: 6:C, 9:C, 10:C, 20:C, 67:P

USFS Ecoregions: 331I:CC, 342B:CC, 342C:CC, 342D:CC, 342I:CC, M242C:CC, M331A:CC, M331D:CC, M331G:CP, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC
Federal Lands: NPS (Grand Teton?); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): D. Sarr, mod. M.S. Reid
References: Caicco and Wellner 1983h, Caicco and Wellner 1983i, Caicco and Wellner 1983j, Chappell et al. 1997, Daubenmire 1970, Fisser 1962, Hess 1981, Hironaka et al. 1983, Johnston 1987, McLean 1970, Mueggler and Stewart 1980, Shiflet 1994, Tweit and Houston 1980, WANHP unpubl. data

[CEGL001539] *Artemisia tripartita* ssp. *tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation

Translated Name: **Threetip Sagebrush / Needle-and-Thread Shrub Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): M.S. Reid

ELEMENT CONCEPT

Global Summary: This association is known from the Columbia Basin and Okanogan Valley in Washington, southeastern Idaho, and western Wyoming. It may also occur in British Columbia, Canada. Sandy to gravelly soils or low-fertility soils (old, weathered volcanic ash) are associated with this type. This is an open to closed bunchgrass community punctuated by low shrubs. *Artemisia tripartita*, typically less than 0.6 m (2 feet) tall, creates the open shrub layer that typically contributes 10-30% to total plant cover. *Artemisia tridentata ssp. wyomingensis, Purshia tridentata*, and *Ericameria* spp. (= *Chrysothamnus* spp.) can be present or codominant, especially on disturbed sites. The general appearance of the community is a bunchgrass community with *Hesperostipa comata (= Stipa comata)* dominating the midgrass layer. Some stands have a short bunchgrass layer of *Poa secunda*. Broad-leaved herbs typically contribute little to the composition of individual sites, although a wide variety of species can grow in these communities. Frequently observed forbs are *Lupinus leucophyllus, Calochortus macrocarpus, Astragalus bisulcatus*, and *Erigeron pumilus*. Annual grasses and forbs are common and can be diverse. Disturbed sites will have *Bromus tectorum* and *Vulpia bromoides*, among many other exotic species. A diverse ground moss and lichen layer can cover much of the space between vascular plants, although it is displaced with ground disturbance. Climatically, this community occurs on cooler and more moist sites than sites of *~Artemisia tridentata ssp. wyomingensis / Hesperostipa comata* Shrubland (CEGL001051)$$.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on a 21% slope at an elevation of 2212 m (7258 feet). The aspect of the slope is directly west. The unvegetated ground cover is composed of 50% litter and duff, 20% bare soil, 6% gravel, and a trace amount of rocks greater than 10 cm. An additional 20% of the ground cover is described as basal vegetation.
Global Environment: This association occurs at moderate elevations, generally below 3000 feet, on sites more favorable, moister or at slightly higher elevations than those dominated by *Artemisia tridentata*. It is recognized as an edaphic climax association by Daubenmire (1970). It occurs on deep gravel or sandy infertile soils in areas too cool and wet for *Artemisia tridentata*. Moisture-holding capacity in these soils is low. In some locations soils may be derived from strongly weathered volcanic ash, with such low fertility as to allow *Hesperostipa comata* to dominate.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane shrubland that occurs on subxeric sites. Only a single stand occurs in the park. The only components of the short-shrub stratum are *Chrysothamnus viscidiflorus, Ericameria nauseosa*, and *Tetradymia canescens*, and each has only 1% canopy cover. The major component of the stand is *Hesperostipa comata*, contributing 30% canopy cover to the herbaceous layer. *Astragalus bisulcatus* is the only other plant present in more than trace quantities, contributing 3% to the herbaceous canopy cover. This shrubland is situated in an opening in the forest canopy.
Global Vegetation: This is a bunchgrass-dominated association, with *Hesperostipa comata (= Stipa comata)* in a taller grass layer up to 0.5 m in height, and with 20% to over 70% cover. A shorter grass layer is dominated by *Poa secunda*, with 10-40% cover. The half-meter-tall shrub layer is discontinuous, with scattered clumps of the evergreen *Artemisia tripartita*, averaging 5-15% cover. Forbs are infrequent and their total cover is less than 3%. Constant perennial forbs include *Calochortus macrocarpus, Erigeron pumilus, Lithophragma glabrum, Astragalus bisulcatus*, and *Lupinus leucophyllus*, and the annual forb *Phlox gracilis (= Microsteris gracilis)*. Species richness is relatively low, with an average of 13 species. High-quality, little-disturbed sites have a well-developed cryptogamic layer.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Chrysothamnus viscidiflorus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Ericameria nauseosa	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Tetradymia canescens	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Astragalus bisulcatus	Herb (field)	Forb	X	X	.
Stipa comata	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Ericameria nauseosa	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Artemisia tripartita	Short shrub/sapling	Broad-leaved evergreen shrub	X	.	.
Balsamorhiza careyana	Herb (field)	Forb	.	X	.
Draba verna	Herb (field)	Forb	.	.	X
Erigeron pumilus	Herb (field)	Forb	.	X	.
Bromus tectorum	Herb (field)	Graminoid	.	.	X
Poa secunda	Herb (field)	Graminoid	X	X	.
Stipa comata	Herb (field)	Graminoid	X	X	.

Higher Taxon / Species Name	Note / GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1 (11-Dec-2000). This type is a highly restricted component of the sagebrush landscape in Washington found in Douglas, Lincoln, Spokane, Okanogan, and eastern Chelan, Kittitas, and Yakima counties. There are seven occurrences in Washington. It may appear in adjacent British Columbia and has been reported from southeastern Idaho. There may be twice this number of sites of all conditions, although many are likely too small to be viable in the long term. Total acreage is estimated at less than 500 acres. A wide diversity of exotic species is changing the composition of this native community. Most occurrences of this type have been fragmented into isolated tracts and are altered or threatened by the introduction of exotic plants. This is a naturally unusual association that has been reduced further through land conversion to agriculture and exotic plant invasion.

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:
- *Artemisia tripartita/Stipa comata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.2.f. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: Although there is no *Artemisia tripartita* within this stand, it looks like an early seral stage of *~Artemisia tripartita ssp. tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001539)$$. Since it will probably fit the concept of this association within 50 years, we are classifying and naming it that.
Grand Teton National Park Other Comments:
Global Classification Comments: As with all the *Artemisia tripartita* types, *Artemisia tridentata ssp. wyomingensis* and *Ericameria* spp. increase with disturbance. A large complete database across their range may separate out an *Artemisia tripartita - Artemisia tridentata ssp. wyomingensis - Ericameria* spp. association or associations. These are currently considered as variations in the condition rank.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The stand occurs at the base of Shadow Mountain adjacent to Antelope Flats.
Global Range: This type is a minor component of the sagebrush landscape in Washington found in Douglas, Lincoln, Spokane, Okanogan, and eastern Chelan, Kittitas, and Yakima counties. One stand has been documented in Grand Teton National Park. It may appear in adjacent British Columbia and in southern Idaho.
Nations: CA?, US
States/Provinces: BC?, ID, OR:S1, WA:S1, WY
TNC Ecoregions: 6:C, 9:C, 20:P
TNC Ecoregion Comments: ECO20 added (mjr 7-05). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 342I:CC, M331D:CC, M331G:CP
Federal Lands: NPS (Grand Teton?); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: The only stand of this association was sampled in 1994. It is less than a mile outside the park boundary in the Bridger-Teton National Forest.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407052

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): M.S. Reid, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Daubenmire 1970	.	X	.	X	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hironaka et al. 1983	.	X	.	X	X	.	.	.	.
McLean 1969	.	.	.	.	X	.	.	.	.
McLean 1970	.	X	.	X	X	.	.	.	.
Reid et al. 1994	.	.	.	.	X	.	.	.	.
WANHP unpubl. data	.	X	.	X	X	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1526 *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance

Mountain Big Sagebrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is widespread in mountainous areas across the western U.S. The alliance can form large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil. The vegetation included in this alliance is characterized by a sparse (<25% cover on average) shrub layer of *Artemisia tridentata ssp. vaseyana*, but generally high cover of perennial graminoids (>20% total cover). Associated shrubs include *Artemisia arbuscula, Artemisia rigida, Ribes cereum, Symphoricarpos oreophilus, Purshia tridentata, Prunus virginiana, Tetradymia canescens*, and *Amelanchier alnifolia*. The herbaceous layer is typically abundant and dominated by perennial graminoids. The most common species is the bunchgrass *Festuca idahoensis*, or *Carex geyeri*, a sod-forming sedge. Other locally important species include *Pseudoroegneria spicata, Festuca thurberi, Bromus carinatus, Elymus elymoides, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis)*, and *Poa secunda*. Forb canopy cover and species composition are variable; species of *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum* are characteristic, and *Balsamorhiza sagittata, Achillea millefolium, Eriogonum umbellatum, Antennaria rosea*, and *Geranium viscosissimum* are common. Trees are uncommon but individuals of *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur. Diagnostic of this shrub herbaceous alliance is the relatively sparse *Artemisia tridentata ssp. vaseyana* shrub layer (<25% cover on average) with an abundant graminoid layer.

Environment: *Artemisia tridentata ssp. vaseyana*-dominated shrub herbaceous communities occupy the coolest and moistest climate zone of the *Artemisia tridentata* shrubland and shrub herbaceous complex. This alliance often occurs above lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25-60 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this alliance is large, from about 1060 m in eastern Oregon and Washington, to well over 3000 m in the mountains of northern Nevada, Idaho, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, and slopes range from nearly flat to very steep. Soils generally are moderately deep to deep, somewhat well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes, often having a substantial volume of coarse fragments. The soils are derived from a variety of parent materials (although sandstones, limestones, basalts, and crystalline rocks are common). In some cases, soils supporting stands of this alliance are unstable and prone to mass movement (Bramble-Brodahl 1978, Hironaka et al. 1983). In subalpine environments, these shrub herbaceous communities are found on deeper soils than *Artemisia arbuscula* subalpine shrublands. Trees are uncommon but individuals of *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Juniperus scopulorum, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

Adjacent vegetation is highly variable. In the Great Basin and Rocky Mountains, adjacent communities typically include *Pinus ponderosa* forests, *Pinus - Juniperus* or *Cercocarpus ledifolius* woodlands, *Populus tremuloides* forests, *Artemisia arbuscula, Artemisia rigida, Artemisia tridentata ssp. wyomingensis*, and *Artemisia tridentata ssp. tridentata* shrublands, and herbaceous meadows. In the Blue Mountains, eastern Cascade Range, and in the Okanogan Highlands these shrublands are found in a matrix with *Juniperus occidentalis, Pinus ponderosa, Pinus albicaulis*, and *Abies lasiocarpa* forests and woodlands.
Vegetation: Plant associations in this alliance are characterized by a sparse (<25% cover on average) shrub layer of *Artemisia tridentata ssp. vaseyana*, a microphyllous evergreen shrub. Associated shrubs across the range of this alliance include *Artemisia arbuscula, Artemisia rigida, Ribes cereum, Symphoricarpos oreophilus, Purshia tridentata, Prunus virginiana, Tetradymia canescens*, and *Amelanchier alnifolia*. The herbaceous layer is typically dominated by cespitose graminoids which form dense swards surrounding and sometimes overtopping the shrubs. Perennial graminoid cover generally exceeds 20%. The most common species is *Festuca idahoensis*, which occurs from the Columbia Basin to the northern Rockies and is almost always present. *Carex geyeri*, a sod-forming sedge, is the dominant herbaceous species in an association found in eastern Oregon and southern Idaho (Hironaka et al. 1983). *Festuca campestris* is another locally important species. Other common species include *Festuca thurberi, Bromus carinatus, Elymus elymoides, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis)*, and *Poa secunda*. These communities are more forb-rich than those of the *Artemisia tridentata ssp. vaseyana* shrublands, but actual species present are highly variable across the range. Species of *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum* are characteristic, and *Balsamorhiza sagittata, Achillea millefolium, Eriogonum umbellatum, Antennaria rosea*, and *Geranium viscosissimum* are common. Trees are uncommon in stands of this alliance, but *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Juniperus scopulorum, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.
Dynamics: Complex ecological interactions between fire regimes, grazing history, and climate patterns result in equally complex patterns of species structure and composition in *Artemisia tridentata* shrublands. These present corresponding difficulties in the classification of these shrublands, which have been compounded by the influence of human settlement and agricultural patterns. What follows is a summary of some of the influences of altered fire regimes and grazing history on *Artemisia tridentata* shrublands and shrub herbaceous vegetation.

Artemisia tridentata ssp. vaseyana shrub herbaceous plant associations may represent either more moist or less disturbed communities within the complex of *Artemisia tridentata ssp. vaseyana* shrublands and shrub-steppe. Shrub densities typically increase with overgrazing of the bunchgrass component or with increasing summer drought (West 1983c). There is considerable debate over whether present shrub-dominated stands are actually degraded 'steppe' (e.g., shrub herbaceous physiognomy), and if the stands will return to steppe with changes in grazing and fire management. *Artemisia tridentata* is inhibited by fire, and excessive grazing may decrease fire frequency due to consumption of herbaceous forage, resulting in increased shrub density. Conversely, invasion by non-native annual grasses (e.g., *Bromus tectorum* at lower elevations) may increase fire frequency sufficiently to eliminate the shrubs from the stands (Hironaka et al. 1983). With a change in fire frequency, species composition will be altered as well (West 1983c). With a high fire frequency, every 2-5 years, perennial grasses and shrubs are eliminated and non-native annual grasses dominate. At fire-return intervals of 10-30 years, short-lived resprouting shrubs such as *Chrysothamnus* or *Tetradymia* spp. dominate. At fire intervals of 30-70 years, a mixture of perennial bunch grasses and shrubs is maintained. Finally, in the complete absence of fire, deep-rooted shrubs such as *Artemisia tridentata* may become dominant.
Similar Alliances:
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance (A.2555)
- *Artemisia tridentata* ssp. *spiciformis* Shrubland Alliance (A.2550)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)

Similar Alliance Comments: This alliance contains stands in which *Artemisia tridentata ssp. vaseyana* is dominant or contributes >40% of the total sagebrush cover and with a diverse herbaceous layer of medium stature (0.5-1 m tall) in which perennial graminoids have total cover >20%. Some stands in the ~*Artemisia tridentata* Shrubland Alliance (A.829)$$ may be identical, but the subspecies was not distinguished in the primary literature.

ALLIANCE DISTRIBUTION

Range: This shrub herbaceous alliance occurs in mountainous regions from eastern Oregon and Washington, across the Great Basin in Nevada and southern Idaho, and in Colorado, Wyoming, and Montana. It has not been reported from California, Utah, Arizona, or New Mexico, but it is very likely to occur in these states at high elevations. In addition, the alliance probably extends north into Alberta and British Columbia, Canada.
Nations: CA, US
Subnations: AB, BC, CA?, CO, ID, MT, NV, OR, UT?, WA, WY

TNC Ecoregions: 4:P, 6:C, 7:C, 9:C, 10:C, 11:C, 20:C, 26:C
USFS Ecoregions: 331D:CC, 331E:C?, 341:C, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Black Canyon of the Gunnison, Curecanti, Glacier, Grand Teton, Rockefeller); USFS (Bighorn, Hells Canyon, Medicine Bow, Sawtooth, Shoshone, Wallowa-Whitman)

ALLIANCE SOURCES

Author(s): D. Sarr, mod. M.S. Reid
References: Bramble-Brodahl 1978, Despain 1973a, Francis 1983, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Hurd 1961, Jensen et al. 1988a, Johnson and Clausnitzer 1992, Johnston 1987, Komarkova 1986, Kuchler 1964, Lewis 1971, Lewis 1975a, Mooney 1985, Mueggler and Stewart 1980, Sabinske 1978, Sawyer and Keeler-Wolf 1995, Shiflet 1994, Smith 1966, Strong 1980, Terwilliger and Smith 1978, Tiedemann et al. 1987, Tweit and Houston 1980, West 1983c

[CEGL001532] *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation

Translated Name: **Mountain Big Sagebrush / Geyer's Sedge Shrub Herbaceous Vegetation**
Common Name: **Mountain Big Sagebrush / Geyer's Sedge**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This shrubland association is present in southern and central Idaho, western Wyoming, northeastern Oregon, and central Colorado. Stands are found above 1524 m (5000 feet) elevation predominately on southerly aspects of moderate to steep mountain ridges and slopes. In Colorado, the association is found on gentle slopes of westerly aspects. Soils are of colluvium deposits with a moderate to high percentage of course fragments. *Artemisia tridentata ssp. vaseyana* dominates the shrub overstory. Commonly the shrub *Symphoricarpos oreophilus* may be present but with low cover. The understory is dominated by *Carex geyeri*. Common herbaceous species include *Arenaria aculeata, Eriogonum heracleoides, Eriogonum umbellatum, Festuca idahoensis, Hesperostipa comata ssp. comata*, and *Lupinus argenteus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on the valley floor at elevations of 6500 to 6900 feet. Unvegetated ground cover for all stands includes bare ground cover with a large amount of small rocks. Two stands contain dead and downed trees. Two stands have horse trails through them. Adjacent vegetation may include *Pinus contorta* forests.

Global Environment: This association occurs from 1551 to 2590 m (5090-8500 feet) on ridgetop, upper or middle slopes or occasionally valley floors; on foothills, canyon slopes, or rough and rolling terrain. It occurs on moderate to steep slopes (3-80%) and on southerly aspects. Soils are sandy loams to clay loams. Ground cover is either duff (20-70%), pavement (3-60%), or gravels (0-20%).

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on mesic sites. *Artemisia tridentata* ssp. *vaseyana* (12 to 30% cover) is the dominant and typically the only species in the shrub layer. The herbaceous layer contributes 30 to 40% ground cover with graminoids being more diverse than forbs. *Carex geyeri* (7 to 30% cover) and *Eriogonum umbellatum* (7% cover) are the only species to occur in all stands. The other high constancy species are *Poa pratensis* and *Koeleria macrantha*, occurring in half the stands.

Global Vegetation: *Artemisia tridentata ssp. vaseyana* is the dominant shrub with 20-50% cover. Other shrubs than can be absent to abundant include *Purshia tridentata, Symphoricarpos oreophilus, Symphoricarpos rotundifolius*, and *Chrysothamnus viscidiflorus*. The herbaceous layer is sparse to abundant, with *Carex geyeri* the most abundant at 10-50% cover. Other graminoids that may be present include *Hesperostipa comata, Bromus carinatus, Festuca arizonica*, and *Carex hoodii*. Common forb species include *Linanthus nuttallii, Balsamorhiza sagittata, Arenaria aculeata, Eriogonum heracleoides, Eriogonum umbellatum, Achillea millefolium*, and *Lupinus argenteus*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.

Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Carex geyeri	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	X	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (17-Mar-2004). This shrubland association is present in central to southern Idaho (Snake River Plains and Sawtooth National Forest), northeastern Oregon (Hells Canyon National Recreation Area, Blue Mountains, and Ochoco Mountains), and central-east Colorado (Pitkin County). Stands are located predominately on southerly aspects of moderate to steep mountain ridges and slopes above 1524 m (5000 feet) elevation. In Colorado, stands are located on gentle slopes of westerly aspects. Soils are of colluvium deposits with a moderate to high percentage of course fragments. The number, condition, and size of stands are degraded by intensive livestock grazing and bedding, introduction of exotic species, and alteration of the fire regime. Suppression of fire has lead to conifer encroachment of these stands. Land-use conversion is a concerning threat in Colorado.

RELATED CONCEPTS

Global Similar Associations:
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum occidentale* Shrubland (CEGL001033)

Global Related Concepts:
- *Artemisia tridentata* ssp. *vaseyana/Carex geyeri* (Bourgeron and Engelking 1994) =
- *Artemisia tridentata ssp. vaseyana - Carex geyeri* Alpine sagebrush - sedge SS-49-11 (Hall 1973) =
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Carex geyeri* Habitat Type (Hironaka et al. 1983) I
- *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Plant Association (Johnson and Simon 1987) =
- *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Plant Association (Johnson and Clausnitzer 1992) =
- DRISCOLL FORMATION CODE:V.B.2.f. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / Carex geyeri* association, but is differentiated by the absence of *Symphoricarpos oreophilus* as a co-dominant species with *Artemisia tridentata* ssp. *vaseyana*.

Global Classification Comments: This association (1 plot) may also occur in west-central Colorado within Black Canyon National Park. The stand has a high percentage cover of *Purshia tridentata* and has yet to be crosswalked (Johnston 1987) to the NVC. Not sure what Colorado ref is being used for the Pitkin County reference. A plot from the Black Canyon National Park vegetation classification and mapping project (data collected in 2003) has been classified as this type. Not sure what Johnston (1987) has to do with this; the type is not listed there.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur on Hermitage Point, across from the Moose Habitat Pullout, and near Pacific creek.

Global Range: This shrubland association is present on the Snake River Plains and Pioneer Mountains of southern Idaho, central Idaho, and in the Blue and Ochoco mountains, and Hells Canyon National Recreation Area in northeastern Oregon. It also occurs in central Colorado in Pitkin County.
Nations: US
States/Provinces: CO:SU, ID:S3, NV?, OR:S3, WY
TNC Ecoregions: 4:P, 6:C, 9:C, 20:C
TNC Ecoregion Comments: ECO9 changed from P to C for Grand Teton (mjr 6-04). ECO4 & ECO9 added (MSR 5-04). ECO20 added (mjr 10-02) per SRM master list.
USFS Ecoregions: 342B:CC, 342C:CC, M242C:CC, M331D:CC, M332G:CC
Federal Lands: NPS (Black Canyon of the Gunnison, Curecanti, Grand Teton); USFS (Hells Canyon, Sawtooth, Wallowa-Whitman)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04R121, 04R136, 04X074, 04X813
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): M. Fain and K. McCloskey
Global Description Author(s): J.J. Miller, mod. G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Hall 1973	.	X	X	.	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	X	.	.	.	.
Johnson and Clausnitzer 1992	.	X	X	X	X	.	.	.	.
Johnson and Simon 1987	.	X	X	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL001533] *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation

Translated Name: **Mountain Big Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation**
Common Name: **Mountain Big Sagebrush / Idaho Fescue**
Ecological System(s):
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group, mod. G. Kittel

ELEMENT CONCEPT

Global Summary: This association is widespread in mountainous areas across the western U.S. The shrubland can form large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil. The vegetation is characterized by an open (<25% cover on average) shrub layer of *Artemisia tridentata ssp. vaseyana*, but generally high cover of perennial graminoids (>20% total cover). Associated shrubs include *Artemisia arbuscula, Artemisia rigida, Ribes cereum, Purshia tridentata, Prunus virginiana*, and *Tetradymia canescens*. The herbaceous layer is typically abundant and dominated by perennial graminoids. The most common species is the bunchgrass *Festuca idahoensis*. Other locally important species include *Pseudoroegneria spicata, Festuca thurberi, Bromus carinatus, Elymus elymoides, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis)*, and *Poa secunda*. Forb canopy cover and species composition are variable. Characteristic forb species include *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum*. Other forbs common, if less frequent, include *Balsamorhiza sagittata, Achillea millefolium, Eriogonum umbellatum, Antennaria rosea*, and *Geranium viscosissimum*. Some authors have noted different phases based on dominance of forb species. All phases are included within this one herbaceous shrubland concept. Trees are uncommon but individuals of *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: This association occurs on flat terrain on the valley floor, basin floors, terraces, and shallow slopes at elevations ranging from 6300 to 6900 feet. Soil textures are generally loams or clay loams but can have a sand component. Gravel composes up to 20% of the unvegetated ground cover. Litter and duff covers up to 70% of the ground surface, while bare soil covers less than 30%. Almost all of the sites sampled have a disturbance component resulting from heavy grazing, fire, or anthropogenic sources. Adjacent vegetation may include *Artemisia arbuscula* shrublands or other *Artemisia tridentata* ssp. *vaseyana* associations.

Global Environment: This *Artemisia tridentata ssp. vaseyana*-dominated shrub herbaceous association occupies the coolest and moistest climate zone of the *Artemisia tridentata* shrubland and shrub herbaceous complex. This open shrubland often occurs above

lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25-60 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this type is wide, from about 1060 m (3500 feet) in eastern Oregon and Washington, 1800-2400 m (6000-8000 feet) on low mountain slopes and valleys in Montana, to well over 3000 m (9850 feet) in the mountains of northern Nevada, Idaho, Montana, Wyoming, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, valley bottoms, flat terraces, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, and slopes range from nearly flat to very steep. Soils generally are moderately deep to deep, somewhat well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes, often having a substantial volume of coarse fragments. The soils are derived from a variety of parent materials, although sandstones, limestones, basalts, and crystalline rocks are commonest. In some cases, soils supporting stands of this association are unstable and prone to mass movement. In subalpine environments, these shrub herbaceous communities are found on deeper soils than *Artemisia arbuscula* subalpine shrublands. Trees are uncommon, but individuals of *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Juniperus scopulorum, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

Adjacent vegetation is highly variable. In the Great Basin and Rocky Mountains, adjacent communities typically include *Pinus ponderosa* forests, *Pinus - Juniperus* or *Cercocarpus ledifolius* woodlands, *Populus tremuloides* forests, *Artemisia arbuscula, Artemisia rigida, Artemisia tridentata ssp. wyomingensis*, and *Artemisia tridentata ssp. tridentata* shrublands, and herbaceous meadows. In the Blue Mountains, East Cascade Mountains, and in the Okanogan Highlands, these shrublands are found in a matrix with *Juniperus occidentalis, Pinus ponderosa, Pinus albicaulis*, and *Abies lasiocarpa* forests and woodlands. In Montana, adjacent vegetation includes *Festuca idahoensis* and *Pseudoroegneria spicata* grasslands.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland that occurs on subxeric sites. *Artemisia tridentata* ssp. *vaseyana* is dominant in the short shrub stratum, ranging from 12 to 50% canopy cover. Other shrub species within the short shrub stratum are uncommon but can include *Symphoricarpos oreophilus, Artemisia arbuscula*, and/or *Purshia tridentata*. Herbaceous cover ranges from 12 to 80% and is dominated by *Festuca idahoensis* (1 to 30% cover) and *Eriogonum umbellatum* (1 to 30% cover). High constancy species include *Koeleria macrantha, Pseudoroegneria spicata*, and *Antennaria microphylla*.

Global Vegetation: This herbaceous shrubland is characterized by an open (10-40% cover) shrub layer of *Artemisia tridentata ssp. vaseyana* but generally with a high cover of perennial graminoids (>20% total cover). Associated shrubs can include *Artemisia arbuscula, Artemisia rigida, Ribes cereum, Purshia tridentata, Prunus virginiana, Symphoricarpos oreophilus*, and *Tetradymia canescens*. The herbaceous layer is typically abundant and dominated by perennial graminoids. The most common species is the bunchgrass *Festuca idahoensis*. Other locally important species include *Pseudoroegneria spicata, Festuca thurberi, Bromus carinatus, Elymus elymoides, Elymus trachycaulus, Koeleria macrantha, Achnatherum occidentale (= Stipa occidentalis)*, and *Poa secunda*. Forb canopy cover and species composition are variable; species of *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus, Collinsia, Collomia* and *Eriogonum* are characteristic, and *Balsamorhiza sagittata, Achillea millefolium, Eriogonum umbellatum, Antennaria rosea*, and *Geranium viscosissimum* are common. Trees are uncommon, but individuals of *Pinus ponderosa, Cercocarpus ledifolius, Populus tremuloides, Juniperus occidentalis, Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur. Diagnostic of this shrub herbaceous association is the relatively sparse *Artemisia tridentata ssp. vaseyana* shrub layer (<25% cover on average) with an abundant graminoid layer.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Antennaria microphylla	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Artemisia tridentata ssp. *vaseyana*	Short shrub/sapling	Broad-leaved evergreen shrub	X	X	.
Festuca idahoensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic

Hordeum jubatum	-	P	exotic
Poa compressa	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Rumex acetosella	-	P	exotic
Taraxacum laevigatum	-	P	exotic
Taraxacum officinale	-	P	exotic
Orobanche corymbosa	-	P	rare (state)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530)
- *Artemisia tridentata* ssp. *vaseyana / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531)
- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii* Shrubland (CEGL001025)

Global Related Concepts:
- *Artemisia tridentata / Festuca idahoensis* Habitat Type (Mueggler and Stewart 1980) B
- *Artemisia tridentata ssp. vaseyana/Festuca idahoensis* (Bourgeron and Engelking 1994) =
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis / Stipa occidentalis* association (Mooney 1985) =
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Community Type (Jensen et al. 1988a) =
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Habitat Type (Lewis 1975a) =
- *Artemisia vaseyana / Festuca idahoensis* Habitat Type (Hironaka et al. 1983) = Big Sagebrush complex (Lewis 1971) =
- DRISCOLL FORMATION CODE:V.B.2.f. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This plant association fits the Hironaka et al. (1983) concept of *Artemisia tridentata ssp. vaseyana / Festuca idahoensis* very well.
Global Classification Comments:

GRAND TETON NATIONAL PARK Other Comments: This association is similar to the *Artemisia tridentata* ssp. *vaseyana – Purshia tridentata / Festuca idahoensis* and the *A. tridentata* ssp. *vaseyana – Symphoricarpos oreophilus / F. idahoensis* associations but is differentiated from them due to the lack of either *P. tridentata* or *S. oreophilus* being co-dominant in the shrub layer with *A. tridentata* ssp. *vaseyana*.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association ranges from the John D. Rockefeller Jr. Memorial Parkway to the southern boundary of GTNP. It is located on both the east and west sides of the valley and on the west side of Jackson Lake.

Global Range: This is a wide-ranging association, known throughout the northern western U.S. It occurs in eastern Oregon, Nevada, Utah, Colorado, Wyoming, Montana, Idaho, possibly occurring further north into Alberta and British Columbia. It may also occur in eastern California.
Nations: CA?, US
States/Provinces: AB?, BC?, CA?, CO:S3S4, ID:S4, MT:S4, NV:S3?, OR:S3, UT?, WA, WY:S3S4
TNC Ecoregions: 1:C, 3:C, 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 11:C, 20:C, 68:C, 81:C
TNC Ecoregion Comments: ECO1, ECO3, ECO4, ECO8, ECO68, ECO81 added (mjr 7-05). ECO7 added for Glacier (mjr 1-04).
USFS Ecoregions: 341:C, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333D:CC
Federal Lands: NPS (Glacier, Grand Teton, Rockefeller); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201003, GT-0202003, GT-03B053

Accuracy Assessment Points: 04J001, 04J003, 04J004, 04K023, 04K025, 04K052, 04K054, 04K070, 04M017, 04R029, 04R035, 04R052, 04R086, 04R087, 04R185, 04R188, 04X062, 04X065, 04X403, 04X489, 04X490
Other plots within park boundaries, from other projects: GT-tm6a, GT-tm6b
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Bramble-Brodahl 1978	.	X	.	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Despain 1973a	.	X	.	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Francis 1983	.	X	.	X	.	.	.	.	.
Hess 1981	.	X	.	X	.	.	.	.	.
Hess and Wasser 1982	.	X	.	X	.	.	.	.	.
Hironaka et al. 1983	.	X	X	X	.	.	.	.	.
Hurd 1961	.	X	.	X	.	.	.	.	.
Jensen et al. 1988a	.	X	X	X	.	.	.	.	.
Johnston 1987	.	X	.	X	.	.	.	.	.
Jones and Ogle 2000	.	.	.	.	X	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Komarkova 1986	.	X	.	X	.	.	.	.	.
Lewis 1971	.	X	X	X	.	.	.	.	.
Lewis 1975a	.	X	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Mooney 1985	.	X	X	X	.	.	.	.	.
Mueggler and Stewart 1980	.	X	X	X	.	.	.	.	.
NVNHP 2003	.	.	.	.	.	.	.	.	.
Sabinske 1978	.	X	.	X	.	.	.	.	.
Smith 1966	.	X	.	X	.	.	.	.	.
Strong 1980	.	X	.	X	.	.	.	.	.
Terwilliger and Smith 1978	.	X	.	X	.	.	.	.	.
Tiedemann et al. 1987	.	X	.	X	.	.	.	.	.
Tweit and Houston 1980	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

A.1524 *Chrysothamnus viscidiflorus* Shrub Herbaceous Alliance

Green Rabbitbrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Stands of the alliance occur on mesas on the Colorado Plateau. A stand has been described from a small woodland park at 2220 m elevation on south end of Bridger Jack Mesa in southern Utah. Slopes are gentle to moderate, and aspects are generally eastern. Soil is loamy fine sand derived from eolian deposits overlaying sandstone. Stands are characterized by a moderate graminoid layer dominated by the medium-tall bunchgrass *Leymus salinus ssp. salinus* with a sparse shrub layer dominated by the evergreen shrub *Chrysothamnus viscidiflorus*. Other grasses present include *Achnatherum hymenoides (= Oryzopsis hymenoides)* and patches of *Bouteloua gracilis*. Associated shrubs and dwarf-shrubs, such as *Amelanchier utahensis, Artemisia tridentata, Ephedra viridis, Gutierrezia sarothrae, Mahonia fremontii,* and *Yucca baccata,* were scattered in the park. Young *Pinus edulis* and *Juniperus osteosperma* trees were also present in the stand. The forb layer was sparse This grassland stand was surrounded by a *Juniperus* woodland and an *Artemisia tridentata - Ephedra viridis* shrubland.

Environment: Stands of the alliance occur on mesas on the Colorado Plateau. Van Pelt (1978) described the following stand from a small woodland park at 2220 m elevation on south end of Bridger Jack Mesa southern Utah. Annual precipitation is highly variable with a mean of 30 cm. Slopes of the park are gentle to moderate (less than 15%). Aspects are generally eastern, but all aspects are possible. Soil is loamy fine sand derived from eolian deposits overlaying sandstone. pH averaged 7.8. Ground cover had 34% bareground and 26% litter. This grassland stand was surrounded by a *Juniperus* woodland and an *Artemisia tridentata - Ephedra viridis* shrubland.

Vegetation: Vegetation included in this woodland park alliance is found on the Colorado Plateau. Stands are characterized by a moderate graminoid layer dominated by the medium-tall bunchgrass *Leymus salinus ssp. salinus* with a sparse shrub layer dominated by the evergreen shrub *Chrysothamnus viscidiflorus*. Other grasses present include the perennial medium-tall bunchgrass *Achnatherum hymenoides (= Oryzopsis hymenoides)* and patches of the sod-forming shortgrass *Bouteloua gracilis*. Associated shrubs and dwarf-shrubs, such as *Amelanchier utahensis, Artemisia tridentata, Ephedra viridis, Gutierrezia sarothrae, Mahonia fremontii,* and *Yucca baccata*, were scattered in the park. Young *Pinus edulis* and *Juniperus osteosperma* trees were also present in the stand. Van Pelt (1978) described the stand with a canopy cover of 5% *Chrysothamnus viscidiflorus* and 29% *Leymus salinus*. The sparse forb layer consists of scattered *Arenaria* sp., *Artemisia carruthii, Erigeron pumilus, Eriogonum* sp., *Stenotus armerioides var. armerioides*, and cacti such as *Mammillaria* and *Opuntia* spp.
Dynamics: Disturbance by fire may be important in the creation and maintenance of these stands. Burned tree snags indicate these woodland parks were created by fire that burned openings in the *Pinus edulis* and *Juniperus osteosperma* woodland (Van Pelt 1978). Van Pelt (1978) reported that young *Pinus edulis* are slowly invading the park and in time will convert it back to a woodland unless fire re-burns the site. Lightning likely starts these fires. With past fire suppression policies on some federal lands and livestock grazing which removes the necessary fine fuels needed to carry fire through woodlands, these parks may be disappearing. More information is needed to understand their current status and management needs.
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: Vegetation in this grassland alliance was described from Utah, but the alliance is likely to occur throughout much of the Colorado Plateau. It has also been recently described from the Mojave Desert in California and in Wyoming.
Nations: US
Subnations: CO, UT, WY
TNC Ecoregions: 9:C, 17:C, 18:C, 20:C
USFS Ecoregions: 313:C, 322A:CC, 331J:CC, M331D:CC, M331I:CC, M341C:CC
Federal Lands: NPS (Curecanti, Florissant Fossil Beds, Grand Teton, Zion); USFS (Bridger-Teton, Pike-San Isabel)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Van Pelt 1978

[CEGL002530] *Chrysothamnus viscidiflorus* Shrub Herbaceous Vegetation [Provisional]

Translated Name: **Green Rabbitbrush Shrub Herbaceous Vegetation**
Common Name:
Ecological System(s):
Status: Provisional **Circumscription Confidence:**
Concept Author(s): G. Kittel

ELEMENT CONCEPT

Global Summary: This shrubland is known from the southern San Luis Valley of Colorado and the lower slopes of Grand Teton National Park, Wyoming. Its is an open shrubland with 3-20% shrub cover of *Chrysothamnus viscidiflorus*. The undergrowth is mainly graminoid species, including *Hesperostipa comata, Pseudoroegneria spicata*, and *Koeleria macrantha*. Forb species include *Castilleja sulphurea, Castilleja applegatei, Castilleja flava, Antennaria lanata, Antennaria microphylla, Astragalus kentrophyta*, and *Astragalus bisulcatus*. Colorado stand information will be added at a later date.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes with variable aspects and gradients between 4 and 55%. The elevations for these stands range between 6600 and 7631 feet. Soil data was collected for one stand – a well-drained silty clay loam. Unvegetated and nonvascular ground surface data are available for five stands, primarily comprised of gravel (1 to 50%), litter and duff (10 to 80%), and bare soil (10 to 60%).

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane shrubland occurring on subxeric sites. Generally, the vegetation has low canopy cover and low species diversity. The dominant shrub species is *Chrysothamnus viscidiflorus* which contributes 3 to 20% canopy cover. The highest constancy graminoids, occurring in four of seven stands are *Hesperostipa comata* (1 to 10% cover), *Pseudoroegneria spicata* (3 to 30% cover), and *Koeleria macrantha* (1 to 20% cover). No forbs occur in even one third of the stands or with more than 3% cover.

Global Vegetation:

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Chrysothamnus viscidiflorus	Short shrub/sapling	Broad-leaved deciduous shrub	X	X	.
Koeleria macrantha	Herb (field)	Graminoid	.	X	.
Pseudoroegneria spicata	Herb (field)	Graminoid	.	X	.
Stipa comata	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa

Tragopogon sp.	exotic

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Tragopogon pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (30-Mar-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This type is described from Element Occurrences from the Colorado Natural Heritage Program and plot data from Grand Teton National Park.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur within GTNP near or on Blacktail Butte and in the Elk Refuge. Stands also occur on the western edge of Bridger-Teton National Forest. Two stands occur northeast of Lower Slide Lake and the other occurs on the western slope of Shadow Mountain.

Global Range: This association occurs in Wyoming and Colorado.
Nations: US
States/Provinces: CO, WY
TNC Ecoregions: 9:C, 20:C
TNC Ecoregion Comments: ECO20 & 331J added (GK 8-05).
USFS Ecoregions: 331J:CC, M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A119
Accuracy Assessment Points: 04X047, 04X049
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9507012, BT-9507003, BT-9407032, BT-9407045

Grand Teton National Park Description Author(s): M. Fain, mod. K. Varga and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.A.8.N.c. Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer

A.1577 *Dryas octopetala* Dwarf-shrub Herbaceous Alliance

Eight-petal Mountain-avens Dwarf-shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant associations in this alliance are typically found well above treeline in high mountains of the interior Pacific Northwest and Rocky Mountains. The climate is cold and snowy with severe winds, snow abrasion, and a short growing season. Annual precipitation ranges from 75 cm in the Rocky Mountains to over 250 cm in the Cascades. The vegetation occurs on dry, exposed mountain ridges where snow blows off or melts relatively early. Elevations range from 1700-2400 m in the Cascades up to 3600 m in the Rocky Mountains. Soils are composed of varied parent materials, including granitics, limestone, and basalt, but are usually young and skeletal. Frost boiling and needle ice formation are common disturbances. Plant associations in this alliance form a distinctive fell-field type on dry ridges above treeline with coarse, frost-heaved soils. The depauperate dwarf-shrub communities are dominated by *Dryas octopetala*, and have few forb and graminoid species in the understory. *Minuartia obtusiloba* is the most characteristic forb species in both Cascade and Rocky Mountain stands. *Carex rupestris* is important and may be codominant in some stands in the Rockies. Other common herbaceous associates across the range include *Sedum lanceolatum, Lupinus sellulus var. lobbii, Danthonia intermedia, Festuca brachyphylla*, and *Luzula spicata*. Adjacent vegetation is usually *Tsuga mertensiana* (in the Cascades), *Pinus albicaulis, Larix lyallii*, or *Abies lasiocarpa* krummholz, dry alpine grasslands, sedge wetlands, or bare rock and ice.

Environment: Plant associations in this alliance are typically found well above treeline in high mountains of the interior Pacific Northwest and Rocky Mountains. The climate is cold and snowy with severe winds, snow abrasion, and a short growing season. Annual precipitation ranges from 75 cm in the Rocky Mountains to over 250 cm in the Cascades. The vegetation occurs on dry, exposed mountain ridges where snow blows off or melts relatively early. Elevations range from 1700-2400 m in the Cascades (Douglas and Bliss 1977) up to 3600 m in the Rocky Mountains (Hess 1981). Soils are composed of varied parent materials, including granitics, limestone, and basalt, but are usually young and skeletal. Frost boiling and needle ice formation are common disturbances. Adjacent vegetation is usually *Tsuga mertensiana* (in the Cascades), *Pinus albicaulis, Larix lyallii*, or *Abies lasiocarpa* krummholz, dry alpine grasslands, sedge wetlands, or bare rock and ice.

Vegetation: Plant associations in this alliance form a distinctive fell-field type on dry ridges above treeline with coarse, frost-heaved soils. The depauperate dwarf-shrub communities are dominated by *Dryas octopetala*, and have few forb and graminoid species in the understory. *Minuartia obtusiloba* is the most characteristic forb species in both Cascade and Rocky Mountain stands. *Carex rupestris* is important and may be codominant in some stands in the Rockies. Other common herbaceous associates across the range include *Sedum lanceolatum, Lupinus sellulus var. lobbii, Danthonia intermedia, Festuca brachyphylla*, and *Luzula spicata*.

Dynamics: This alliance is associated with frigid, excessively drained, skeletal soils which are strongly influenced by frost heaving and needle ice formation (Bamberg and Major 1968). Bamberg and Major (1968) describe soil and vegetation movements of several centimeters in a single season due to frost churning. A net movement in the downslope direction, even on mild slopes (4-10%), occurs over time.

Similar Alliances:

- *Carex rupestris* Herbaceous Alliance (A.1307)

Similar Alliance Comments: One of the associations in the ~*Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)$$ is codominated by *Carex rupestris* and *Dryas octopetala*. Most stands in this alliance are dominated by *Dryas*.

ALLIANCE DISTRIBUTION

Range: Vegetation within this alliance has been reported from alpine habitats of the eastern Cascades of Washington to the northern Rocky Mountains of Alberta, Idaho, Wyoming, and Montana, south into the Colorado Rockies. The alliance is also likely to occur in mountains of British Columbia, Canada.

Nations: CA, US

Subnations: AB, BC?, CO, ID?, MT, WA, WY

TNC Ecoregions: 3:C, 7:C, 8:C, 9:C, 20:C

USFS Ecoregions: M242C:CC, M331A:CC, M331D:CC, M331I:CC, M332A:C?, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333C:CC

Federal Lands: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Jasper?, Waterton Lakes); USFS (Arapaho-Roosevelt, Beaverhead, Gunnison, Lewis and Clark, White River NF)

ALLIANCE SOURCES

Author(s): D. Sarr

References: Bamberg and Major 1968, Cooper and Lesica 1992, Cooper et al. 1997, Cox 1933, Douglas and Bliss 1977, Eddleman 1967, Fritz 1981, Hess 1981, Hess and Wasser 1982, Holway 1960, Holway 1962a, Holway and Ward 1963, Johnston 1987, Kiener 1967, Komarkova 1976, Welden 1981, Willard 1963, Willard 1979, Williams 1961

[CEGL001893] *Dryas octopetala - Carex* spp. Dwarf-shrub Herbaceous Vegetation

Translated Name: **Eight-petal Mountain-avens - Sedge species Dwarf-shrub Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This is an alpine dwarf-shrubland known from southwestern Montana and western Wyoming. Stands occur on calcareous substrates on windswept, exposed slopes. Elevations range from 2800 to 3145 m (9200-10,318 feet). Soils are thin, gravelly sandy loams and are poorly developed. *Dryas octopetala* is the most abundant species with *Carex elynoides*, *Carex rupestris*, *Lupinus sericeus*, and *Oxytropis sericea*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The single sampled stand of this association occurs on a moderate northwest-facing slope at an elevation of 3145 m (10,318 feet). The soil is a well-drained sandy loam. The unvegetated and nonvascular ground surface is composed of lichen (50% cover), gravel (20% cover), litter and duff (10% cover), rocks greater than 10 cm (5% cover), and moss (1% cover). Adjacent vegetation includes *Abies lasiocarpa* krummholz, *Pinus albicaulis* krummholz, various alpine vegetation types, and patchy *Pinus albicaulis* on a scree slope.
Global Environment: Stands occur on calcareous substrates on windswept, exposed slopes. Elevations range from 2800 to 3145 m (9200-10,318 feet). Soils are thin, gravelly sandy loams and are poorly developed. Stands occur on north-facing slopes.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is an alpine dwarf-shrub community that occurs on mesic sites. *Dryas octopetala* (3% cover) is a common semi-shrub and occurs with scarce *Salix rotundifolia* in the dwarf-shrub layer. *Trisetum spicatum* (10% cover) is the only well-represented graminoid. Common graminoids with 3% cover include *Carex albonigra* and *Carex elynoides*. *Silene acaulis* (3% cover) is the only common forb.
Global Vegetation: The dwarf-shrub *Dryas octopetala* is the most abundant species with *Carex elynoides*, *Carex rupestris*, *Lupinus sericeus*, and *Oxytropis sericea*. *Polygonum viviparum* was notably absent from both the Montana and Wyoming plots. Wyoming stands also include *Salix rotundifolia*, *Carex albonigra*, and *Trisetum spicatum*.
Global Dynamics: Stands of *Dryas octopetala* may become meadows of *Carex elynoides* with sufficient build up of the turf and humus layer (Bamberg and Major 1968).

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Dryas octopetala	Short shrub/sapling	Dwarf-shrub	.	X	.
Silene acaulis	Herb (field)	Forb	.	X	.
Carex albonigra	Herb (field)	Graminoid	.	X	.
Carex elynoides	Herb (field)	Graminoid	.	X	.
Trisetum spicatum	Herb (field)	Graminoid	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Dryas octopetala	Herb (field)	Dwarf-shrub	X	X	X
Carex elynoides	Herb (field)	Graminoid	.	X	.

Higher Taxon / Species Name	Note: GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Dryas octopetala - Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892)
- *Dryas octopetala - Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891)

Global Related Concepts:

- *Dryas octopetala-Carex* spp. (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This type is very similar to ~*Dryas octopetala* - *Carex rupestris* Dwarf-shrubland (CEGL001892)$$ and is differentiated by the more abundant and consistently present *Carex elynoides* or other *Carex* spp. It is also very closely related to ~*Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894)$$, although no *Polygonum viviparum* was observed in the *Dryas octopetala* - *Carex* spp. type. A crosswalk between these alpine dwarf-shrub communities seems warranted.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs on a ridgeline east of Ranger Peak.
Global Range: This association occurs in alpine areas of southwestern Montana and western Wyoming.
Nations: US
States/Provinces: MT:S3?, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO8 added (mjr 8-04). ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M332B:CC, M332C:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B104
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bamberg and Major 1968	.	X	.	X	.	.	.	.	.
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.B.2.N.a. Tall temperate or subpolar perennial forb vegetation

A.1604 *Ligusticum filicinum* Herbaceous Alliance

Fernleaf Wild Lovage Herbaceous Alliance

ALLIANCE CONCEPT

Summary: These lush, forb-dominated subalpine meadows and parks occur in the mountains and plateaus of western Wyoming. Elevations range from 1990-3330 m. Sites vary from gentle to steep slopes, but are most often midslopes with eastern aspects. Stands have a dense (nearly 100% cover), tall herbaceous layer that is dominated by mixed perennial forbs. *Ligusticum filicinum* often dominates with lesser amounts of *Delphinium X occidentale* or *Osmorhiza occidentalis*. Associated perennial forbs include *Geranium viscosissimum, Lupinus argenteus, Senecio crassulus, Symphyotrichum foliaceum (= Aster foliaceus)*, and *Potentilla gracilis*. Graminoids are relatively sparse and include *Elymus trachycaulus, Bromus carinatus*, and *Melica spectabilis*. These stands have high species richness with an average of 24 species per plot.
Environment: These lush, forb-dominated subalpine meadows and parks occur in the mountains and plateaus of western Wyoming. Elevations range from 1990-3330 m. Sites were varied from gentle to steep (5-60%) slopes, but were most often on midslopes with eastern aspects. Soils varied from silt loams to clay loams with an average pH of 5.9. Parent material includes sandstone, limestone or shale. Adjacent stands include subalpine forests dominated by *Picea engelmannii*, *Abies lasiocarpa*, and *Pseudotsuga menziesii*.

Gregory (1983) specifically mentions the *Abies lasiocarpa / Mahonia repens* or *Abies lasiocarpa / Ribes montigenum* subalpine forests nearby her plots.
Vegetation: Vegetation in this alliance occurs in subalpine meadows in the mountains of western Wyoming. Stands have a dense (nearly 100% cover), tall herbaceous layer (0.8-1.2 m tall) that is dominated by mixed perennial forbs. *Ligusticum filicinum* (21% cover) often dominates with lesser amounts of *Delphinium X occidentale* or *Osmorhiza occidentalis*. Associated perennial forbs include *Geranium viscosissimum, Lupinus argenteus, Senecio crassulus, Symphyotrichum foliaceum (= Aster foliaceus)*, and *Potentilla gracilis*. Graminoids are relatively sparse and include *Elymus trachycaulus, Bromus carinatus*, and *Melica spectabilis*. These stands have high species richness with and average of 24 species per plot (Gregory 1983).
Dynamics: Past heavy use by sheep has caused a shift from forb to graminoid species dominance in some of these subalpine parks (Horton 1971).
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from subalpine areas in western Wyoming.
Nations: US
Subnations: ID, WY
TNC Ecoregions: 9:C
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, Caribou-Targhee)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Gregory 1983, Horton 1971

[CEGL001941] *Ligusticum filicinum - Delphinium X occidentale* Herbaceous Vegetation

Translated Name: **Fernleaf Wild Lovage - Duncecap Larkspur Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Meadow (CES306.829)

Status: Standard **Circumscription Confidence:** 1 - Strong
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This mesic tall-forb meadow association occurs in mid- to upper-subalpine sites in the mountains of northwestern Wyoming. Elevations range from 1981 to 3109 m (6500-10,200 feet). Stands may be located on gentle to moderately steep slopes (2-60%) oriented to any aspect but often occur on lee slopes where snow collects and melts later in the spring. Soils are derived from a variety of sources, including loess, limestone, shale, siltstone, glacial till and colluvium. Soil textures are generally silt loam or silty clay loam. The vegetation is characterized by *Ligusticum filicinum* with between 3 and 60% cover. *Delphinium X occidentale, Pedicularis bracteosa, Senecio crassulus*, and/or *Osmorhiza occidentalis* are the most consistent codominant species. Other tall-forb species present in some stands include *Geranium viscosissimum, Lupinus argenteus, Eucephalus engelmannii*, and *Symphyotrichum foliaceum*. Grasses are much less abundant and diverse than forbs in this association but may include *Elymus trachycaulus, Bromus carinatus*, and *Melica spectabilis*. Scattered shrubs may be present, including *Salix* spp., *Ribes lacustre*, or *Vaccinium scoparium*. Disturbance by gophers appears to be necessary to maintaining forb dominance in these subalpine meadows.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on slopes in the mountains from 7950 to 10200 feet. Slope and aspect are variable; over half of the stands are situated south or south east. One stand is located on the valley floor at an elevation of 6900 feet. The parent material for the soils is usually either colluvium or residuum from loess, limestone, shale, and/or siltstone. The parent material for one stand that sits in a cirque basin is glacial till from granitics and loess. Seven stands sampled in the Caribou-Targhee National Forest have either yodal soils or cryochrepts; the majority of the textures sampled within GTNP are silty clay loams, but they also include silty clays, silt loams, sandy loams, and loams. The soils are well-drained and can contain between 0 and 70% gravel. Data from five stands is available for the unvegetated ground cover consideration. The stands are composed of 20 to 60% litter and duff, 5 to 50% bare soil, 1 to 40% gravel, and 0 to 20% rocks greater than 10cm. Few of the sampled stands mention adjacent vegetation; coniferous patches and stringers are located near at least seven stands.

Global Environment: This mesic tall-forb meadow association occurs in mid- to upper-subalpine sites in the mountains of northwestern Wyoming. Elevations range from 1981 to 3109 m (6500-10,200 feet). Stands may be located on gentle to moderately steep slopes (2-60%) oriented to any aspect but often occur on lee slopes where snow collects and melts later in the spring. Litter and rock cover most of the unvegetated surface, and most stands have less than 10% cover by bare ground. Soils are derived from a

variety of sources, including loess, limestone, shale, siltstone, glacial till and colluvium. Soil textures are generally silt loam or silty clay loam.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane to subalpine forb community that occurs on subxeric to mesic sites. Shrubs are generally absent but may include *Salix* spp., *Ribes lacustre,* or *Vaccinium scoparium*. Graminoids generally have neither high constancy nor are common within the stands. *Elymus trachycaulus* is the highest constancy graminoid and is present in almost half of the stands. The herbaceous layer is dominated by forbs, most notably *Ligusticum filicinum* (3 to 60% cover). Other high constancy forb species include *Pedicularis bracteosa* (trace to 10% cover), *Senecio crassulus* (trace to 20% cover), *Geranium viscosissimum* (1 to 12% cover), and *Lupinus argenteus* (1 to 20% cover). No other forbs are highly constant, though there are many species that may co-dominate or even be dominant over *Ligusticum filicinum.* Some of the more notable species include *Eucephalus engelmannii* (1 to 30% cover), *Mertensia ciliata* (1 to 30% cover), *Chamerion angustifolium* (trace to 20% cover), *Helianthella quinquenervis* (1 to 60% cover), *Hedysarum occidentale* (trace to 20% cover), and *Delphinium* x *occidentale* (trace to 20% cover).

Global Vegetation: This mesic tall-forb association is common in meadows in the mountains of northwestern Wyoming. Total vegetation cover is high for an herbaceous type, ranging from a low of around 60% to nearly 100%. *Ligusticum filicinum* is dominant to abundant, with between 3 and 60% cover. *Delphinium X occidentale, Pedicularis bracteosa, Senecio crassulus,* and/or *Osmorhiza occidentalis* are the most consistent codominant species. Other tall-forb species present in some stands include *Geranium viscosissimum, Lupinus argenteus, Eucephalus engelmannii,* and *Symphyotrichum foliaceum*. Grasses are much less abundant and diverse than forbs in this association but may include *Elymus trachycaulus, Bromus carinatus,* and *Melica spectabilis*. Scattered shrubs may be present, including *Salix* spp., *Ribes lacustre,* or *Vaccinium scoparium*.

Global Dynamics: Disturbance by gophers appears to be necessary to maintaining forb dominance in these subalpine meadows. Gregory (1983) reports that the use of herbicides to control *Delphinium X occidentale,* which is poisonous to cattle, may have caused grass species to be more important in these meadows than they would be in untreated situations. Stands of *Populus tremuloides / Ligusticum filicinum* reported from the same area (e.g., Youngblood and Mueggler 1981) have nearly identical herbaceous components and may result in part from the invasion of *Ligusticum filicinum - Delphinium X occidentale* meadows by aspen.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Geranium viscosissimum	Herb (field)	Forb	.	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.
Senecio crassulus	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Delphinium x *occidentale*	Herb (field)	Forb	X	X	.
Ligusticum filicinum	Herb (field)	Forb	X	X	.
Osmorhiza occidentalis	Herb (field)	Forb	X	X	.
Pedicularis bracteosa	Herb (field)	Forb	.	X	.
Senecio crassulus	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Lesquerella paysonii	G3	P	rare
Rumex acetosella	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Viola orbiculata	-	P	rare

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Lesquerella paysonii	G3	P	rare
Poa pratensis	-	P	exotic
Rumex acetosella	-	P	exotic
Taraxacum officinale	-	P	exotic
Tragopogon dubius	-	P	exotic
Viola orbiculata	-	P	rare

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Populus tremuloides / Ligusticum filicinum* Forest (CEGL000591)

Global Related Concepts:
- *Ligusticum filicinum - Delphinium occidentale* Cover Type (Gregory 1983) =
- *Ligusticum filicinum-Delphinium occidentale* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.D.1.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: *Delphinium* x *occidentale* occurs in only 14 out of 39 stands.

Grand Teton National Park Other Comments:
Global Classification Comments: *Delphinium X occidentale* is present in fewer than half the sampled plot assigned to this association. Dominance by *Ligusticum filicinum* is the diagnostic characteristic of this association.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur in the appropriate habitat throughout GTNP and the Jedediah Smith Wilderness. Nine stands are located within or close to the Jedediah Smith Wilderness. The rest occur on the eastern slopes of the Teton Range from Moose Basin to Granite Canyon, except one stand which occurs in the drainage of Two Ocean Lake.

Global Range: This association has been documented from northwestern Wyoming, where it is a common and important wet meadow community on both the Bridger-Teton National Forest (Gregory 1983) and in Grand Teton National Park.
Nations: US
States/Provinces: ID, WY:S3
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton, Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Nine stands were sampled in or close to the Jedediah Smith Wilderness.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A033, GT-03A052, GT-03A054, GT-03B047, GT-03C018, GT-0201045, GT-0201046, GT-0201077, GT-0201078, GT-0201079, GT-0201081, GT-0202061
Accuracy Assessment Points: 04J200, 04K094, 04R061, 04R165, 04R169, 04R170, 04R172, 04R174, 04R178, 04R180, 04R183, 04X027, 04X030, 04X037, 04X326, 04X327, 04X329, 04X336, 04X345
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-028, CT-95-JD-029, CT-95-JD-030, CT-95-JD-031, CT-95-JD-045, CT-95-JD-047, CT-95-JD-062, CT-95-JD-069, CT-95-JD-070

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Gregory 1983	.	X	X	X	X	.	.	.	.
Horton 1971	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood and Mueggler 1981	.	.	.	X	.	.	.	.	.

A.1606 *Mertensia ciliata* Herbaceous Alliance

Mountain Bluebells Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This minor alliance occurs in valleys in the Wasatch Mountains of Utah and Idaho, western Wyoming and the Centennial Mountains of northeastern Idaho and possibly Montana. Elevation ranges from 2400-2720 m. Stands occur along small streams, benches near seeps, and on moist toeslopes in narrow valley bottoms. Sites are flats, or gentle to very steep toeslopes. The water table ranges up to depths of 20 cm. Soils are moderately deep to deep, well-drained loams with a thick mollic horizon. Soils are developed from colluvium and more recently alluvium. Stands have a dense and lush tall herbaceous layer about 1 m tall that is dominated by the perennial forb *Mertensia ciliata*. Associated species include *Rudbeckia occidentalis, Heracleum maximum, Geranium richardsonii, Senecio triangularis, Hymenoxys hoopesii (= Helenium hoopesii), Saxifraga odontoloma*, and the graminoids *Carex microptera* and *Poa palustris* (exotic).

Environment: This minor alliance occurs in scattered locations in valleys of northeastern Utah, southern Idaho, and western Wyoming. Elevation ranges from 2400-2720 m. Stands occur along small streams, benches near seeps, and on moist toeslopes in narrow valley bottoms. Sites are flats, or gentle to very steep toeslopes. The water table ranges up to depths of 20 cm. Soils are moderately deep to deep, well-drained loams with a thick mollic horizon. Soils are developed from colluvium and more recently alluvium (Gregory 1983, Youngblood et al. 1985a). Adjacent communities are subalpine forests dominated by *Picea engelmannii* or *Abies lasiocarpa*, and shrublands dominated by *Artemisia tridentata ssp. vaseyana* or *Artemisia cana* (Gregory 1983, Youngblood et al. 1985a).

Vegetation: Vegetation included in this minor alliance occurs in mesic areas along streams and on toeslopes in narrow mountain valleys in Idaho, Utah and Wyoming. Stands have a dense and lush tall herbaceous layer about 1 m tall that is dominated by the perennial forb *Mertensia ciliata*. Associated species include *Rudbeckia occidentalis, Heracleum maximum, Geranium richardsonii, Senecio triangularis, Hymenoxys hoopesii (= Helenium hoopesii), Saxifraga odontoloma*, and the graminoids *Carex microptera* and *Poa palustris* (exotic).

Dynamics: When disturbed by extensive sheep grazing this community is converted to a *Rudbeckia occidentalis*- or *Veratrum californicum*-dominated community (Padgett et al. 1989)

Similar Alliances:
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This vegetation occurs in alpine wetlands in the mountains of Idaho, Utah, Wyoming, and Colorado and possibly Montana.
Nations: US
Subnations: ID, UT, WY
TNC Ecoregions: 9:C
USFS Ecoregions: M331A:CC, M331B:C?, M331D:CC, M332E:CC
Federal Lands: NPS (Grand Teton)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Gregory 1983, Johnston 1987, Komarkova 1976, Norton et al. 1981, Padgett et al. 1989, Youngblood et al. 1985a

[CEGL001944] *Mertensia ciliata* Herbaceous Vegetation

Translated Name: **Mountain Bluebells Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Meadow (CES306.829)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This association is described from subalpine meadows in Wyoming and eastern Idaho and is expected to occur in northern Utah. Elevation ranges from 2400 to 2720 m (7900-10,400 feet). It occurs adjacent to small stream channels, near small seeps and springs, on toeslopes, moist sites on lower slopes, and flat benches in narrow to moderately wide valley bottoms. Above treeline this association is common on gentle to steep slopes on talus debris in the Bridger Wilderness, Wyoming. Soils are deep Mollisols with fine-loamy textures. Soils are well-drained but moist throughout the growing season. Stands are often narrow strings limited to the streambank and are dominated by *Mertensia ciliata*. Other forbs present are highly variable and include *Arnica latifolia, Rudbeckia occidentalis, Senecio triangularis, Valeriana occidentalis, Erigeron peregrinus, Mitella pentandra, Parnassia fimbriata, Rhodiola rhodantha (= Sedum rhodanthum), Heracleum maximum, Delphinium X occidentale, Geranium richardsonii, Hymenoxys hoopesii (= Helenium hoopesii), Saxifraga odontoloma, Senecio crassulus, Thalictrum occidentale*, and *Lupinus argenteus*. Graminoids present include *Bromus carinatus, Phleum alpinum, Carex microptera, Juncus balticus, Elymus caninus (= Agropyron caninum), Poa trivialis*, and *Deschampsia caespitosa*. A few *Salix* shrubs may be creep into this association from nearby or adjacent wetland shrublands.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: This association occurs in the mountains from canyon floors to backslopes. Stand elevations range from 8700 to 9750 feet and slopes vary from 10 to 63%. Soils include moderately well- to well-drained sandy loams, silt loams, and loams. One stand is located in a palustrine area that is temporarily flooded during the growing season. The unvegetated ground surface is generally composed of 5 to 40% large rocks (greater than 10cm), 5 to 40% gravel, 20 to 80% litter and duff, and up to 40% bare soil. Wood, mosses, and lichens may be present in small quantities. Small drainage rivulets (less than 1 foot wide) involved in spring run-off are present in three stands; one stand is situated next to a rivulet that runs at least into August (disregarding severe drought conditions). Adjacent vegetation may include *Salix* spp. communities, graminoid and forb meadows with varying compositions, and any combination of *Pinus albicaulis, Picea engelmannii,* and *Abies lasiocarpa*. One stand has some bare ground due to rodent burrowing.

Global Environment: This association is described from subalpine meadows in Wyoming and eastern Idaho and is expected to occur in northern Utah. Elevation ranges from 2400 to 2720 m (7900-10,400 feet). It occurs adjacent to small stream channels, near small seeps and springs, on toeslopes, moist sites on lower slopes, and flat benches in narrow to moderately wide valley bottoms. Above treeline this association is common on gentle to steep slopes on talus debris in the Bridger Wilderness, Wyoming. Soils are deep Mollisols with fine-loamy textures. Soils are well-drained but moist throughout the growing season.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a subalpine to alpine tall forb meadow community that occurs in mesic areas. The herbaceous layer is thick with 60 to 100% cover; it is so dense in one stand that it precludes almost all undergrowth. The herbaceous layer is dominated by *Mertensia ciliata*, composing 10 to 60% of the canopy cover. Other forb species with 10 to 40% canopy cover may include *Arnica longifolia, Lupinus argenteus, Senecio triangularis, Senecio serra, Senecio crassulus,* and *Thalictrum occidentale.* Graminoids are present but not diverse; *Carex microptera* (2 out of 5 stands, 1 and 10% cover) is the only species that contributes more than 3% cover.

Global Vegetation: Stands are often narrow strings limited to the streambank and are dominated by *Mertensia ciliata*. Other forbs present are highly variable and include *Arnica latifolia, Rudbeckia occidentalis, Senecio triangularis, Valeriana occidentalis, Erigeron peregrinus, Mitella pentandra, Parnassia fimbriata, Rhodiola rhodantha (= Sedum rhodanthum), Heracleum maximum, Delphinium X occidentale, Geranium richardsonii, Hymenoxys hoopesii (= Helenium hoopesii), Saxifraga odontoloma, Senecio crassulus, Thalictrum occidentale*, and *Lupinus argenteus*. Graminoids present include *Bromus carinatus, Phleum alpinum, Carex microptera, Juncus balticus, Elymus caninus (= Agropyron caninum), Poa trivialis*, and *Deschampsia caespitosa*. A few *Salix* shrubs may creep into this association from nearby or adjacent wetland shrublands.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Mertensia ciliata	Herb (field)	Forb	X	X	.
Senecio crassulus	Herb (field)	Forb	X	X	.
Senecio serra	Herb (field)	Forb	X	X	.
Senecio triangularis	Herb (field)	Forb	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Mertensia ciliata	Herb (field)	Forb	X	X	X

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:

- *Calamagrostis canadensis - Carex scopulorum - Mertensia ciliata* Herbaceous Vegetation (CEGL001560)
- *Cardamine cordifolia - Mertensia ciliata - Senecio triangularis* Herbaceous Vegetation (CEGL002662)
- *Deschampsia caespitosa - Mertensia ciliata* Herbaceous Vegetation (CEGL001887)

Global Related Concepts:

- *Mertensia ciliata / Deschampsia cespitosa* Plant Association (Johnston 1987) ?
- *Mertensia ciliata* (Bourgeron and Engelking 1994) =

- *Mertensia ciliata* Community Type (Youngblood et al. 1985a) =
- *Mertensia ciliata* Community Type (Gregory 1983) B
- *Mertensia ciliata* Community Type (Padgett et al. 1989) = DRISCOLL FORMATION CODE:V.D.1.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: Youngblood (1985) sets the upper elevational limit for this association at 8900 feet. Three stands sampled in GTNP are located higher than 8900 feet. All other aspects of the Youngblood description fit well.

Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This association occurs in the appropriate habitat throughout GTNP. The sampled stands are located in the North Fork of Cascade Canyon, the North Fork of Moran Creek, in the upper elevations of Open Canyon, and the west side of Forellen Peak.

Global Range:
Nations: US
States/Provinces: ID:S2S3, UT:S1S2, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO20 deleted, not at ROMO (KAS 8-05). ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 8-04). ECO20 added for ROMO (KAS 5-04).
USFS Ecoregions: M331A:CC, M331B:C?, M331D:CC, M332E:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A068, GT-03A085, GT-03C048, GT-03C054
Accuracy Assessment Points: 04X342
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Gregory 1983	.	.	X	.	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	.	X	.	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	X	X	.	.	.	.	.

No Alliance Assigned—NVC Tall temperate or subpolar perennial forb vegetation

[CEGL002536] *Geranium viscosissimum* Herbaceous Vegetation [Provisional]

Translated Name: **Sticky Geranium Herbaceous Vegetation**
Common Name:
Ecological System(s):
Status: Provisional **Circumscription Confidence:** 3 - Weak
Concept Author(s): G. Kittel

ELEMENT CONCEPT

Global Summary: This open meadow association is known only from Grand Teton N ational Park and surrounding U.S. Forest Service land. It is a montane to subalpine forb community that occurs in subxeric to mesic areas. The elevational range of stands is 2365 to 2760 m (7750-9050 feet). The well-drained soils include loams, sandy loams, and clay loams. It is dominated by forbs, although graminoids do occur. The most abundant and consistently present species in 7 plots are *Geranium viscosissimum*, *Delphinium X occidentale*, and *Elymus trachycaulus*. It may be similar to other forb-dominated associations noted in the literature elsewhere in Wyoming and eastern Idaho.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on shallow and moderate slopes with various aspects. The elevational range of the stands is 6900 to 9200 feet. Where data are available the well-drained soils include loams, sandy loams, and clay loams. Unvegetated ground cover data from five stands indicate that litter and duff is the primary component with 50 to 90% cover. The remainder of the cover is co-dominated by large rocks (1 to 10% cover), gravel (1 to 30% cover), wood (0 to 5% cover), and bare soil (5 to 20% cover). Six other stands indicate that bare soil, boulders, cobbles, and gravel may be the dominant unvegetated ground cover. Two stands are situated at the base of avalanche chutes near *Salix* spp. dominated riparian corridors. Adjacent vegetation may include *Abies lasiocarpa – Picea engelmannii* forests and/or patches, *A. lasiocarpa* Krummholz communities, *Pseudotsuga menziesii* patches, *Pinus albicaulis* communities, *Pinus contorta* forests, and/or *Salix* spp. riparian areas.

Global Environment:

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane to subalpine forb community that occurs in subxeric to mesic areas. Forbs are diverse and dominate the herbaceous layer, which covers 12 to 80% of the ground, though typically covers more than 40% of the ground. *Geranium viscosissimum* (3 to 20% cover) is present in every stand. Other high-constancy species include *Delphinium X occidentale*, *Eriogonum umbellatum*, and *Lupinus argenteus*. Other forbs that may be locally abundant with up to 20% cover include *Senecio serra*, *Agastache urticifolia*, *Solidago canadensis*, and *Eurybia integrifolia*. Graminoids are not diverse and generally comprise 10% cover or less within the herbaceous layer. High-constancy species include *Melica spectabilis*, *Bromus carinatus*, *Carex hoodii*, and *Elymus trachycaulus*. Seedlings of all conifer types mentioned as adjacent vegetation may occur with up to 3% cover in individual stands.

Global Vegetation:

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Delphinium x *occidentale*	Herb (field)	Forb	.	X	.
Eriogonum umbellatum	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Bromus carinatus	Herb (field)	Graminoid	.	X	.
Carex hoodii	Herb (field)	Graminoid	.	X	.
Elymus trachycaulus	Herb (field)	Graminoid	.	X	.
Melica spectabilis	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Delphinium x *occidentale*	Herb (field)	Forb	X	X	X
Geranium viscosissimum	Herb (field)	Forb	X	X	X
Elymus trachycaulus	Herb (field)	Graminoid	.	X	X

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Bromus inermis	-	P	exotic
Bromus tectorum	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (30-Mar-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: This is a previously undescribed association.
Grand Teton National Park Other Comments:
Global Classification Comments: This type is well-documented with 7 quantitative plots. It may prove similar to mesic forb-dominated types describe by Youngblood et al. (1985a) and Gregory (1983), although the species composition is different from that reported for Grand Teton National Park.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands for this association occur in the John D. Rockefeller Jr., Memorial Parkway east of the highway and south of the Grassy Lake Road, east of Lizard Creek, south of Two Ocean and Emma Matilda lakes, in the area between the tram and Marion Lake, in Granite Canyon, Moose Basin, south of Survey Peak in Upper Berry Canyon, west of Mount Forellen, and southwest of Fossil Mountain in the Jedediah Smith Wilderness Area.
Global Range: This association is only known from western Wyoming.
Nations: US
States/Provinces: WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments:
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton, Rockefeller)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A045, GT-03C026, GT-0202120, GT-03A046, GT-03A048, GT-03C022
Accuracy Assessment Points: 04J011, 04K085, 04R067, 04R239, 04X024, 04X032, 04X036, 04X038, 04X039, 04X328, 04X332, 04X333, 04X349, 04X437
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-076

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga, M. Fain and K. McCloskey
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Gregory 1983	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.
Youngblood et al. 1985a	.	X	.	.	.	.	.	.	.

No Alliance Assigned—Park Special Tall temperate or subpolar perennial forb Vegetation

[PARK SPECIAL GRTE-005] *Arnica longifolia* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur mostly on south-facing talus slopes. Data was collected on sites with gradients of 6 to 66%. The elevations for these stands range from 8400 to 9700 feet. Soil data is available for only one stand; the soil is well-drained loamy sand. The unvegetated and nonvascular ground surface of one plot is composed of rocks greater than 10 cm (40% cover), gravel (40% cover), litter and duff (20% cover), and trace quantities of bare soil and mosses. The adjacent vegetation includes *Pinus albicaulis* with a *Vaccinium scoparium* understory, *Abies lasiocarpa* krummholtz, and scree dominated by *Juncus* sp.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane forbland community that occurs on mesic sites. Conifers and shrubs exist in only one stand with (1 to 3% cover). The herbaceous layer is diverse, but few species occur in more than a few plots. The most constant graminoids include *Juncus parryi* (trace to 10% cover) and *Elymus trachycaulus* (trace to 1% cover). The dominant forb is *Arnica longifolia* (7 to 50% cover). *Mertensia ciliata* is the next most constant forb (trace to 12% cover), occurring in four plots.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Arnica longifolia*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Juncus parryi, Arnica longifolia, Mertensia ciliata

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands are located in Avalanche Canyon, Open Canyon, the north fork of Cascade Canyon, south of Mt. Hunt Divide, the Death Canyon Shelf area, and the Marion Lake area.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C049
Accuracy Assessment Points: 04J182, 04R140, 04R164, 04R166, 04X304, 04X313, 04X320, 04K093, 04K102, 04K104
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-005
Local Author: C. Brian Villalobos
Date: 02 April 2004
Local Editor: Klara Varga
Date: 7 April 2004
Re-write: Mark Fain
Date: 21 October 2004
Re-edit: Klara Varga
Date: 25 October 2004

Global Author:

REFERENCES: Gregory 1983

[PARK SPECIAL GRTE-003] *Helianthella uniflora* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands defining this association occur on moderate to steep slopes with varying aspects. The elevational range of the stands is 7200 to 8750 feet. Soil data are available from two out of the four stands. The Katpa soils in one stand are derived from colluvium from loess and limestone and soils from another stand are well-drained clay loams. The unvegetated ground cover is dominated by litter and duff (40 to 60% cover). Other prominent components include bare soil (10 to 30% cover), rocks greater than 10cm (0 to 20% cover), gravel (1 to 10% cover), wood (0 to 10% cover), and basal vegetation (0 to 40% cover). Adjacent vegetation may include *Abies lasiocarpa – Picea engelmannii* forests and/or patches.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane to subalpine forb community. Shrubs may be present or absent within the stands; if present, shrubs generally compose less than 1% canopy cover each. The only high constancy species is *Symphoricarpos oreophilus*, present in three stands with 1 to 3% cover. Herbaceous cover ranges from 20 to 50% and is dominated by *Helianthella uniflora*, which composes 3 to 20% cover. High constancy forbs (present in 3 out of 4 stands) include *Geranium viscosissimum* (1 to 3% cover) and *Eriogonum umbellatum* (1% cover). Forbs that may compose up to 10% cover but are not present in more than two stands include *Balsamorhiza sagittata, Eucephalus elegans,* and *Ligusticum filicinum*. Graminoids are present in varying quantities but are never dominant; well represented graminoids with 10% cover but only present in one stand each include *Festuca idahoensis* and *Carex praegracilis*.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***

FORB	*Helianthella uniflora*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Eriogonum umbellatum, Geranium viscosissimum, Helianthella uniflora

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This plant association has not been previously described.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One stand defining this association occurs in the upper elevations of Granite Canyon and one occurs in the Jedediah Smith Wilderness Area near Darby Creek. In the Bridger-Teton National Forest two stands are located southwest of Shadow Mountain.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C027
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: BT-9407078, BT-9507006, CT-95-JD-049

GRAND TETON NATIONAL PARK Inventory Notes: Only one of the sampled stands defining this association occurs in GTNP.

Classification Confidence: **Identifier:** New-GRTE-003
Local Author: Rob Massatti
Date: 23 April 2004
Local Editor: Klara Varga
Date: 3 May 2004

Global Author:

REFERENCES: Gregory 1983

[PARK SPECIAL GRTE-039] *Apocynum androsaemifolium* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stand of this association occurs on a southeast-facing slope with a gradient of 65%. The elevation of this stand is 8532 feet. The soil is well-drained loam. The unvegetated and non-vascular ground surface is comprised of gravel (60% cover), litter and duff (20% cover), bare soil (10% cover), rocks greater than 10 cm (1% cover), and wood (1% cover). Adjacent vegetation includes *Abies lasiocarpa* individuals and a coniferous forest.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane forbland community that occurs on subxeric sites. *Abies lasiocarpa* is present in trace quantities as emergent vegetation. *Populus tremuloides* seedlings are present in the short shrub stratum at 3% cover. Present as dwarf shrubs in trace quantities are *Amelanchier alnifolia*, *Sorbus scopulina*, and *Symphoricarpos oreophilus*. The herbaceous layer has a diverse and abundant forb stratum that constitutes 80% ground cover. Only one graminoid is present, and it occurs in trace quantities. The most abundant forbs include *Apocynum androsaemifolium* (40% cover), *Erigeron speciosus* (10% cover), *Eriogonum umbellatum* (10% cover), *Geranium viscosissimum* (3% cover), *Helianthella uniflora* (3% cover), *Phacelia hastata* (3% cover), *Potentilla* sp. (3% cover), and *Solidago missouriensis* (3% cover).

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Apocynum androsaemifolium*, *Erigeron speciosus*, *Eriogonum umbellatum*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Apocynum androsaemifolium, *Erigeron speciosus*, *Eriogonum umbellatum*, *Geranium viscosissimum*, *Helianthella uniflora*, *Phacelia hastata*, *Potentilla* sp., *Solidago missouriensis*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments: This association was observed frequently, however it rarely occurs in stands large enough to put a plot in.

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: This stand occurs in Moose Basin.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A042
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one sampled stand composes this association.

Classification Confidence: **Identifier:** New-GRTE-039
Local Author: C. Brian Villalobos
Date: 01 April 2004
Local Editor: Klara Varga
Date: 7 April 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-017] *Erigeron peregrinus* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on southwest-facing slopes with gradients of 7 and 18% and elevations of 6900 and 9020 feet. The soil taxonomic class for the higher elevation stand is fine-loamy, mixed, active Abruptic Paleboralfs. The well-drained Yodal soils are derived from local alluvium or colluvium from mixed sources. No additional environmental data is available for the lower elevation stand.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane forb community that occurs on mesic sites. Dominant forbs include *Erigeron peregrinus* (7 and 10% cover) and *Geranium viscosissimum* (1 and 3% cover). A variety of other forbs and a few graminoids are present with 3% or more cover in just one stand.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Erigeron peregrinus*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Erigeron peregrinus, Geranium viscosissimum

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Phleum pratense, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs west of Fox Creek Pass and the other occurs on the west shore of Jackson Lake.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: None
Accuracy Assessment Points: 04J132
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-072

GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association.

Classification Confidence: **Identifier:** New-GRTE-017
Local Author: C. Brian Villalobos
Date: 07 April 2004
Local Editor: Klara Varga
Date: 10 April 2004
Re-write: Mark Fain
Date: 1 November 2004
Re-edit: kelly McCloskey

Date: 21 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-079] *Eucephalus engelmannii* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on a variety of east- or south-facing slopes with gradients between 22 and 52% at elevations of 8700 to 9400 feet. One stand has a west facing aspect. Data for three stands show well-drained sandy loam or loam soils with unvegetated ground cover consisting primarily of litter and duff (60 to 90%) and bare soil (5 to 20%) with various amounts of cobbles, rocks, and wood. Unvegetated ground cover for four stands includes bare soil, small rocks, boulders, and/or snow. Adjacent vegetation may include *Picea engelmannii* forests, *Mertensia ciliata* forblands, unspecified forblands, or various *Salix* spp. occurring in nearby drainages.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is a montane to subalpine forbland that occurs on mesic sites. Various pole-sized conifers and/or shrubs may occur depending on the site, but none occur in large enough amounts to define a stratum. Total herbaceous cover for the sampled stands ranges from 30 to 90%. Overall, forbs are more diverse and dominant than graminoids. *Eucephalus engelmannii* dominates all stands with 7 to 50% cover. High constancy species include *Carex hoodii, Geranium viscosissimum, Delphinium* x *occidentale, Lupinus argenteus, Chamerion angustifolium, Ligusticum filicinum,* and *Frasera speciosa.*

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Eucephalus engelmannii*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Carex hoodii, Chamerion angustifolium, Delphinium x *occidentale, Eucephalus engelmannii, Frasera speciosa, Geranium viscosissimum, Ligusticum filicinum, Lupinus argenteus*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Poa pratensis, Taraxacum officinale*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments:

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands for this association occur near Marion Lake, in the north fork of Cascade Canyon, in the north fork of Death Canyon, east of Moose Creek, in the Death Canyon drainage, and one occurs in the Jedediah Smith Wilderness.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A048, GT-03C022, GT-03C026
Accuracy Assessment Points: 04J175, 04K115, 04R171, 04R182, 04X033, 04X035
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-076
GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-079
Local Author: Mark Fain
Date: 05 November 2004
Local Editor: Klara Varga
Date: 13 December 2004

Global Author:

REFERENCES: Gregory 1983

[PARK SPECIAL GRTE-004] *Symphyotrichum ascendens* Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on an interfluve, a step-in-slope, and a shoulder at elevations of 7700 to 9583 feet. The two western-facing slopes have gradients of 4 and 20%, and the east-facing slope has a gradient of 15%. The soil for the stand occurring on the interfluve is well-drained loam with limestone shards scattered over the soil surface. Bare soil is noted for two of the sampled stands.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an upper montane to subalpine forbland community that occurs on mesic sites. Forbs dominate over graminoids in the herbaceous layer. Graminoids that occur in two of three stands include *Elymus trachycaulus* and *Bromus carinatus*. No graminoid occurs with more than 3% cover. Dominant forbs include *Symphyotrichum ascendens* (10 to 20% cover) and *Lupinus argenteus* (1 to 20% cover). *Geranium viscosissimum* (12 and 20% cover) and *Eriogonum umbellatum* (3% cover) occur in two of three stands. Numerous other forbs occur in one stand only with at least 3% cover.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Symphyotrichum ascendens, Lupinus argenteus*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Bromus carinatus, Elymus trachycaulus, Eriogonum umbellatum, Geranium viscosissimum, Lupinus argenteus, Symphyotrichum ascendens

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: *Taraxacum laevigatum*

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: One sampled stand occurs southwest of Fox Creek Pass and two occur west of Forellen Peak.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202062
Accuracy Assessment Points: 04X334, 04X348
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-004
Local Author: C. Brian Villalobos
Date: 06 April 2004
Local Editor: Klara Varga
Date: 10 April 2004
Re-write: Mark Fain
Date: 1 November 2004
Re-edit: Klara Varga
Date: 14 December 2004

Global Author:

REFERENCES: None

V.B.2.N.b. Low temperate or subpolar perennial forb vegetation

A.1627 *Ivesia gordonii* Herbaceous Alliance

Alpine Mousetail Herbaceous Alliance

ALLIANCE CONCEPT

Summary: These herbaceous communities are found scattered in alpine fell-field environments in the mountains of central Idaho and northwestern Wyoming. They are typically found on small, gently sloped ridgecrest sites between approximately 3170 and 3355 m elevation. Some sites resemble stabilized talus more than fell-fields. Substrates are rocky and poorly developed with little soil development. Stands have a sparse herbaceous layer of low-growing, prostrate, mat-forming forb species and a few graminoids that grow between the exposed rocks. *Ivesia gordonii* is dominant or codominant with *Eriogonum caespitosum* or *Minuartia obtusiloba*. Associated species may include *Agoseris glauca, Minuartia obtusiloba (= Arenaria obtusiloba), Eriogonum ovalifolium, Oxytropis parryi, Poa cusickii ssp. epilis (= Poa epilis), Potentilla diversifolia, Phlox pulvinata, Smelowskia calycina*, and *Trisetum spicatum*. The moss *Selaginella densa* is often present.
Environment: These herbaceous stands are found scattered in alpine fell-field environments, as well as on rocky slopes and benches in the high subalpine in the mountains of central Idaho and northwestern Wyoming. The typically small, gently to steeply sloped sites occur at approximately 3170 to 3355 m elevation. Some sites resemble stabilized talus more than fell-fields. Substrates are rocky and poorly developed with little soil development.
Vegetation: This minor alliance is described from a few small dispersed alpine fell-field sites located in the mountains of central Idaho. Stands have a sparse herbaceous layer of low-growing, prostrate, mat-forming forb species and a few graminoids that grow between the exposed rocks. *Ivesia gordonii* is dominant or codominant with *Eriogonum caespitosum* or *Minuartia obtusiloba*. Associated species may include *Agoseris glauca, Minuartia obtusiloba (= Arenaria obtusiloba), Eriogonum caespitosum, Oxytropis parryi, Poa cusickii ssp. epilis (= Poa epilis), Potentilla diversifolia, Phlox pulvinata, Smelowskia calycina*, and *Trisetum spicatum*. The moss *Selaginella densa* is often present.
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been reported from a few dispersed stands across the high-elevation mountainous terrain of central Idaho and northwestern Wyoming. This alliance likely occurs elsewhere in the Rocky Mountains, Uinta Mountains and possibly the Sierra Nevada.
Nations: US
Subnations: CA?, ID, WY
TNC Ecoregions: 8:C, 9:C
USFS Ecoregions: M331D:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee)

ALLIANCE SOURCES

Author(s): K.A. Schulz, mod. J. Coles
References: Caicco 1983, Ellison 1954, Johnston 1987, Komarkova 1986, Langenheim 1962, Major and Taylor 1977

[CEGL001903] *Ivesia gordonii - Eriogonum caespitosum* Herbaceous Vegetation

Translated Name: **Alpine Mousetail - Matted Wild Buckwheat Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Subalpine Mesic Meadow (CES306.829)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): S.K. Rust

ELEMENT CONCEPT

Global Summary: This association is described from one site located in the Pioneer Mountains of central Idaho and the Grand Teton Mountains of northwestern Wyoming. The association occurs in stabilized talus slopes and rocky benches in the high subalpine zone. The gently to steeply sloped sites occur at approximately 2745 to 3355 m (9000-11,000 feet) elevation. The association consists of a patchy, very low-growing, prostrate mat of herbaceous species and few graminoids. *Ivesia gordonii* is codominant with *Eriogonum caespitosum*. Associated species include *Achillea millefolium, Agoseris glauca, Eriogonum caespitosum, Festuca ovina, Frasera speciosa, Poa cusickii ssp. epilis (= Poa epilis), Trisetum spicatum,* and *Potentilla diversifolia*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
GRAND TETON NATIONAL PARK Environment: The sampled stands for this association occur on terraces, shelves, and slopes in the mountains from 9000 to 10646 feet. The slopes vary from 10 to 64%; the majority of the stands face northwest, but they can face east or south as well. Four stands occur on limestone shelves; their fragmented cryochrept soils are derived from residuum from loess and limestone. Two other stands have silty clay loam soils, one of which is mixed with about 80% gravel. Unvegetated ground cover data is available for one stand; rocks greater than 10cm dominate with 60% cover. Gravel, bare soil, and wood co-dominate the remaining surface with 20, 10, and 5% cover, respectively. Adjacent vegetation to one stand includes *Pinus albicaulis* and alpine forb meadows.

Global Environment: This association is described from the Pioneer Mountains of central Idaho (Challis Volcanics ecoregional section) and from limestone shelves, terraces and slopes in the Grand Teton Mountains of northwestern Wyoming. The association occurs in well-drained, low alpine and high subalpine environments, including fell-fields, talus slopes and rocky benches. Stands occur on gentle to steep slopes at approximately 2745 to 3355 m (9000-11,000 feet) elevation. Rock and gravel account for the majority of the unvegetated ground surface.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an alpine forb community. The canopy cover of the herbaceous layer is 30% or less, except one stand with 50% cover and is composed of a wide variety of forbs. *Ivesia gordonii* is the only forb present in all stands and occupies 1 to 30% of the canopy cover. Other common forbs include *Frasera speciosa, Ligusticum filicinum,* and *Achillea millefolium*. Graminoids are neither diverse nor present in high quantities. The highest constancy graminoid is *Festuca ovina*, present in four of ten stands with 1 to 3% canopy cover. One stand is being colonized by *Abies lasiocarpa* and *Pinus albicaulis*, both present as saplings and poles.

Global Vegetation: This association consists of a very low-growing, prostrate mat of forbs and few graminoids. *Ivesia gordonii* is codominant with *Eriogonum caespitosum*. *Eriogonum caespitosum* is sometimes absent from stands in Wyoming. Total vegetation cover may be somewhat sparse (30% or less) because of the high cover of rock. Associated species vary among sites but include *Achillea millefolium, Agoseris glauca, Eriogonum caespitosum, Festuca ovina, Frasera speciosa, Poa cusickii ssp. epilis (= Poa epilis), Trisetum spicatum,* and *Potentilla diversifolia*.
Global Dynamics: This association tends to occur on gravelly and rocky sites that are somewhat dry. In low-alpine situations, *Ivesia gordonii* has been characterized as an aggressive, early-seral species of gravelly disturbed sites (Ellison 1954). In one of the Grand Teton stands, *Pinus albicaulis* and *Abies lasiocarpa* are invading the community.

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	.	X	.
Frasera speciosa	Herb (field)	Forb	.	X	.
Ivesia gordonii	Herb (field)	Forb	X	X	.
Festuca ovina	Herb (field)	Graminoid	.	X	.
Grand Teton National Park Higher Taxa					
Poa spp.	characteristic graminoids				

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Eriogonum caespitosum	Herb (field)	Forb	X	X	.
Ivesia gordonii	Herb (field)	Forb	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2? (11-Aug-2005). This is a regional endemic plant association occurring in relatively few, dispersed stands. It is found on gentle ridgecrest slopes in the alpine and high subalpine vegetation zones, in the high-elevation mountainous terrain of central Idaho and northwestern Wyoming. The easily accessed, fragile sites may be threatened by the impacts of trampling. Additional information on the number and condition of occurrences and variability in stand composition among occurrences is needed to assist in assessing the association's conservation status.

RELATED CONCEPTS

Global Similar Associations:
- *Ivesia gordonii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001902)

Global Related Concepts:
- *Ivesia gordonii-Eriogonum caespitosum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments: *Eriogonum caespitosum* was not found in any stand.
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stands for this association occur in the appropriate habitat throughout Grand Teton National Park. They are located on the Death Canyon Shelf, near Fox Creek Pass, near Mt. Hunt Divide, near Avalanche Divide, on Mt. Bannon, and in the Jedediah Smith Wilderness Area near Beard Mountain and Treasure Mountain.
Global Range: The association occurs on the high-elevation mountainous terrain of central Idaho, within the Idaho Batholith and Challis Volcanics ecoregional sections. It also occurs in the upper subalpine of the Grand Teton Mountains of northwestern Wyoming.
Nations: US
States/Provinces: ID:S2?, WY
TNC Ecoregions: 8:C, 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04). ECO8 added (MSR 6-01).
USFS Ecoregions: M331D:CC, M332A:CC, M332E:CC, M332F:CC
Federal Lands: NPS (Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A031, GT-03B045
Accuracy Assessment Points: 04R159, 04R168, 04X311
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-032, CT-95-JD-033, CT-95-JD-046, CT-95-JD-071, CT-95-JD-073

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga, M. Fain, K. McCloskey
Global Description Author(s): S.K. Rust, mod. J. Coles

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Caicco 1983	.	X	.	X	X	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Ellison 1954	.	.	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

No Alliance Assigned—Park Special Low temperate or subpolar perennial forb vegetation

[PARK SPECIAL GRTE-030] *Phlox multiflora* Alpine Cushion Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on shallow north- or southeast-facing slopes at elevations of 8600 to 10276 feet. Where data are available the soil textures of the stands include well-drained loams that are very stony, and silty clay loams. Another stand has limestone based soils full of cobbles. Unvegetated data for this stand includes 60 to 70% bare soil and rocks.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is an alpine herbaceous community that occurs on mesic sites. The herbaceous layer is diverse and dominated by forbs. *Poa* spp. is the only graminoid genera to occur in all stands. *Trisetum spicatum* occurs in two stands. *Phlox multiflora* is the dominant forb with 7 to 10% cover which occurs in all stands with *Arenaria congesta* (1 to 3% cover). Forbs that occur in two of three stands include *Potentilla diversifolia, Ivesia gordonii, Agroseris glauca, Hedysarum occidentale, Oreostemma alpigenum,* and *Gentiana calycosa.*

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Phlox multiflora*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK

Poa spp., *Trisetum spicatum, Agroseris glauca, Arenaria congesta, Gentiana calycosa, Hedysarum occidentale, Ivesia gordonii, Oreostemma alpigenum, Phlox multiflora, Potentilla diversifolia*

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK

Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:

•

SYNONYMY:

•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: Two of the sampled stands occur east of Fox Creek Pass and one occurs west of Mt. Forellen.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201041, GT-0201103
Accuracy Assessment Points: 04X335
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes:

Classification Confidence: **Identifier:** New-GRTE-030
Local Author: C. Brian Villalobos
Date: 21 April 2004
Local Editor: Klara Varga
Date: 29 April 2004
Re-write: Mark Fain
Date: 10 November 2004
Re-edit: kelly McCloskey
Date: 22 December 2004

Global Author:

REFERENCES: None

[PARK SPECIAL GRTE-029] *Pteryxia hendersonii* Alpine Herbaceous Vegetation

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:

GRAND TETON NATIONAL PARK Environment: The single sampled stand of this association occurs on a very steep south-facing slope at an elevation of 10475 feet. The soil is a well-drained sandy loam. The unvegetated and non-vascular ground surface is composed of rocks greater than 10 cm (50% cover), litter and duff (20% cover), gravel (10% cover), lichen (10% cover), bare soil (5% cover), and mosses (1% cover). Adjacent to this stand is a continuation of this vegetation and several *Pinus albicaulis* clumps.

Global Environment:

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This association is an alpine herbaceous community that occurs on mesic sites. *Pteryxia hendersonii* (20% cover) is the only well represented species. Common forbs with 3% cover each include *Astragalus kentrophyta* and *Solidago multiradiata*. A variety of other forbs and graminoids occur in trace quantities.

Global Vegetation:

Global Dynamics:

MOST ABUNDANT SPECIES

GRAND TETON NATIONAL PARK

Stratum	***Species***
FORB	*Pteryxia hendersonii*

GLOBAL

Stratum	***Species***

CHARACTERISTIC SPECIES

GRAND TETON NATIONAL PARK
Astragalus kentrophyta, Pteryxia hendersonii, Solidago multiradiata

GLOBAL

OTHER NOTEWORTHY SPECIES

GRAND TETON NATIONAL PARK
Non-Native Species: N/A

GLOBAL

GLOBAL SIMILAR ASSOCIATIONS:
•

SYNONYMY:
•

Global Conservation Status Rank:

CLASSIFICATION COMMENTS

GRAND TETON NATIONAL PARK Classification Comments: This is a previously undescribed association.

GRAND TETON NATIONAL PARK Other Comments:

Global Classif Comments:

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stand occurs south of Prospector's Peak, below the ridgeline.

Global Range:

Nations:
States/Provinces:
TNC Ecoregions:
USFS Ecoregions:
Federal Lands: GRTE

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Map Units:
GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03C050
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

GRAND TETON NATIONAL PARK Inventory Notes: Only one stand defines this association.

Classification Confidence: **Identifier:** New-GRTE-029
Local Author: C. Brian Villalobos
Date: 20 April 2004
Local Editor: Klara Varga
Date: 29 April 2004

Global Author:

REFERENCES: None

V.B.2.N.d. Temporarily flooded temperate perennial forb vegetation

A.1661 *Heracleum maximum* Temporarily Flooded Herbaceous Alliance

Cow-parsnip Temporarily Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance occurs in subalpine meadows in the mountains of western Wyoming. Elevations range from 1970-2720 m, and sites are moist, often concave, lower slopes and benches that temporarily flood or are saturated from snowmelt and remain moist most of the growing season. Slopes are generally moderately steep, up to 40%. Substrate is clay loam or clay soils with relatively high organic matter and therefore good water-holding capacity. Parent material may include sandstone, limestone, shale and quartzite. Stands have a dense (nearly 100% cover) herbaceous layer that is dominated by perennial forbs, typically *Heracleum maximum*, but codominants include *Rudbeckia occidentalis* and *Thalictrum fendleri*. Other frequent forb associates include *Delphinium X occidentale, Geranium viscosissimum, Agastache urticifolia, Symphyotrichum foliaceum (= Aster foliaceus)*, and *Lupinus argenteus*. Graminoids are sparse. The most common are *Elymus trachycaulus, Bromus carinatus, Melica spectabilis*, and *Elymus glaucus*.
Environment: Stands in this alliance occur in subalpine meadows in the mountains of western Wyoming. Elevations ranged from 1970-2720 m. Stands are moist, often concave, lower slopes and benches that temporarily flood or are saturated from snowmelt and remain moist most of the growing season. Sites described by Gregory (1983) generally have moderately steep (17%) slopes, but may be up to 40%. Substrate is clay loam or clay soils relatively high organic matter (7% average) and therefore good water-holding capacity. pH averaged 6.1. Rock cover averaged 17%. Bare ground cover was usually only 1%. Parent material may include sandstone, limestone shale and quartzite.

Adjacent stands are typically *Abies lasiocarpa* subalpine forests, *Artemisia* spp. shrublands, or various riparian types.
Vegetation: Vegetation in this alliance occur in subalpine meadows in the mountains of western Wyoming. Stands have a dense (nearly 100% cover) herbaceous layer that is dominated by perennial forbs, typically *Heracleum maximum*, but codominants include *Rudbeckia occidentalis* and *Thalictrum fendleri*. Other frequent forb associates include *Delphinium X occidentale, Geranium viscosissimum, Agastache urticifolia, Symphyotrichum foliaceum (= Aster foliaceus)*, and *Lupinus argenteus*. Graminoids are sparse. The most common are *Elymus trachycaulus, Bromus carinatus, Melica spectabilis*, and *Elymus glaucus*. These stands have high species richness with an average of 28 species per plot.
Dynamics: *Heracleum maximum* is highly palatable to livestock and declines when heavily grazed, whereas *Rudbeckia occidentalis* and *Thalictrum fendleri* have relatively low palatability and will increase in abundance (Gregory 1983).
Similar Alliances:
- *Saussurea americana* Temporarily Flooded Herbaceous Alliance (A.1662)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from subalpine areas in western Wyoming, Montana and Alberta, Canada.
Nations: CA, MX, US
Subnations: AB, MT, WY
TNC Ecoregions: 7:C, 9:C
USFS Ecoregions: M331D:CC, M331J:CC, M332C:CC, M333C:PP
Federal Lands: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Bridger-Teton)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Gregory 1983

[CEGL001940] *Heracleum maximum - Rudbeckia occidentalis* Herbaceous Vegetation

Translated Name: **Cow-parsnip - Western Coneflower Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Gregory (1983)

ELEMENT CONCEPT

Global Summary: This association is a rich meadow type known only from northwestern Wyoming, but it is well-documented with 24 plots. It occurs primarily in the subalpine zone, at elevations of 1700 to 2700 m (6450-8900 feet), on moderate to steep slopes (average 17%), up to 40%. It occurs on benches and lower slopes of moist pockets facing any aspect; the local topography is even to

concave, and stands are generally moist throughout the summer. Soils are rich with clay and organic matter; textures include silty clay loam to sandy clay. It is dominated by tall forbs, characterized by the presence of one or more of the species *Heracleum maximum*, *Rudbeckia occidentalis*, or *Thalictrum fendleri*. Usually two of the three species will be abundant, although stands do occur with only one of the three species present. Other forbs commonly present include *Achillea millefolium*, *Delphinium X occidentale*, and *Geranium viscosissimum*. Graminoids are typically present but in lower abundance than all forbs combined. Graminoid species include *Poa pratensis*, *Bromus vulgaris*, *Bromus carinatus*, *Elymus caninus (= Agropyron caninum)*, *Carex hoodii*, *Elymus trachycaulus*, and *Festuca idahoensis*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine

GRAND TETON NATIONAL PARK Environment: The sampled stands of this association occur on the valley floor and on south-facing slopes of 5 and 20% at elevations between 6800 to 7000 feet. Soil data for one stand indicate a silty clay loam. A patch of *Populus tremuloides* is located at one end of one stand and *Abies lasiocarpa* regeneration/encroachment occurs in another stand.

Global Environment: This rich meadow association occurs at elevations of 1700 to 2700 m (6450-8900 feet), on moderate to steep slopes (average 17%), up to 40%. It occurs on benches and lower slopes of moist pockets facing any aspect; the local topography is even to concave, and stands are generally moist throughout the summer. Soils are rich with clay and organic matter; textures include silty clay loam to sandy clay.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is a montane forbland community that occurs on mesic sites. A variety of trees and/or shrubs may occur in small amounts in each stand. The herbaceous layer is diverse with forbs dominating over graminoids. Constant graminoids, occurring on two-thirds of the stands include *Poa pratensis*, *Carex geyeri*, and *Phleum pratense*. Dominant forbs, occurring in each sampled stand include *Heracleum maximum*, *Geranium viscosissimum*, *Rudbeckia occidentalis*, and *Delphinium* x *occidentale*.

Global Vegetation: This association is described from 24 plots. It is dominated by tall forbs, characterized by the presence of one or more of the species *Heracleum maximum*, *Rudbeckia occidentalis*, or *Thalictrum fendleri*. Usually two of the three species will be abundant, although stands do occur with only one of the three species present. Other forbs commonly present include *Achillea millefolium*, *Delphinium X occidentale*, and *Geranium viscosissimum*. Graminoids are typically present but in lower abundance than all forbs combined. Graminoid species include *Poa pratensis*, *Bromus vulgaris*, *Bromus carinatus*, *Elymus caninus (= Agropyron caninum)*, *Carex hoodii*, *Elymus trachycaulus*, and *Festuca idahoensis*.

Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Achillea millefolium	Herb (field)	Forb	X	X	.
Delphinium x *occidentale*	Herb (field)	Forb	.	X	.
Galium triflorum	Herb (field)	Forb	.	X	.
Geranium viscosissimum	Herb (field)	Forb	X	X	.
Heracleum maximum	Herb (field)	Forb	X	X	.
Ligusticum filicinum	Herb (field)	Forb	.	X	.
Lupinus argenteus	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.
Senecio serra	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Phleum pratense	Herb (field)	Graminoid	.	X	.
Poa pratensis	Herb (field)	Graminoid	X	X	.

Higher Taxon	Note
Polygonum sp.	

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Heracleum maximum	Herb (field)	Forb	X	X	.
Potentilla pulcherrima	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Thalictrum occidentale	Herb (field)	Forb	.	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium arvense	-	P	exotic
Phleum pratense	-	P	exotic
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Heracleum maximum* Herbaceous Vegetation (CEGL005857)

Global Related Concepts:
- *Heracleum lanatum-Rudbeckia occidentalis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.D.1.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association is a rich meadow type known only from northwestern Wyoming, but it is well-documented with 24 plots.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur northwest of Colter Bay Village, near Lupine Meadows trailhead, and east of Lizard Creek.

Global Range: This association is known only from northwestern Wyoming in Grand Teton National Park and the adjacent Bridger-Teton National Forest.
Nations: US
States/Provinces: MT?, WY:S2S3
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331D:CC, M331J:CC
Federal Lands: NPS (Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0202004
Accuracy Assessment Points: 04K084, 04X901
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, K. McCloskey, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Gregory 1983*	.	X	.	X	.	.	.	.	.
MTNHP 2002b	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.	X°	.	.	.	.	.	.	.	.

V.B.2.N.e. Semipermanently flooded temperate perennial forb vegetation

A.1680 *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance

Arrowleaf Ragwort Semipermanently Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This lush herbaceous alliance has been described from semipermanently flooded areas in the mountains of western Wyoming. Elevations are 1700-1800 m. Stands occur on moderate to steep, mid and lower slopes and toeslopes near seeps. Soils are saturated, but not stagnant, and composed of a sandy-textured mineral horizon with a thin organic layer. Stands have a medium-tall (0.5 m), moderately dense to dense herbaceous layer that is codominated by the perennial forbs *Senecio triangularis* and *Mimulus guttatus*. Associated species include mesic and wetland forbs such as *Epilobium* spp., *Mimulus lewisii, Mitella pentandra, Parnassia fimbriata, Saxifraga odontoloma*, and the graminoid *Agrostis exarata*. Mosses form a nearly continuous ground cover between the forbs. Shrubs and trees are not present.
Environment: This lush herbaceous vegetation has been described from semipermanently flooded areas in the mountains of western Wyoming. Elevations are 1700-1800 m. Stands occur on moderate to steep, mid and lower slopes and toeslopes near seeps. Soils are saturated, but not stagnant, and composed of sandy-textured mineral horizon with a thin organic layer. Adjacent vegetation is typically montane and subalpine forests.
Vegetation: These herbaceous wetlands have been described from seeps on the slopes of mountains of western Wyoming. Stands have a medium-tall (0.5 m), moderately dense to dense herbaceous layer that is codominated by the perennial forbs *Senecio triangularis* and *Mimulus guttatus*. Associated species include mesic and wetland forbs such as *Epilobium* spp., *Mimulus lewisii, Mitella pentandra, Parnassia fimbriata, Saxifraga odontoloma* and the graminoid *Agrostis exarata*. Mosses form a nearly continuous ground cover between the forbs. Shrubs and trees are not present.
Dynamics:
Similar Alliances:
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)

Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: Vegetation included in this alliance occurs near seeps in the mountains of Yellowstone and Grand Teton national parks in western Wyoming, and likely occur in eastern Utah.
Nations: US
Subnations: WY
TNC Ecoregions: 9:C
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton, Yellowstone)

ALLIANCE SOURCES

Author(s): K. Schulz
References: Mattson 1984, Norton et al. 1981

[CEGL001988] *Senecio triangularis - Mimulus guttatus* Herbaceous Vegetation

Translated Name: **Arrowleaf Ragwort - Seep Monkeyflower Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This wet forb-dominated herbaceous type occurs in the mountains at upper montane and subalpine elevations. It is commonly associated with moderately steep to steep mid to low slopes usually near seeps, and wet toeslopes. Soils are silty clay loam to sandy and are saturated throughout the growing season. This is a wet herb-rich association. It is usually dominated by forbs; *Senecio triangularis* is the most consistently present species across all document sites. Common co-associates include *Mimulus lewisii, Mimulus guttatus, Mitella pentandra, Platanthera dilatata (= Habenaria dilatata)*, and *Epilobium* spp. Graminoids are also often present and can have individually high cover but are never as abundant as all forb cover combined. Graminoids include *Agrostis exarata, Carex paysonis, Deschampsia caespitosa*, and *Juncus mertensianus*.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
GRAND TETON NATIONAL PARK Environment: One sampled stand of this association occurs on a north-facing slope with a gradient of 20% at an elevation of 9461 feet. The other sampled stand occurs on a shallow east facing step-in-slope at an elevation of 8500 feet. The soil for the higher elevation stand is a poorly-drained silty clay loam with unvegetated and nonvascular ground surface composed of litter and duff (60% cover), rocks greater than 10 cm (30% cover), gravel (5% cover), mosses (5% cover), and bare soil

(1% cover). Seasonally-dry drainage rivulets run through both sampled stands. The adjacent vegetation to one stand includes mixed graminoids and a forest dominated by *Abies lasiocarpa.*

Global Environment: This wet forb-dominated herbaceous type occurs in the mountains at fairly high elevations. It is commonly associated with moderately steep to steep mid to low slopes usually near seeps, and wet toeslopes. Soils are silty clay loam to sandy and are saturated and non-stagnant throughout the growing season.

VEGETATION DESCRIPTION

GRAND TETON NATIONAL PARK Vegetation: This is an upper montane to alpine forb community that occurs on mesic sites. The only species to occur in both sample stands is *Senecio triangularis* (3 and 30% cover). Graminoids and forbs that occur in only one stand with 7% or more cover include *Carex paysonis, Carex hoodii, Carex aquatilis, Arnica mollis,* and *Aconitum columbianum.*

Global Vegetation: This is a wet herb-rich association. It is usually dominated by forbs; *Senecio triangularis* is the most consistently present species across all document sites. Common co-associates include *Mimulus lewisii, Mimulus guttatus, Mitella pentandra, Platanthera dilatata (= Habenaria dilatata),* and *Epilobium* spp. Graminoids are also often present and can have individually high cover but are never as abundant as all forb cover combined. Graminoids include *Agrostis exarata, Carex paysonis, Deschampsia caespitosa,* and *Juncus mertensianus*.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Senecio triangularis	Herb (field)	Forb	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Mimulus guttatus	Herb (field)	Forb	.	X	.
Mimulus lewisii	Herb (field)	Forb	.	X	.
Mitella pentandra	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare(geog area),Invasive, Animal, or Other*)
Poa pratensis	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Cardamine cordifolia - Mertensia ciliata - Senecio triangularis* Herbaceous Vegetation (CEGL002662)
- *Senecio triangularis* Herbaceous Vegetation (CEGL001987)

Global Related Concepts:
- *Senecio triangularis-Mimulus guttatus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.D.2.a. (Driscoll et al. 1984) B

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: *~Cardamine cordifolia - Mertensia ciliata - Senecio triangularis* Herbaceous Vegetation (CEGL002662)$$ is similar in that *Senecio triangularis* can be the dominant forb.

ELEMENT DISTRIBUTION

GRAND TETON NATIONAL PARK Range: The sampled stands occur east of Survey Peak and in the higher elevations of Leigh Canyon.

Global Range: This association is known from Yellowstone and Grand Teton national parks and from Grey's River watershed in west-central Wyoming.
Nations: US
States/Provinces: WY:S3?
TNC Ecoregions: 9:C
TNC Ecoregion Comments: ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC
Federal Lands: NPS (Grand Teton, Yellowstone)

ELEMENT SOURCES

GRAND TETON NATIONAL PARK Inventory Notes: Only two stands define this association.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A090
Accuracy Assessment Points: 04X330
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos, M. Fain, and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.
Mattson 1984	.	X	.	X	.	.	.	.	.
Norton et al. 1981	.	X	.	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

V.B.2.N.f. Saturated temperate perennial forb vegetation

A.1698 *Caltha leptosepala* Saturated Herbaceous Alliance

White Marsh-marigold Saturated Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance occurs in subalpine and alpine areas in the Rocky Mountains. Elevations range from 2850-3500 m. Landforms that support these types are seeps, streamsides, springs, and wet meadows with high winter snow accumulation. Types can occur on slopes up to 30%. This type rarely occurs on eastern slopes, but is common on western slopes. Soils are poorly drained alluvium. The substrate is saturated to the surface for extended periods. Commonly there is standing water from underground seeps or subsurface flows. A dense, conspicuous layer of *Caltha leptosepala* dominates the forb stratum with 60-100% cover. Many graminoids and forbs that tolerate long-term soil saturation may also be present. *Carex aquatilis* and *Deschampsia caespitosa* are very common and typically codominant with *Caltha leptosepala*. Other forbs may include *Pedicularis groenlandica, Stellaria umbellata, Swertia perennis, Polygonum bistortoides, Ranunculus alismifolius, Senecio crassulus*, and *Rhodiola rhodantha (= Sedum rhodanthum)*. Other graminoids can include *Phleum alpinum, Calamagrostis canadensis, Carex scopulorum*, and *Carex phaeocephala*. In forest openings this alliance is found with *Salix planifolia* shrublands and *Carex aquatilis* and *Senecio triangularis* meadows. On high-elevation peatlands it occurs with stands of *Eleocharis quinqueflora* and *Salix planifolia* shrublands.
Environment: Vegetation types within this alliance occur in the subalpine and alpine areas in the Rocky Mountains. Elevations range from 2850-3500 m. Landforms that support these types typically are seeps, stream sides, springs, and wet meadows with high winter snow accumulation. Types can occur on slopes up to 30%. Komarkova (1976) reports that this type rarely occurs on eastern slopes, but is common on western slopes. The substrate is saturated to the surface for extended periods. Commonly there is standing water from underground seeps or subsurface flows. Soils are poorly drained alluvium, with shallow Histic Epipedons, ranging from 15-45 cm (Padgett et al. 1988b). pH ranges from 4.6-7.0 (Johnston 1987). In forest openings this association is found with *Salix planifolia* shrublands and *Carex aquatilis* and *Senecio triangularis* meadows. On high-elevation peatlands it occurs with stands of *Eleocharis quinqueflora* and *Salix planifolia* shrublands (Kittel et al. 1999b).
Vegetation: Vegetation types within this alliance are classified as saturated temperate perennial forb vegetation. A dense, conspicuous layer of *Caltha leptosepala* dominates the forb stratum with 60-100% cover. Many graminoids and forbs that tolerate long-term soil saturation may also be present. *Carex aquatilis* and *Deschampsia caespitosa* are very common and typically codominant with *Caltha leptosepala*. Other forbs may include *Pedicularis groenlandica, Stellaria umbellata, Swertia perennis,*

Polygonum bistortoides, Ranunculus alismifolius, Senecio crassulus, and *Rhodiola rhodantha (= Sedum rhodanthum)*. Other graminoids can include *Phleum alpinum, Calamagrostis canadensis, Carex scopulorum*, and *Carex phaeocephala*.
Dynamics: *Caltha leptosepala* is considered a stable community type (Padgett et al. 1989). It receives little livestock use, probably because of its wet substrate and because livestock avoid it due to its bitter acrid taste (Craighead et al. 1963, as cited in Sanderson and Kettler 1996). Use by deer and elk is likely when this plant association occurs within forest openings
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range: This alliance has been described from Colorado, Utah, Idaho, Wyoming, and New Mexico. It likely extends into the higher elevations of Nevada, western Montana, Oregon, Washington, and northern Arizona.
Nations: US
Subnations: CO, ID, MT, NM, UT, WY
TNC Ecoregions: 9:C, 10:C, 19:C, 20:C
USFS Ecoregions: M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Caribou-Targhee)

ALLIANCE SOURCES

Author(s): D. Culver
References: Andrews 1983, Baker 1983a, Carsey et al. 2003a, Carsey et al. 2003b, Ellison 1954, Gregory 1983, Johnston 1987, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Padgett et al. 1988b, Padgett et al. 1989, Potkin and Munn 1989, Sanderson and Kettler 1996, Starr 1974

[CEGL001954] *Caltha leptosepala* Herbaceous Vegetation

Translated Name: **White Marsh-marigold Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

Status: Standard **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This wet meadow association occurs in the Rocky Mountains from Colorado to Montana, west into Utah and Idaho. Stands occur in the subalpine and lower alpine zones on perennially saturated ground in narrow forest openings to broad mountain valley bottoms and is often associated with shallow seeps on hillslopes. This association typically occupies seeps, streamsides, springs, and wet, subirrigated meadows and on slopes up to 30%. Substrates are always saturated at the surface with moderate to high water-holding capacity and fine-loamy, fine, and clayey skeletal particle size classes. Soils are somewhat variable, ranging in texture from organic muck and peat to sandy loam to fine-textured and originating from organic deposits, glacial-fluvial deposits, or granitic igneous rock. Litter and duff are typically 10-20% cover, and moss can cover up to 50% of the ground surface. The vegetation is characterized by a moderate to dense (30-100% cover) herbaceous layer dominated by *Caltha leptosepala* and low cover of *Cardamine cordifolia* and *Rhodiola rhodantha (= Sedum rhodanthum)*. Many graminoids and forbs that tolerate long-term soil saturation may also be present. *Carex aquatilis* is very common and is sometimes a codominant with *Caltha leptosepala*. *Deschampsia caespitosa* may be present in small amounts. Other common associates include graminoids *Calamagrostis canadensis, Carex aquatilis* (and many other wet sedges), *Eleocharis* spp., *Poa arctica, Juncus drummondii*, and forbs *Arnica mollis, Erigeron peregrinus, Equisetum arvense, Ligusticum tenuifolium, Oxypolis fendleri, Parnassia fimbriata, Pedicularis groenlandica, Polygonum bistortoides, Senecio triangularis, Sibbaldia procumbens, Stellaria umbellata, Swertia perennis*, and *Trollius laxus ssp. albiflorus*. Scattered shrubs may be present. Stands can be recognized by the prominence of *Caltha leptosepala*, a near absence of shrubs, and low cover of *Cardamine cordifolia* and *Rhodiola rhodantha*. In forest openings this association is found with *Salix planifolia* shrublands and *Carex aquatilis* and *Senecio triangularis* meadows. On high-elevation peatlands it occurs with stands of *Eleocharis quinqueflora* and *Salix planifolia* shrublands.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Palustrine
Grand Teton National Park Environment: This association occurs on flat terrain and shallow slopes less than 12% within the Teton Range. Stand elevation varies from 2804 to 2972 m (9200-9750 feet). This type often occurs in cirque basins on glacial soils derived from granitics and/or loess. Soils include loams and silt loams that are moderately well-drained. Unvegetated ground surface data are unavailable for all but one stand, in which litter and duff compose 80% ground cover, bare soil contributes 10%, and mosses contribute 10%. Two stands occur in palustrine areas where the hydrologic regime is saturated. Data are unavailable for the other two stands. Adjacent vegetation to one stand includes *Pinus albicaulis* and *Abies lasiocarpa* with fire scars and riparian communities along the nearby creek.

Global Environment: This wet meadow association occurs in the Rocky Mountains from Colorado to Montana, west into Utah and Idaho. Elevations range from 3000 to 3500 m (9820-11,500 feet) in Colorado and 2745 to 3110 m (9000-10,200 feet) in Utah, Idaho, Wyoming and Montana. Stands occur in the subalpine and lower alpine zones on perennially saturated ground in narrow forest openings to broad mountain valley bottoms and is often associated with shallow seeps on hillslopes. This association typically occupies seeps, streamsides, springs, and wet, subirrigated meadows and on slopes up to 30% (Padgett et al. 1989, Kittel et al. 1999b, Carsey et. al. 2003b). Substrates are always saturated at the surface with moderate to high water-holding capacity and fine-loamy, fine, and clayey skeletal particle size classes(Padgett et al. 1989). Soils are somewhat variable, ranging in texture from organic muck and peat to sandy loam to fine-textured and originating from organic deposits, glacial-fluvial deposits, or granitic igneous rock. Soils are classified as Histic Cryaquepts, Terric Borohemists, and Terric and Lithic Borosaprists (Padgett et al. 1989). Litter and duff are typically 10-20% cover, and moss can cover up to 50% of the ground surface.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is an upper montane to alpine perennial forb community. Dwarf-shrubs are generally absent but can include *Kalmia microphylla, Salix* spp., and *Phyllodoce empetriformis* in low amounts. The herbaceous cover ranges from 30 to 80% and is dominated by *Caltha leptosepala* (30-40% canopy cover). Graminoids are common and diverse but provide low cover overall; the only high-constancy graminoids are *Carex* spp. and *Juncus drummondii*. High-constancy or common forbs include *Sibbaldia procumbens, Pedicularis groenlandica, Castilleja* spp., *Polygonum bistortoides*, and *Senecio* spp.
Global Vegetation: This wetland association is characterized by a moderate to dense (30-100% cover) herbaceous layer dominated by *Caltha leptosepala* and low cover of *Cardamine cordifolia* and *Rhodiola rhodantha (= Sedum rhodanthum)*. Many graminoids and forbs that tolerate long-term soil saturation may also be present. *Carex aquatilis* is very common and is sometimes a codominant with *Caltha leptosepala*. *Deschampsia caespitosa* may be present in small amounts. Other common associates include graminoids *Calamagrostis canadensis, Carex aquatilis, Carex illota, Carex pellita (= Carex lanuginosa), Carex muricata, Carex nigricans, Carex scopulorum, Carex simulata, Carex utriculata, Eleocharis* spp., *Poa arctica, Juncus drummondii*, and forbs *Arnica mollis, Erigeron peregrinus, Equisetum arvense, Ligusticum tenuifolium, Oxypolis fendleri, Parnassia fimbriata, Pedicularis groenlandica, Polygonum bistortoides, Senecio triangularis, Sibbaldia procumbens, Stellaria umbellata, Swertia perennis*, and *Trollius laxus ssp. albiflorus* (Padgett et al. 1989, Kittel et al. 1999b). Scattered shrubs may be present, including *Kalmia microphylla, Salix planifolia, Salix wolfii, Vaccinium* spp., and *Phyllodoce empetriformis* in low amounts. In forest openings this association is found with *Salix planifolia* shrublands and *Carex aquatilis* and *Senecio triangularis* meadows. On high-elevation peatlands it occurs with stands of *Eleocharis quinqueflora* and *Salix planifolia* shrublands.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Caltha leptosepala	Herb (field)	Forb	X	X	.
Pedicularis groenlandica	Herb (field)	Forb	.	X	.
Polygonum bistortoides	Herb (field)	Forb	.	X	.
Sibbaldia procumbens	Herb (field)	Forb	.	X	.
Juncus drummondii	Herb (field)	Graminoid	.	X	.

Grand Teton National Park Higher Taxa	
Carex spp.	dominant and characteristic graminoids
Castilleja spp.	characteristic forbs
Juncus spp.	dominant and characteristic graminoids
Senecio spp.	characteristic forbs

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Caltha leptosepala	Herb (field)	Forb	X	X	.
Pedicularis groenlandica	Herb (field)	Forb	.	X	.
Senecio triangularis	Herb (field)	Forb	.	.	.
Carex aquatilis	Herb (field)	Graminoid	X	.	.
Juncus drummondii	Herb (field)	Graminoid	X	.	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Luzula glabrata var. *hitchcockii*	-	P	rare
Taraxacum officinale	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

RELATED CONCEPTS

Global Similar Associations:
- *Caltha leptosepala - Polygonum bistortoides* Herbaceous Vegetation (CEGL001956)
- *Caltha leptosepala - Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957)
- *Cardamine cordifolia - Caltha leptosepala* Herbaceous Vegetation (CEGL001958)
- *Deschampsia caespitosa - Caltha leptosepala* Herbaceous Vegetation (CEGL001882)

Global Related Concepts:
- *Caltha leptosepala* (Bourgeron and Engelking 1994) =
- *Caltha leptosepala* Community Type (Padgett et al. 1989) =
- *Caltha leptosepala* Dominance Type (Hansen et al. 1988b) B
- *Caltha leptosepala* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Caltha leptosepala* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Caltha leptosepala* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Caltha leptosepala* Plant Association (Sanderson and Kettler 1996) =
- *Deschampsia cespitosa - Caltha leptosepala* Plant Association (Johnston 1987) I
- DRISCOLL FORMATION CODE:V.D.2.a. (Driscoll et al. 1984) B
- Wet Meadow Communities (Ellison 1954) =

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments: This association needs to be compared with ~*Caltha leptosepala - Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957)$$, because they are very similar and may not be distinct.

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs in Moose Basin, next to Indian Lake and in the vicinity of Green Lake Mountain and Dry Ridge Mountain in the Jedediah Smith Wilderness.
Global Range: This widespread wet meadow association occurs in the Rocky Mountains from Colorado to Montana, west into Utah and Idaho.
Nations: US
States/Provinces: CO:S4, ID:S4, MT, UT:S2S3, WY
TNC Ecoregions: 8:C, 9:C, 10:C, 19:C, 20:C
TNC Ecoregion Comments: ECO8 added (mjr 7-05). ECO9 added for Grand Teton (mjr 7-04).
USFS Ecoregions: M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC
Federal Lands: NPS (Grand Teton, Rocky Mountain); USFS (Caribou-Targhee)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03A058, GT-0201042
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: CT-95-JD-061, CT-95-JD-063

Grand Teton National Park Description Author(s): R. Massatti and K. Varga
Global Description Author(s): G. Kittel, mod. K.A. Schulz

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Bourgeron and Engelking 1994	.	.	X	X	.	.	.	.	.
CONHP unpubl. data 2003	.	X	.	.	.	.	.	.	.
Carsey et al. 2003a	.	X	X	X	.	.	.	.	.
Carsey et al. 2003b	.	X	X	X	.	.	.	.	.
Driscoll et al. 1984	.	.	X	X	.	.	.	.	.

Ellison 1954	.	X	X	X	.	.	.	.	.
Hansen et al. 1988b	.	X	X	X	.	.	.	.	.
IDCDC 2005	.	X	.	.	.	.	.	.	.
Johnston 1987	.	X	X	.	.	.	.	.	.
Kittel et al. 1999b	.	X	X	X	.	.	.	.	.
Komarkova 1986	.	X	.	X	.	.	.	.	.
Padgett et al. 1988b	.	X	.	X	.	.	.	.	.
Padgett et al. 1989	.	X	X	X	.	.	.	.	.
Sanderson and Kettler 1996	.	X	X	X	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

ALLIANCE CONCEPT

Summary:
Environment:
Vegetation:
Dynamics:
Similar Alliances:
Similar Alliance Comments:

ALLIANCE DISTRIBUTION

Range:
Nations: #ERROR#
Subnations: #ERROR#
TNC Ecoregions: #ERROR#
USFS Ecoregions:
Federal Lands:

ALLIANCE SOURCES

Author(s):
References:

No Alliance Assigned—NVC Saturated temperate perennial forb vegetation

[CEGL003410] *Menyanthes trifoliata* Herbaceous Vegetation [Provisional]

Translated Name: **Buckbean Herbaceous Vegetation**
Common Name:
Ecological System(s):
- Temperate Pacific Freshwater Aquatic Bed (CES200.876)

Status: Provisional **Circumscription Confidence:** 2 - Moderate
Concept Author(s): Western Ecology Group

ELEMENT CONCEPT

Global Summary: This wetland herbaceous associations is known from California, Oregon, Washington, Wyoming, Colorado, and Alaska. It grows in perennial flooded or saturated depressions, on the edges of ponds and lakes, and occasionally along slackwater areas of low-gradient, slow-moving streams. Sites are submerged through much of the year but may dry to the soil surface during the growing season. Water depths average 10-35 cm. Rootmats 25-75 cm thick can form and anchor to the bottom or float. Soils can be silts or organic peats. Ponds and lakes where this association is found are in very low-gradient and wide valleys. This association has low species diversity and can be a monotypic stand of *Menyanthes trifoliata*. Cover ranges from 10-100%. Commonly co-occurring species include *Carex utriculata, Carex limosa, Carex arcta, Eleocharis palustris, Utricularia macrorhiza, Nuphar lutea,* and *Potamogeton* spp.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: The one sampled stand of this association occurs at an elevation of 2134 m (7001 feet) and is permanently flooded. The vegetation in this pond and in the surrounding area was described as occurring in three separate zones. In zone one, the pond area that usually contains water, there is nearly a monoculture of *Menyanthes trifoliata*. Zone two surrounds zone one and is composed of a monoculture of *Carex utriculata*, indicating the presence of standing water. Zone three forms a ring around zone two. It is unknown what grows in zone three.

Global Environment: It grows in perennial flooded or saturated depressions, on the edges of ponds and lakes, and occasionally along slackwater areas of low-gradient, slow-moving streams. Sites are submerged through much of the year but may dry to the soil surface during the growing season. Water depths average 10-35 cm. Rootmats 25-75 cm thick can form and anchor to the bottom or float. Soils can be silts or organic peats. Ponds and lakes where this association is found are in very low-gradient and wide valleys.

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This is a montane aquatic herbaceous community that occurs on hydric sites. The dominant forb is *Menyanthes trifoliata* (40% cover). *Carex utriculata* and *Polygonum amphibium* are the only other plants present and both occur at 1% cover.
Global Vegetation: This association has low species diversity and can be a monotypic stand of *Menyanthes trifoliata*. Cover ranges from 10-100%. Commonly co-occurring species include *Carex utriculata, Carex limosa, Carex arcta, Eleocharis palustris, Utricularia macrorhiza, Nuphar lutea*, and *Potamogeton* spp.
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Menyanthes trifoliata	Herb (field)	Forb	X	X	.
Polygonum amphibium	Herb (field)	Forb	.	X	.
Carex utriculata	Herb (field)	Graminoid	.	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Menyanthes trifoliata	Herb (field)	Forb	X	X	.

Higher Taxon / Species Name	Note GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Oct-2002).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: The sampled stand occurs northeast of Two Ocean Lake.
Global Range: This wetland herbaceous associations is known from California, Oregon, Washington, Wyoming, Colorado, and Alaska, and British Columbia, Canada.
Nations: CA, US
States/Provinces: AK, BC:S4, CA, CO, OR:S4, WA:S4?, WY
TNC Ecoregions: 2:C, 9:C
TNC Ecoregion Comments: ECO9 and M331D added for Grand Teton (mjr 7-04).
USFS Ecoregions: 242A:CC, M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes: Only one stand defines this association, and the pond was dry when sampled.

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-0201095
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): C.B. Villalobos and K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Christy 2004	.	X	.	X	.	.	.	.	.
Crowe and Clausnitzer 1997	.	X	.	X	.	.	.	.	.
Crowe et al. 2004	.	X	.	X	.	.	.	.	.
Kagan et al. 2000	.	X	.	.	.	.	.	.	.
Sawyer and Keeler-Wolf 1995	.	X	.	.	.	.	.	.	.
WANHP unpubl. data	.	X	.	.	.	.	.	.	.
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

[CEGL002544] *Pteridium aquilinum* Herbaceous Vegetation [Provisional]

Translated Name: **Northern Bracken Herbaceous Vegetation**
Common Name:
Ecological System(s):
Status: Provisional **Circumscription Confidence:**
Concept Author(s): G. Kittel

ELEMENT CONCEPT

Global Summary: This herbaceous association is documented with plot data from Grand Teton National Park, western Wyoming, but has been observed elsewhere in the West. It usually occurs on steep slopes (40-55% and up) and is documented at elevations ranging from 2060 to 2260 m (6750-7400 feet). Sampled stands vary between east- and south-facing aspects. The well-drained soils include loamy sands and sandy clay loams. Stands are dominated by *Pteridium aquilinum*, along with other graminoids and forbs. *Pteridium aquilinum* has been associated with recently disturbed, mesic ground on steep slopes.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System:
Grand Teton National Park Environment: This association occurs on slopes varying from 38 to 53% at elevations ranging from 2057 to 2256 m (6750-7400 feet). The aspects of the stands vary between east and south. The well-drained soils include loamy sands and sandy clay loams. The unvegetated ground cover is composed primarily of litter and duff, covering 70 to 90% of the ground. Large rocks, gravel and wood are all present in trace amounts. Bare soil may comprise up to 30% of the ground cover. Two stands are situated in avalanche-prone areas, and one stand is situated directly above a hiking trail. Adjacent to two stands are *Pseudotsuga menziesii - Abies lasiocarpa* forests with mixed shrub understories. The other stand is bordered by *Alnus incana* and *Acer glabrum*.
Global Environment:

VEGETATION DESCRIPTION

Grand Teton National Park Vegetation: This association is a montane forb community that occurs in mesic areas. Shrubs can be absent or present in varying quantities. Common shrubs may include *Amelanchier alnifolia*, *Prunus virginiana*, and *Paxistima myrsinites*. The herbaceous layer covers 70 to 90% of the ground surface. Graminoids generally are not diverse but may contribute up to 20% canopy cover. Common species include *Carex geyeri* and *Elymus glaucus*. *Pteridium aquilinum* forms the major component of the herbaceous layer, covering 50 to 70% of the ground. Forbs may or may not be diverse; no species is present in any stand with more than 10% canopy cover. Common or high-constancy forb species include *Angelica arguta* and *Rudbeckia occidentalis*.
Global Vegetation:
Global Dynamics:

GRAND TETON NATIONAL PARK FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Amelanchier alnifolia	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Prunus virginiana	Short shrub/sapling	Broad-leaved deciduous shrub	.	X	.
Paxistima myrsinites	Short shrub/sapling	Broad-leaved evergreen shrub	.	X	.
Angelica arguta	Herb (field)	Forb	.	X	.
Rudbeckia occidentalis	Herb (field)	Forb	.	X	.
Carex geyeri	Herb (field)	Graminoid	.	X	.
Elymus glaucus	Herb (field)	Graminoid	.	X	.
Pteridium aquilinum	Herb (field)	Fern	X	X	.

GLOBAL FLORISTIC COMPOSITION

Species Name	Stratum	Lifeform	Dom	Char	Const
Pteridium aquilinum	Herb (field)	Fern	X	X	.

Higher Taxon	Note

GRAND TETON NATIONAL PARK OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)
Cirsium vulgare	-	P	exotic
Tragopogon dubius	-	P	exotic

GLOBAL OTHER NOTEWORTHY SPECIES

Species Name	GRank	Animal	Note (*specify Rare (geog area), Invasive, Animal, or Other*)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (30-Mar-2005).

RELATED CONCEPTS

Global Similar Associations:
Global Related Concepts:

CLASSIFICATION & OTHER COMMENTS

Grand Teton National Park Classification Comments:
Grand Teton National Park Other Comments:
Global Classification Comments:

ELEMENT DISTRIBUTION

Grand Teton National Park Range: This association occurs near Phelps Lake and near Leigh Lake. It has also been noted on the north side of Colter Canyon.
Global Range: This association is documented in Wyoming but is suspected to occur throughout the western U.S.
Nations: US
States/Provinces: WY
TNC Ecoregions: 9:C
TNC Ecoregion Comments:
USFS Ecoregions: M331D:CC
Federal Lands: NPS (Grand Teton)

ELEMENT SOURCES

Grand Teton National Park Inventory Notes:

GRAND TETON NATIONAL PARK Plots Defining This Type:
Full Plots: GT-03B011, GT-03C064, GT-03B090
Accuracy Assessment Points: None
Other plots within park boundaries, from other projects: None
Other plots outside park boundaries, but within 2 miles: None

Grand Teton National Park Description Author(s): R. Massatti, mod. K. Varga
Global Description Author(s): G. Kittel

References (enter Reference Code when known, otherwise, enter Short Citation; enter full citation if reference is new)

Reference (*=concept ref)	name	classif	related	char	rank	eospec	eorank	manage	image
Western Ecology Working Group n.d.*	X°	.	.	.	.	.	.	.	.

Bibliography

Achuff, P. L. 1989. Old-growth forests of the Canadian Rocky Mountain National Parks. Natural Areas Journal 9:12-26.

Achuff, P. L., R. L. McNeil, M. L. Coleman, C. Wallis and C. Wershler. 2002a. Ecological land classification of Waterton Lakes National Park, Alberta. Volume I: Integrated resource description. Parks Canada, Waterton Lakes National Park, Alberta. 226 pp.

Achuff, P. L., R. L. McNeil, and M. L. Coleman. 1997. Chapter III-Vegetation. Pages 28-93 in: P. L. Achuff, R. L. McNeil, and M. L. Coleman. Ecological land classification of Waterton Lakes National Park, Alberta. Parks Canada, Waterton Lakes National Park. 250 pp. plus maps.

Achuff, P. L., W. S. Taylor, and L. J. Knapik. 1993. Chapter III-Vegetation. Pages 40-136 in: P. L. Achuff, W. S. Taylor, and L. J. Knapik. Ecological land classification of Yoho National Park, British Columbia. Report prepared for Yoho National Park, Canadian Parks Service, Environment Canada.

Achuff, P. L., and H. A. Dudynsky. 1984a. Chapter III. Vegetation. Pages 43-125 in: P. L. Achuff, W. D. Holland, G. M. Coen, and K. Van Tighem, editors. Ecological and classification of Kootenay National Park, British Columbia. Volume I: Integrated resource description. Alberta Institute of Pedology. Publication No. M-84-10.

Achuff, P. L., and H. A. Dudynsky. 1984b. Chapter III. Vegetation. Pages 33-79 in: P. L. Achuff, W. D. Holland, G. M. Coen, and K. Van Tighem, editors. Ecological land classification of Mt. Revelstoke and Glacier national parks, British Columbia. Volume I: Integrated resource description. Alberta Institute of Pedology. Publication No. M-84-11.

Achuff, P. L., and I. G. W. Corns. 1982. Chapter III. Vegetation. Pages 71-156 in: W. D. Holland and G. M. Coen, editors. Ecological (biophysical) land classification of Banff and Jasper national parks. Volume II: Soil and vegetation resources. Alberta Institute of Pedology. Publication No. SS-82-44.

Agee, J. K., and J. Kertis. 1987. Forest types of the north Cascades National Park Service complex. Canadian Journal of Botany 65:1520-1530.

Agee, J. K., and R. Wasem. 1987. Stetattle Creek Research Natural Area. Federal Research Natural Areas in Oregon and Washington. Supplement No. 25. 25 pp.

Alexander, B. G., Jr. 1981. A preliminary forest habitat classification for the Lincoln National Forest, New Mexico. Unpublished thesis, Northern Arizona University, Flagstaff. 94 pp.

Alexander, B. G., Jr., E. L. Fitzhugh, F. Ronco, Jr., and J. A. Ludwig. 1987. A classification of forest habitat types of the northern portion of the Cibola National Forest, NM. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-143. Fort Collins, CO. 35 pp.

Alexander, B. G., Jr., F. Ronco, Jr., A. S. White, and J. A. Ludwig. 1984b. Douglas-fir habitat types of northern Arizona. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-108. Fort Collins, CO. 13 pp.

Alexander, B. G., Jr., F. Ronco, Jr., E. L. Fitzhugh, and J. A. Ludwig. 1984a. A classification of forest habitat types of the Lincoln National Forest, New Mexico. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-104. Fort Collins, CO. 29 pp.

Alexander, R. M. 1986. Classification of the forest vegetation of Wyoming. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-466. Fort Collins, CO. 10 pp.

Alexander, R. R. 1985. Major habitat types, community types, and plant communities in the Rocky Mountains. USDA Forest Service General Technical Report RM-123. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 105 pp.

Alexander, R. R., G. R. Hoffman, and J. M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: A habitat type classification. USDA Forest Service Research Paper No. RM-271.

Alexander, R. R., and F. Ronco, Jr. 1987. Classification of the forest vegetation on the national forests of Arizona and New Mexico. USDA Forest Service Research Note RM-469. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Allard, D. J. 1990. Southeastern United States ecological community classification. Interim report, Version 1.2. The Nature Conservancy, Southeast Regional Office, Chapel Hill, NC. 96 pp.

Amundsen, C. C. 1967. The subalpine forest of Wild Basin, Front Range, Colorado. Unpublished dissertation, University of Colorado, Boulder. 129 pp.

Anderson, D. M. 1982. Plant communities of Ohio: A preliminary classification and description. Division of Natural Areas and Preserves, Ohio Department of Natural Resources, Columbus, OH. 182 pp.

Anderson, W. E. 1956. Some soil-plant relationships in eastern Oregon. Journal of Range Management 9:171-175.

Andrews, T. 1983. Subalpine meadow and alpine vegetation of the upper Pecos River. USDA Forest Service, Southwestern Region. Report RM-51. Albuquerque, NM.

Arno, S. F. 1980. Forest fire history in the northern Rockies. Journal of Forestry 78(8):460-465.

Arno, S. F., D. G. Simmerman, and R. E. Keane. 1985. Forest succession on four habitat types in western Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station. General Technical Report INT-177. Ogden, UT. 74 pp.

Arno, S. F., and T. Weaver. 1990. Whitebark pine community types and their patterns on the landscape. Pages 97-105 in: W. C. Schmidt and K. J. McDonald, compilers. Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. March 29-31 1989, Bozeman, MT. USDA Forest Service, Intermountain Research Station. General Technical Report INT-270. Ogden, UT. 386 pp.

Atzet, T. A., D. E. White, L. A. McCrimmon, P. A. Martinez, P. R. Fong, and V. D. Randall. 1996. Field guide to the forested plant associations of southwestern Oregon. USDA Forest Service, Pacific Northwest Region. Technical Paper R6-NR-ECOL-TP-17-96. Portland, OR.

Atzet, T., and D. L. Wheeler. 1984. Preliminary plant associations of the Siskiyou Mountains Province, Siskiyou National Forest. USDA Forest Service, Pacific Northwest Region, Portland, OR.

Atzet, T., and L. A. McCrimmon. 1990. Preliminary plant associations of the southern Oregon Cascade Mountain Province. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, OR. 330 pp.

Bachrach, J. H. 1951. The plant communities of a valley in the montane forest of the Colorado Front Range. Unpublished thesis, University of Colorado, Boulder. 68 pp.

Bader, E. H. 1932. The vegetation of the Mesa Verde National Park, Colorado. Unpublished thesis, University of Colorado, Boulder. 64 pp.

Baker, W. L. 1980a. Alpine vegetation of the Sangre De Cristo Mountains, New Mexico: Gradient analysis and classification. Unpublished thesis, University of North Carolina, Chapel Hill. 55 pp.

Baker, W. L. 1982b. Natural vegetation of the Piceance Basin, Colorado. Appendix D, pages 1-113 in: J. S. Peterson and W. L. Baker, editors. Inventory of the Piceance Basin, Colorado. Unpublished report for the Bureau Land Management, Craig, CO.

Baker, W. L. 1983a. Alpine vegetation of Wheeler Peak, New Mexico, USA: Gradient analysis, classification, and biogeography. Arctic and Alpine Research 15(2):223-240.

Baker, W. L. 1983b. Some aspects of the presettlement vegetation of the Piceance Basin, Colorado. Great Basin Naturalist 43(4):687-699.

Baker, W. L. 1983c. Natural vegetation of part of northwestern Moffat County, Colorado. Unpublished report prepared for the State of Colorado Natural Areas Program, Department of Natural Resources, Denver by Colorado Natural Heritage Inventory, Denver.

Baker, W. L. 1984a. A preliminary classification of the natural vegetation of Colorado. Great Basin Naturalist 44(4):647-676.

Baker, W. L. 1986. Riparian vegetation of the montane and subalpine zones in west-central and southwestern Colorado: Final report prepared for The Nature Conservancy and Colorado Natural Areas Program, Boulder.

Baker, W. L. 1989a. Macro- and micro-scale influences on riparian vegetation in western Colorado. Annals of the Association of American Geographers 79(1):65-78.

Baker, W. L. 1989b. Classification of the riparian vegetation of the montane and subalpine zones in western Colorado. Great Basin Naturalist 49(2):214-228.

Baker, W. L., and S. C. Kennedy. 1985. Presettlement vegetation of part of northwestern Moffat County, Colorado, described from remnants. Great Basin Naturalist 45(4):747-777.

Bamberg, S. A., and J. Major. 1968. Ecology of the vegetation and soils associated with calcareous parent materials in three alpine regions of Montana. Ecological Monographs 38(2):127-167.

Barbour, M. G., and J. Major, editors. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York. 1002 pp.

Barbour, M. G., and J. Major, editors. 1988. Terrestrial vegetation of California: New expanded edition. California Native Plant Society, Special Publication 9, Sacramento. 1030 pp.

Barrows, J. S., E. W. Mogren, K. Rowdabaugh, and R. Yancik. 1977. The role of fire in ponderosa pine and mixed conifer ecosystems. Final report, Cooperative report between the National Park Service and Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 101 pp.

Bassett, D., M. Larson, and W. Moir. 1987. Forest and woodland habitat types of Arizona south of the Mogollon Rim and southwestern New Mexico. Edition 2. USDA Forest Service, Southwestern Region, Albuquerque, NM.

Beetle, A. A., and K. L. Johnson. 1982. Sagebrush in Wyoming. Wyoming Agricultural Experiment Station Bulletin 779. University of Wyoming, Laramie.

Beidleman, R. G. 1954. The cottonwood river-bottom community as a vertebrate habitat. Unpublished dissertation, University of Colorado, Boulder. 358 pp.

Benedict, J. B. 1977b. A master plan for the Bunker Hill Placer Preserve, Boulder County, Colorado. Unpublished report prepared for The Nature Conservancy, Denver, CO. 61 pp.

Benedict, N. B. 1983. Plant associations of subalpine meadows, Sequoia National Park, California. Arctic and Alpine Research 15(3):383-396.

Bierly, K. F. 1972. Meadow and fen vegetation in Big Meadows, Rocky Mountain National Park. Unpublished thesis, Colorado State University, Fort Collins. 102 pp.

Bighorn Coal Mine. No date. Application No. 213-T2, on file at Wyoming Department of Environmental Quality, Land Quality Division, Cheyenne.

Billings, W. D. 1945. The plant associations of the Carson Desert region, western Nevada. Butler University Botanical Studies 7:89-123.

Blackburn, W. H. 1967. Plant succession on selected habitat types in Nevada. Unpublished thesis, University of Nevada, Reno. 162 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1968a. Vegetation and soils of the Mill Creek Watershed. Nevada Agricultural Experiment Station Bulletin R-43. Reno. 69 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1968b. Vegetation and soils of the Crowley Creek Watershed. Nevada Agricultural Experiment Station Bulletin R-42. Reno. 60 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1968c. Vegetation and soils of the Duckwater Watershed. Nevada Agricultural Experiment Station Bulletin R-40. Reno. 76 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1969a. Vegetation and soils of the Cow Creek Watershed. Nevada Agricultural Experiment Station Bulletin R-49. Reno. 80 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1969b. Vegetation and soils of the Coils Creek Watershed. Nevada Agricultural Experiment Station Bulletin R-48. Reno. 81 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1969c. Vegetation and soils of the Churchill Canyon Watershed. Nevada Agricultural Experiment Station Bulletin R-45. Reno. 157 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1969d. Vegetation and soils of the Pine and Mathews Canyon Watersheds. Nevada Agricultural Experiment Station Bulletin R-46. Reno. 111 pp.

Blackburn, W. H., P. T. Tueller, and R. E. Eckert, Jr. 1971. Vegetation and soils of the Rock Springs Watershed. Nevada Agricultural Experiment Station Bulletin R-83. Reno. 116 pp.

Blackhawk Coal Company. 1981. Vegetation resources. Chapter 9 Section 9.2, pages 9-1 through 9-27 in: Mining and Reclamation Plan for Willow Creek Mine, Blackhawk Coal Company. Utah Division of Oil, Gas & Mining Number ACT/007/002. Salt Lake City, UT.

Boggs, K., P. Hansen, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in northwestern Montana. Draft version I. Report prepared for the Montana Riparian Association and Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula. 216 pp.

Boles, P. H., and W. A. Dick-Peddie. 1983. Woody riparian vegetation patterns on a segment of the Mimbres River in southwestern New Mexico. Southwestern Naturalist 28:81-87.

Bond, H. E. 1959. Revegetation and disintegration of pocket gopher mounds on Black Mesa, Colorado. Unpublished thesis, Colorado State University, Fort Collins.

Bonham, C. D., and R. T. Ward. 1970. Phytosociological relationships in alpine tufted hairgrass (*Deschampsia caespitosa* (L.) Beauv.) meadows. Arctic and Alpine Research 2(4):267-275.

Bourgeron, P. S., L. D. Engelking, H. C. Humphries, E. Muldavin, and W. H. Moir. 1995. Assessing the conservation value of the Gray Ranch: Rarity, diversity and representativeness. Desert Plants 11:2-3.

Bourgeron, P. S., and L. D. Engelking, editors. 1994. A preliminary vegetation classification of the western United States. Unpublished report. The Nature Conservancy, Western Heritage Task Force, Boulder, CO. 175 pp. plus appendix.

Bowerman, T. S., J. Dorr, S. Leahy, K. Varga, and J. Warrick. 1997. Targhee National Forest ecological unit inventory. USDA Forest Service, Targhee National Forest, St. Anthony, ID. 789 pp.

Boyce, D. A. 1977. Vegetation of the South Fork of the White River Valley, Colorado. Unpublished dissertation, University of Colorado, Boulder. 312 pp.

Bramble-Brodahl, M. K. 1978. Classification of *Artemisia* vegetation in the Gros Ventre area, Wyoming. M.S. thesis, University of Idaho, Moscow.

Brayshaw, T. C. 1965. The dry forest of southern British Columbia. Pages 65-75 in: V. J. Krajina, editor. Ecology of western North America. Volume I, illustrated. University of British Columbia, Department of Botany.

Briggs, G. M., and J. A. MacMahon. 1983. Alpine and subalpine wetland plant communities of the Uinta Mountains, Utah. Great Basin Naturalist 43(4):523-530.

Brockway, D. G., C. Topik, M. A. Hemstrom, and W. H. Emmingham. 1983. Plant association and management guide for the Pacific silver fir zone, Gifford Pinchot National Forest. USDA Forest Service, Pacific Northwest Region. Technical Report R6-Ecol-130a-1983. Portland, OR. 122 pp.

Brooks, R. E., and S. E. Clemants. Juncaceae. Pages 211-267 in: Flora of North America Editorial Committee, editors. Flora of North America. Volume 22. Oxford University Press, New York, NY.

Brotherson, J. D. 1987. Plant community zonation in response to soil gradients in a saline meadow near Utah Lake, Utah County, Utah. Great Basin Naturalist 47(2):322-333.

Brotherson, J. D., and S. J. Barnes. 1984. Habitat relationships of *Glaux maritima* in central Utah. Great Basin Naturalist 44(2):299-309.

Brown, D. E., editor. 1982. Biotic communities of the American Southwest-United States and Mexico. Desert Plants Special Issue 4(1-4):1-342.

Brown, H. E., and J. R. Thompson. 1965. Summer water use by aspen, spruce, and grassland in western Colorado. Journal of Forestry 63:756-760.

Buckner, D. L. 1977. Ribbon forest development and maintenance in the central Rocky Mountains of Colorado. Unpublished dissertation, University of Colorado, Boulder. 224 pp.

Bunin, J. E. 1975a. Aspen forests of the west slope of the Park Range, north-central Colorado. Unpublished paper presented at the 1975 AIBS/ESA Meetings, 17-22 August 1975, Oregon State University, Corvallis. 22 pp.

Bunin, J. E. 1975c. The vegetation of the west slope of the Park Range, Colorado. Unpublished dissertation, University of Colorado, Boulder. 235 pp.

Bunin, J. E. 1985. Vegetation of the City of Boulder, Colorado open space lands. Report prepared for the City of Boulder, Real Estate/Open Space, Boulder, CO. 114 pp.

Burns, R. M., and B. H. Honkala, technical coordinators. 1990a. Silvics of North America: Volume 1. Conifers. USDA Forest Service. Agriculture Handbook 654. Washington, DC. 675 pp.

Bursik, R. J., and R. K. Moseley. 1995. Ecosystem conservation strategy for Idaho Panhandle peatlands. Cooperative project between Idaho Panhandle National Forests and Idaho Department of Fish and Game, Conservation Data Center, Boise. 28 pp. plus appendix.

Butler, D. R. 1979. Snow avalanche path terrain and vegetation, Glacier National Park, Montana. Arctic and Alpine Research 11:17-32.

CONHP [Colorado Natural Heritage Program]. 2003. Unpublished data. List of Elements and Elcodes converted and entered into Biotics Tracker 4.0. Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

CONHP [Colorado Natural Heritage Program]. No date. Biological and Conservation Data (BCD) System. Unpublished data from field surveys. Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

CONHP [Colorado Natural Heritage Program]. Personal communication. Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Caicco, S. 1988. Idaho Natural Heritage Program plant association classification. Idaho Natural Heritage Program, Boise, ID. Mimeograph copy.

Caicco, S. L. 1983. Alpine vegetation of the Copper Basin area, south-central Idaho. Unpublished thesis, University of Idaho, Moscow. 99 pp.

Caicco, S. L., and C. A. Wellner. 1983a. Research Natural Area recommendation for City of Rocks. Unpublished report prepared for USDI Bureau of Land Management, Burley District, Idaho by Idaho Natural Areas Coordinating Committee. On file at Idaho Conservation Data Center, Boise, ID. 12 pp.

Caicco, S. L., and C. A. Wellner. 1983c. Research Natural Area recommendation for Southwest Lemhi Range. Unpublished report prepared for USDI Bureau of Land Management, Idaho Falls District, Idaho by Idaho Natural Areas Coordinating Committee. On file at Idaho Conservation Data Center, Boise, ID.

Caicco, S. L., and C. A. Wellner. 1983h. Research Natural Area recommendation for Brass Cap Kipuka. Unpublished report prepared for USDI Bureau of Land Management, Shoshone District, Idaho by Idaho Natural Areas Coordinating Committee. 15 pp.

Caicco, S. L., and C. A. Wellner. 1983i. Research Natural Area recommendation for Substation Tract. Unpublished report prepared for USDI Bureau of Land Management, Shoshone District, Idaho by Idaho Natural Areas Coordinating Committee. 11 pp.

Caicco, S. L., and C. A. Wellner. 1983j. Research Natural Area recommendation for Big Juniper Kipuka. Unpublished report prepared for USDI Bureau of Land Management, Shoshone District, Idaho by Idaho Natural Areas Coordinating Committee.

Caicco, S. L., and C. A. Wellner. 1983n. Research Natural Area recommendation for Little Jacks Creek. Unpublished report prepared for USDI Bureau of Land Management, Boise District, Idaho by Idaho Natural Areas Coordinating Committee. 14 pp.

Campbell, A. G. 1973. Vegetative ecology of Hunts Cove, Mt. Jefferson, OR. M.S. thesis, Oregon State University, Corvallis. 89 pp.

Carsey, K., D. Cooper, K. Decker, D. Culver, and G. Kittel. 2003b. Statewide wetlands classification and characterization: Wetland plant associations of Colorado. Prepared for Colorado Department of Natural Resources, Denver, by Colorado Natural Heritage Program, College of Natural Resources, Colorado State University, Fort Collins. 79 pp. [http://www.cnhp.colostate.edu/documents/2003/wetland_classification_final_report_2003.pdf]

Carsey, K., G. Kittel, K. Decker, D. J. Cooper, and D. Culver. 2003a. Field guide to the wetland and riparian plant associations of Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Chapman, K. A., D. A. Albert, and G. A. Reese. 1989. Draft descriptions of Michigan's natural community types. Michigan Department of Natural Resources, Lansing, MI. 35 pp.

Chappell, C. 1994. Natural forests of the Puget Lowland, Washington. Northwest Science Abstract.

Chappell, C., R. Crawford, J. Kagan, and P. J. Doran. 1997. A vegetation, land use, and habitat classification system for the terrestrial and aquatic ecosystems of Oregon and Washington. Unpublished report prepared for Wildlife habitat and species associations within Oregon and Washington landscapes: Building a common understanding for management. Prepared by Washington and Oregon Natural Heritage Programs, Olympia WA, and Portland, OR. 177 pp.

Christensen, E. M. 1963. The foothill bunchgrass vegetation of central Utah. Ecology 44(1):156-158.

Christensen, E. M., and S. L. Welsh. 1963. Presettlement vegetation of the valleys of western Summit and Wasatch counties, Utah. Proceedings of the Utah Academy of Science, Arts and Letters 40:163-174.

Christy, J. A. 2004. Native freshwater wetland plant associations of northwestern Oregon. Oregon Natural Heritage Information Center, Oregon State University, Portland, OR.

Christy, John. Personal communication. Wetlands Ecologist. Oregon Natural Heritage Information Center, Portland, OR.

Clausnitzer, R. R., and B. A. Zamora. 1987. Forest habitat types of the Colville Indian Reservation. Unpublished report prepared for the Department of Forest and Range Management, Washington State University, Pullman. 110 pp.

Coenenberg, J. G., and E. J. Depuit. 1979. Baseline wildlife studies, Crow Coal Lease, southeastern Montana, 1975-1978. Montana Agricultural Experiment Station, Reclamation Research Unit, Bozeman, MT. 133 pp.

Cogan, D., M. Reid, K. Schulz, and M. Pucherelli. 2004. Zion National Park, Utah 1999-2003. Vegetation Mapping Project. Technical Memorandum 8260-03-01. Remote Sensing and GIS Group Technical Service Center, Bureau of Reclamation, Denver, CO. Appendix F: Vegetation Association Descriptions for Zion.

Cole, D. 1977a. Ecosystem dynamics in the coniferous forest of the Willamette Valley, Oregon, USA. Journal of Biogreography 4:181-192.

Cole, D. N. 1982. Vegetation of two drainages in Eagle Cap Wilderness, Wallowa Mountains, Oregon. USDA Forest Service Research Paper INT-288.

Collins, E. I., R. W. Lichvar, and E. F. Evert. 1984. Description of the only known fen-palsa in the 48 contiguous United States. Arctic and Alpine Research 16:255-258.

Colorado Natural Heritage Program Ecology Team. 2001. A classification of the native vegetation of Colorado. Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Comer, P. (editor), L. Allen, S. Cooper, D. Faber-Langendoen, and G. Jones. 1999. Selected shrubland and grassland communities of the northern Great Plains. Report to the Nebraska National Forest. The Nature Conservancy.

Cooper, D. J. 1986a. Ecological studies of wetland vegetation, Cross Creek Valley, Holy Cross Wilderness Area, Sawatch Range, Colorado. Holy Cross Wilderness Defense Fund, Technical Report No. 2. 24 pp.

Cooper, D. J., and T. R. Cottrell. 1990. Classification of riparian vegetation in the northern Colorado Front Range. Unpublished report prepared for The Nature Conservancy, Colorado Field Office, Boulder. 115 pp.

Cooper, S. V. 1975. Forest habitat types of northwestern Wyoming and contiguous portion of Montana and Idaho. Unpublished dissertation, Washington State University, Pullman. 190 pp.

Cooper, S. V., C. Jean, and B. L. Heidel. 1999. Plant associations and related botanical inventory of the Beaverhead Mountains Section, Montana. Unpublished report to the Bureau of Land Management. Montana Natural Heritage Program, Helena. 235 pp.

Cooper, S. V., K. E. Neiman, R. Steele, and D. W. Roberts. 1987. Forest habitat types of northern Idaho: A second approximation. USDA Forest Service, Intermountain Research Station. General Technical Report INT-236. Ogden, UT. 135 pp. [reprinted in 1991]

Cooper, S. V., P. Lesica, R. L. DeVelice, and T. McGarvey. 1995. Classification of southwestern Montana plant communities with emphasis on those of Dillon Resource Area, Bureau of Land Management. Montana Natural Heritage Program, Helena, MT. 154 pp.

Cooper, S. V., P. Lesica, and D. Page-Dumroese. 1997. Plant community classification for alpine vegetation on Beaverhead National Forest, Montana. USDA Forest Service, Intermountain Research Station, Report INT-GTR-362. Ogden, UT. 61 pp.

Cooper, S. V., and B. L. Heidel. 1997. Population status and ecology of trembling aspen and black cottonwood communities on the Blackfeet Indian Reservation. Prepared for the Blackfeet Nation-Fish and Wildlife Department and the USDI Fish & Wildlife Service by Montana Natural Heritage Program, Helena, MT.

Cooper, S. V., and P. Lesica. 1992. Plant community classification for alpine vegetation on Beaverhead National Forest, Montana. Conservation Biology Research, Helena, MT. 80 pp.

Cooper, S. V., and R. D. Pfister. 1985. Forest habitat types of the Crow and Northern Cheyenne Indian Reservations. Unpublished termination report prepared for Bureau of Indian Affairs, Billings Area Office by USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. 118 pp.

Cooper, S., and R. Pfister. 1981. Forest habitat types of the Blackfeet Indian Reservation. Review Draft, 5/21/81, for Bureau of Indian Affairs, Wind River Agency, Fort Washakie, WY.

Cooper, Steve. Personal communication. Ecologist, Montana Natural Heritage Program, 1515 East Sixth Avenue, P.O. Box 201800, Helena, MT 59620-1800. 406/444-3009.

Copeland, W. N. 1980a. The Lawrence Memorial Grassland Preserve, a biophysical inventory with management recommendations. June 1980. Unpublished report prepared by The Nature Conservancy Field Office, Portland, Oregon. 161 pp.

Costello, D. F. 1954. Vegetation zones in Colorado. Pages iii-x in: H. D. Harrington, editor. Manual of the plants of Colorado. Sage Books, Denver.

Cotter-Ferguson Project. No date. Application No. 490, on file at Wyoming Department of Environmental Quality, Land Quality Division, Cheyenne.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Biological Service Program. FWS/OBS-79/31. Washington, DC. 103 pp.

Cox, B. J. 1968. A vegetational comparison of the Gothic and Galena Mountain area. Transactions of the Missouri Academy of Science 2:72-83.

Cox, C. F. 1933. Alpine plant succession on James Peak, Colorado. Ecological Monographs 3:299-372.

Crawford, R. C. 2001. Initial riparian and wetland classification and characterization of the Columbia Basin in Washington. Prepared for Environmental Protection Agency and Bureau of Land Management, Spokane District. Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia. 83 pp.

Crawford, R. C. 2003. Riparian vegetation classificaiton of the Columiba Basin, Washington. Natural Heritage Report 2003-03. Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia. 98 pp. plus appendices.

Crawford, R. C., C. Chappell, B. Stephens, C. Soper, and D. Rolph. 1994. Inventory and mapping of endangered native ecosystems on Fort Lewis: Final report. Final report to Fort Lewis Military Base, WA. 47 pp.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal, and P. K. Holmgren. 1977. Intermountain flora: Vascular plants of the Intermountain West, U.S.A. Volume 6: The Monocotyledons. Columbia University Press, New York. 584 pp.

Cross, A. F. 1991. Vegetation of two southeastern Arizona desert marshes. Madrono 38(3):185-194.

Crouch, G. L. 1983. Effects of commercial clear-cutting of aspen on understory vegetation and wildlife habitat values in southwestern Colorado. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-246. Fort Collins, CO.

Crowe, E. A., B. L. Kovalchik, and M. J. Kerr. 2004. Riparian and wetland vegetation of central and eastern Oregon. Oregon Natural Heritage Information Center, Institute for Natural Resources, Oregon State University, Portland. 473 pp. [<http://oregonstate.edu/ornhic/ publications.html>]

Crowe, E. A., and R. R. Clausnitzer. 1997. Mid-montane wetland plant associations of the Malheur, Umatilla, and Wallowa-Whitman national forests. USDA Forest Service, Pacific Northwest Region. Technical Paper R6-NR-ECOL-TP-22-97.

Crowe, E., B. Kovalchik, M. J. Kerr, J. Titus, and J. S. Kagan. 2002. Riparian and wetland plant communities of eastern Oregon. Draft report. Oregon Natural Heritage Information Center, Portland, OR.

Cunningham, H. 1971. Soil-vegetation relationships of a bitterbrush-sagebrush association in northwestern Colorado. Unpublished thesis, Colorado State University, Fort Collins. 94 pp.

Current, F. B. 1984. The distribution and description of the vegetation of Battle Mountain as explained by abiotic factors. Unpublished dissertation, University of Wyoming, Laramie.

Curry, R. R. 1962. Geobotanical correlations in the alpine and subalpine regions of the Tenmile Range, Summit County, Colorado. Unpublished thesis, University of Colorado, Boulder. 133 pp.

Curtis, J. T. 1959. The vegetation of Wisconsin: An ordination of plant communities. University of Wisconsin Press, Madison. 657 pp. [reprinted in 1987]

Damm, C. 2001. A phytosociological study of Glacier National Park, Montana, U. S. A., with notes on the syntaxonomy of alpine vegetation in western North America. Dissertation from Georg - August University, Germany. 297 pp. plus appendices.

Daubenmire, R. 1952. Forest vegetation of northern Idaho and adjacent Washington, and its bearing on concepts of vegetation classification. Ecological Monographs 22(4):301-330.

Daubenmire, R. 1988. Steppe vegetation of Washington. Washington State University Cooperative Extension Service Publication EB1446. (Revised from and replaces Washington Agricultural Experiment Station Publication XT0062.) 131 pp.

Daubenmire, R. 1992. Palouse prairie. Pages 297-312 in: R. T. Coupland, editor. Natural grasslands introduction and Western Hemisphere. Ecosystems of the world, Volume 8A. Elsevier Publishing Company, Amsterdam.

Daubenmire, R. F. 1970. Steppe vegetation of Washington. Washington State University Agricultural Experiment Station Technical Bulletin No. 62. 131 pp.

Daubenmire, R. F., and J. B. Daubenmire. 1968. Forest vegetation of eastern Washington and northern Idaho. Washington State University Agricultural Experiment Station Technical Bulletin No. 60. 104 pp.

Day, T. A. 1985. Plant association and soil factors in primary succession on cinder cones in Idaho. Unpublished thesis, University of Idaho, Moscow. 62 pp.

Day, T. A., and R. G. Wright. 1985. The vegetation types of Craters of the Moon National Monument. Forestry, Wildlife, and Range Experiment Station Bulletin No. 38. University of Idaho, Moscow. 6 pp.

DeByle, N. V. 1985. Managing wildlife habitat with fire in the aspen ecosystem. Pages 73-82 in: Fire's effects on wildlife habitat-Symposium proceedings. USDA Forest Service General Technical Report INT-186. Intermountain Research Station, Ogden, UT.

DeByle, N. V. 1989. Aspen ecology and management in the western United States. Pages 11-20 in: USDA Forest Service General Technical Report.

DeByle, N. V., and R. P. Winokur, editors. 1985. Aspen: Ecology and management in the western United States. USDA Forest Service General Technical Report RM-119. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 283 pp.

DeLeuw, Cather & Company. 1977. Vegetation sampling (Glenwood Canyon). Unpublished report prepared by DeLeuw, Cather & Company, Consulting Engineers and Planners, Chicago, Illinois for Colorado Division of Highways, Glenwood Springs, CO.

DeVelice, R. L. 1983. Forest vegetation of northern New Mexico and southern Colorado. Unpublished dissertation, New Mexico State University, Las Cruces. 191 pp.

DeVelice, R. L. 1992. Classification of the plant communities of Beaverhead, Silver Bow, and Madison counties, Montana. Volume I (text). Prepared for the Montana Natural Heritage Program, Helena, MT. 35 pp.

DeVelice, R. L., J. A. Ludwig, W. H. Moir, and F. Ronco, Jr. 1986. A classification of forest habitat types of northern New Mexico and southern Colorado. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-131. Fort Collins, CO. 59 pp.

DeVelice, R. L., J. Lichthardt, and P. S. Bourgeron. 1991. A preliminary classification of the plant communities of northeastern Montana. Prepared for the Montana Natural Heritage Program. Helena, MT. 144 pp.

DeVelice, R. L., S. V. Cooper, J. T. McGarvey, J. Lichthardt, and P. S. Bourgeron. 1995. Plant communities of northeastern Montana: A first approximation. Montana Natural Heritage Program, Helena, MT. 116 pp.

DeVelice, R. L., and J. A. Ludwig. 1983a. Climax forest series of northern New Mexico and southern Colorado. Pages 45-53 in: Proceedings of the Workshop on Southwestern Habitat Types, 6-8 April 1983, Albuquerque, NM. USDA Forest Service, Southwest Region, Albuquerque, NM.

DeVelice, R. L., and P. Lesica. 1993. Plant community classification for vegetation on BLM lands, Pryor Mountains, Carbon County, Montana. Unpublished report by Montana Natural Heritage Program, Helena, MT. 78 pp.

Dealy, J. E. 1971. Habitat characteristics of the Silver Lake mule deer range. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-125. Portland, OR. 99 pp.

Del Moral, R. 1979. High elevation vegetation of the Enchantment Lakes Basin, Washington. Canadian Journal of Botany 57(10):1111-1130.

Del Moral, R., and J. N. Long. 1977. Classification of montane forest community types in the Cedar River drainage of western Washington, U.S.A. Canadian Journal of Forest Research 7(2):217-225.

Despain, D. G. 1973a. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43(3):329-354.

Despain, D. G. 1973b. Major vegetation zones of Yellowstone National Park. USDI National Park Service, Yellowstone National Park. Information Paper No. 19.

Diamond, D. D. 1993. Classification of the plant communities of Texas (series level). Unpublished document. Texas Natural Heritage Program, Austin. 25 pp.

Diaz, N. M., and T. K. Mellen. 1996. Riparian ecological types, Gifford Pinchot and Mt. Hood National Forests, and Columbia River Gorge National Scenic Area. USDA Forest Service, Pacific Northwest Region. Technical Report R6-NR-TP-10-96. 203 pp. plus appendices.

Dick-Peddie, W. A. 1993. New Mexico vegetation: Past, present, and future. University of New Mexico Press, Albuquerque. 244 pp.

Dix, R. L., and F. E. Smeins. 1967. The prairies, meadows, and marsh vegetation of Nelson County, North Dakota. Canadian Journal of Botany 45:21-58.

Dix, R. L., and J. D. Richards. 1976. Possible changes in species structure of the subalpine forest induced by increased snowpack. Pages 311-322 in: Steinhoff and Ives, editors. Ecological impacts. Final Report, San Juan Ecology Project, Colorado State University, Fort Collins, CO. Prepared for USDI Bureau of Reclamation, Division of Atmos. Water Resource Management, Denver, Colorado.

Dorn, R. D. 1969. Relations of moose, cattle and willows in southwestern Montana. Unpublished thesis, Montana State University, Bozeman. 79 pp.

Dorn, R. D. 1995. A taxonomic study of *Salix* section *Cordatae* subsection *Luteae* (Salicaceae). Brittonia 47(2):160-174.

Dorn, R. D. 1997. Rocky Mountain region willow identification field guide. Renewable Resources R2-RR-97-01. USDA Forest Service, Rocky Mountain Region, Denver, CO. 107 pp.

Douglas, G. W. 1971. An ecological survey of potential natural areas in the North Cascades National Park complex. Unpublished report prepared for Intercampus Education and Science Preserves Commission, State of Washington. 137 pp.

Douglas, G. W., and L. C. Bliss. 1977. Alpine and high subalpine plant communities of the North Cascades Range, Washington and British Columbia. Ecological Monographs 47:113-150.

Drake, J., and D. Faber-Langendoen. 1997. An alliance level classification of the vegetation of the midwestern United States. Unpublished report. The Nature Conservancy, Midwest Conservation Science Department, Minneapolis, MN.

Driscoll, R. S., D. L. Merkel, D. L. Radloff, D. E. Snyder, and J. S. Hagihara. 1984. An ecological land classification framework for the United States. USDA Forest Service. Miscellaneous Publication No. 1439. Washington, DC. 56 pp.

Durkin, P., M. Bradley, E. Muldavin, and P. Mehlhop. 1994b. A riparian/wetland vegetation community classification of New Mexico: Pecos River Basin. Unpublished report for New Mexico Environment Department Surface Water Quality Bureau.

Durkin, P., M. Bradley, E. Muldavin, and P. Mehlhop. 1995a. Riparian/wetland vegetation community classification of Rio Grande: A classification and site evaluation. Unpublished report for New Mexico Environment Department Surface Water Quality Bureau. New Mexico Natural Heritage Program, Albuquerque.

Dye, A. J., and W. H. Moir. 1977. Spruce-fir forest at its southern distribution in the Rocky Mountains, New Mexico. The American Midland Naturalist 97(1):133-146.

Dyrness, C. T., J. F. Franklin, and W. H. Moir. 1974a. A preliminary classification of forest communities in the central portion of the western Cascades of Oregon. Coniferous Forest Biome Bulletin 4:1-123.

Eddleman, L. E. 1967. A study of phyto-edaphic relationships in alpine tundra of northern Colorado. Unpublished dissertation, Colorado State University, Fort Collins. 148 pp.

Eddleman, L. E., and R. Jaindl. 1994. Great Basin National Park vegetation analysis. USDI National Park Service Technical Report NPS/PNROSU/NRTR-94/02. USDI National Park Service, Pacific Northwest Region. 110 pp.

Eggler, W. A. 1941. Primary succession on volcanic deposits in southern Idaho. Ecological Monographs 11(3):278-298.

Ellis, S. L., T. Shoemaker, and R. Sanz. 1979. Inventories of plants, birds, mammals, reptiles, and amphibians of the Unaweep Canyon Springs, Mesa County, Colorado. Unpublished report prepared for Colorado Natural Areas Program, Department of Natural Resources, Denver.

Ellison, L. 1954. Subalpine vegetation of the Wasatch Plateau, Utah. Ecological Monographs 24(2):89-104.

Elzinga, C., and R. Rosentreter. 2000. Riparian and wetland plants of the Intermountain West. Unpublished draft distributed for review by Alderspring Consulting, Tendoy, ID.

Evans, S. 1989a. Riparian survey of Washington's Columbia Basin. Unpublished report prepared for The Nature Conservancy Washington Natural Heritage Program, Olympia, Washington.

Evans, S., R. Schuller, and E. Augenstein. 1984. A report on *Castilleja leviscita* at Rocky Prairie, Thurston County, Washington. Unpublished report prepared for The Nature Conservancy. 56 pp.

Evenden, A. G. 1990. Ecology and distribution of riparian vegetation in the Trout Creek Mountains of southeastern Oregon. Ph.D. dissertation, Oregon State University, Corvallis. 156 pp.

Eyre, F. H., editor. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, DC. 148 pp.

Faber-Langendoen, D., and Midwest State Natural Heritage Program Ecologists. 1996. Terrestrial vegetation of the midwest United States. International classification of ecological communities: Terrestrial vegetation of the United States. The Nature Conservancy, Arlington, VA.

Faber-Langendoen, D., editor. 2001. Plant communities of the Midwest: Classification in an ecological context. Association for Biodiversity Information, Arlington, VA. 61 pp. plus appendix (705 pp.).

Ferchau, H. A. 1973. Vegetation inventory analysis & impact study of the Parachute Creek area, Garfield County, Colorado. Part II, Volume 1, Chapter VI:1-77 in: Unpublished Colony Environmental Report for Colony Develop. Operation, Denver, prepared by Thorne Ecological Institute, Boulder.

Fike, J. 1999. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Natural Diversity Inventory. Pennsylvania Department of Conservation and Recreation. Bureau of Forestry. Harrisburg, PA. 86 pp.

Fischer, W. C., and A. F. Bradley. 1987. Fire ecology of western Montana forest habitat types. USDA Forest Service General Technical Report INT-223. Intermountain Research Station, Ogden, UT. 95 pp.

Fischer, W. C., and B. D. Clayton. 1983. Fire ecology of Montana forest habitat types east of the Continental Divide. USDA Forest Service, Intermountain Forest Range Experiment Station. General Technical Report INT-141. Ogden, UT. 83 pp.

Fisser, H. G. 1962. An ecological study of the *Artemisia tripartita* subsp. *rupicola* and related shrub communities in Wyoming. Unpublished dissertation, University of Wyoming, Laramie.

Fisser, H. G. 1964. Range survey in Wyoming's Big Horn Basin of Wyoming. Wyoming Agricultural Experiment Station Bulletin 424.

Fisser, H. G., J. R. Wight, J. R. Flesland, and L. D. Robinson. 1965. *Halogeton* research, 1964 results. University of Wyoming Cooperative Research Report to the USDI Bureau of Land Management, Sections I-VI. Wyoming Agricultural Experiment Station. Mimeographed Circular pages 1-82. University of Wyoming, Laramie.

Fitzhugh, E. L., W. H. Moir, J. A. Ludwig, and F. Ronco, Jr. 1987. Forest habitat types in the Apache, Gila, and part of the Cibola national forests. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-145. Fort Collins, CO. 116 pp.

Flowers, S. 1962. Vegetation of Morrow Point and Blue Mesa Reservoir basins of the upper Gunnison River, Colorado. Pages 47-102 in: A. M. Woodbury, editor. Ecological studies of the flora and fauna of the Curecanti Reservoir Basins, western Colorado. University of Utah, Anthropological Papers No. 59 (Upper Colo. Series No. 8).

Fonda, R. W., and J. A. Bernardi. 1976. Vegetation of Sucia Island in Puget Sound, Washington. Bulletin of the Torrey Botanical Club 103(3):99-109.

Fonda, R. W., and L. C. Bliss. 1969. Forest vegetation of the mountain and subalpine zones, Olympic Mountains, Washington. Ecological Monographs 39(3):271-301.

Francis, R. E. 1983. Sagebrush-steppe habitat types in northern Colorado: A first approximation. Pages 67-71 in: Proceedings of the Workshop on Southwestern habitat types. USDA Forest Service, Southwestern Region, Albuquerque, NM.

Franklin, J. F. 1966. Vegetation and soils in the subalpine forests of the southern Washington Cascade range. Unpublished dissertation, Washington State University, Pullman. 132 pp.

Franklin, J. F., W. H. Moir, M. A. Hemstrom, S. E. Greene, and B. G. Smith. 1988. The forest communities of Mount Rainier National Park. USDI National Park Service. Scientific Monograph Series 19. Washington, DC. 194 pp.

Franklin, J. F., W. H. Moir, M. A. Hemstrom, and S. Greene. 1979. Forest ecosystems of Mount Rainier National Park. Unpublished report prepared for the USDI National Park Service.

Franklin, J. F., and C. T. Dyrness. 1969. Vegetation of Oregon and Washington. USDA Forest Service Research Paper PNW-80. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 216 pp.

Franklin, J. F., and C. T. Dyrness. 1973. Natural vegetation of Oregon and Washington. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-8. Portland, OR. 417 pp.

Freeman, C. E., and W. A. Dick-Peddie. 1970. Woody riparian vegetation in the Black and Sacramento Mountain ranges, southern New Mexico. The Southwestern Naturalist 15(2):145-164.

Fritz, R. J. 1981. Alpine vegetational patterns around isolated tree islands on the eastern and western slopes of the Tenmile Range, Summit County, Colorado. Unpublished thesis, University of Colorado, Boulder, CO. 233 pp.

Galatowitsch, S., and P. S. Bourgeron. 1985. Colorado plant association classification draft. Unpublished report prepared for The Nature Conservancy, Rocky Mountain Heritage Task Force, Lakewood, CO. 49 pp.

Ganskopp, D. C. 1979. Plant communities and habitat types of the Meadow Creek Experimental Watershed. Unpublished thesis, Oregon State University, Corvallis. 162 pp.

Giese, T. G. 1975. The ecology of the Middle Blue River Valley, Summit County, Colorado, with an analysis of modifications due to powerline construction. Unpublished thesis, University of Colorado, Boulder. 109 pp.

Girard, M. M., H. Goetz, and A. J. Bjugstad. 1989. Native woodland habitat types of southwestern North Dakota. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-281. Fort Collins, CO. 36 pp.

Girard, M., D. L. Wheeler, and S. B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. R2-RR-97-02. USDA Forest Service, Rocky Mountain Region, Sheridan, WY. 308 pp.

Gleason, H. A., and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, NY. 910 pp.

Goodrich, S., E. D. MacArthur, and A. Winward. 1985. A new combination and a new variety in *Artemisia tridentata*. Great Basin Naturalist 45:99-104.

Graybosch, R. A., and H. Buchanan. 1983. Vegetative types and endemic plants of the Bryce Canyon Breaks. Great Basin Naturalist 43:701-712.

Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence. 1402 pp.

Green, R. N., and K. Klinka. 1994. A field guide to site interpretation for the Vancouver Forest Region. British Columbia Ministry of Forests. ISSN 0229-1622 Land Management Handbook 28. 285 pp.

Gregory, S. 1983. Subalpine forb community types of the Bridger-Teton National Forest, Wyoming. Unpublished completion report #36 for USDA Forest Service Cooperative Education Agreement (contract 40-8555-3-115). Bozeman, MT 63 pp.

Grossman, D. H., K. Lemon Goodin, and C. L. Reuss, editors. 1994. Rare plant communities of the conterminous United States: An initial survey. The Nature Conservancy. Arlington, VA. 620 pp.

Habeck, J. R. 1969. A gradient analysis of a timberline zone at Logan Pass, Glacier Park, Montana. Northwest Science 43(2):65-73.

Habeck, J. R., and C. M. Choate. 1963. An analysis of krummholz communities at Logan Pass, Glacier National Park. Northwest Science 37:165-166.

Hall, F. C. 1973. Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington. USDA Forest Service, Pacific Northwest Region. R6 Area Guide 3-1. 62 pp.

Hall, H. H. 1971. Ecology of a subalpine meadow of the Aquarius Plateau, Garfield and Wayne counties, Utah. Unpublished dissertation, Brigham Young University, Provo, UT.

Hall, J. B., and P. L. Hansen. 1997. A preliminary riparian habitat type classification system for the Bureau of Land Management districts in southern and eastern Idaho. Riparian and Wetland Research Program, School of Forestry, University of Montana. Idaho Bureau of Land Management, Technical Bulletin No. 97-11. 381 pp.

Hallock, D., N. Lederer, and M. Figgs. 1986. Ecology, status and avifauna of willow carrs in Boulder County. Boulder County Nature Association Publication No. 4. Boulder, CO. 38 pp.

Halpern, C. B. 1986. Montane meadow plant associations of Sequoia National Park, CA. Madrono 33:1-23.

Hamann, M. J. 1972. Vegetation of alpine and subalpine meadows of Mount Rainier National Park, Washington. Unpublished thesis, Washington State University, Pullman. 120 pp.

Hammerson, G. A. 1979. Structure and reproduction of "tree island" populations of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) in the lower alpine tundra of Colorado. Journal of the Colorado-Wyoming Academy of Science 11(1):23-24 (Abstract).

Hansen, H. P. 1942. Post-Mount Mazama forest succession on the east slope of the central Cascades of Oregon. The American Midland Naturalist 47:523-534.

Hansen, M., J. Coles, K. A. Thomas, D. Cogan, M. Reid, J. Von Loh, and K. Schulz. 2004c. USGS-NPS Vegetation Mapping Program: Sunset Crater National Monument, Arizona, vegetation classification and distribution. U.S. Geological Survey Technical Report. Southwest Biological Science Center, Flagstaff, AZ.

Hansen, P. L. 1985. An ecological study of the vegetation of the Grand River/Cedar River, Sioux, and Ashland districts of the Custer National Forest. Unpublished dissertation, South Dakota State University. 257 pp.

Hansen, P. L., G. R. Hoffman, and G. A. Steinauer. 1985. Upland forest and woodland habitat types of the Missouri Plateau, Great Plains Province. Pages 15-26 in: D. L. Noble and R. P. Winokur, editors. Wooded draws: Characteristics and values for the northern Great Plains. Proceedings of the symposium; 1984 June 12-13. South Dakota School of Mines and Technology, Rapid City, SD.

Hansen, P. L., K. Bogs, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in central and eastern Montana. Draft version 2. Montana Riparian Association, Montana Forest and Conservation Experiment Station, School of Forestry. University of Montana, Missoula, MT. 279 pp.

Hansen, P. L., R. D. Pfister, K. Boggs, B. J. Cook, J. Joy, and D. K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Miscellaneous Publication No. 54. 646 pp. + posters.

Hansen, P. L., S. W. Chadde, and R. D. Pfister. 1988b. Riparian dominance types of Montana. University of Montana Miscellaneous Publication 49. Montana Forest and Conservation Experiment Station, Missoula. 411 pp.

Hansen, P. L., and G. R. Hoffman. 1988. The vegetation of the Grand River/Cedar River, Sioux, and Ashland districts of the Custer National Forest: A habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-157. Fort Collins, CO. 68 pp.

Hansen, P. L., and J. B. Hall. 2002. Classification and management of the USDI Bureau of Land Management's riparian and wetland sites in eastern and southern Idaho. Unpublished draft prepared for the Upper Snake River District, Bureau of Land Management, by Bitterroot Restoration, Inc., Corvallis, MT.

Hansen, P., K. Boggs, and R. Pfister. 1991. Classification and management of riparian and wetland sites in Montana. Unpublished draft version prepared for Montana Riparian Association, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula. 478 pp.

Hansen, P., R. Pfister, J. Joy, D. Svoboda, K. Boggs, L. Myers, S. Chadde, and J. Pierce. 1989. Classification and management of riparian sites in southwestern Montana. Unpublished draft prepared for the Montana Riparian Association, School of Forestry, University of Montana, Missoula. 292 pp.

Hansen, P., S. Chadde, R. Pfister, J. Joy, D. Svoboda, J. Pierce, and L. Myers. 1988a. Riparian site types, habitat types, and community types of southwestern Montana. Draft Version 1. Montana Riparian Association, Missoula.

Harrington, F. A., Jr. 1978. Ecological segregation of ungulates in alpine and subalpine communities. Unpublished dissertation, Colorado State University, Fort Collins. 142 pp.

Harris, A. G., S. C. McMurray, P. W. C. Uhlig, J. K. Jeglum, R. F. Foster, and G. D. Racey. 1996. Field guide to the wetland ecosystem classification for northwestern Ontario. Ontario Ministry of Natural Resources, Northwest Science and Technology, Thunder Bay, Ontario. Field guide FG-01. 74 pp. plus appendix.

Hartman, E. L., and M. L. Rottman. 1988. The vegetation and alpine vascular flora of the Sawatch Range, Colorado. Madrono 35(3):202-225.

Harvey, S. J. 1980. The potential and current vegetation of the Sun River Game Range. Montana Department of Fish, Wildlife and Parks. Helena, MT. 85 pp.

Heifner, M. A. 1974. Ecological studies in Colorado alpine willow marshes. Unpublished thesis, Colorado State University, Fort Collins. 66 pp.

Heinze, D. H., R. E. Eckert, and P. T. Tueller. 1962. The vegetation and soils of the Steptoe Watershed. Unpublished report prepared for the USDI Bureau of Land Management. 40 pp.

Hemstrom, M. A., S. E. Logan, and W. Pavlat. 1987. Plant association and management guide, Willamette National Forest. USDA Forest Service Report R6-Ecol 257-B-86. Pacific Northwest Region, Portland, OR. 312 pp.

Henderson, J. A. 1981. Preliminary plant associations and habitat types of the White River District, Mt. Baker-Snoqualmie National Forest. Unpublished report prepared for USDA Forest Service, Pacific Northwest Region. 40 pp.

Henderson, J. A., D. A. Peter, R. Lesher, and D. C. Shaw. 1989. Forested plant associations of the Olympic National Forest. USDA Forest Service, Pacific Northwest Region. R6-ECOL-TP-001-88. Portland, OR. 502 pp.

Henderson, J. A., D. A. Peter, R. Lesher, and D. C. Shaw. 1992. Field guide to forested plant associations of the Mt. Baker-Snoqualmie National Forest. USDA Forest Service Technical Paper R6-ECOL-TP-028-91. Pacific Northwest Region. 196 pp.

Henderson, J. A., D. A. Peter, and R. Lesher. 1985. Preliminary plant associations and habitat types of the Mt. Baker Ranger District, Mt. Baker-Snoqualmie National Forest. Unpublished report for USDA Forest Service, Pacific Northwest Region. 74 pp.

Henderson, J. A., D. A. Peter, and R. Lesher. 1986. Preliminary plant associations of the Olympic National Forest. USDA Forest Service, Pacific Northwest Region. 136 pp.

Henderson, J. A., R. L. Mauk, D. L. Anderson, R. Ketchie, P. Lawton, S. Simon, R. H. Sperger, R. W. Young, and A. Youngblood. 1976. Preliminary forest habitat-types of northwestern Utah and adjacent Idaho. A report for the Department of Forestry and Outdoor Recreation, Utah State University, Logan. 99 pp.

Henderson, J. A., S. A. Simon, and S. B. Hartvigsen. 1977. Plant community types and habitat types of the Price District Manti-La Sal National Forest. Unpublished report prepared for Utah State University, Department of Forestry and Outdoor Recreation, Logan.

Hendrickson, D. A., and W. L. Minckley. 1984. Cienegas - Vanishing climax communities of the American Southwest. Desert Plants 6(3):131-175.

Hermann, F. J. 1970. Manual of the Carices of the Rocky Mountains and Colorado Basin. Agriculture Handbook No. 374. USDA Forest Service, Washington, DC. 397 pp.

Hess, K. 1981. Phyto-edaphic study of habitat types of the Arapaho-Roosevelt National Forest, Colorado. Unpublished dissertation, Colorado State University, Fort Collins. 558 pp.

Hess, K., and C. H. Wasser. 1982. Grassland, shrubland, and forest habitat types of the White River-Arapaho National Forest. Unpublished final report 53-82 FT-1-19. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 335 pp.

Hess, K., and R. R. Alexander. 1986. Forest vegetation of the Arapaho and Roosevelt national forests in northcentral Colorado: A habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-266. Fort Collins, CO. 48 pp.

Hickman, J. C. 1993. The Jepson Manual: Higher plants of California. University of California Press, Ltd., Berkeley, CA. 1400 pp.

Hironaka, M. 1978. Basic synecological relationships of the Columbia River sagebrush type. University of Idaho, Forest Wildlife and Range Experiment Station Contribution Number 124:27-31.

Hironaka, M., M. A. Fosberg, and A. H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Forestry, Wildlife, and Range Experiment Station Bulletin No. 15, University of Idaho, Moscow. 44 pp.

Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson. 1964. Vascular plants of the Pacific Northwest. Part 2: Salicaeae to Saxifragaceae. University of Washington Press, Seattle. 597 pp.

Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson. 1977a. Vascular plants of the Pacific Northwest. Part 1: Vascular Cryptogams, Gymnosperms, and Monocotyledons. University of Washington Press, Seattle. 914 pp.

Hoffman, G. R., and R. R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: A habitat type classification. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 38 pp.

Hoffman, G. R., and R. R. Alexander. 1980. Forest vegetation of the Routt National Forest in northwestern Colorado: A habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-221. Fort Collins, CO. 41 pp.

Hoffman, G. R., and R. R. Alexander. 1983. Forest vegetation of the White River National Forest in western Colorado: A habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-249. Fort Collins, CO. 36 pp.

Hoffman, G. R., and R. R. Alexander. 1987. Forest vegetation of the Black Hills National Forest of South Dakota and Wyoming: A habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-276. Fort Collins, CO. 48 pp.

Holland, R. F. 1986b. Preliminary descriptions of the terrestrial natural communities of California. Unpublished report prepared for the California Department of Fish and Game, Nongame-Heritage Program and Natural Diversity Database, Sacramento. 156 pp.

Holmstead, G. 2001. Vegetation of the Snake River corridor in Hells Canyon-Weiser, Idaho to the Salmon River. Technical Report Appendix E.3.3-1 prepared for FERC License No. 1971, Hells Canyon Complex by Idaho Power Company, Boise, ID. 49 pp. plus appendices.

Holway, J. G. 1960. Phenological observations on the major alpine species in the vicinity of False Mummy Pass, Rocky Mountain National Park, Colorado. Unpublished thesis, Colorado State University, Fort Collins. 84 pp.

Holway, J. G. 1962a. Phenology of Colorado alpine plants. Unpublished dissertation, Colorado State University, Fort Collins. 154 pp.

Holway, J. G., and R. T. Ward. 1963. Snow and meltwater effects in an area of Colorado alpine. The American Midland Naturalist 69(1):189-197.

Hopkins, W. E. 1979a. Plant associations of the Fremont National Forest. USDA Forest Service Technical Report R6-ECOL-79-004. Pacific Northwest Region, Portland.

Horton, L. E. 1971. Vegetation and ecological relationships, west slope of the Teton study area, Targhee National Forest. USDA Forest Service, Intermountain Region. Unpublished mimeographed report. 50 pp. plus appendices.

Huckaby, L. S., and W. H. Moir 1998. Forest communities at Fraser Experimental Forest. Southwestern Naturalist 43(2):204-218.

Hull, A. C., Jr., and M. K. Hull. 1974. Presettlement vegetation of Cache Valley, Utah and Idaho. Journal of Range Management 27(1):27-29.

Hurd, R. M. 1961. Grassland vegetation in the Big Horn Mountains, Wyoming. Ecology 42(3):459-467.

Hyde, R. M. 1964. Vegetation in Sunlight Basin, Park County, Wyoming. Unpublished dissertation, University of Wyoming, Laramie.

IDCDC [Idaho Conservation Data Center]. 2002. Unpublished riparian and wetland association occurrence and plot data on file at the Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

IDCDC [Idaho Conservation Data Center]. 2005. Wetland and riparian plant associations in Idaho. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise. [http://fishandgame.idaho.gov/tech/CDC/ecology/wetland_riparian_assoc.cfm] (accessed 14 June 2005).

Ives, J. D. 1978. Remarks on the stability of timberline. Pages 313-317 in: C. Troll and W. Lauer, editors. Geoecological relations between the Southern Temperate Zone and the tropical mountains. Franz Steiner Verlag GMBH, Wiesbaden.

Jankovsky-Jones, M., C. J. Murphy, and C. L. Coulter. 2001. Riparian and wetland plant associations of southwestern Idaho in the Lower Snake River District, Bureau of Land Management. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise.

Jenny, H., R. J. Arkley, and A. M. Schultz. 1969. The pygmy forest-podsol ecosystem and its dune associates of the Mendocino coast. Madrono 20:60-74.

Jensen, M. E., L. S. Peck, and M. V. Wilson. 1988a. A sagebrush community type classification for mountainous northeastern Nevada rangelands. Great Basin Naturalist 48(4):422-433.

Jensen, M. E., L. S. Peck, and M. V. Wilson. 1988b. Vegetation characteristics of mountainous northeastern Nevada sagebrush community types. The Great Basin Naturalist 48(4):403-421.

Jensen, S. E. 1990. Wetlands delineation, Moose Meadow Ranch, Fremont County, Idaho. White Horse Associates, Smithfield, UT. 17 pp.

Jensen, S. E., and J. S. Tuhy. 1981. Soils investigation of riparian communities of East Smiths Fork and Henrys Fork drainages, North Slope Uinta Mountains, Utah. Unpublished report presented to USDA Forest Service, Ogden, UT. 35 pp.

Johnson, A. W. 1956b. Ecology of subalpine forest communities in the Silver Lake Valley of the Front Range in Colorado. Unpublished dissertation, University of Colorado, Boulder. 121 pp.

Johnson, C. G., Jr. 1981a. Final report - Research Natural Area program - inventory phase area 3. 83 pp.

Johnson, C. G., Jr. 1985a. Plant associations of Hells Canyon National Recreation Area. USDA Forest Service Pacific Northwest Region.

Johnson, C. G., Jr., and S. A. Simon. 1987. Plant associations of the Wallowa-Snake Province Wallowa-Whitman National Forest. USDA Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. Technical Paper R6-ECOL-TP-255A-86. 399 pp. plus appendices.

Johnson, C. G., and R. R. Clausnitzer. 1992. Plant associations of the Blue and Ochoco Mountains. USDA Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest R6-ERW-TP-036-92. 163 pp. plus appendices.

Johnson, C. G., and S. A. Simon. 1985. Plant associations of the Wallowa Valley Ranger District, Part II: Steppe. USDA Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. 258 pp.

Johnson, F. D. 1968. Taxonomy and distribution of northwestern alders. Pages 9-22 in: J. M. Trappe, J. F. Franklin, R. F. Tarrant, and G. M. Hansen, editors. Biology of Alder. Pacific Northwest Forest and Range Experimental Station, Portland, OR.

Johnson, K. L. 1970a. Alpine vegetation and soils of Mesa Seco Plateau, San Juan Mountains, Colorado. Unpublished dissertation, University of Illinois, Urbana. 217 pp.

Johnson, K. R. 1932a. Plant ecology of a glacial lake. Journal of the Colorado-Wyoming Academy of Science 1(4):13 (Abstract).

Johnson, K. R. 1932b. Ecology of a glacial lake in central Colorado. Unpublished thesis, University of Colorado, Boulder. 30 pp.

Johnson, K. R. 1936. Ecology of a glacial lake in central Colorado. University of Colorado Studies 23(3):235-243.

Johnson, K. R. 1939. Plant ecology of northwestern Colorado lakes and surrounding areas. Unpublished dissertation, University of Colorado, Boulder. 138 pp.

Johnson, W. M. 1956a. The effect of grazing intensity on plant composition, vigor, and growth of pine-bunchgrass ranges in central Colorado. Ecology 37:790-798.

Johnson, W. M. 1961b. The ecology of alpine and subalpine ranges in Wyoming as related to use by big game and domestic sheep. Unpublished dissertation, University of Wyoming, Laramie.

Johnston, B. C. 1984. Plant associations of Region Two. Edition 3.5. USDA Forest Service, Rocky Mountain Region. Lakewood, CO.

Johnston, B. C. 1987. Plant associations of Region Two: Potential plant communities of Wyoming, South Dakota, Nebraska, Colorado, and Kansas. R2-ECOL-87-2. USDA Forest Service, Rocky Mountain Region. Lakewood, CO. 429 pp.

Johnston, B. C., and L. Hendzel. 1985. Examples of aspen treatment, succession and management in western Colorado. USDA Forest Service, Range Wildlife Fisheries and Ecology. Denver, CO. 164 pp.

Jones, G. 1992b. Wyoming plant community classification (Draft). Wyoming Natural Diversity Database, Laramie, WY. 183 pp.

Jones, G. P. 1989b. Survey of plant species and communities of interest in the Beaver Rim Area of Critical Environmental Concern. Report submitted to the Bureau of Land Management, Rawlins District Office, under Work Effort No. WY030-09-4352-06-2512. Wyoming Natural Diversity Database, Laramie, WY.

Jones, G. P. 1999. Ecological evaluation of the potential Roaring Fork Mountiain Research Natural Area within the Shoshone National Forest, Fremont County, Wyoming. Prepared for the Shoshone National Forest, USDA Forest Service by the Wyoming Natural Diversity Database. 47 pp.

Jones, G. P., and G. M. Walford. 1995. Major riparian vegetation types of eastern Wyoming. Submitted to Wyoming Department of Environmental Quality, Water Quality Division. Wyoming Natural Diversity Database, Laramie, WY. 245 pp.

Jones, G. P., and W. Fertig. 1998a. Ecological evaluation of the Mann Creek potential Research Natural Area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database. 91 pp.

Jones, G. P., and W. Fertig. 1999d. Ecological evaluation of the potential Lake Creek Research Natural Area within the Shoshone National Forest, Park County, Wyoming. Prepared for the Shoshone National Forest, USDA Forest Service by the Wyoming Natural Diversity Database. 46 pp.

Jones, G., and S. Ogle. 2000. Characterization abstracts for vegetation types on the Bighorn, Medicine Bow, and Shoshone national forests. Prepared for USDA Forest Service, Region 2 by the Wyoming Natural Diversity Database, University of Wyoming.

Kagan, J. 1997. Draft of Oregon and Washington vegetation report. Oregon Natural Heritage Program, Portland.

Kagan, J. S., J. A. Christy, M. P. Murray, and J. A. Titus. 2000. Classification of native vegetation of Oregon. Oregon Natural Heritage Program, Portland. 63 pp.

Kagan, J. S., J. A. Christy, M. P. Murray, and J. A. Titus. 2004. Classification of native vegetation of Oregon. January 2004. Oregon Natural Heritage Information Center, Portland. 52 pp.

Kartesz, J. T. 1994a. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. Second edition. Volume 1--Checklist. Timber Press, Portland, OR. 622 pp.

Kartesz, J. T. 1999. A synonymized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. First edition. In: J. T. Kartesz and C. A. Meacham. Synthesis of the North American Flora, Version 1.0. North Carolina Botanical Garden, Chapel Hill, NC.

Kauffman, J. B. 1982. Synecological effects of cattle grazing riparian ecosystems. Unpublished thesis, Oregon State University, Corvallis. 283 pp.

Kauffman, J. B., W. C. Krueger, and M. Vavra. 1985. Ecology and plant communities of the riparian area associated with Catherine Creek in northeastern Oregon. Technical Bulletin 147. Eastern Oregon Agricultural Experiment Station, Oregon State University, Corvallis. 35 pp.

Keammerer, W. R. 1974a. Vegetation of the Grand Valley area. Pages 73-117 in: Ecological inventory of the Grand Valley area Unpublished report prepared for the Colony Development Operation, Atlantic Richfield Company, Denver, CO.

Keammerer, W. R. 1974b. Vegetation of Parachute Creek Valley. Pages 4-91 in: Environmental inventory and impact analysis of a proposed utilities corridor in Parachute Creek Valley, Co. Unpublished report prepared for Colony Development Operation, Denver, Colo.

Keammerer, W. R., and R. E. Stoecker. 1975. Vegetation and wildlife studies along proposed corridors for oil shale tract C-b. Unpublished report prepared for Shell Oil Co., Denver, by Stoecker-Keammerer and Associates, Boulder, CO. 86 pp.

Keammerer, W. R., and R. E. Stoecker. 1980. Vegetation and wildlife studies for the Mount Emmons project. Unpublished report prepared for AMAX Environmental Services, Inc., by Stoecker-Keammerer and Associates, Ecological Consultants, Boulder, CO. 3 volumes.

Keammerer, W. R., and S. J. Peterson. 1981. Vegetation studies on the Naval Oil Shale Reserve. Unpublished report prepared for TRW Energy Systems Group, McLean, Virginia, by Stoecker-Keammerer and Associates, Ecological Consultants, Boulder, CO. 77 pp.

Kearney, T. H., and R. H. Peebles, and collaborators. 1969. Arizona flora. University of California, Berkeley, CA. 1085 pp.

Keeler-Wolf. T., and X. Thomas. 2000. Draft descriptions of vegetation alliances for the Mojave Ecosystem Mapping project. California Natural Diversity Database. California Department of Fish and Game.

Kerr, C. W., and J. A. Henderson. 1979. Upland vegetation classification and map for a test area, Manti-La Sal National Forest. Appendix Report 15 in: J. A. Henderson, L. S. Davis, and E. M. Ryberg, editors. ECOSYM: A classification and information system for wildlife resource management. Utah State University, Logan. 53 pp.

Kettler, S., and A. McMullen. 1996. Routt National Forest riparian vegetation classification. Report prepared for Routt National Forest by the Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Kiener, W. 1939. Sociological studies of the alpine vegetation on Long's Peak. Unpublished dissertation, University of Nebraska, Lincoln.

Kiener, W. 1967. Sociological studies of the alpine vegetation on Longs Peak. University of Nebraska Studies: New Series 34. University of Nebraska, Lincoln, NE.

Kittel, G. M. 1994. Montane vegetation in relation to elevation and geomorphology along the Cache la Poudre River, Colorado. Unpublished thesis, University of Wyoming, Laramie.

Kittel, G. M., and N. D. Lederer. 1993. A preliminary classification of the riparian vegetation of the Yampa and San Miguel/Dolores river basins. Unpublished report prepared for Colorado Department of Health and the Environmental Protection Agency by The Nature Conservancy, Colorado Field Office, Boulder.

Kittel, G., E. Van Wie, M. Damm, R. Rondeau, S. Kettler, A. McMullen, and J. Sanderson. 1999b. A classification of riparian and wetland plant associations of Colorado: A user's guide to the classification project. Colorado Natural Heritage Program, Colorado State University, Fort Collins CO. 70 pp. plus appendices.

Kittel, G., E. Van Wie, M. Damm, R. Rondeau, S. Kettler, and J. Sanderson. 1999a. A classification of the riparian plant associations of the Rio Grande and Closed Basin watersheds, Colorado. Unpublished report prepared by the Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Kittel, G., E. Van Wie, and M. Damm. 1997a. A classification of the riparian vegetation of the South Platte Basin (and part of Republican River Basin), Colorado. Submitted to Colorado Department of Natural Resources and the Environmental Protection Agency, Region VIII. Prepared by Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Kittel, G., E. Van Wie, and M. Damm. 1997b. Populus deltoides ssp. monilifera / Symphoricarpos occidentalis Community Characterization Abstract-Subnational Basic, draft March 12, 1997. Colorado Natural Heritage Program, Fort Collins, CO.

Kittel, G., R. Rondeau, N. Lederer, and D. Randolph. 1994. A classification of the riparian vegetation of the White and Colorado River basins, Colorado. Final report submitted to Colorado Department of Natural Resources and the Environmental Protection Agency. Colorado Natural Heritage Program, Boulder. 166 pp.

Kittel, G., R. Rondeau, and A. McMullen. 1996. A classification of the riparian vegetation of the Lower South Platte and parts of the Upper Arkansas River basins, Colorado. Submitted to Colorado Department of Natural Resources and the Environmental Protection Agency, Region VIII. Prepared by Colorado Natural Heritage Program, Fort Collins. 243 pp.

Kittel, G., R. Rondeau, and S. Kettler. 1995. A classification of the riparian vegetation of the Gunnison River Basin, Colorado. Submitted to Colorado Department of Natural Resources and the Environmental Protection Agency. Prepared by Colorado Natural Heritage Program, Fort Collins. 114 pp.

Kleiner, E. F. 1968. Comparative study of grasslands of Canyonlands National Park. Unpublished dissertation, University of Utah, Salt Lake City. 58 pp.

Klish, M. W. 1977. The vegetation of Summit County, Colorado Unpublished thesis, Colorado State University, Fort Collins. 103 pp.

Knight, D. H. 1994. Mountains and plains: Ecology of Wyoming landscapes. Yale University Press, New Haven, MA. 338 pp.

Komarkova, V. 1976. Alpine vegetation of the Indian Peaks Area, Front Range, Colorado Rocky Mountains. Unpublished dissertation, University of Colorado, Boulder. 655 pp.

Komarkova, V. 1979. Alpine vegetation of the Indian Peaks area, Front Range, Colorado Rocky Mountains. Flora et vegetatio mundi 7, R. Tuxen, editor, 2 volumes, Vaduz: J. Cramer. 591 pp.

Komarkova, V. 1982. Habitat types on selected parts of the Gunnison and Uncompahgre national forests, first approximation. Unpublished progress report Number 2 to USDA Forest Service, Rocky Mountain Region, Lakewood, CO. 206 pp.

Komarkova, V. 1986. Habitat types on selected parts of the Gunnison and Uncompahgre national forests. Unpublished final report prepared for USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 270 pp. plus appendices.

Komarkova, V. K., R. R. Alexander, and B. C. Johnston. 1988b. Forest vegetation of the Gunnison and parts of the Uncompahgre national forests: A preliminary habitat type classification. USDA Forest Service. Research Paper RM-163. 65 pp.

Komarkova, V., A. Peters, G. Kamani, W. Jones, V. Howard, H. Gordon, and K. Southwick. 1988a. Natural recovery of plant communities on disturbance plots and history of land use in the Niwot Ridge/Green Lakes Valley, Front Range, Colorado. University of Colorado Longterm Ecological Research Working Paper 88/1. Boulder, CO. 46 pp.

Komarkova, V., and P. J. Webber. 1978. An alpine vegetation map of Niwot Ridge, Colorado. Arctic and Alpine Research 10:1-29.

Kovalchik, B. L. 1987. Riparian zone associations - Deschutes, Ochoco, Fremont, and Winema national forests. USDA Forest Service Technical Paper 279-87. Pacific Northwest Region, Portland, OR. 171 pp.

Kovalchik, B. L. 1993. Riparian plant associations on the national forests of eastern Washington - Draft version 1. USDA Forest Service, Colville National Forest, Colville, WA. 203 pp.

Kovalchik, B. L. 2001. Classification and management of aquatic, riparian and wetland sites on the national forests of eastern Washington. Part 1: The series descriptions. 429 pp. plus appendix. [http://www.reo.gov/col/wetland_classification/wetland_classification.pdf]

Kovalchik, B. L., and W. Elmore. 1992. Effects of cattle grazing systems on willow-dominated plant associations in central Oregon. In: W.P. Clary, E.D. McArthur, D. Bedunah, and C.L. Wambolt, compilers. Proceedings-Symposium on Ecology and Management of Riparian Shrub Communities, May 29-31, 1991, Sun Valley, ID. USDA Forest Service General Technical Report INT-289. Intermountain Forest and Range Experiment Station. Ogden, UT. 232 pp.

Krajina, V. J. 1969. Ecology of western North America. Volume II. Illustrated, University of British Columbia, Department of Botany.

Kuchler, A. W. 1964. Potential natural vegetation of the conterminous United States. American Geographic Society Special Publication 36. New York, NY. 116 pp.

Kumler, M. L. 1969. Plant succession on the sand dunes of the Oregon coast. Ecology 50:695-704.

Kunze, L. M. 1994. Preliminary classification of native, low elevation, freshwater wetland vegetation in western Washington. Washington State Department of Natural Resources, Natural Heritage Program. 120 pp.

Lang, F. A. 1961. A study of vegetation change on the gravelly prairies of Pierce and Thurston counties, western Washington. Unpublished thesis, University of Washington, Seattle. 109 pp.

Langenheim, J. H. 1962. Vegetation and environmental patterns in the Crested Butte area, Gunnison County, Colorado. Ecological Monographs 32:249-285.

Lanner, R. M., and S. B. Vander Wall. 1980. Dispersal of limber pine seed by Clark's nutcracker. Journal of Forestry 78(10):637-639.

Larson, M., and W. H. Moir. 1986. Forest and woodland habitat types (plant associations) of southern New Mexico and central Arizona (north of the Mogollon Rim). USDA Forest Service, Southwestern Region, Albuquerque, NM. 76 pp.

Larson, M., and W. H. Moir. 1987. Forest and woodland habitat types of northern New Mexico and northern Arizona. Edition 2. USDA Forest Service, Southwestern Region, Albuquerque, NM.

Laurenzi, A. W., R. D. Ohmart, and N. C. Hink. 1983. Classification of mixed broadleaf riparian forests in Tonto National Forest. Pages 72-81 in: Proceedings of the workshop on Southwestern habitat types. USDA Forest Service, Southwestern Region.

Lee, L. C., and C. J. Jonkel. 1980. The vegetation structure and ecology of grizzly bear habitat in the Pine and Antelope Butte Wetlands, Montana. Unpublished Border Grizzly Project Special Report 36. University of Montana, Missoula. 63 pp.

Lesica, P. 1982. Vegetation of the wetland and riparian areas of Pine Butte Preserve, Teton County, Montana. Unpublished report prepared for The Nature Conservancy, Helena, MT. 50 pp.

Lesica, P., and R. L. DeVelice. 1992. Plant communities of the Pryor Mountains. Preliminary report prepared by the Montana Natural Heritage Program, Helena, MT.

Lewis, M. E. 1970. Alpine rangelands of the Uinta Mountains, Ashley and Wasatch national forests, Region 4 of the USDA Forest Service. Unpublished report mimeographed for USDA Forest Service, Region IV, Ogden, UT. 75 pp.

Lewis, M. E. 1971. Flora and major plant communities of the Ruby-East Humboldt Mountains with special emphasis on Lamoille Canyon. Unpublished report compiled for USDA Forest Service, Region IV, Ogden, UT. 62 pp.

Lewis, M. E. 1975a. Plant communities of the Jarbidge Mountain Complex, Humboldt National Forest. Unpublished report compiled for USDA Forest Service, Region IV, Ogden, UT. 22 pp.

Lillybridge, T. R., B. L. Kovalchik, C. K. Williams, and B. G. Smith. 1995. Field guide for forested plant associations of the Wenatchee National Forest. USDA Forest Service General Technical Report PNW-GTR-359, Pacific Northwest Research Station, Portland. Portland, OR. 335 pp.

Looman, J. 1981a. The vegetation of the Canadian prairie provinces. III. Aquatic and semi-aquatic vegetation. Phytocoenologia 9(4):473-497.

Looman, J. 1982. The vegetation of the Canadian prairie provinces. III. Aquatic and semi-aquatic vegetation, Part 2. Freshwater marshes and bogs. Phytocoenologia 10(4):401-423.

Loope, L. L. 1969. Subalpine and alpine vegetation of northeastern Nevada. Unpublished thesis, Duke University, Durham, NC.

Lynn, R., M. Larson, D. Hoeft, L. Todd, T. Raetz, L. Fager, and G. Barranco. No date. Black Hills National Forest ecological land units study. USDA Forest Service, Black Hills National Forest, SD.

MNNHP [Minnesota Natural Heritage Program]. 1993. Minnesota's native vegetation: A key to natural communities. Version 1.5. Minnesota Department of Natural Resources, Natural Heritage Program, St. Paul, MN. 110 pp.

MTNHP [Montana Natural Heritage Program]. 2002b. List of ecological communities for Montana. Montana Natural Heritage Program, Montana State Library, Helena, MT.

MTNHP [Montana Natural Heritage Program]. No date. Unpublished data on file. Helena, MT.

MacKenzie, W. H., and J. R. Moran. 2004. Wetlands of British Columbia: A guide to identification. Land Management Handbook #52, British Columbia Ministry of Forests, Victoria, BC. 287 pp.

Macdonald, C. A. 1989. Plant colonization of gopher mounds in adjacent pasture and prairie communities. Unpublished thesis, Oregon State University, Corvallis. 67 pp.

Mackenzie, Will. Personal communication. British Columbia Ministry of Forestry Wetlands & Riparian Specialist, Smithers, BC, Canada.

Magee, T. 1985. Baseline vegetation description and establishment of a monitoring system to evaluate vegetation change in response to fire at Wren Prairie Preserve. Unpublished report prepared for The Nature Conservancy, Portland, OR.

Major, J., and D. W. Taylor. 1977. Alpine. Pages 601-675 in: Barbour, M. G. and J. Major, eds. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York.

Manning, M. 1988. Ecology and rooting characteristics of four intermountain meadow community types. Unpublished thesis, University of Nevada, Reno.

Manning, M. E., and W. G. Padgett. 1989. Preliminary riparian community type classification for Nevada. Draft report prepared for USDA Forest Service, Intermountain Region, Ogden, UT. 134 pp.

Manning, M. E., and W. G. Padgett. 1991. Riparian community type classification for the Humboldt and Toiyabe national forests, Nevada and eastern California. Unpublished draft report prepared for USDA Forest Service, Intermountain Region Ecology and Classification Program, Ogden, UT. 490 pp.

Manning, M. E., and W. G. Padgett. 1992. Riparian community type classification for the Humboldt and Toiyabe national forests, Nevada and eastern California. USDA Forest Service, Intermountain Region Ecology and Classification Program. 274 pp.

Manning, M. E., and W. G. Padgett. 1995. Riparian community type classification for Humboldt and Toiyabe national forests, Nevada and eastern California. USDA Forest Service, Intermountain Region. 306 pp.

Mark, A. F. 1958. The ecology of the southern Appalachian grass balds. Ecological Monographs 28:293-336.

Marr, J. W. 1959. Forms of tree islands in alpine tundra. Journal of the Colorado-Wyoming Academy of Science 4(11):34 (Abstract).

Marr, J. W. 1964a. Utilization of the Front Range tundra, Colorado. Pages 109-118 in: D. J. Crisp, editor. Grazing in terrestrial and marine environments. Blackwell Scientific Publishing, Oxford, England.

Marr, J. W. 1964b. The vegetation of the Boulder area. University of Colorado Museum Leaflet 13:34-42.

Marr, J. W. 1965. Forest ecology of the Front Range. Pages 16-20 in: C. Schulz and H. Smith, editors. Guidebook for one-day field Conferences-Boulder area, Colorado. VIIth International Association for Quaternary Research Congress, Nebraska Academy of Science, Lincoln, NE.

Marr, J. W. 1967. Ecosystems of the east slope of the Front Range in Colorado. University of Colorado Studies, Series in Biology 8. 134 pp.

Marr, J. W. 1977a. The development and movement of tree islands near the upper limit of tree growth in the southern Rocky Mountains. Ecology 58:1159-1164.

Marr, J. W. 1977b. A classification of tree island forms in the high mountains of Colorado. Journal of the Colorado-Wyoming Academy of Science 9(1):35 (Abstract).

Marr, J. W., D. A. Boyce, and J. W. Todd. 1973b. Preliminary report on the Redcliff project, Eagle County, Colorado. Unpublished report to the D. E. Fleming Company, Denver, and the Colorado River Water Conservation District, Glenwood Springs, by University of Colorado, Boulder. 9 pp.

Marr, J. W., D. Buckner, and C. Mutel. 1973a. Ecological analyses of potential shale oil products pipeline corridors in Colorado and Utah. Unpublished report prepared for Colony Development Operation, Atlantic Richfield Company, Denver, by Thorne Ecological Institute and University of Colorado, Boulder. 96 pp. plus appendices.

Marr, J. W., D. M. Armstrong, H. Chronic, J. Chronic, R. W. Pennak, W. A. Weber, R. E. Marr, D. Steward, and J. C. Meyer. 1980. Natural landmarks of the southern Rocky Mountain region. Unpublished report prepared for USDI Heritage Conservation and Recreation Service, Denver, CO, by Thorne Ecological Institute, Boulder, CO. 736 pp.

Marr, J. W., and B. E. Willard. 1970. Persisting vegetation in an alpine recreation area in the southern Rocky Mountains Colorado. Biological Conservation 2:97-104.

Marr, J. W., and W. S. Boyd. 1979. Vegetation in the greater Denver area, Front Range Urban Corridor, Colorado. USDI Geologic Survey Miscellaneous Investigative Series, Map I-856-I.

Marriott, H. J., and G. P. Jones. 1989. Special status plant surveys and plant community surveys in the Trapper Creek and Medicine Lodge Wilderness Study Areas and the Spanish Point Karst ACEC. Report submitted to the Bureau of Land Management, Worland District Office, under Cooperative Agreement Task Order No. WY910-CA9-001TQE1. Wyoming Natural Diversity Database, Laramie. 42 pp. plus appendices.

Marriott, Hollis J. Personal communication. Former Heritage Botanist, WYNDD, and former Public Lands Coordinator, The Nature Conservancy. 655 N. Cedar, Laramie, WY 82070. (307) 721-4909.

Marsh, F., R. Helliwell, and J. Rodgers. 1987. Plant association guide for the commercial forest of the Warm Springs Indian Reservation. Confederated Tribes of the Warm Springs Indians.

Martin, R. C., and R. E. Frenkel. 1978. Preserve analysis: Blacklock Point. Oregon Natural Area Preserves Advisory Committee to the State Land Board, Salem, OR. 63 pp.

Mattson, D. J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. Unpublished thesis, University of Idaho, Moscow. 409 pp.

Mauk, R. L., and J. A. Henderson. 1984. Coniferous forest habitat types of northern Utah. USDA Forest Service. General Technical Report INT-170. Intermountain Forest and Range Experiment Station, Ogden, UT. 89 pp.

May, D. E. 1973. Models for predicting composition and production of alpine tundra vegetation from Niwot Ridge, Colorado. Unpublished thesis, University of Colorado, Boulder. 99 pp.

McArthur, E. D., and B. L. Welch, compilers. 1986. Proceedings-Symposium on the biology of *Artemisia* and *Chrysothamnus*. 1984 July 9-13, Provo, Utah. USDA Forest Service General Technical Report INT-200. Intermountain Research Station, Ogden, UT. 398 pp.

McLean, A. 1969. Plant communities of the Similkameen Valley, British Columbia, and their relationships to soils. Unpublished dissertation, Washington State University, Pullman. 133 pp.

McLean, A. 1970. Plant communities of the Similkameen Valley, British Columbia, and their relationships to soils. Ecological Monographs 40(4):403-424.

Midwestern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Minneapolis, MN.

Miller, T. B. 1976. Ecology of riparian communities dominated by white alder in western Idaho. Unpublished thesis, University of Idaho, Moscow. 154 pp.

Mills, R. C. 1962. A study of near climax conditions in a spruce-fir ecosystem. Unpublished thesis, University of Colorado, Boulder. 66 pp.

Moir, W. H. 1969a. The lodgepole pine zone in Colorado. The American Midland Naturalist 81(1):87-99.

Moir, W. H., and J. A. Ludwig. 1979. A classification of spruce-fir and mixed conifer habitat types of Arizona and New Mexico. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-207. Fort Collins, CO. 47 pp.

Mooney, M. J. 1985. A preliminary classification of high elevation sagebrush-grass plant vegetation in northern and central Nevada. Unpublished thesis, University of Nevada, Reno. 118 pp.

Morgan, M. D. 1969. Ecology of aspen in Gunnison County, Colorado. The American Midland Naturalist 82(1):204-228.

Moseley, R. K. 1985. Synecological relationships of alpine spike-fescue grasslands in east-central Idaho. Unpublished thesis, University of Idaho, Moscow. 70 pp.

Moseley, R. K. 1987a. Synecological relationships of alpine spike-fescue (*Leucopoa kingii* (Wats.) Weber) grasslands in eastcentral Idaho, U.S.A. Unpublished manuscript prepared for Arctic and Alpine Research. 33 pp.

Moseley, R. K., R. J. Bursik, F. W. Rabe, and L. D. Cazier. 1994. Peatlands of the Sawtooth Valley, Custer, and Blaine counties, Idaho. Sawtooth NF/TNC/IdCDC Idaho Department of Fish & Game Cooperative Cost Share Project. SNF Purchase Order #40-0267-3-0233. 64 pp.

Moseley, R. K., R. J. Bursik, and M. Manusco. 1991. Floristic inventory of wetlands in Fremont and Teton counties, Idaho. Unpublished report on file IDCDC Department of Fish & Game, Boise, ID. 60 pp.

Moseley, R. K., and R. J. Bursik. 1994. Black cottonwood communities of Spion Kop Research Natural Area, Coeur d'Alene, Blaine County, Idaho. Idaho Panhandle NFs/IdCDC Idaho Department of Fish & Game Cooperative Cost Share Project. 14 pp.

Mozingo, H. 1987. Shrubs of the Great Basin: A natural history. University of Nevada Press, Las Vegas. 342 pp.

Mueggler, W. F. 1988. Aspen community types of the Intermountain Region. USDA Forest Service General Technical Report INT-250. Intermountain Research Station, Ogden, UT. 135 pp.

Mueggler, W. F., and R. B. Campbell, Jr. 1982. Aspen community types on the Caribou and Targhee national forests in southeastern Idaho. USDA Forest Service, Intermountain Forest and Range Experiment Station. Research Paper INT-294. Ogden, UT. 32 pp.

Mueggler, W. F., and R. B. Campbell, Jr. 1986. Aspen community types of Utah. USDA Forest Service Research Paper INT-362, Intermountain Forest and Range Experiment Station, Ogden, UT.

Mueggler, W. F., and W. L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service, General Technical Report INT-66. Intermountain Forest and Range Experiment Station. Ogden, UT. 154 pp.

Muldavin, E. 1991. Riparian and wetlands survey, Pecos National Historic Park. Unpublished report prepared for the National Park Service, New Mexico Natural Heritage Program, University of New Mexico, Albuquerque. 30 pp.

Muldavin, E. 1994. Organ Mountains sensitive species and plant community inventory. Unpublished report prepared by the New Mexico Natural Heritage Program, Albuquerque.

Muldavin, E. H., R. L. DeVelice, and F. Ronco, Jr. 1996. A classification of forest habitat types southern Arizona and portions of the Colorado Plateau. USDA Forest Service General Technical Report RM-GTR-287. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 130 pp.

Muldavin, E., B. Sims, and L. Johnson. 1993b. Pecos Wild and Scenic River in stream flow report. Final Report prepared for the USDA National Forest Service, Santa Fe National Forest, Santa Fe, NM.

Muldavin, E., P. Durkin, M. Bradley, M. Stuever, and P. Mehlhop. 2000a. Handbook of wetland vegetation communities of New Mexico: Classification and community descriptions (volume 1). Final report to the New Mexico Environment Department and the Environmental Protection Agency prepared by the New Mexico Natural Heritage Program, University of New Mexico, Albuquerque, NM.

Muldavin, E., R. Wallace, and P. Mehlhop. 1993a. Riparian ecological site inventory for New Mexico Bureau Land Management lands. Final Report COOP Agreement F91070-0003, USDI Bureau of Land Management, New Mexico State Office, Santa Fe.

Murphy, P. H. 1982. The forest vegetation of the Lost Creek area in the southern Front Range, Colorado. Unpublished thesis, University of Colorado, Boulder. 145 pp.

Murray, M. P. 1996. Landscape dynamics of an island range: Interrelationships of fire and whitebark pine (*Pinus albicaulis*). Unpublished dissertation, College of Graduate Studies, University of Idaho, Moscow.

Mutel, C. F. 1973. An ecological study of the plant communities of certain montane meadows in the Front Range of Colorado. Unpublished thesis, University of Colorado, Boulder. 77 pp.

Mutel, C. F. 1976. From grassland to glacier: An ecology of Boulder County, Colorado. Johnson Publishing Company, Boulder. 169 pp.

Mutel, C., and J. W. Marr. 1973. A vegetative study of three montane herbaceous basins. Journal of the Colorado-Wyoming Academy of Science 7(4):28 (Abstract).

Muthukumar, T., K. Udaiyan, and P. Shanmughavel. 2004. Mycorrhiza in sedges: An overview. Mycorrhiza 14:65-77.

Mutz, K. M., and J. Queiroz. 1983. Riparian community classification for the Centennial Mountains and South Fork Salmon River, Idaho. Unpublished report prepared for USDA Forest Service Intermountain Region under contract 53-84M8-2-0048 by Meiiji Resource Consultants, Layton, UT. 168 pp.

Mutz, K. M., and R. Graham. 1982. Riparian community type classification-Big Piney Range District, Wyoming. Unpublished report prepared for USDA Forest Service, Intermountain Region under contract 53-84M8-1-974, by Meiiji Resource Consultants, Layton, UT. 88 pp.

NDNHI [North Dakota Natural Heritage Inventory]. No date. Vegetation classification of North Dakota. North Dakota Natural Heritage Inventory, North Dakota Parks & Recreation Department, Bismarck.

NRCS [National Resources Conservation Service]. 2001. The PLANTS Database, Version 3.1. National Plant Data Center, Baton Rouge, LA. http://plants.usda.gov.

NVNHP [Nevada Natural Heritage Program]. 2003. National Vegetation Classification for Nevada. Nevada Natural Heritage Program, Department of Conservation and Natural Resources, Carson City. 26 September 2003.

Nachlinger, J. L. 1985. The ecology of subalpine meadows in the Lake Tahoe region, California and Nevada. Unpublished thesis, University of Nevada, Reno. 151 pp.

Nelson, L. P., and M. E. Jensen. 1987. Sagebrush-grass community types of the Humboldt National Forest. Unpublished report prepared for USDA Forest Service, Humboldt National Forest, Elko, NV. 80 pp.

Nelson, W. T., W. T. Barker, and H. Goetz. 1981. Habitat type classification of grasslands of Sheyenne National Grassland of southeastern North Dakota. Completion Report for Cooperative Agreement No. RM-80-139-CA. Unpublished report. 138 pp.

Nesser, J. A., G. L. Ford, C. L. Maynard, and D. S. Page-Dumroese. 1997. Ecological units of the Northern Region: Subsections. USDA Forest Service, Intermountain Research Station. General Technical Report INT-GTR-369. Ogden, UT. 88 pp.

Norton, B. E., J. Tuhy, and S. Jensen. 1981. Riparian community classification for the Grey's River, Wyoming. Unpublished final report prepared by Department of Range Science, Utah State University, Logan for USDA Forest Service, Region 4, Ogden, UT. 188 pp.

ORNHP [Oregon Natural Heritage Program]. 2002. Unpublished data files. Oregon Natural Heritage Program, The Nature Conservancy, Portland, OR.

ORNHP [Oregon Natural Heritage Program]. No date. Unpublished data files. Oregon Natural Heritage Program, The Nature Conservancy, Portland, OR.

Ode, Dave. Personal communication. South Dakota Natural Heritage Program, Pierre, SD.

Ogilvie, R. T. 1962. Ecology of spruce forests on the east slope of the Rocky Mountains in Alberta. Unpublished dissertation, Washington State University, Pullman. 189 pp.

Olmsted, C. E., III, and W. R. Taylor. 1977a. Ecological resource inventory of the Bunker Hill Property, Boulder County, CO. Unpublished report prepared for The Nature Conservancy, Denver, CO. 35 pp.

Olson, R. A., and W. A. Gerhart. 1982. A physical and biological characterization of riparian habitat and its importance to wildlife in Wyoming. Unpublished report prepared for Wyoming Fish and Game Department, Cheyenne, WY. 188 pp.

Osburn, W. S., Jr. 1963. The dynamics of fallout distribution in a Colorado alpine tundra snow accumulation ecosystem. Pages 51-71 in: S. Vincent and A. W. Klement, Jr., editors. Radioecology: Selected papers from the Symposium. Reinhold Publishing Company, New York, and American Institute of Biological Science.

Oswald, E. T. 1966. A synecological study of the forested moraines of the valley floor of Grand Teton National Park, Wyoming. Unpublished thesis, Montana State University, Bozeman. 101 pp.

Ownbey, G. B., and T. Morley. 1991. Vascular plants of Minnesota: A checklist and atlas. University of Minnesota Press, Minneapolis.

Padgett, W. G. 1982. Ecology of riparian plant communities in southern Malheur National Forest. Unpublished thesis, Oregon State University, Corvallis. 143 pp.

Padgett, W. G., A. P. Youngblood, and A. H. Winward. 1988a. Riparian community type classification of Utah and southeastern Idaho. Research Paper R4-ECOL-89-0. USDA Forest Service, Intermountain Region, Ogden, UT.

Padgett, W. G., A. P. Youngblood, and A. H. Winward. 1988b. Riparian community type classification of Utah. USDA Forest Service, Intermountain Region Publication R4-ECOL-88-01. Ogden, UT.

Padgett, W. G., A. P. Youngblood, and A. H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region. Report R4-ECOL-89-01. Ogden, UT. 191 pp.

Padgett, W. G., and M. E. Manning. 1988. Preliminary riparian community type classification for Nevada. Draft. Unpublished report prepared for USDA Forest Service Region IV, Intermountain Region Ecology and Classification Program, Ogden, UT.

Palmer, E. J. 1929. The ligneous flora of the Davis Mountains. Journal of Arnold Arboretum 10:8-45.

Paulsen, H. A., Jr. 1969. Forage values on a mountain grassland-aspen range in western Colorado. Journal of Range Management 22:102-107.

Peet, R. K. 1975. Forest vegetation of the east slope of the northern Colorado Front Range. Unpublished dissertation, Cornell University, Ithaca, NY.

Peet, R. K. 1978a. Latitudinal variation in southern Rocky Mountain forests. Journal of Biogeography 5:275-289.

Peet, R. K. 1980. Forest vegetation of the northern Colorado Front Range, USA: I. Community composition. Unpublished manuscript prepared for Cornell University, Ithaca, NY. 83 pp.

Peet, R. K. 1981. Forest vegetation of the Colorado Front Range. Vegetatio 45:3-75.

Peet, R. K. 1988. Forests of the Rocky Mountains. Pages 64-101 in: M. G. Barbour and W. D. Billings, editors. North American Terrestrial Vegetation. Cambridge University Press, New York.

Penfound, W. T. 1953. Plant communities of Oklahoma lakes. Ecology 34:561-583.

Pfister, R. D. 1972. Vegetation and soils in the subalpine forests of Utah. Unpublished dissertation, Washington State University, Pullman. 98 pp.

Pfister, R. D., B. L. Kovalchik, S. F. Arno, and R. C. Presby. 1977. Forest habitat types of Montana. USDA Forest Service. General Technical Report INT-34. Intermountain Forest and Range Experiment Station, Ogden, UT. 174 pp.

Phillips, C. M. 1977. Willow carrs of the upper Laramie River Valley, Colorado. Unpublished thesis, Colorado State University, Fort Collins. 71 pp.

Plumb, G. A. 1988. An algorithmic approach to automated vegetation mapping of Big Bend National Park, Texas. Ph.D. dissertation, University of Kansas, Lawrence. 449 pp.

Potkin, M., and L. Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. USDA Forest Service Contract No. 53-8555-3-00015. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie. 117 pp. plus appendix.

Potter, L. D., and D. R. Moir. 1961. Phytosociological study of burned and unburned deciduous woods, Turtle Mountains, North Dakota. Ecology 42:468-480.

Poulton, C. E. 1955. Ecology of the non-forested vegetation in Umatilla and Morrow counties, Oregon. Unpublished dissertation. State College of Washington, Pullman. 166 pp.

Powell, D. C. 1988a. Aspen community types of the Pike and San Isabel national forests in south-central Colorado. USDA Forest Service, Rocky Mountain Region, Report R2-ECOL-88-01. 254 pp.

Price, K. P., and J. D. Brotherson. 1987. Habitat and community relationships of cliffrose (*Cowania mexicana var. stansburiana*) in central Utah. Great Basin Naturalist 47(1):132-151.

Prodgers, R. 1978. Circle West vegetation baseline study: Final report. Circle West Technical Report No. 1. Energy Division, Montana Department of Natural Resources and Conservation, Helena. 115 pp.

Ramaley, F. 1919a. The role of sedges in some Colorado plant communities. American Journal of Botany 6:120-130.

Ramaley, F. 1920. Subalpine lake-shore vegetation in north central Colorado. American Journal of Botany 7:57-74.

Ramaley, F. 1942. Vegetation of the San Luis Valley in southern Colorado. University of Colorado Studies, Series D, 1:231-277.

Ramaley, F., and W. W. Robbins. 1909. Studies in lake and streamside vegetation. I. Redrock Lake near Ward, Colorado. University of Colorado Studies 6:133-168.

Raven, K. A. 1948. Ecology of a timberline area in the Colorado Front Range. Unpublished thesis, University of Colorado, Boulder. 83 pp.

Ream, R. R. 1964. The vegetation of the Wasatch Mountains, Utah and Idaho. Unpublished Ph.D. dissertation, University of Wisconsin, Madison. 190 pp.

Rector, C. D. 1979. Lower Gunnison River Basin wetland inventory and evaluation. Unpublished thesis, University of Colorado, Boulder. 71 pp.

Reed, R. M. 1969. A study of forest vegetation in the Wind River Mountains, Wyoming. Unpublished dissertation, Washington State University, Pullman. 77 pp.

Reed, R. M. 1971. Aspen forests of the Wind River Mountains, Wyoming. The American Midland Naturalist 86(2):327-343.

Reed, R. M. 1976. Coniferous forest habitat types of the Wind River Mountains, Wyoming. The American Midland Naturalist 95(1):159-173.

Reid, M. 1990. Yampa River Basin riparian vegetation classification project. Unpublished data prepared for The Nature Conservancy, Colorado Field Office and Western Heritage Task Force, Boulder, CO.

Reid, M. S., L. S. Engelking, and P. S. Bourgeron. 1994. Rare plants communities of the conterminous United States, Western Region. Pages 305-620 in: D. H. Grossman, K. L. Goodin, and C. L Reuss, editors. Rare plant communities of the conterminous United States, a initial survey. The Nature Conservancy, Arlington, VA.

Reznicek, A. A. 1987. Key to Carex rostrata complex in North America. Unpublished key. 3 pp.

Richard, C., G. Kittel, and S. Kettler. 1996. A classification of the riparian vegetation of the San Juan National Forest. Draft 1 report. Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Roach, A. W. 1952. Phytosociology of the Nash Crater lava flows, Linn County, Oregon. Ecological Monographs 22:169-193.

Robbins, W. W. 1918. Successions of vegetation in Boulder Park, Colorado. Botanical Gazette 65(6):493-525.

Roberts, D. W. 1980. Forest habitat types of the Bear's Paw Mountains and Little Rocky Mountains, Montana. Unpublished thesis, Department of Forestry, University of Montana, Missoula. 116 pp.

Roberts, D. W., D. W. Wight, and G. P. Hallsten. 1992. Plant community distribution and dynamics in Bryce Canyon National Park. Unpublished final report for Bryce Canyon National Park Project PX1200-7-0966. 146 pp.

Roberts, D. W., J. I. Sibbernsen, and R. D. Pfister. 1979a. Forest and woodland habitat types of northcentral Montana. Volume 2: The Missouri River Breaks. Unpublished report prepared by University of Montana, School of Forestry. IFRES YA-512-CT6-B4. Prepared for the USDI Bureau of Land Management State Office, Research Division, Billings, MT. 24 pp.

Rolston, L. K. 1961. The subalpine coniferous forest of the Bighorn Mountains, Wyoming. Unpublished thesis, University of Wyoming, Laramie.

Rominger, J. M., and L. A. Paulik. 1983. A floristic inventory of the plant communities of the San Francisco Peaks Research Natural Area. USDA Forest Service General Technical Report RM-96. Rocky Mountain Forest and Range Experiment Station, Ft Collins, CO. 9 pp.

Rondeau, Renee. Personal communication. Interim Director/Ecologist, Colorado Natural Heritage Program, Colorado State University, 254 General Services Building, Fort Collins, CO, 80523.

Ross, R. L., E. P. Murray, and J. G. Haigh. 1973. Soil and vegetation inventory of near-pristine sites, Montana. USDA Soil Conservation Service, Bozeman, MT. 55 pp.

Rust, S. K. 1997a. Community concepts and applications for conservation. Unpublished report prepared for USDA Forest Service, Northern Region, Intermountain Region and Intermountain Research Station. Conservation Data Center, Idaho Department of Fish and Game, Boise. 67 pp.

Rust, S. K. 1998. Establishment record for Patrick Butte Research Natural Area within Payette National Forest, Idaho County, Idaho. Unpublished report prepared for the USDA Forest Service Rocky Mountain Research Station, Ogden, UT. 19 pp. plus appendices and maps.

Rzedowski, J. 1981. Vegetaciòn de México. Editorial Limusa, Mexico City, Mexico. 432 pp.

Sabinske, D. W. 1972. The sagebrush community of Grand Teton National Park: A vegetation analysis. Unpublished thesis, University of Wyoming, Laramie.

Sanderson, J., and M. March. 1996. Extreme rich fens of South Park, Colorado: Their distribution, identification, and natural heritage significance. Report submitted to Park County, the Colorado Department of Natural Resources, and the Environmental Protection Agency. Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

Sanderson, J., and S. Kettler. 1996. A preliminary wetland vegetation classification for a portion of Colorado's west slope. Report prepared for Colorado Department of Natural Resources, Denver, CO, and U.S. Environmental Protection Agency, Region VIII, Denver, CO. Colorado Natural Heritage Program, Ft. Collins, CO. 243 pp.

Sarr, D. 1995. Grazing, graminoids, and hysteresis: Exploring relationships between livestock production, riparian communities, and ecosystem recovery in the southern Sierra Nevada, California. Unpublished M.A. thesis, University of California, Santa Barbara. 167 pp.

Savage, D. E. 1968. The relationship of sage grouse to upland meadows in Nevada. Unpublished thesis, University of Nevada, Reno.

Sawyer, J. O., and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento. 471 pp.

Schlatterer, E. F. 1972. A preliminary description of plant communities found on the Sawtooth, White Cloud, Boulder, and Pioneer mountains. Unpublished report prepared for USDA Forest Service, Intermountain Region, Ogden, UT. 111 pp.

Schmidt, W. C., and K. J. McDonald, compilers. 1990. Proceedings-Symposium on whitebark pine ecosystems: Ecology and management of a high-mountain resource. March 29-31 1989, Bozeman, MT. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. 386 pp.

Schuller, R., and S. Evans. 1986. Botanical reconnaissance of Meeks Table Research Natural Area, Washington. Research Note PNW-RN-451. Portland, OR.

Scott, R. W. 1966. The alpine flora of northwestern Wyoming. Unpublished thesis, University of Wyoming, Laramie.

Scott, R. W. 1995. The alpine flora of the Rocky Mountains. Volume 1. The Middle Rockies. University of Utah Press, Salt Lake City, Utah. 901 pp.

Scott-Williams, B. W. 1965. The ecology of the alpine tundra on Trail Ridge. Pages 13-16 in: C. B. Schulz and H. T. Smith, editors. Guidebook for one-day field conferences -- Boulder area, Colorado. VIIth International Association for Quaternary Research Congress, Nebraska Academy of Science, Lincoln, NE.

Scow, K. L., and L. D. Culwell. 1986. Vegetation inventory of the Mill Gulch Extension Area, Little Rocky Mountains, Montana. Unpublished report prepared for Hydrometrics, Inc., Helena, MT. 26 pp. plus appendices.

Seminoe II Mine Application. No date. Application No. 377-T2, on file at Wyoming Department of Environmental Quality, Land Quality Division, Cheyenne.

Severson, K. E., and J. F. Thilenius. 1976. Classification of quaking aspen stands in the Black Hills and Bear Lodge Mountains. USDA Forest Service Research Paper RM-166. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 24 pp.

Seyer, S. C. 1979. Vegetative ecology of a montane mire, Crater Lake National Park, Oregon. Unpublished thesis, Oregon State University, Corvallis. 87 pp.

Shepherd, H. R. 1975. Vegetation of two dissimilar bighorn sheep ranges in Colorado. Colorado Division of Wildlife Report 4. 223 pp.

Shepperd, W. D. 1990. Initial growth, development, and clonal dynamics of regenerated aspen in the Rocky Mountains. USDA Forest Service Research Paper RM-312. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 8 pp.

Shiflet, T. N., editor. 1994. Rangeland cover types of the United States. Society for Range Management. Denver, CO. 152 pp.

Shupe, J. B., J. D. Brotherson, and S. R. Rushforth. 1986. Patterns of vegetation surrounding springs in Goshen Bay, Utah County, Utah, U.S.A. Hydrobiologia 139:97-107.

Smith, E. L., Jr. 1966. Soil-vegetation relationships of some *Artemisia* types in North Park, Colorado. Unpublished dissertation, Colorado State University, Fort Collins. 27 pp.

Smith, S. 1994b. Ecological guide to eastside pine plant associations, northeastern California. USDA Forest Service, Pacific Southwest Region, R5-ECOL-TP-004. 174 pp.

Smith, T. L. 1991. Natural ecological communities of Pennsylvania. First revision. Unpublished report. Pennsylvania Science Office of The Nature Conservancy, Middletown, PA. 111 pp.

Sneddon, L., M. Anderson, and K. Metzler. 1996. Community alliances and elements of the Eastern Region. Unpublished report. The Nature Conservancy, Eastern Heritage Task Force, Boston, MA. 235 pp.

Soil Conservation Service. 1978. Range site descriptions for Colorado. Technical Guide, Section II-E. USDA Soil Conservation Service, Colorado State Office, Denver.

Soil Conservation Service. 1981b. Average annual precipitation Montana. USDA-SCS, Bozeman, MT.

Spencer, J. P. 1975. The effects of winter weather modification on alpine plant communities in the San Juan Mountains, Colorado. Unpublished thesis, University of Colorado, Boulder. 122 pp.

Spies, T. A., J. F. Franklin, and M. Klopsch. 1990. Canopy gaps in Douglas-fir forests of the Cascade Mountains. Canadian Journal of Forest Research 20:649-658.

Starr, C. R. 1974. Subalpine meadow vegetation in relation to environment at Headquarters Park, Medicine Bow Mountains, Wyoming. Unpublished thesis, University of Wyoming, Laramie.

Stearns-Roger, Inc. 1978. Rawhide Energy Project. Transmission system, ecological investigations. Volume II. Technical baseline report to Platte River Power Authority. 51 pp.

Steele, R., R. D. Pfister, R. A. Ryker, and J. A. Kittams. 1981. Forest habitat types of central Idaho. USDA Forest Service General Technical Report INT-114. Intermountain Forest and Range Experiment Station, Ogden, UT. 138 pp.

Steele, R., S. V. Cooper, D. M. Ondov, D. W. Roberts, and R. D. Pfister. 1983. Forest habitat types of eastern Idaho - western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. 122 pp.

Steele, R., and K. Geier-Hayes. 1987. The grand fir/blue huckleberry habitat type in central Idaho: Succession and management. USDA Forest Service General Technical Report INT-228. Intermountain Research Station, Ogden, UT. 66 pp.

Steele, R., and K. Geier-Hayes. 1995. Major Douglas-fir habitat types of central Idaho: A summary of succession and management. USDA Forest Service General Technical Report INT-GTR-331. USDA Forest Service Intermountain Research Station, Ogden, UT.

Steen, O. A., and R. L. Dix. 1974. A preliminary classification of Colorado subalpine forests: A working guide. Unpublished report prepared by the USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 9 pp.

Steinauer, G., and S. Rolfsmeier. 2000. Terrestrial natural communities of Nebraska. Unpublished report of the Nebraska Game and Parks Commission. Lincoln, NE. 143 pp.

Stewart, B. K. 1940. Plant ecology and paleoecology of the Creede Valley, Colorado. Unpublished dissertation, University of Colorado, Boulder. 154 pp.

Stoddart, L. A. 1941. The palouse grassland association in northern Utah. Ecology 22(2):158-163.

Strong, L. L. 1980. Estimating phytomass production of habitat types on sagebrush steppe. Unpublished thesis, Colorado State University, Fort Collins. 133 pp.

Stuever, M. C., and J. S. Hayden. 1997a. Plant associations of Arizona and New Mexico. Volume 2: Woodlands. USDA Forest Service, Southwestern Region, Habitat Typing Guides. 196 pp.

Stuever, M. C., and J. S. Hayden. 1997b. Plant associations of Arizona and New Mexico. Edition 3. Volume 1: Forests. USDA Forest Service, Southwestern Region. Habitat Typing Guides. 291 pp.

Sturges, D. L. 1968. Hydrologic properties of peat from a Wyoming mountain bog. Soil Science 106:262-264.

Sunderman, N. 2000. An investigation of avian communities and avian-habitat relationships in the Hells Canyon study area. Technical Report Appendix E.3.2-1 prepared for FERC License No. 1971, Hells Canyon Complex by Idaho Power Company, Boise, ID.

Svalberg, T., D. Tart, D. Fallon, M. Ferwerda, E. Lindquist, and H. Fisk. 1997. Bridger-East Ecological Unit Inventory. Vol. 2. Taxonomic unit descriptions. USDA Forest Service, Bridger-Teton National Forest. Final Draft. Jackson, WY. 900 pp.

Szaro, R. C. 1989. Riparian forest and scrubland community types of Arizona and New Mexico. Desert Plants Special Issue 9(3-4):70-139.

Tart, D. L. 1995. Vegetation keys for the Bridger-Teton National Forest. USDA Forest Service, Bridger-Teton National Forest. Draft. Jackson, WY. 58 pp.

Tart, D. L. 1996. Big sagebrush plant associations of the Pinedale Ranger District. Final review draft. Bridger-Teton National Forest, Jackson WY. 97 pp.

Taylor, D. W. 1984. Vegetation of the Harvey Monroe Hall Research Natural Area, Inyo National Forest, California. Unpublished report. USDA Forest Service, Pacific Southwest Research Station, Berkeley, CA.

Terwilliger, C., Jr., K. Hess, and C. H. Wasser. 1979b. The habitat types of Region II. USDA Forest Service: A preliminary list and description. Unpublished initial progress report for Habitat Type Classification, Region 2, USDA Forest Service.

Terwilliger, C., Jr., and E. L. Smith. 1978. Range resource types in North Park, Colorado. Colorado State University Range Science Department Science Series 32. 48 pp.

Terwilliger, C., Jr., and J. A. Tiedemann. 1978. Habitat types of the mule deer critical winter range and adjacent steppe region of Middle Park, Colorado. Unpublished report prepared for USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 108 pp.

Terwilliger, C., K. Hess, and C. Wasser. 1979a. Key to the preliminary habitat types of Region 2. Addendum to initial progress report for habitat type classification. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

Thilenius, J. F. 1971. Vascular plants of the Black Hills of South Dakota and adjacent Wyoming. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-71. Fort Collins, CO.

Thilenius, J. F., G. R. Brown, and A. L. Medina. 1995. Vegetation on semi-arid rangelands, Cheyenne River Basin, Wyoming. USDA Forest Service. General Technical Report RM-GTR-263. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 60 pp.

Thorne Ecological Institute. 1973b. Pages 26-30 in: Part 1 of Vegetation. The Colony Environmental Study - Parachute Creek, Garfield County, Colorado. Unpublished report prepared for Colony Development Operation by Thorne Ecological Institute, Boulder, CO.

Tiedemann, A. 1972. Soil properties and nutrient availability in tarweed communities of central Washington. Journal of Range Management 25(6):438-443.

Tiedemann, A. R., and G. O. Klock. 1977. Meeks Table Research Natural Area reference sampling and habitat classification. Research Report PNW-223. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland. 19 pp.

Tiedemann, J. A., R. E. Francis, C. Terwilliger, Jr., and L. H. Carpenter. 1987. Shrub-steppe habitat types of Middle Park, Colorado. USDA Forest Service Research Paper RM-273. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 20 pp.

Tiedemann, J. A., and C. Terwilliger, Jr. 1978. Phyto-edaphic classification of the Piceance Basin. Colorado State University, Range Science Department Science Series 31. 265 pp.

Tisdale, E. M., and M. Bramble-Brodahl. 1983. Relationships of site characteristics to vegetation in canyon grasslands of west-central Idaho and adjacent areas. Journal of Range Management 36:775-778.

Tisdale, E. W. 1947. The grasslands of the southern interior of British Columbia. Ecology 28(4):346-382.

Tisdale, E. W. 1979. A preliminary classification of Snake River Canyon grasslands in Idaho. Forestry, Wildlife, and Range Experiment Station Bulletin No. 32, University of Idaho, Moscow. 8 pp.

Tisdale, E. W. 1986. Canyon grasslands and associated shrublands of west-central Idaho and adjacent areas. Bulletin No. 40. Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow. 42 pp.

Tisdale, E. W., M. Hironaka, and M. A. Fosberg. 1965. An area of pristine vegetation in Craters of the Moon National Monument, Idaho. Ecology 46(3):349-352.

Tisdale, E. W., and A. McLean. 1957. The Douglas fir zone of southern British Columbia. Ecological Monographs 27:247-266.

Topik, C. 1989. Plant associations and management guide for the *Abies grandis* zone Gifford Pinchot National Forest. USDA Forest Service, Pacific Northwest Region R6-ECOL-TP-006-88. Portland, OR. 110 pp.

Topik, C., N. M. Halverson, and D. G. Brockway. 1986. Plant associations and management guide for the western hemlock zone. USDA Forest Service, Pacific Northwest Region. Gifford Pinchot National Forest. R6-ECOL-230a-1986, Portland, OR. 137 pp.

Topik, C., N. M. Halverson, and T. High. 1988. Plant associations and management guide of the ponderosa pine, Douglas-fir, and grand fir zone, Mt. Hood National Forest. USDA Forest Service R6-ECOL-TP-004-88. 136 pp.

Tueller, P. T., D. H. Heinze, and R. E. Eckert. 1966. A tentative list of existing Nevada plant communities (A third approximation). Unpublished report prepared for the Department of Range Wildlife and Forestry, University of Nevada, Reno. 14 pp.

Tueller, P. T., and R. E. Eckert, Jr. 1987. Big sagebrush (*Artemisia tridentata vaseyana*) and longleaf snowberry (*Symphoricarpos oreophilus*) plant associations in northeastern Nevada. Great Basin Naturalist 47(1):117-131.

Tueller, P. T., and W. H. Blackburn. 1974. Condition and trend of the big sagebrush/needle-and-thread habitat type in Nevada. Journal of Range Management 27(1):36-40.

Tuhy, J. S. 1981. Stream bottom community classification for the Sawtooth Valley, Idaho. Unpublished thesis, University of Idaho, Moscow. 230 pp.

Tuhy, J. S., and S. Jensen. 1982. Riparian classification for the Upper Salmon and Middle Fork Salmon River drainages, Idaho. Unpublished report prepared for the USDA Forest Service, Intermountain Region by White Horse Associates, Smithfield, UT. 183 pp.

Turner, G. T. 1969. Response of mountain grassland vegetation to gopher control, reduced grazing, and herbicide. Journal of Range Management 22:377-383.

Turner, G. T., and E. J. Dortignac. 1954. Infiltration, erosion and herbage production of some mountain grasslands in western Colorado. Journal of Forestry 52:858-860.

Tweit, S., and K. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region, Shoshone National Forest.

UNESCO [United Nations Educational, Scientific and Cultural Organization]. 1973. International classification and mapping of vegetation. Series 6, Ecology and Conservation. United Nations Educational, Scientific, and Cultural Organization. Paris. 93 pp.

USFS [U.S. Forest Service]. 1983b. Plant associations of Region Two. Third edition. USDA Forest Service, Region Two, Range, Wildlife, and Ecology, Denver, CO. 379 pp.

USFS [U.S. Forest Service]. 1992. Draft habitat types of the Little Missouri National Grasslands. Medora and McKenzie ranger districts, Custer National Forest. Dickinson, ND.

Ueckert, D. N. 1968. Diets of some grasshoppers common on mountain herbland in northern Colorado. Unpublished thesis, Colorado State University, Fort Collins. 37 pp.

Urbanczyk, S. M. 1993. Classification and ordination of alpine plant communities, Sheep Mountain, Lemhi County, Idaho. Unpublished thesis, University of Idaho, Moscow.

Van Pelt, N. S. 1978. Woodland parks in southeastern Utah. Unpublished thesis, University of Utah, Salt Lake City.

Vestal, A. G. 1917. Foothills vegetation in the Colorado Front Range. Botanical Gazette 64(5):353-385.

Vestal, A. G. 1919. Phytogeography of the eastern mountain front in Colorado. I. Physical geography and distribution of vegetation. Botanical Gazette 68(3):153-193.

Viereck, L. A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. USDA Forest Service, General Technical Report PNW-GTR-286. Pacific Northwest Research Station, Portland, OR. 278 pp.

Volland, L. A. 1976. Plant communities of the central Oregon pumice zone. USDA Forest Service R-6 Area Guide 4-2. Pacific Northwest Region, Portland, OR. 113 pp.

Volland, L. A. 1978. Trends in standing crop and species composition of a rested Kentucky bluegrass meadow over an 11-year period. Pages 525-529 in: D. N. Hyder, editor. Proceedings, First International Rangeland Congress, Denver, CO.

Volland, L. A., and J. D. Dell. 1981. Fire effects on Pacific Northwest forest and range vegetation. USDA Forest Service. Pacific Northwest Region, Portland, OR. 23 pp.

Von Loh, J. 2000. Draft local descriptions of the vegetation associations of Ouray National Wildlife Refuge. USGS Bureau of Reclamation, Remote Sensing and GIS Group, Denver Federal Center, Denver.

Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota. USDI Bureau of Reclamation. Technical Memorandum No. 8260-99-02. Denver, CO.

Von Loh, J., D. Cogan, D. J. Butler, D. Faber-Langendoen, D. Crawford, and M.J. Pucherelli. 2000. USGS-NPS Vegetation Mapping Program, Theodore Roosevelt National Park, North Dakota. USBR Technical Service Center. U.S. Department of the Interior, Bureau of Reclamation's Remote Sensing and GIS Group, Denver Federal Center, Denver, CO.

Vories, K. C. 1974. A vegetation inventory and analysis of the Piceance Basin and adjacent drainages. Unpublished thesis. Western State College of Colorado, Gunnison. 243 pp.

Voss, E. G. 1972. Michigan flora: A guide to the identification and occurrence of the native and naturalized seed-plants of the state. Part I. Gymnosperms and Monocots. Cranbrook Institute of Science. 488 pp.

WANHP [Washington Natural Heritage Program]. 2002. Unpublished riparian and wetland association occurrence and plot data on file at Washington Natural Heritage Program, Washington State Department of Natural Resources, Olympia, WA.

WANHP [Washington Natural Heritage Program]. No date. Unpublished data files. Washington Natural Heritage Program, Department of Natural Resources, Olympia, WA.

Walford, G., G. Jones, W. Fertig, S. Mellman-Brown, and K. Houston. 2001. Riparian and wetland plant community types of the Shoshone National Forest. General Technical Report RMRS-GTR-85. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 122 pp.

Walford, G., G. Jones, W. Fertig, and K. Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Unpublished report. Wyoming Natural Diversity Database for The Nature Conservancy, and the USDA Forest Service. Wyoming Natural Diversity Database, Laramie. 227 pp.

Walker, R. B. 1962. Comparison of a wide south-facing and a narrow north-facing canyon. Pages 103-119 in: Ecological studies of the flora & fauna of the Curecanti Reservoir basins, western Colorado. University of Utah Anthropology Papers 59 (Upper Colorado Series 8).

Walkup, C. J. 1991. Shepherdia canadensis. In: Fire Effects Information System. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). [http://www.fs.fed.us/database/feis/] (accessed March 4, 2005)

Ward, A. L., and J. O. Keith. 1962. Feeding habits of pocket gophers on mountain grasslands, Black Mesa, Colorado. Ecology 43:744-749.

Wardle, P. 1968. Engelmann spruce (*Picea engelmannii* Engel.) at its upper limits on the Front Range, Colorado. Ecology 49:483-495.

Wasser, C. H., and K. Hess. 1982. The habitat types of Region II. USDA Forest Service: A synthesis. Final report prepared for USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 140 pp.

Weaver, T., and D. Dale. 1974. *Pinus albicaulis* in central Montana: Environment, vegetation and production. The American Midland Naturalist 92:222-230.

Webber, P. J., J. C. Emerick, D. May, and V. Komarkova. 1976. The impact of increased snowfall on alpine vegetation. Pages 201-264 in: H. Steinhoff and J. Ives, editors. Ecological impacts of snowpack augmentation in the San Juan Mountains. Report of the San Juan Ecology Project, Fort Collins, to USDI Bureau of Reclamation, Division of Atmosphere and Water Resource Management, Denver, CO.

Weixelman, D. A., D. C. Zamudio, and K. A. Zamudio. 1996. Central Nevada riparian field guide. USDA Forest Service Technical Report R4-ECOL-96-01. USDA Forest Service, Intermountain Region.

Welden, C. W. 1981. Pattern in alpine tundra. Unpublished thesis, Colorado State University, Fort Collins. 144 pp.

Welsh, S. L., N. D. Atwood, S. Goodrich, and L. C. Higgins, editors. 1987. A Utah flora. Great Basin Naturalist Memoirs 9. Provo, UT. 894 pp.

West, N. E. 1983c. Western Intermountain sagebrush steppe. Pages 351-374 in: N. E. West, editor. Temperate deserts and semi-deserts. Ecosystems of the world, Volume 5. Elsevier Publishing Company, Amsterdam.

Western Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Boulder, CO.

Whipple, S. A. 1975. The influence of environmental gradients on vegetational structure in the subalpine forest of the southern Rocky Mountains. Unpublished dissertation, Colorado State University, Fort Collins.

Whitfield, C. J. 1933. The vegetation of the Pike's Peak region. Ecological Monographs 3:75-105.

Wiedemann, A. M. 1966. Contributions to the plant ecology of the Oregon coastal sand dunes. Ph.D. dissertation, Oregon State University, Corvallis. 255 pp.

Wiedemann, A. M. 1984. The ecology of Pacific Northwest coastal sand dunes: A community profile. USDI Fish and Wildlife Service Report FWS/OBS-84/04. 130 pp.

Wiedemann, A. M. [1977]. Southern Puget Trough. Pages 93-144 in: Chilote, editor. National Landmark Theme Study.

Wilford, B. H. 1967. Conditions and trends of forest stands within the Park Range weather modification study area, Routt National Forest. Unpublished report prepared for Hahns Peak District Headquarters, Steamboat Springs, CO. 23 pp.

Willard, B. E. 1963. Phytosociology of the alpine tundra of Trail Ridge, Rocky Mountain National Park, Colorado. Unpublished dissertation, University of Colorado, Boulder.

Willard, B. E. 1979. Plant sociology of alpine tundra, Trail Ridge, Rocky Mountain National Park, Colorado. Colorado School of Mines Quarterly 74(4):1-119.

Williams, C. K., B. F. kelly, B. G. Smith, and T. R. Lillybridge. 1995. Forest plant associations of the Colville National Forest. General Technical Report PNW-GTR-360. USDA Forest Service, Pacific Northwest Region, Portland, OR. 140 pp.

Williams, C. K., T. R. Lillybridge, and B. G. Smith. 1990b. Forested plant associations of the Colville National Forest. Report prepared for USDA Forest Service, Colville National Forest, Colville, WA. 133 pp.

Williams, C. K., and B. G. Smith. 1990. Forested plant associations of the Wenatchee National Forest. Unpublished draft prepared by the USDA Forest Service, Pacific Northwest Region, Portland, OR. 217 pp.

Williams, C. K., and T. R. Lillybridge. 1983. Forested plant associations of the Okanogan National Forest. USDA Forest Service, Pacific Northwest Region. R6-Ecol-132b-1983. 140 pp.

Williams, C. K., and T. R. Lillybridge. 1985. Forested plant associations of the Colville National Forest. Draft. Unpublished field guide prepared for USDA Forest Service.

Williams, C. S. 1961. Distribution of vegetation in the Wind River Canyon, Wyoming. Unpublished thesis, University of Wyoming, Laramie.

Wilson, H. C. 1969. Ecology and successional patterns of wet meadows, Rocky Mountain National Park, Colorado. Unpublished dissertation, University of Utah, Salt Lake City. 99 pp.

Winward, A. 1991. Management in the Sagebrush Steppe. Agricultural Experiment Station, Oregon State University. Special Report 880. 7 pp.

Winward, A. H. 1970. Taxonomic and ecological relationships of the big sagebrush complex in Idaho. Unpublished dissertation, University of Idaho, Moscow. 90 pp.

Winward, A. H. 1980b. Taxonomy and ecology of sagebrush in Oregon. Oregon State University Agricultural Experiment Station Bulletin 642:1-15.

Winward, A. H., and B. A. Youtie. 1976. Ecological inventory of the Lawrence Memorial Grassland Preserve. A report presented to the Pacific Northwest chapter of The Nature Conservancy. 43 pp.

Winward, A. H., instructor. 1980a. Habitat types of the northwestern United States. Unpublished outline of Rangeland Ecology Class-Rng 542, Oregon State University, Spring term, 1980. 198 pp.

Wohl, E. E., and A. Hammack. 1995. Recent channel change along the Gunnison River at Curecanti National Recreation Area. Unpublished report. USDI National Park Service. NPBIB ID: CURE0236.

Woodbury, A. M., S. D. Durrant, and S. Flowers. 1961. A survey of vegetation in the Navajo Reservoir basin. University of Utah Anthropological Papers 51, Salt Lake City. 99 pp.

Wright, H. A., L. F. Neuenschwander, and C. M. Britton. 1979. The role and use of fire in sagebrush-grass and pinyon-juniper plant communities: A state of the art review. USDA Forest Service General Technical Report INT-58. Intermountain Forest and Range Experiment Station. Ogden, UT.

Young, J. F. 1982. Soil survey of Teton County, Wyoming, Grand Teton National Park Area. USDA Soil Conservation Service and Wyoming Agricultural Experiment Station. 173 pp.

Youngblood, A. P., W. G. Padgett, and A. H. Winward. 1985a. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service, Intermountain Region. R4-Ecol-85-01. Ogden, UT. 78 pp.

Youngblood, A. P., W. G. Padgett, and A. H. Winward. 1985b. Riparian community type classification of northern Utah and adjacent Idaho. Unpublished report prepared for USDA Forest Service, Intermountain Region, Ogden, UT. 104 pp.

Youngblood, A. P., and R. L. Mauk. 1985. Coniferous forest habitat types of central and southern Utah. USDA Forest Service, Intermountain Research Station. General Technical Report INT-187. Ogden, UT. 89 pp.

Youngblood, A. P., and W. F. Mueggler. 1981. Aspen community types on the Bridger-Teton National Forest in western Wyoming. USDA Forest Service. Research Paper INT-272. Intermountain Forest and Range Experiment Station, Ogden, UT. 34 pp.

Zamora, B. A. 1983. Forest habitat types of the Spokane Indian Reservation. Agricultural Research Center, Washington State University Research Bulletin XB-0936-1983.

Zamora, B., and P. T. Tueller. 1973. *Artemisia arbuscula*, *A. longiloba*, and *A. nova* habitat types in northern Nevada. Great Basin Naturalist 33(4):225-242.

Zwinger, A. H., and B. E. Willard. 1996. Land above the trees: A guide to American alpine tundra. Johnson Books, Boulder, CO. 425 pp.

APPENDIX E: GRTE Species List

This is not a complete list of species for the Park.

List compiled from a combination of species recorded for the 2002-2003 sample plots, 2004 accuracy assessment and for species found in plots in the environs on the Bridger-Teton National Forest, Caribou – Targhee National Forest, and the National Elk Refuge.

Genus-only records indicate an unknown species.

“Number of Plots” represents the number of sample plots and accuracy assessment points the species in which the species occurred.

SCIENTIFIC NAME	NUMBER OF PLOTS
Abies lasiocarpa (Hook.) Nutt. var. lasiocarpa	357
Abies lasiocarpa (Hook.) Nutt. var. lasiocarpa--Sapling and Pole	352
Abies lasiocarpa (Hook.) Nutt. var. lasiocarpa--Seedling	416
Acer glabrum Torr.	107
Achillea millefolium L. var. occidentalis DC.	353
Achnatherum Beauv.	28
Achnatherum contractum (B.L. Johnson) Barkworth	1
Achnatherum hymenoides (Roemer & J.A. Schultes) Barkworth	10
Achnatherum lettermanii (Vasey) Barkworth	26
Achnatherum nelsonii (Scribn.) Barkworth	116
Achnatherum occidentale (Thurb. ex S. Wats.) Barkworth ssp. occidentale	12
Achnatherum pinetorum (M.E. Jones) Barkworth	1
Achnatherum richardsonii (Link) Barkworth	2
Aconitum columbianum Nutt.	81
Actaea rubra (Ait.) Willd.	43
Agastache urticifolia (Benth.) Kuntze var. urticifolia	113
Agoseris Raf.	35
Agoseris aurantiaca (Hook.) Greene	13
Agoseris glauca (Pursh) Raf.	63
Agropyron Gaertn.	2
Agropyron cristatum (L.) Gaertn.	2
Agrostis L.	21
Agrostis capillaris L.	2
Agrostis exarata Trin.	3
Agrostis humilis Vasey	6
Agrostis scabra Willd.	15
Agrostis stolonifera L.	12
Agrostis variabilis Rydb.	1
Allium L.	5
Allium brevistylum S. Wats.	7
Allium schoenoprasum L.	1
Alnus incana (L.) Moench ssp. tenuifolia (Nutt.) Breitung	80
Alnus viridis (Vill.) Lam. & DC.	1
Alopecurus aequalis Sobol.	7
Alyssum alyssoides (L.) L.	1
Amelanchier Medik.	29
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	379
Amelanchier pumila (Torr. & Gray) Nutt. ex M. Roemer	5
Anaphalis margaritacea (L.) Benth.	9
Androsace L.	1
Androsace septentrionalis L.	16
Anemone L.	6
Anemone drummondii S. Wats.	2
Anemone multifida Poir.	4
Anemone parviflora Michx.	1

Anemone tetonensis Porter ex Britt.	5
Angelica L.	13
Angelica arguta Nutt.	52
Angelica pinnata S. Wats.	2
Angelica roseana Henderson	1
Antennaria Gaertn.	69
Antennaria alpina (L.) Gaertn.	7
Antennaria anaphaloides Rydb.	4
Antennaria aromatica Evert	1
Antennaria corymbosa E. Nels.	3
Antennaria dimorpha (Nutt.) Torr. & Gray	9
Antennaria lanata (Hook.) Greene	4
Antennaria luzuloides Torr. & Gray	4
Antennaria media Greene	6
Antennaria microphylla Rydb.	94
Antennaria parvifolia Nutt.	2
Antennaria pulcherrima (Hook.) Greene	1
Antennaria racemosa Hook.	32
Antennaria rosea Greene	16
Antennaria umbrinella Rydb.	16
Apocynum L.	1
Apocynum androsaemifolium L	1
Apocynum androsaemifolium L.	17
Aquilegia L.	29
Aquilegia caerulea James	49
Aquilegia flavescens S. Wats.	12
Aquilegia formosa Fisch. ex DC.	1
Aquilegia jonesii Parry	1
Arabidopsis Heynh.	14
Arabis L.	86
Arabis drummondii Gray	21
Arabis glabra (L.) Bernh.	9
Arabis hirsuta (L.) Scop. var. pycnocarpa (M. Hopkins) Rollins	4
Arabis holboellii Hornem.	18
Arabis lemmonii S. Wats.	3
Arabis lyallii S. Wats.	1
Arabis sparsiflora Nutt. var. subvillosa (S. Wats.) Rollins	2
Arabis williamsii Rollins var. saximontana (Rollins) Rollins	1
Arctostaphylos uva-ursi (L.) Spreng.	14
Arenaria L.	16
Arenaria congesta Nutt.	54
Arenaria kingii (S. Wats.) M.E. Jones	1
Argentina anserina (L.) Rydb.	3
Arnica L.	17
Arnica chamissonis Less.	6
Arnica cordifolia Hook.	234
Arnica gracilis Rydb.	1

Arnica latifolia Bong.	63
Arnica longifolia D.C. Eat.	48
Arnica mollis Hook.	18
Arnica parryi Gray	6
Arnica rydbergii Greene	1
Artemisia L.	13
Artemisia arbuscula Nutt.	50
Artemisia biennis Willd.	1
Artemisia cana Pursh	22
Artemisia dracunculus L.	6
Artemisia frigida Willd.	2
Artemisia ludoviciana Nutt.	16
Artemisia michauxiana Bess.	2
Artemisia scopulorum Gray	2
Artemisia tridentata Nutt. ssp. spiciformis (Osterhout) Kartesz & Gandhi	77
Artemisia tridentata Nutt. ssp. vaseyana (Rydb.) Beetle	324
Artemisia tripartita Rydb.	16
Aster L.	102
Astragalus L.	50
Astragalus agrestis Dougl. ex G. Don	3
Astragalus alpinus L.	7
Astragalus bisulcatus (Hook.) Gray	2
Astragalus kentrophyta Gray	13
Astragalus miser Dougl.	48
Astragalus molybdenus Barneby	3
Astragalus paysonii (Rydb.) Barneby	1
Astragalus purshii Dougl. ex Hook. var. purshii	1
Astragalus tenellus Pursh	1
Athyrium filix-femina (L.) Roth	3
Balsamorhiza sagittata (Pursh) Nutt.	255
Beckmannia syzigachne (Steud.) Fern.	1
Besseya alpina (Gray) Rydb.	1
Besseya wyomingensis (A. Nels.) Rydb.	11
Betula nana L.	18
Botrychium multifidum (Gmel.) Trev.	2
Brassica L.	1
Bromus L.	78
Bromus anomalus Rupr. ex Fourn.	33
Bromus carinatus Hook. & Arn.	176
Bromus ciliatus L.	75
Bromus inermis Leyss.	114
Bromus marginatus Nees ex Steud.	35
Bromus porteri (Coult.) Nash	9
Bromus tectorum L.	8
Bromus vulgaris (Hook.) Shear	38
Calamagrostis Adans.	8
Calamagrostis canadensis (Michx.) Beauv.	84

Calamagrostis inexpansa Gray	2
Calamagrostis koelerioides Vasey	3
Calamagrostis montanensis Scribn. ex Vasey	1
Calamagrostis purpurascens R. Br.	3
Calamagrostis rubescens Buckl.	456
Calamagrostis scopulorum M.E. Jones	3
Calamagrostis stricta (Timm) Koel.	20
Callistephus chinensis (L.) Nees	1
Callitriche palustris L.	1
Caltha L.	1
Caltha leptosepala DC.	19
Calypso bulbosa (L.) Oakes	3
Camassia quamash (Pursh) Greene	3
Campanula L.	1
Campanula rotundifolia L.	129
Campanula uniflora L.	1
Capsella Medik.	1
Capsella bursa-pastoris (L.) Medik.	4
Cardamine breweri S. Wats.	2
Cardamine pensylvanica Muhl. ex Willd.	2
Carduus nutans L.	76
Carex L.	175
Carex albonigra Mackenzie	2
Carex aquatilis Wahlenb.	37
Carex athrostachya Olney	9
Carex aurea Nutt.	1
Carex bebbii Olney ex Fern.	1
Carex bolanderi Olney	1
Carex brunnescens (Pers.) Poir.	1
Carex buxbaumii Wahlenb.	4
Carex diandra Schrank	1
Carex disperma Dewey	3
Carex elynoides Holm	6
Carex engelmannii Bailey	1
Carex filifolia Nutt.	1
Carex geyeri Boott	519
Carex haydeniana Olney	5
Carex heteroneura W. Boott	3
Carex hoodii Boott	183
Carex illota Bailey	2
Carex interior Bailey	1
Carex laeviculmis Meinsh.	1
Carex lasiocarpa Ehrh.	5
Carex lenticularis Michx.	3
Carex luzulina Olney var. ablata (Bailey) F.J. Herm.	4
Carex microptera Mackenzie	68
Carex nardina Fries	2

Carex nebrascensis Dewey	6
Carex nesophila Holm	1
Carex neurophora Mackenzie	2
Carex nigricans C.A. Mey.	14
Carex norvegica Retz.	2
Carex nova Bailey	3
Carex pachystachya Cham. ex Steud.	3
Carex parryana Dewey var. parryana	1
Carex paysonis Clokey	30
Carex pellita Muhl ex Willd.	10
Carex pelocarpa F.J. Herm.	2
Carex pensylvanica Lam.	1
Carex petasata Dewey	6
Carex phaeocephala Piper	7
Carex praegracilis W. Boott	9
Carex praticola Rydb.	22
Carex preslii Steud.	1
Carex pyrenaica Wahlenb.	3
Carex raynoldsii Dewey	9
Carex rossii Boott	107
Carex rupestris All.	2
Carex scirpoidea Michx.	2
Carex simulata Mackenzie	2
Carex spectabilis Dewey	3
Carex stenoptila F.J. Herm.	2
Carex utriculata Boott	84
Carex vallicola Dewey	9
Carex vesicaria L.	11
Castilla Cerv.	30
Castilleja Mutis ex L. f.	42
Castilleja angustifolia (Nutt.) G. Don	2
Castilleja applegatei Fern. ssp. martinii (Abrams) Chuang & Heckard	2
Castilleja flava S. Wats.	6
Castilleja linariifolia Benth.	4
Castilleja miniata Dougl. ex Hook.	67
Castilleja occidentalis Torr.	1
Castilleja pilosa (S. Wats.) Rydb. var. longispica (A. Nels.) N. Holmgren	16
Castilleja pulchella Rydb.	4
Castilleja rhexiifolia Rydb.	12
Castilleja sulphurea Rydb.	35
Caulanthus amplexicaulis S. Wats. var. amplexicaulis	2
Ceanothus velutinus Dougl. ex Hook.	101
Centaurea biebersteinii DC.	7
Cerastium L.	1
Cerastium arvense L.	10
Cerastium fontanum Baumg.	1
Cerastium fontanum Baumg. ssp. vulgare (Hartman) Greuter & Burdet	4

Cercocarpus ledifolius Nutt.	2
Chaenactis douglasii (Hook.) Hook. & Arn.	3
Chamerion Raf. ex Holub	1
Chamerion angustifolium (L.) Holub ssp. angustifolium	334
Chamerion latifolium (L.) Holub	1
Chenopodium L.	8
Chenopodium album L.	3
Chenopodium atrovirens Rydb.	2
Chimaphila umbellata (L.) W. Bart.	58
Chrysothamnus Nutt.	3
Chrysothamnus viscidiflorus (Hook.) Nutt.	32
Cichorium L.	1
Cinna latifolia (Trev. ex Goepp.) Griseb.	5
Circaea alpina L. ssp. alpina	1
Cirsium P. Mill.	24
Cirsium arvense (L.) Scop.	120
Cirsium eatonii (Gray) B.L. Robins.	3
Cirsium scariosum Nutt.	45
Cirsium scopulorum (Greene) Cockerell ex Daniels	2
Cirsium tweedyi (Rydb.) Petrak	3
Cirsium vulgare (Savi) Ten.	13
Claytonia L.	2
Claytonia lanceolata Pall. ex Pursh	33
Clematis L.	6
Clematis columbiana (Nutt.) Torr. & Gray	3
Clematis hirsutissima Pursh	15
Clematis ligusticifolia Nutt.	1
Clematis occidentalis (Hornem.) DC.	13
Collinsia Nutt.	3
Collinsia linearis Gray	4
Collinsia parviflora Lindl.	66
Collomia Nutt.	11
Collomia linearis Nutt.	91
Comandra Nutt.	1
Comandra umbellata (L.) Nutt.	40
Comarum palustre L.	3
Corallorrhiza Gagnebin	22
Corallorrhiza maculata (Raf.) Raf. var. occidentalis (Lindl.) Ames	2
Corallorrhiza mertensiana Bong.	4
Corallorrhiza striata Lindl.	1
Cordylanthus ramosus Nutt. ex Benth.	1
Cornus L.	1
Cornus sericea L.	18
Crataegus douglasii Lindl.	10
Crepis L.	14
Crepis acuminata Nutt.	10
Crepis acuminata Nutt. ssp. acuminata	10

Crepis atribarba Heller	2
Crepis intermedia Gray	1
Crepis modocensis Greene	1
Crepis runcinata (James) Torr. & Gray	5
Crepis tectorum L.	2
Cryptantha affinis (Gray) Greene	3
Cryptantha torreyana (Gray) Greene	3
Cryptogramma acrostichoides R. Br.	3
Cuscuta pentagona Engelm. var. pentagona	1
Cymopterus longipes S. Wats.	2
Cymopterus nivalis S. Wats.	1
Cynoglossum L.	1
Cynoglossum officinale L.	10
Cystopteris fragilis (L.) Bernh.	3
Dactylis glomerata L.	11
Danthonia DC.	6
Danthonia intermedia Vasey	45
Danthonia spicata (L.) Beauv. ex Roemer & J.A. Schultes	1
Danthonia unispicata (Thurb.) Munro ex Macoun	16
Dasiphora floribunda (Pursh) Kartesz, comb. nov. ined.	107
Delphinium burkei Greene (pro sp.)	2
Delphinium occidentale (S. Wats.) S. Wats. (pro sp.)	102
Delphinium L.	33
Delphinium barbeyi (Huth) Huth	1
Delphinium bicolor Nutt.	1
Delphinium glaucum S. Wats.	5
Delphinium nuttallianum Pritz. ex Walp.	26
Deschampsia Beauv.	3
Deschampsia caespitosa (L.) Beauv.	98
Deschampsia danthonioides (Trin.) Munro	2
Descurainia Webb & Berth.	7
Descurainia californica (Gray) O.E. Schulz	1
Descurainia incana (Bernh. ex Fisch. & C.A. Mey.) Dorn	8
Descurainia pinnata (Walt.) Britt.	3
Descurainia sophia (L.) Webb ex Prantl	1
Dianthus armeria L.	1
Dicentra uniflora Kellogg	1
Disporum trachycarpum (S. Wats.) Benth. & Hook. f.	22
Dodecatheon L.	3
Dodecatheon jeffreyi Van Houtte	1
Dodecatheon pulchellum (Raf.) Merr.	3
Draba L.	16
Draba albertina Greene	4
Draba crassifolia Graham	2
Draba fladnizensis Wulfen	1
Draba nemorosa L.	2
Draba oligosperma Hook.	1

Draba verna L.	2
Drosera anglica Huds.	1
Dryas octopetala L.	3
Elaeagnus commutata Bernh. ex Rydb.	15
Eleocharis R. Br.	5
Eleocharis acicularis (L.) Roemer & J.A. Schultes	2
Eleocharis flavescens (Poir.) Urban	1
Eleocharis palustris (L.) Roemer & J.A. Schultes	8
Eleocharis quinqueflora (F.X. Hartmann) Schwarz	1
Eleocharis rostellata (Torr.) Torr.	1
Elymus L.	116
Elymus canadensis L.	1
Elymus cinereus Scribn. & Merr.	3
Elymus elymoides (Raf.) Swezey	13
Elymus glaucus Buckl.	283
Elymus lanceolatus (Scribn. & J.G. Sm.) Gould	17
Elymus repens (L.) Gould	4
Elymus trachycaulus (Link) Gould ex Shinners	226
Epilobium L.	34
Epilobium anagallidifolium Lam.	4
Epilobium brachycarpum K. Presl	4
Epilobium ciliatum Raf.	12
Epilobium clavatum Trel.	2
Epilobium halleanum Hausskn.	1
Epilobium lactiflorum Hausskn.	2
Equisetum L.	17
Equisetum arvense L.	79
Equisetum hyemale L.	20
Equisetum laevigatum A. Braun	24
Ericameria Nutt.	2
Ericameria nauseosa (Pallas ex Pursh) Nesom & Baird	28
Ericameria suffruticosa (Nutt.) Nesom	1
Erigeron L.	53
Erigeron acris L.	1
Erigeron caespitosus Nutt.	1
Erigeron compositus Pursh	5
Erigeron concinnus (Hook. & Arn.) Torr. & Gray var. concinnus	2
Erigeron corymbosus Nutt.	2
Erigeron divergens Torr. & Gray	2
Erigeron eatonii Gray	5
Erigeron formosissimus Greene	2
Erigeron glabellus Nutt.	2
Erigeron gracilis Rydb.	1
Erigeron lanatus Hook.	3
Erigeron leiomerus Gray	1
Erigeron lonchophyllus Hook.	1
Erigeron ochroleucus Nutt.	10

Erigeron peregrinus (Banks ex Pursh) Greene	43
Erigeron rydbergii Cronq.	1
Erigeron simplex Greene	6
Erigeron speciosus (Lindl.) DC.	25
Erigeron ursinus D.C. Eat.	4
Eriogonum Michx.	20
Eriogonum caespitosum Nutt.	1
Eriogonum heracleoides Nutt.	1
Eriogonum ovalifolium Nutt.	2
Eriogonum umbellatum Torr.	425
Eriophorum chamissonis C.A. Mey.	1
Eriophyllum lanatum (Pursh) Forbes	16
Erysimum L.	3
Erysimum capitatum (Dougl. ex Hook.) Greene var. capitatum	1
Eucephalus elegans Nutt.	22
Eucephalus engelmannii (D.C. Eat.) Greene	251
Eurybia conspicua (Lindl.) Nesom	55
Eurybia glauca (Nutt.) Nesom	4
Eurybia integrifolia (Nutt.) Nesom	29
Eurybia merita (A. Nels.) Nesom	3
Festuca L.	3
Festuca brachyphylla J.A. Schultes ex J.A. & J.H. Schultes ssp. coloradensis Frederiksen	4
Festuca idahoensis Elmer	140
Festuca ovina L.	6
Festuca rubra L. ssp. arenaria (Osbeck) F. Aresch.	1
Festuca saximontana Rydb.	3
Floerkea proserpinacoides Willd.	1
Fragaria L.	11
Fragaria vesca L.	82
Fragaria virginiana Duchesne	195
Frasera speciosa Dougl. ex Griseb.	103
Fritillaria L.	2
Fritillaria atropurpurea Nutt.	15
Fritillaria pudica (Pursh) Spreng.	17
Galium L.	63
Galium aparine L.	6
Galium bifolium S. Wats.	38
Galium boreale L.	98
Galium trifidum L.	16
Galium triflorum Michx.	69
Gaultheria humifusa (Graham) Rydb.	1
Gayophytum A. Juss.	6
Gayophytum diffusum Torr. & Gray	12
Gayophytum racemosum Torr. & Gray	1
Gayophytum ramosissimum Torr. & Gray	1
Gentiana L.	15
Gentiana affinis Griseb.	3

Gentiana calycosa Griseb.	25
Gentianella amarella (L.) Boerner	4
Gentianopsis detonsa (Rottb.) Ma ssp. detonsa	2
Gentianopsis thermalis (Kuntze) Iltis	2
Geranium L.	23
Geranium richardsonii Fisch. & Trautv.	30
Geranium viscosissimum Fisch. & C.A. Mey. ex C.A. Mey.	448
Geum L.	14
Geum macrophyllum Willd.	57
Geum rossii (R. Br.) Ser.	4
Geum triflorum Pursh	32
Gilia tenerrima Gray	1
Glyceria R. Br.	1
Glyceria borealis (Nash) Batchelder	7
Glyceria grandis S. Wats.	3
Glyceria striata (Lam.) A.S. Hitchc.	14
Glycyrrhiza lepidota Pursh	3
Goodyera oblongifolia Raf.	49
Grindelia squarrosa (Pursh) Dunal	1
Habenaria Willd.	8
Habenaria saccata Greene	1
Hackelia Opiz	4
Hackelia floribunda (Lehm.) I.M. Johnston	9
Hackelia micrantha (Eastw.) J.L. Gentry	7
Hackelia patens (Nutt.) I.M. Johnston	6
Hedysarum L.	13
Hedysarum alpinum L.	7
Hedysarum boreale Nutt.	16
Hedysarum occidentale Greene	16
Helianthella Torr. & Gray	4
Helianthella quinquenervis (Hook.) Gray	30
Helianthella uniflora (Nutt.) Torr. & Gray	230
Helianthus L.	2
Heliomeris multiflora Nutt. var. multiflora	35
Heracleum maximum Bartr.	109
Hesperochiron pumilus (Dougl. ex Griseb.) Porter	1
Hesperostipa (Elias) Barkworth	1
Hesperostipa comata (Trin. & Rupr.) Barkworth	87
Heterotheca villosa (Pursh) Shinners var. depressa (Rydb.) Semple	17
Heuchera L.	3
Heuchera parvifolia Nutt. ex Torr. & Gray	10
Hieracium L.	60
Hieracium albiflorum Hook.	26
Hieracium cynoglossoides Arv.-Touv.	21
Hieracium gracile Hook.	16
Hieracium scouleri Hook.	2
Hieracium umbellatum L.	3

Hierochloe hirta (Schrank) Borbás ssp. arctica (J. Presl) G. Weim.	2
Hierochloe odorata (L.) Beauv.	2
Hordeum L.	2
Hordeum brachyantherum Nevski	8
Hordeum jubatum L.	9
Hydrophyllum L.	2
Hydrophyllum capitatum Dougl. ex Benth.	42
Hymenopappus tenuifolius Pursh	1
Hymenoxys Cass.	1
Hypericum L.	1
Hypericum scouleri Hook. ssp. Scouleri	2
Hypericum scouleri Hook. ssp. scouleri	13
Iliamna rivularis (Dougl. ex Hook.) Greene	17
Ipomopsis Michx.	2
Ipomopsis aggregata (Pursh) V. Grant	47
Ivesia gordonii (Hook.) Torr. & Gray	29
Juncus L.	16
Juncus balticus Willd. var. montanus Engelm.	52
Juncus confusus Coville	1
Juncus drummondii E. Mey.	23
Juncus ensifolius Wikstr.	7
Juncus longistylis Torr.	4
Juncus mertensianus Bong.	13
Juncus nodosus L. var. nodosus	1
Juncus parryi Engelm.	93
Juncus regelii Buch.	8
Juncus saximontanus A. Nels.	2
Juniperus communis L.	114
Juniperus scopulorum Sarg.	3
Kalmia microphylla (Hook.) Heller	5
Koeleria Pers.	5
Koeleria macrantha (Ledeb.) J.A. Schultes	159
Lactuca L.	1
Lactuca biennis (Moench) Fern.	1
Lactuca serriola L.	5
Lappula occidentalis (S. Wats.) Greene var. occidentalis	1
Lemna minor L.	1
Lepidium L.	2
Lepidium campestre (L.) Ait. f.	1
Lepidium densiflorum Schrad. var. pubecarpum (A. Nels.) Thellung	1
Leptodactylon pungens (Torr.) Torr. ex Nutt.	5
Lesquerella paysonii Rollins	1
Leucanthemum vulgare Lam.	2
Leucopoa kingii (S. Wats.) W.A. Weber	27
Lewisia pygmaea (Gray) B.L. Robins.	9
Leymus cinereus (Scribn. & Merr.) A. Löve	1
Lichen	3

Ligusticum L.	2
Ligusticum filicinum S. Wats.	202
Linanthastrum nuttallii (Gray) Ewan	1
Linanthus Benth.	1
Linanthus nuttallii (Gray) Greene ex Milliken ssp. nuttallii	5
Linanthus septentrionalis Mason	22
Linaria dalmatica (L.) P. Mill.	1
Linaria vulgaris P. Mill.	8
Linnaea borealis L.	3
Linum lewisii Pursh	50
Linum perenne L.	5
Listera R. Br. ex Ait. f.	2
Listera caurina Piper	3
Listera cordata (L.) R. Br. ex Ait. f.	4
Lithophragma (Nutt.) Torr. & Gray	5
Lithophragma parviflorum (Hook.) Nutt. ex Torr. & Gray	15
Lithophragma tenellum Nutt.	1
Lithospermum L.	2
Lithospermum ruderale Dougl. ex Lehm.	32
Lloydia serotina (L.) Reichenb.	3
Lomatium Raf.	14
Lomatium ambiguum (Nutt.) Coult. & Rose	15
Lomatium cous (S. Wats.) Coult. & Rose	8
Lomatium dissectum (Nutt.) Mathias & Constance	7
Lomatium simplex (Nutt.) J.F. Macbr. var. simplex	12
Lomatium triternatum (Pursh) Coult. & Rose	1
Lonicera L.	1
Lonicera involucrata Banks ex Spreng.	75
Lonicera utahensis S. Wats.	256
Lupinus L.	132
Lupinus argenteus Pursh	306
Lupinus depressus Rydb.	3
Lupinus leucophyllus Dougl. ex Lindl.	1
Lupinus polyphyllus Lindl.	6
Lupinus prunophilus M.E. Jones	1
Lupinus sericeus Pursh	62
Luzula DC.	7
Luzula glabrata (Hoppe ex Rostk.) Desv. var. hitchcockii (Hämet-Ahti) Dorn	17
Luzula parviflora (Ehrh.) Desv.	9
Luzula piperi (Coville) M.E. Jones	1
Luzula spicata (L.) DC.	3
Luzula wahlenbergii Rupr.	3
Machaeranthera canescens (Pursh) Gray	13
Madia Molina	1
Madia glomerata Hook.	1
Mahonia repens (Lindl.) G. Don	384
Maianthemum G.H. Weber ex Wiggers	1

Maianthemum racemosum (L.) Link	21
Maianthemum stellatum (L.) Link	82
Medicago L.	1
Medicago lupulina L.	16
Medicago sativa L.	10
Melica L.	5
Melica bulbosa Geyer ex Porter & Coult.	33
Melica spectabilis Scribn.	149
Melica subulata (Griseb.) Scribn.	4
Melilotus P. Mill.	2
Mentha arvensis L.	9
Menyanthes trifoliata L.	1
Menziesia ferruginea Sm.	35
Mertensia Roth	5
Mertensia ciliata (James ex Torr.) G. Don	58
Mertensia oblongifolia (Nutt.) G. Don	3
Microseris D. Don	1
Microseris nutans (Hook.) Schultz-Bip.	12
Mimulus L.	4
Mimulus guttatus DC.	10
Mimulus lewisii Pursh	17
Mimulus moschatus Dougl. ex Lindl. var. moschatus	1
Mimulus suksdorfii Gray	2
Minuartia filiorum (Maguire) McNeill	1
Minuartia nuttallii (Pax) Briq. ssp. Nuttallii	1
Minuartia nuttallii (Pax) Briq. ssp. nuttallii	2
Minuartia obtusiloba (Rydb.) House	7
Minuartia rubella (Wahlenb.) Hiern.	2
Mitella L.	14
Mitella stauropetala Piper	4
Moehringia lateriflora (L.) Fenzl	12
Moss	18
Muhlenbergia Schreb.	8
Muhlenbergia andina (Nutt.) A.S. Hitchc.	1
Muhlenbergia filiformis (Thurb. ex S. Wats.) Rydb.	1
Muhlenbergia racemosa (Michx.) B.S.P.	1
Muhlenbergia reverchonii Vasey & Scribn.	1
Muhlenbergia richardsonis (Trin.) Rydb.	6
Myosotis asiatica (Vesterg.) Schischkin & Sergievskaja	1
Myriophyllum L.	1
Nemophila breviflora Gray	29
Nemophila parviflora Dougl. ex Benth.	3
Nuphar lutea (L.) Sm. ssp. polysepala (Engelm.) E.O. Beal	16
Onosmodium molle Michx.	1
Opuntia fragilis (Nutt.) Haw.	2
Oreostemma alpigenum (Torr. & Gray) Greene	22
Orobanche L.	4

Orobanche corymbosa (Rydb.) Ferris ssp. corymbosa	3
Orobanche fasciculata Nutt.	2
Orobanche uniflora L.	4
Orthilia secunda (L.) House	72
Orthocarpus Nutt.	1
Orthocarpus luteus Nutt.	4
Orthocarpus tolmiei Hook. & Arn. ssp. tolmiei	1
Oryzopsis asperifolia Michx.	1
Osmorhiza Raf.	56
Osmorhiza berteroi DC.	134
Osmorhiza depauperata Phil.	18
Osmorhiza occidentalis (Nutt. ex Torr. & Gray) Torr.	22
Oxalis albicans Kunth ssp. californica (Abrams) Eiten	1
Oxytropis DC.	4
Oxytropis deflexa (Pallas) DC. var. foliolosa (Hook.) Barneby	3
Oxytropis lagopus Nutt.	4
Packera A. & D. Löve	1
Packera cana (Hook.) W.A. Weber & A. Löve	1
Packera dimorphophylla (Greene) W.A. Weber & A. Löve	19
Packera paupercula (Michx.) A.& D. Löve	5
Packera pseudaurea (Rydb.) W.A. Weber & A. Löve var. pseudaurea	2
Packera streptanthifolia (Greene) W.A. Weber & A. Löve	20
Parnassia L.	5
Parnassia fimbriata Koenig	3
Pascopyrum smithii (Rydb.) A. Löve	6
Paxistima myrsinites (Pursh) Raf.	213
Pedicularis L.	35
Pedicularis bracteosa Benth.	100
Pedicularis contorta Benth.	10
Pedicularis groenlandica Retz.	42
Pedicularis parryi Gray	1
Pedicularis racemosa Dougl. ex Benth.	67
Penstemon Schmidel	43
Penstemon attenuatus Dougl. ex Lindl.	2
Penstemon cyananthus Hook.	3
Penstemon cyaneus Pennell	3
Penstemon deustus Dougl. ex Lindl.	1
Penstemon ellipticus Coult. & Fisher	1
Penstemon procerus Dougl. ex Graham	8
Penstemon rydbergii A. Nels.	1
Penstemon whippleanus Gray	5
Perideridia Reichenb.	3
Perideridia bolanderi (Gray) A. Nels. & J.F. Macbr.	3
Perideridia gairdneri (Hook. & Arn.) Mathias	107
Phacelia Juss.	12
Phacelia hastata Dougl. ex Lehm.	12
Phacelia heterophylla Pursh	8

Phacelia hydrophylloides Torr. ex Gray	1
Phacelia linearis (Pursh) Holz.	1
Phacelia sericea (Graham) Gray	5
Phalaris arundinacea L.	6
Phleum L.	5
Phleum alpinum L.	50
Phleum pratense L.	283
Phlox L.	11
Phlox gracilis (Hook.) Greene	10
Phlox hoodii Richards.	5
Phlox longifolia Nutt.	24
Phlox multiflora A. Nels.	6
Phlox pulvinata (Wherry) Cronq.	20
Phyllodoce empetriformis (Sm.) D. Don	14
Picea engelmannii Parry ex Engelm.	226
Picea engelmannii Parry ex Engelm.--Sapling and Pole	138
Picea engelmannii Parry ex Engelm.--Seeding	154
Picea pungens Engelm.	88
Picea pungens Engelm.--Sapling and Pole	66
Picea pungens Engelm.--Seedling	39
Pinus L.--Seedling	1
Pinus albicaulis Engelm.	97
Pinus albicaulis Engelm.--Sapling and Pole	95
Pinus albicaulis Engelm.--Seedling	103
Pinus contorta Dougl. ex Loud. var. latifolia Engelm. ex S. Wats.	371
Pinus contorta Dougl. ex Loud. var. latifolia Engelm. ex S. Wats.--Sapling and Pole	264
Pinus contorta Dougl. ex Loud. var. latifolia Engelm. ex S. Wats.--Seedling	207
Pinus flexilis James	30
Pinus flexilis James--Sapling and Pole	51
Pinus flexilis James--Seedling	60
Piperia unalascensis (Spreng.) Rydb.	4
Piptatherum exiguum (Thurb.) Barkworth, comb. nov. ined.	3
Plagiobothrys scouleri (Hook. & Arn.) I.M. Johnston var. hispidulus (Greene) Dorn	1
Plantago L.	1
Plantago major L.	2
Platanthera dilatata (Pursh) Lindl. ex Beck	9
Platanthera hyperborea (L.) Lindl.	2
Platanthera stricta Lindl.	1
Poa L.	100
Poa abbreviata R. Br. ssp. pattersonii (Vasey) A.& D. Löve & Kapoor	4
Poa alpina L.	38
Poa arctica R. Br.	4
Poa arida Vasey	11
Poa arnowiae Soreng, ined.	2
Poa bulbosa L.	4
Poa compressa L.	39
Poa curta auct. non Rydb.	1

Poa cusickii Vasey	56
Poa fendleriana (Steud.) Vasey	9
Poa glauca Vahl ssp. rupicola (Nash ex Rydb.) W.A. Weber	9
Poa leptocoma Trin.	2
Poa lettermanii Vasey	5
Poa nemoralis L. ssp. interior (Rydb.) W.A. Weber	19
Poa nervosa (Hook.) Vasey	1
Poa palustris L.	40
Poa pratensis L.	516
Poa reflexa Vasey & Scribn. ex Vasey	11
Poa secunda J. Presl	91
Poa wheeleri Vasey	53
Polemonium L.	4
Polemonium foliosissimum Gray	1
Polemonium viscosum Nutt.	1
Polygonum L.	32
Polygonum amphibium L.	6
Polygonum aviculare L.	2
Polygonum bistortoides Pursh	54
Polygonum douglasii Greene	55
Polygonum polygaloides Wallich ex Meisn.	2
Polygonum viviparum L.	7
Polystichum lonchitis (L.) Roth	1
Populus L.	1
Populus angustifolia James	90
Populus angustifolia James--Sapling and Pole	26
Populus angustifolia James--Seedling	55
Populus balsamifera L.	31
Populus balsamifera L.--Sapling and Pole	16
Populus balsamifera L.--Seedling	14
Populus tremuloides Michx.	184
Populus tremuloides Michx.--Sapling and Pole	173
Populus tremuloides Michx.--Seedling	254
Porterella carnosula (Hook. & Arn.) Torr.	2
Potamogeton L.	1
Potentilla L.	64
Potentilla arguta Pursh	13
Potentilla concinna Richards.	3
Potentilla diversifolia Lehm.	24
Potentilla flabellifolia Hook. ex Torr. & Gray	6
Potentilla glandulosa Lindl.	58
Potentilla gracilis Dougl. ex Hook.	144
Potentilla nivea L.	4
Potentilla norvegica L.	1
Potentilla ovina Macoun ex J.M. Macoun	1
Potentilla pectinisecta Rydb.	1
Potentilla pulcherrima Lehm.	15

Primula parryi Gray	5
Prunella vulgaris L.	7
Prunus virginiana L. var. melanocarpa (A. Nels.) Sarg.	200
Pseudoroegneria (Nevski) A. Löve	1
Pseudoroegneria spicata (Pursh) A. Löve	103
Pseudostellaria jamesiana (Torr.) W.A. Weber & R.L. Hartman	1
Pseudotsuga menziesii (Mirbel) Franco var. glauca (Beissn.) Franco	234
Pseudotsuga menziesii (Mirbel) Franco var. glauca (Beissn.) Franco--Sapling and Pole	120
Pseudotsuga menziesii (Mirbel) Franco var. glauca (Beissn.) Franco--Seedling	76
Pteridium aquilinum (L.) Kuhn	17
Pterospora andromedea Nutt.	8
Pteryxia hendersonii (Coult. & Rose) Mathias & Constance	3
Pulsatilla patens (L.) P. Mill. ssp. multifida (Pritz.) Zamels	4
Purshia tridentata (Pursh) DC.	72
Pyrola L.	27
Pyrola asarifolia Michx.	11
Pyrola chlorantha Sw.	6
Pyrola minor L.	3
Pyrola picta Sm.	4
Pyrrocoma uniflora (Hook.) Greene var. uniflora	2
Ranunculus L.	11
Ranunculus acriformis Gray	1
Ranunculus acris L.	1
Ranunculus adoneus Gray	2
Ranunculus alismifolius Geyer ex Benth.	1
Ranunculus aquatilis L.	2
Ranunculus eschscholtzii Schlecht.	21
Ranunculus flammula L. var. filiformis (Michx.) Hook.	1
Ranunculus jovis A. Nels.	1
Ranunculus macounii Britt.	1
Ranunculus uncinatus D. Don ex G. Don	4
Rhamnus alnifolia L'Hér.	8
Rhodiola rhodantha (Gray) Jacobsen	1
Ribes L.	93
Ribes aureum Pursh var. aureum	1
Ribes cereum Dougl.	4
Ribes hudsonianum Richards.	2
Ribes inerme Rydb.	2
Ribes inerme Rydb. var. inerme	21
Ribes lacustre (Pers.) Poir.	53
Ribes montigenum McClatchie	41
Ribes oxyacanthoides L.	5
Ribes viscosissimum Pursh	54
Rorippa curvipes Greene	2
Rorippa palustris (L.) Bess. ssp. fernaldiana (Butters & Abbe) Jonsell	2
Rosa L.	157
Rosa nutkana K. Presl	5

Rosa sayi Schwein.	2
Rosa woodsii Lindl.	49
Rubus L.	4
Rubus idaeus L.	21
Rubus parviflorus Nutt.	62
Rudbeckia occidentalis Nutt.	99
Rumex L.	19
Rumex acetosa L.	2
Rumex acetosella L.	4
Rumex crispus L.	2
Rumex crispus L. ssp. crispus	4
Rumex maritimus L.	1
Rumex paucifolius Nutt.	4
Rumex salicifolius Weinm. var. mexicanus (Meisn.) C.L. Hitchc.	3
Sagittaria cuneata Sheldon	1
Salix L.	80
Salix arctica Pallas	12
Salix barclayi Anderss.	1
Salix bebbiana Sarg.	5
Salix boothii Dorn	57
Salix brachycarpa	1
Salix brachycarpa Nutt.	5
Salix commutata Bebb	2
Salix drummondiana Barratt ex Hook.	35
Salix eastwoodiae Cockerell ex Heller	32
Salix exigua Nutt.	5
Salix geyeriana Anderss.	25
Salix glauca L. ssp. glauca var. villosa (D. Don ex Hook.) Anderss.	18
Salix lasiandra Benth.	2
Salix lemmonii Bebb	14
Salix lucida Muhl. ssp. caudata (Nutt.) E. Murr.	1
Salix lutea Nutt.	4
Salix melanopsis Nutt.	1
Salix nivalis Hook.	2
Salix petrophila Rydb.	11
Salix planifolia Pursh	9
Salix reticulata L.	3
Salix rotundifolia	1
Salix rotundifolia Trautv. ssp. dodgeana (Rydb.) Argus	1
Salix scouleriana Barratt ex Hook.	25
Salix tweedyi (Bebb ex Rose) Ball	4
Salix wolfii Bebb	61
Salix wolfii x boothi	1
Salix wolfii x eastwoodii	1
Sambucus L.	1
Sambucus racemosa L.	21
Saxifraga L.	8

Saxifraga arguta auct. non D. Don	3
Saxifraga nidifica Greene var. nidifica	1
Saxifraga odontoloma Piper	17
Saxifraga rhomboidea Greene	1
Schoenoplectus tabernaemontani (K.C. Gmel.) Palla	2
Scrophularia lanceolata Pursh	1
Scutellaria galericulata L.	1
Sedum L.	13
Sedum debile S. Wats.	10
Sedum lanceolatum Torr.	55
Sedum stenopetalum Pursh	3
Senecio L.	48
Senecio crassulus Gray	94
Senecio fremontii Torr. & Gray	5
Senecio hydrophilus Nutt.	3
Senecio integerrimus Nutt.	13
Senecio serra Hook.	73
Senecio triangularis Hook.	62
Shepherdia canadensis (L.) Nutt.	214
Sibbaldia procumbens L.	43
Silene L.	3
Silene acaulis (L.) Jacq.	13
Silene latifolia Poir. ssp. alba (P. Mill.) Greuter & Burdet	3
Silene menziesii Hook. ssp. menziesii var. menziesii	3
Silene parryi (S. Wats.) C.L. Hitchc. & Maguire	1
Sisymbrium altissimum L.	2
Sisyrinchium idahoense Bickn.	6
Sium suave Walt.	4
Smelowskia calycina (Steph. ex Willd.) C.A. Mey.	2
Solidago L.	35
Solidago canadensis L.	44
Solidago gigantea Ait.	1
Solidago missouriensis Nutt.	15
Solidago mollis Bartl.	2
Solidago multiradiata Ait.	49
Solidago simplex Kunth ssp. simplex var. spathulata (DC.) Cronq.	1
Sonchus L.	1
Sonchus oleraceus L.	1
Sorbus scopulina Greene	203
Sparganium angustifolium Michx.	1
Sphagnum	1
Spiraea L.	6
Spiraea betulifolia Pallas	249
Spiraea splendens Baumann ex K. Koch	34
Spiranthes L.C. Rich.	1
Spiranthes romanzoffiana Cham.	3
Stellaria L.	6

Stellaria borealis Bigelow ssp. borealis	1
Stellaria calycantha (Ledeb.) Bong.	1
Stellaria crispa Cham. & Schlecht.	1
Stellaria longifolia Muhl. ex Willd. var. longifolia	4
Stellaria longipes Goldie	5
Stellaria obtusa Engelm.	3
Stellaria umbellata Turcz. ex Kar. & Kir.	2
Stenotus acaulis (Nutt.) Nutt.	1
Stephanomeria minor (Hook.) Nutt. var. minor	1
Stipa L.	8
Streptopus amplexifolius (L.) DC.	23
Symphoricarpos Duham.	5
Symphoricarpos albus (L.) Blake	60
Symphoricarpos oreophilus Gray	416
Symphyotrichum ascendens (Lindl.) Nesom	40
Symphyotrichum campestre (Nutt.) Nesom var. campestre	11
Symphyotrichum ciliolatum (Lindl.) A.& D. Löve	1
Symphyotrichum cusickii (Gray) Nesom	1
Symphyotrichum foliaceum (DC.) Nesom	32
Symphyotrichum lanceolatum (Willd.) Nesom ssp. hesperium (Gray) Nesom	4
Symphyotrichum lanceolatum (Willd.) Nesom ssp. hesperium (Gray) Nesom var. hesperium	11
Symphyotrichum lanceolatum (Willd.) Nesom ssp. lanceolatum	1
Symphyotrichum spathulatum (Lindl.) Nesom var. spathulatum	17
Taraxacum G.H. Weber ex Wiggers	90
Taraxacum laevigatum (Willd.) DC.	38
Taraxacum officinale G.H. Weber ex Wiggers	149
Tetradymia DC.	2
Tetradymia canescens DC.	8
Tetraneuris grandiflora (Torr. & Gray ex Gray) Parker	9
Thalictrum L.	160
Thalictrum fendleri Engelm. ex Gray	41
Thalictrum occidentale Gray	163
Thalictrum sparsiflorum Turcz. ex Fisch. & C.A. Mey.	3
Thinopyrum intermedium (Host) Barkworth & D.R. Dewey	3
Thlaspi arvense L.	24
Thlaspi montanum L.	3
Tofieldia glutinosa (Michx.) Pers. ssp. montana C.L. Hitchc.	1
Torreyochloa pallida (Torr.) Church var. pauciflora (J. Presl) J.I. Davis	2
Townsendia alpigena Piper var. alpigena	3
Tragopogon L.	22
Tragopogon dubius Scop.	58
Tragopogon pratensis L.	1
Trifolium L.	35
Trifolium hybridum L.	13
Trifolium longipes Nutt.	27
Trifolium pratense L.	14
Trifolium repens L.	22

Trisetum Pers.	2
Trisetum spicatum (L.) Richter	83
Trisetum wolfii Vasey	16
Triteleia grandiflora Lindl. var. grandiflora	1
Trollius laxus Salisb.	1
Typha latifolia L.	3
Unknown Forb	306
Unknown Graminoid	104
Unknown Moss	6
Unknown Shrub	5
Urtica dioica L. ssp. gracilis (Ait.) Seland.	47
Vaccinium L.	4
Vaccinium caespitosum Michx.	2
Vaccinium membranaceum Dougl. ex Torr.	216
Vaccinium occidentale Gray	1
Vaccinium scoparium Leib. ex Coville	263
Vaccinium uliginosum L.	7
Vahlodea atropurpurea (Wahlenb.) Fries ex Hartman	8
Valeriana L.	18
Valeriana acutiloba Rydb.	6
Valeriana californica Heller	1
Valeriana dioica L.	1
Valeriana edulis Nutt. ex Torr. & Gray	31
Valeriana occidentalis Heller	40
Veratrum californicum Dur.	4
Verbascum thapsus L.	3
Veronica L.	4
Veronica americana Schwein. ex Benth.	5
Veronica officinalis L.	3
Veronica scutellata L.	1
Veronica serpyllifolia L. ssp. humifusa (Dickson) Syme	1
Veronica wormskjoldii Roemer & J.A. Schultes	6
Vicia L.	1
Vicia americana Muhl. ex Willd.	8
Viola L.	76
Viola adunca Sm.	14
Viola nuttallii Pursh	31
Viola orbiculata Geyer ex Holz.	21
Viola praemorsa Dougl. ex Lindl. ssp. linguifolia (Nutt.) M.S. Baker & J.C. Clausen ex M.E. Peck	10
Viola purpurea Kellogg	12
Viola vallicola A. Nels. var. vallicola	6
Wyethia Nutt.	1
Wyethia amplexicaulis (Nutt.) Nutt.	12
Wyethia helianthoides Nutt.	1
Xerophyllum tenax (Pursh) Nutt.	8
Xylorhiza glabriuscula Nutt. var. glabriuscula	1
Zigadenus Michx.	16

Zigadenus elegans Pursh ssp. elegans	8
Zigadenus paniculatus (Nutt.) S. Wats.	2
Zigadenus venenosus S. Wats. var. gramineus (Rydb.) Walsh ex M.E. Peck	6
TOTAL OF 988 SPECIES RECORDED FOR GRTE DURING THE MAPPING PROJECT	

APPENDIX F: Photo Interpretation Mapping Conventions and Visual Key

Map Unit Description

Grand Teton National Park - Map Units

This section describes the map units for the Grand Teton National Park Vegetation Mapping Project. Its purpose is to:

- Describe the vegetation of each map unit;
- Provide a ground photo image for each map unit;
- Describe the link between each map unit and the U.S. National Vegetation Classification (USNVC);
- Provide visual examples of each map unit with aerial photographs and delineated overlays;
- Describe the spatial characteristics of each map unit;
- Provide an area report for each map unit.

The map units for GRTE were based on a combination of NVC plant associations, local requests (i.e. Park Specials), the limitations of the aerial photography, and land-use / land-cover classes. The vegetation described in this section reflects the classification designed specifically for this project. Comparisons across a more regional scale may be achieved by using the Anderson Land Cover classification or the ecological and physiognomic categories provided in the GIS layer. Lookup tables that include the names of each code are included in these appendices and on the DVD. Non-vegetated map units are not described here.

Each map unit is described by a variety of characteristics and features. These include vegetation descriptions, a ground photograph, spatial characteristics and typical aerial photo signatures taken from the 2002 true color digital orthophoto created expressively for this project. Many of the map unit descriptions rely heavily on the vegetation descriptions for the associations within the map unit provided by NatureServe and NPS. Each map unit is typically made up off several vegetation associations and these are listed. The sample ground photographs are from a variety of sources including ground photos of the sample plots and photos taken during signature verification trips. The sample aerial photos were taken from the new photography acquired specifically for this project. The spatial characteristics are derived from the GIS database. These data include items such as elevation ranges, slope/steepness, polygon size, and distribution within the mapping area.

Summary of Map Units

There are 52 map units that were used to describe the land cover in and around Grand Teton National Park. These include both vegetated and non-vegetated areas. Within the Park there are 333,320 acres and an additional 216,767 acres surrounding the Park were mapped as the Environs, totaling 550,087 acres. The table below details the map units, frequency, acres and hectares within the Park and the entire mapping area (Park + Environs).

Summary of Grand Teton National Park map units, frequency and area.

		Park			Total Project Area		
Map Code	**Map Unit Name**	**Frequency**	**Acres**	**Hectares**	**Frequency**	**Acres**	**Hectares**
DSA	Artic Willow Dwarf Shrubland	222	672	272	312	1131	458
DSE	Low Sagebrush Dwarf Shrubland	80	2792	1130	82	2807	1136
FAP	Aspen Forest	947	4280	1732	2266	10464	4235
FBS	Blue Spruce Riparian Forest	174	1341	543	239	1678	679
FCW	Cottonwood Riparian Forest	587	3324	1345	1079	5740	2323
FDF	Douglas-fir Forest	1530	14585	5902	2615	25208	10201
FEP	Mixed Evergreen - Poplar Forest	259	1792	725	686	3969	1606
FJ	Rocky Mountain Juniper Woodland Stand	0	0	0	10	76	31
FLM	Limber Pine Forest	2	9	4	17	93	38
FLP	Lodgepole Pine Forest	2135	40073	16217	4101	77765	31470
FMC	Mixed Conifer Forest	211	6153	2490	298	10364	4194
FRM	Mixed Conifer - Cottonwood Riparian Forest	185	1880	761	262	3326	1346
FSF	Subalpine Fir - Engelmann Spruce Forest	3970	43676	17675	6579	81813	33109
FWB	Whitebark Pine Forest	1260	9280	3755	1642	12127	4907
HA	Herbaceous Aquatics	15	78	32	19	255	103
HBR	Bracken Fern Herbaceous Vegetation	81	226	91	133	383	155
HDA	Alpine Herbaceous Vegetation	675	7052	2854	815	11547	4673
HFD	Montane Mesic Forb Herbaceous Vegetation	500	2708	1096	1361	7206	2916
HFX	Montane Xeric Forb Herbaceous Vegetation	467	3424	1386	1422	10365	4194
HGL	Mixed Grassland Herbaceous Vegetation	1011	11247	4551	2165	25873	10471
HGS	Flooded Wet Meadow Herbaceous Vegetation	975	4154	1681	1476	8581	3473
HSA	Subalpine Mixed Herbaceous Vegetation	923	6022	2437	1288	9159	3707
HWM	Alpine Mesic Meadows	117	1046	423	213	2110	854
KRM	Krummholtz Woodland	1288	3400	1376	1543	4261	1724
NGS	Perennial Snow - Glaciers	53	1409	570	55	1469	594
NID	Irrigation Canals	12	38	16	23	81	33

NIP	Cropland and Pasture	18	689	279	119	8313	3364
NLP	Lakes and Reservoirs	276	31594	12786	548	32526	13163
NRD	Transportation, Communications, and Utilities	11	912	369	15	1818	736
NRF	Mixed Urban or Built-up Land	182	1225	496	941	3763	1523
NRK	Bare Exposed Rock	970	15038	6086	1161	16427	6648
NSM	Strip Mines, Quarries, and Gravel Pits	10	74	30	16	108	44
NST	Streams	125	2705	1095	144	4269	1728
NVS	Non-vegetated Sand Bars	323	1096	444	472	1592	644
RAM	Mixed Subalpine Fir - Engelmann Spruce Woodland - Deciduous Shrubland Regeneration	677	4583	1855	762	5107	2067
RAP	Aspen Woodland Regeneration	279	1369	554	725	3896	1577
RLC	Lodgepole Pine - Ceanothus Woodland Regeneration	11	264	107	12	283	115
RLP	Lodgepole Pine Woodland Regeneration	279	4097	1658	573	10319	4176
RMC	Mixed Conifer Woodland Regeneration	78	551	223	226	1609	651
SAI	Alder Shrubland	22	109	44	23	110	44
SCV	Ceanothus Shrubland	62	1779	720	81	2020	817
SDS	Mixed Deciduous Shrubland	155	734	297	178	808	327
SES	Sagebrush - Antelope bitterbrush Mixed Shrubland	165	7287	2949	232	8654	3502
SMR	Mixed Tall Deciduous Shrubland	627	3636	1472	1356	7113	2878
SSD	Sagebrush Dry Shrubland	1051	39957	16170	2541	59274	23987
SSW	Sagebrush / Shrubby Cinquefoil Mesic Shrubland	323	3395	1374	724	6060	2453
SWL	Willow Shrubland	1500	10180	4120	2384	14147	5725
VCT	Cliff and Talus Sparse Vegetation	1560	21587	8736	2066	28742	11631
VEH	Exposed Hillside Sparse Vegetation	188	1233	499	834	4068	1646
VLP	Limestone Pavement Sparse Vegetation	83	1884	762	114	3524	1426
VRB	Recently Burned Sparse Vegetation	76	4882	1976	76	4942	2000
VSL	Exposed Lake Shoreline - Stream Deposit Sparse Vegetation	365	1796	727	578	2750	1113
	Total Natural Vegetation Map Units	22843	247156	100021	40440	435697	176321
	Total Sparse Vegetation	2272	31,383	12,700	3668	44,025	17,816
	Total Non-vegetated Land-Uuse	1980	54,781	22,169	3494	70,366	28,476
TOTAL		**27,095**	**333,320**	**134,890**	**47,602**	**550,087**	**222,613**

There are 47,602 polygons representing 550,087 acres of land. The minimum mapping unit was defined as 0.5 hectares for this project, however this definition was used as a loose guideline and the actual minimum threshold defined by the resolution of the aerial photography was 0.25 acres. The mean polygon size was 7 hectares (17 acres) for this project. The table below shows the summary statistics for the polygons created in this project. Please note that these numbers are based on the average for all of the polygons in both GRTE and the entire project. No attempt was made to separate the relatively flat valley polygons from the steep mountain portion.

Summary statistics for Grand Teton National Park vegetation map.

Park Polygons	27,095
Project Polygons	47,602
Park Avg. Aspect	179 ^{o}
Project Avg. Aspect	188 ^{o}
Park Avg. Slope	11 ^{o}
Project Avg. Slope	12 ^{o}
Park Avg. Elev. (ft)	7,488
Project Avg. Elev. (ft)	7,645
Park Avg. Acres	16
Project Avg. Acres	17
Park Total Acres	333,320
Project Total Acres	550,087
Park Avg. Hectares	7
Project Avg. Hectares	7
Park Total Hectares	134,890
Project Total Hectares	222,613

Forests and Woodlands

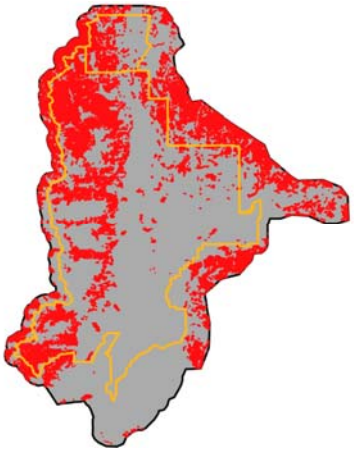
FSF *Abies lasiocarpa - Picea engelmannii* Forest
Subalpine Fir - Engelmann Spruce Forest

Associations:
Abies lasiocarpa - Picea engelmannii / Acer glabrum Forest
Abies lasiocarpa - Picea engelmannii / Actaea rubra Forest
Abies lasiocarpa - Picea engelmannii / Arnica cordifolia Forest
Abies lasiocarpa - Picea engelmannii / Arnica latifolia Forest
Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis Forest
Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens Forest
Abies lasiocarpa - Picea engelmannii / Carex geyeri Forest
Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Forest
Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea Forest
Abies lasiocarpa - Picea engelmannii / Ribes (montigenum, lacustre, inerme) Forest
Abies lasiocarpa - Picea engelmannii / Ribes lacustre Forest
Abies lasiocarpa - Picea engelmannii / Shepherdia canadensis Forest
Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest
Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus Forest
Abies lasiocarpa - Picea engelmannii / Thalictrum occidentale Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum Rocky Mountain Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium Forest
Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium Woodland
Abies lasiocarpa - Pseudotsuga menziesii - Pinus contorta Forest
Picea engelmannii / Equisetum arvense Forest
Picea engelmannii / Galium triflorum Forest

Photo Signature Example

Common species:
Abies lasiocarpa, Picea engelmannii, Acer glabrum
Arnica spp., *Calamagrostis* spp. *Carex geyeri,*
Menziesia ferruginea, Ribes spp., *Shepherdia canadensis*
Streptopus amplexifolius, Symphoricarpos albus,
Thalictrum occidentale, Vaccinium membranaceum
Vaccinium scoparium, Pinus contorta, Equisetum arvense

Range and Distribution



Project Specifics:
Frequency: 6,579 polygons (3,970 GRTE)
Average Aspect: 180° (157° GRTE)
Average Slope: 17° (19° GRTE)
Minimum Elevation: 6,198 ft. (6,459 ft. GRTE)
Maximum Elevation: 10,547 ft. (10,547 ft. GRTE)
Average Elevation: 8,296 ft (8,316 ft. GRTE)
Average Size: 12.4 acres (11.0 acres GRTE)
Total Size: 81,812.7 acres (43,675.8 acres GRTE)

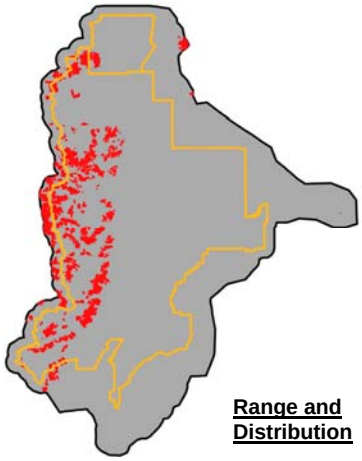
Description:
Engelmann spruce and subalpine fir forests comprise a substantial part of the forests within the Park representing most of the forests occurring in the subalpine zone. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with both spruce and fir dominating either mixed or alone. Towards lower elevations, the spruce-fir types give way, often along abrupt boundaries, to lodgepole pine or aspen-dominated forests. Douglas-fir trees may also be present and persist as mixed stands. On the photos this type was recognized by its very dark green color, pointed crowns, and location in the higher elevations of the Park.

Ground Photos

FWB *Pinus albicaulis* Forest
Whitebark Pine Forest

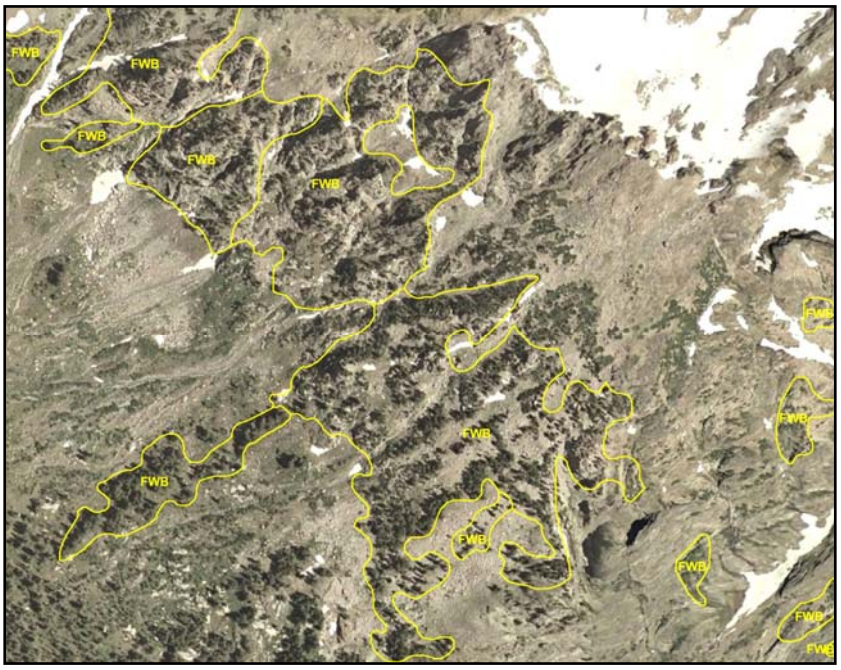
Associations:
Pinus albicaulis - Abies lasiocarpa Woodland [Provisional]
Pinus albicaulis / Vaccinium scoparium Forest

Common species:
Pinus albicaulis
Abies lasiocarpa
Vaccinium scoparium



Range and Distribution

Photo Signature Example



Project Specifics:
1,642 polygons (1,260 GRTE)
Average Aspect: 174° (163° GRTE)
Average Slope: 24° (26° GRTE)
Minimum Elevation: 7,493 ft. (7,493 ft. GRTE)
Maximum Elevation: 10,618 ft. (10,618 ft. GRTE)
Average Elevation: 9,442 ft. (9,449 ft. GRTE)
Average Size: 7.4 acres (7.4 acres GRTE)
Total Size: 12,126.6 acres (9,279.8 acres GRTE)

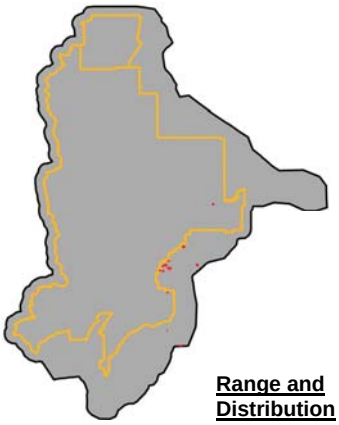
Description:
Whitebark pine was found in GRTE in the upper sub-alpine regions. It often formed large stands that extended into the alpine where it was a major component of krummholz stands. Whitebark pine often intermixes with spruce-fir and was usually present as a minor component of the high-elevation spruce-fir stands. Whitebark pine may hybridize with limber pine at GRTE and the two species are often hard to distinguish from one another. On the aerial photos whitebark stands appeared as bushy, dark green to brown trees. Stands were often patchy in nature or occurred in linear stings.

Ground Photos:

FLM *Pinus flexilis* Forest
Limber Pine Forest

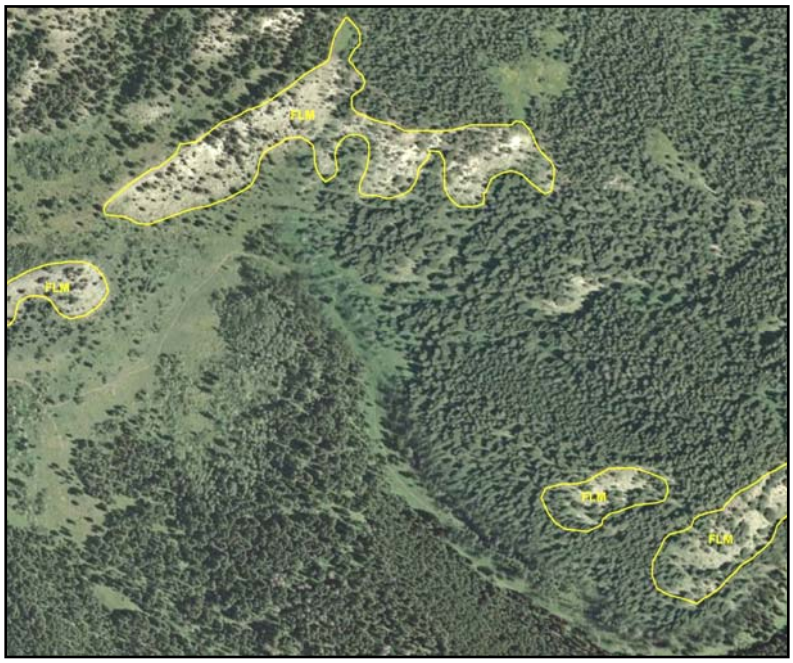
Association:
Pinus flexilis / Pseudoroegneria spicata Woodland

Common species:
Pinus flexilis
Pseudoroegneria spicata
Pinus contorta



Range and Distribution

Photo Signature Example



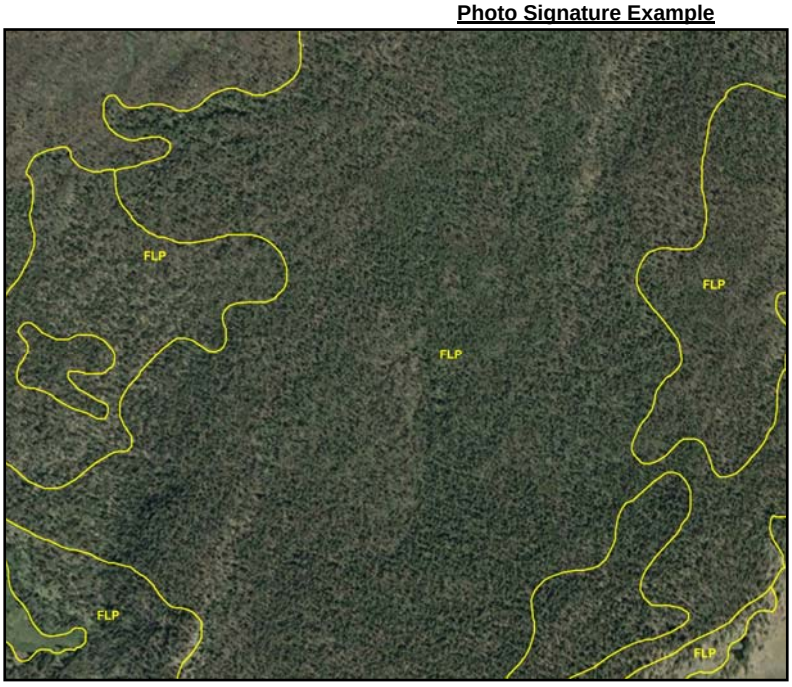
Project Specifics:
Frequency: 17 polygons (2 GRTE)
Average Aspect: 248° (269° GRTE)
Average Slope: 13° (11° GRTE)
Minimum Elevation: 6,888 ft. (6,888 ft. GRTE)
Maximum Elevation: 8,280 ft. (6950 ft. GRTE)
Average Elevation: 7,451 ft. (6,919 ft. GRTE)
Average Size: 5.5 acres (4.5 acres GRTE)
Total Size: 92.8 acres (9.0 acres GRTE)

Description:
This map class was uncommon with only a few homogenous limber pine stands greater than the minimum mapping unit identified. These occur primarily in the east and southeast regions of the study area. Although limber pine is common in GRTE, only a few stands were large and consistent enough to map in this study. Limber pine is a common associate species in other forest types at GRTE and may be confused with whitebark pine. On the aerial photos this type appeared on light colored soils as dark brown/green, bushy trees. This type was usually sparse and occurred on dry aspects.

Ground Photo:

FLP *Pinus contorta* Forest
Lodgepole Pine Forest

Photo Signature Example

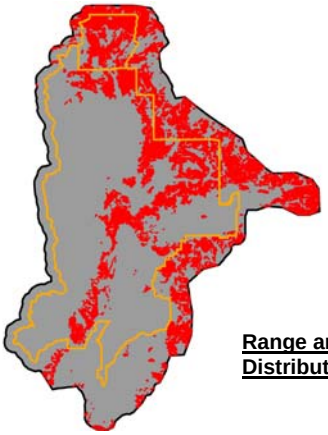


Associations:
Pinus contorta / Calamagrostis canadensis Forest
Pinus contorta / Calamagrostis rubescens Forest
Pinus contorta / Carex geyeri Forest
Pinus contorta / Carex rossii Forest
Pinus contorta / Ceanothus velutinus Forest
Pinus contorta / Dasiphora floribunda Forest
Pinus contorta / Hierochloe hirta Forest
Pinus contorta / Shepherdia canadensis Forest
Pinus contorta / Spiraea betulifolia Forest
Pinus contorta / Vaccinium membranaceum Rocky Mountain Forest
Pinus contorta / Vaccinium scoparium Forest

Common species:
Pinus contorta, Calamagrostis canadensis
Calamagrostis rubescens, Carex geyeri
Carex rossii, Ceanothus velutinus
Dasiphora floribunda, Vaccinium membranaceum
Vaccinium scoparium

Project Specifics:
Frequency: 4,101 polygons (2,135 GRTE)
Average Aspect: 200° (184° GRTE)
Average Slope: 7° (4° GRTE)
Minimum Elevation: 6,224 ft. (6,380 ft. GRTE)
Maximum Elevation: 9,454 ft. (9,048 ft. GRTE)
Average Elevation: 7,285 ft. (7,034 ft. GRTE)
Average Size: 19.0 acres (18.8 acres GRTE)
Total Size: 77,764.9 acres (40,073.4 acres GRTE)

Description:
The lodgepole pine map unit is common and widespread in the montane to subalpine regions of the Park. Late successional lodgepole pine stands often have high amounts of spruce-fir making delineation difficult and some truly mixed stands were mapped as Mixed Conifer Forest (see FMC). Mature stands of this map class were even-aged and often contained a sparse understory cover with low species diversity. Following stand-replacing fires at GRTE, lodgepole pine often rapidly colonize and develop into dense, even-aged stands (see also map classes RLP and RLC). Open canopy lodgepole pine has an air-photo signature which can be easily confused with Douglas-fir. On the aerial photos this map class appeared as a pebbled-textured, dark green signature. Individual trees appeared dark green to brown, slightly bushy and contained very small openings in the canopy.

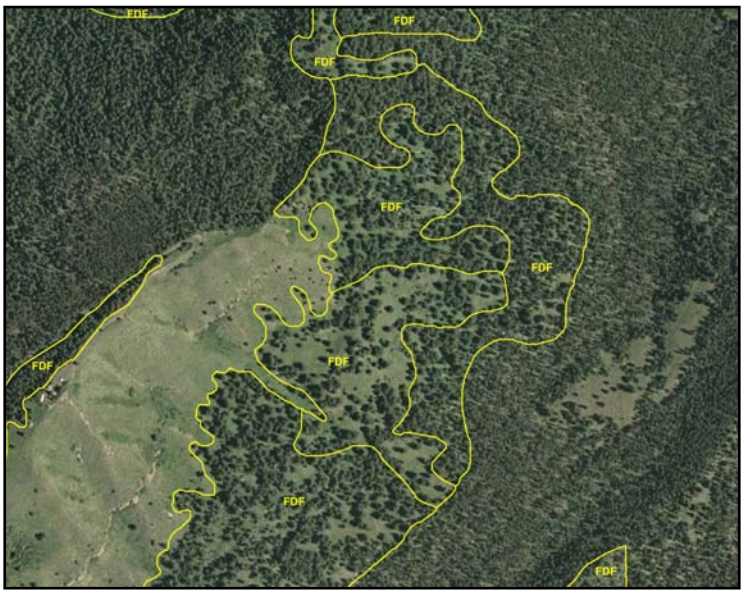


Range and Distribution

Ground Photos:

FDF *Pseudotsuga menziesii Forest*
Douglas-fir Forest

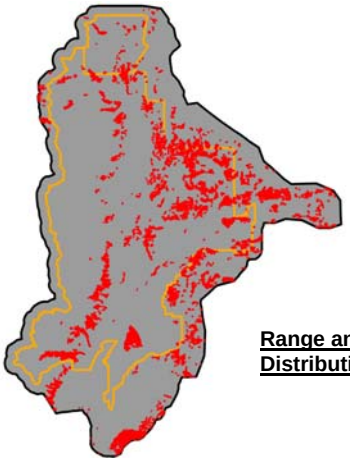
Photo Signature Example



Associations:
Pseudotsuga menziesii / Thalictrum occidentale Forest
Pseudotsuga menziesii / Acer glabrum Forest
Pseudotsuga menziesii / Amelanchier alnifolia Forest
Pseudotsuga menziesii / Calamagrostis rubescens Forest
Pseudotsuga menziesii / Carex geyeri Forest
Pseudotsuga menziesii / Osmorhiza berteroi Forest
Pseudotsuga menziesii / Spiraea betulifolia Forest
Pseudotsuga menziesii / Symphoricarpos albus Forest
Pseudotsuga menziesii / Symphoricarpos oreophilus Forest
Pseudotsuga menziesii / Vaccinium membranaceum Forest

Common species:
Pseudotsuga menziesii, Thalictrum occidentale, Acer glabrum, Amelanchier alnifolia, Calamagrostis rubescens , Carex geyeri, Spiraea betulifolia, Symphoricarpos spp. Vaccinium membranaceum

Project Specifics:
Frequency: 2,615 polygons (1,530 GRTE)
Average Aspect: 196° (175° GRTE)
Average Slope: 12° (11° GRTE)
Minimum Elevation: 6,287 ft. (6,551 ft. GRTE)
Maximum Elevation: 9,216 ft. (9216 ft. GRTE)
Average Elevation: (7,346 ft. (7,236 ft. GRTE)
Average Size: 9.6 acres (9.5 acres GRTE)
Total Size: 25,207.7 acres (14,584.6 acres GRTE)



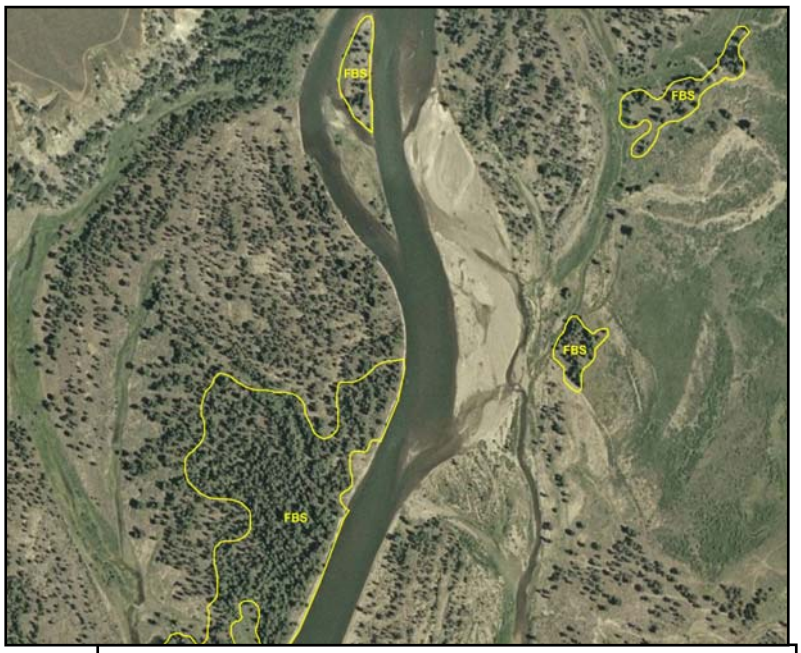
Range and Distribution

Description:
The Douglas Fir Forest map class occurs on south-facing slopes and in valley bottoms throughout the montane and lower sub-alpine areas of GRTE and the National Elk Refuge. Bushy lodgepole pines often have the same appearance as Douglas-fir trees and can form mixed stands. This is a highly variable map unit within the Park ranging from dense stands on mesic sites, to sparse stands on drier sites. The composition and structure of the overstory is likely dependent on site soil, moisture, and temperature characteristics, combined with the physiology of the species; Douglas-fir is more shade tolerant than lodgepole pine and aspen but less tolerant than spruce-fir. This type was mapped from the aerial photography by identifying its typical bushy crowns, location on dry slopes or wet valley bottoms, and its dark, kelly-green color

Ground Photos

FBS *Picea pungens* Riparian Forest
Blue Spruce Riparian Forest

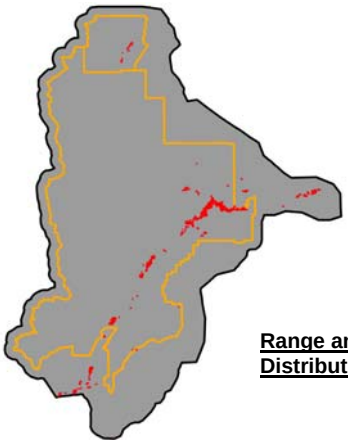
Photo Signature Example



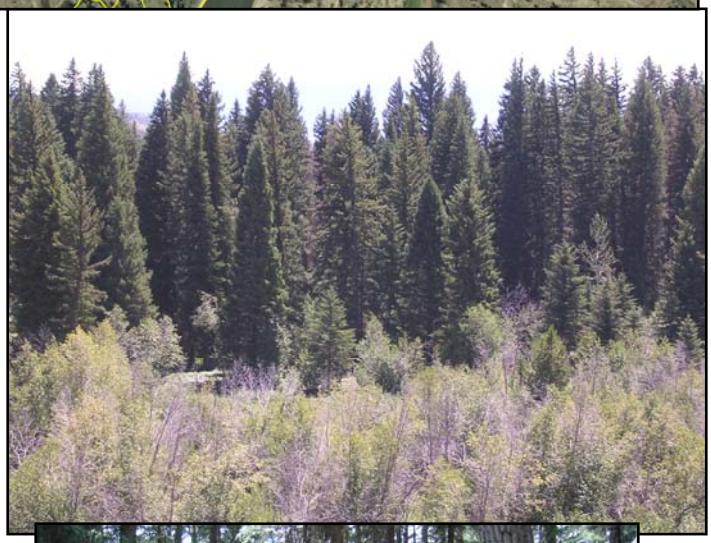
Associations:
Picea pungens / Actea rubra Forest
Picea pungens / Alnus incana Woodland
Picea pungens / Equisetum arvense Woodland
Picea pungens / Juniperus communis Forest
Picea pungens / Shepherdia canadensis Forest

Common species:
Picea pungens, Actea rubra
Alnus incana, Equisetum arvense,
Juniperus communis, Shepherdia Canadensis

Project Specifics:
Frequency: 239 polygons (174 GRTE)
Average Aspect: 212° (211° GRTE)
Average Slope: 2° (2° GRTE)
Minimum Elevation: 6,193 ft. (6,447 ft. GRTE)
Maximum Elevation: 7,144 ft. (7,144 ft. GRTE)
Average Elevation: 6,746 ft. (6,786 ft. GRTE)
Average Size: 7.0 acres (7.7 acres GRTE)
Total Size: 1,677.7 acres (1,341.2 GRTE)



Range and Distribution

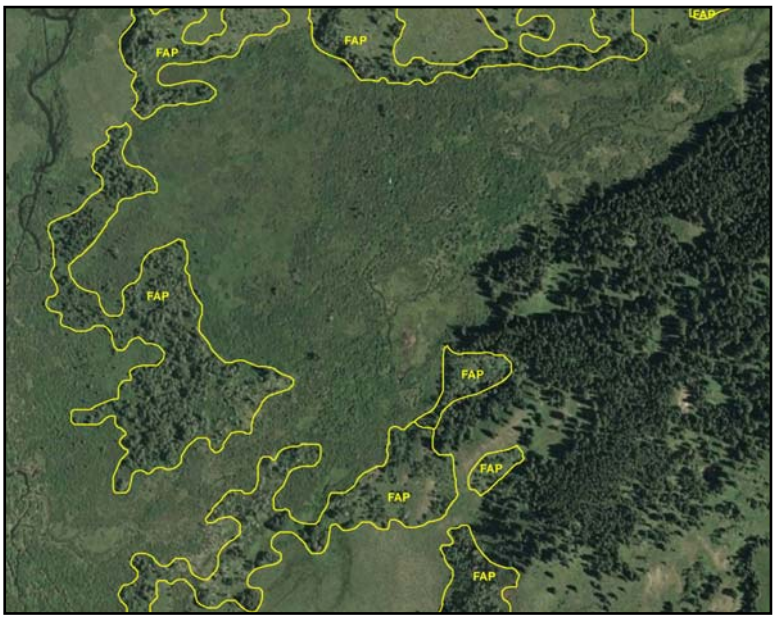


Description:
Blue spruce is common at GRTE in the lower floodplains of the Snake River and its tributaries. Blue spruce usually occurs with or adjacent to other conifer and cottonwood trees. On the aerial photography blue spruce typically appeared as dark green, mature trees with a faint bluish tint. All of the blue spruce trees were rather pointy and had large base crowns. The location of the trees on the floodplain along with their color and shape formed the basis for their delineation.

Ground Photos:

FAP *Populus tremuloides* Forest
Aspen Forest

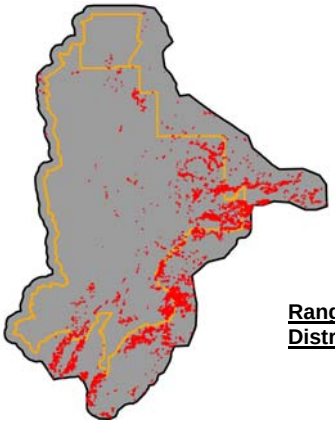
Photo Signature Example



Association:
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Amelanchier alnifolia / Carex geyeri Forest
Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum Forest
Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland
Populus tremuloides / Calamagrostis rubescens Forest
Populus tremuloides / Ceanothus velutinus Forest
Populus tremuloides / Salix scouleriana Forest
Populus tremuloides / Shepherdia canadensis Forest
Populus tremuloides / Symphoricarpos albus Forest
Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens Forest
Populus tremuloides / Symphoricarpos oreophilus / Tall Forbs Forest
Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Tall Forbs Forest
Populus tremuloides / Phleum pratense Semi-Natural Forest
Populus tremuloides / Poa pratensis Forest
Populus tremuloides / Thalictrum fendleri Forest

Common species:
Populus tremuloides, Carex geyeri, Pinus contorta Symphoricarpos oreophilus, Amelanchier alnifolia Thalictrum fendleri, Pteridium aquilinum, Symphoricarpos oreophilus, Poa pratensis

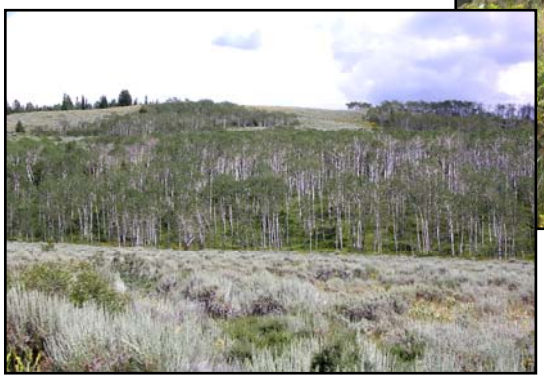
Project Specifics:
Frequency: 2266 polygons (947 GRTE)
Average Aspect: 197° (188° GRTE)
Average Slope: 6° (5° GRTE)
Minimum Elevation: 6,200 ft. (6,354 ft. GRTE)
Maximum Elevation: 9,035 ft. (8,046 ft. GRTE)
Average Elevation: 7,018 ft. (6,972 ft. GRTE)
Average Size: 4.6 acres (4.5 acres GRTE)
Total Size: 10,463.7 acres (4,280.4 acres GRTE)



Range and Distribution

Description:
Aspen woodlands are found throughout the montane and lower sub-alpine life zones especially along the eastern edge of the project area. Aspen intermingles with cottonwood and other riparian trees along the floodplains with lodgepole pine and Douglas-fir in the montane zone and with spruce fir in the sub-alpine zone. Aspen ages ranged from over-mature, decadent stands to young saplings. On the photos aspen was characterized by its light green signature that contrasted with the dark green conifers. In older stands and stands that were disturbed the white bark of the trees could be seen on the photography.

Ground Photos:



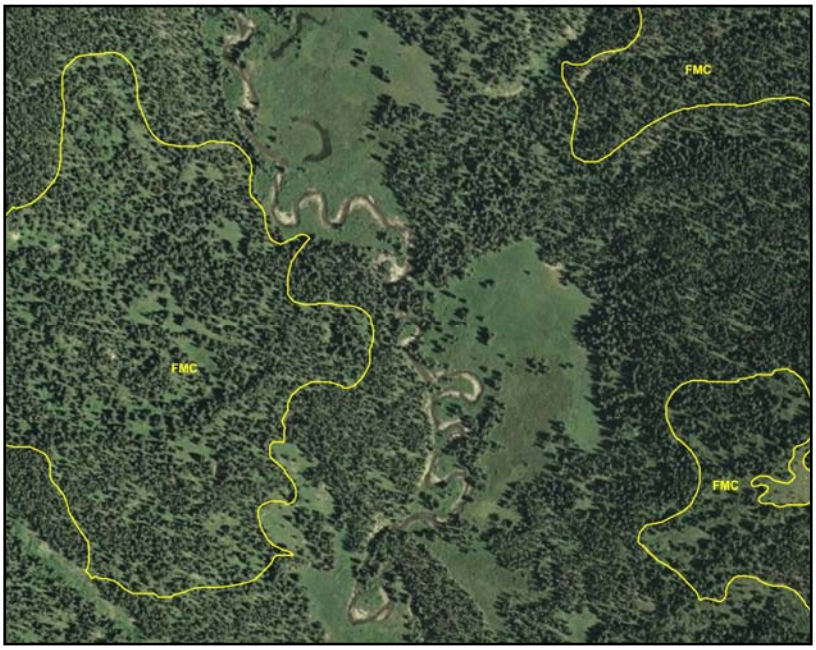
FMC Mixed Conifer Forest

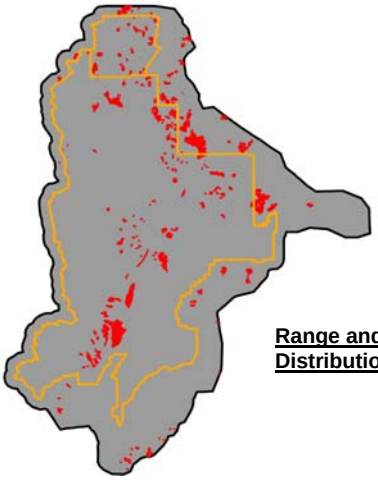
Associations:
(Mixed Stands of the previously listed Conifer Associations)

Common species:
Abies lasiocarpa, Picea engelmannii, Pinus contorta, Pseudotsuga menziesi, Pinus flexilis

Project Specifics:
Frequency: 298 polygons (211 GRTE)
Average Aspect: 201° (190° GRTE)
Average Slope: 7° (5° GRTE)
Minimum Elevation: 6,467 ft. (6,478 ft. GRTE)
Maximum Elevation: 9,798 ft. (9,798 ft. GRTE)
Average Elevation: 7,276 ft. (7,103 ft. GRTE)
Average Size: 34.8 acres (29.2 acres GRTE)
Total Size: 10,363.7 acres (6,152.8 acres GRTE)

Photo Signature Example

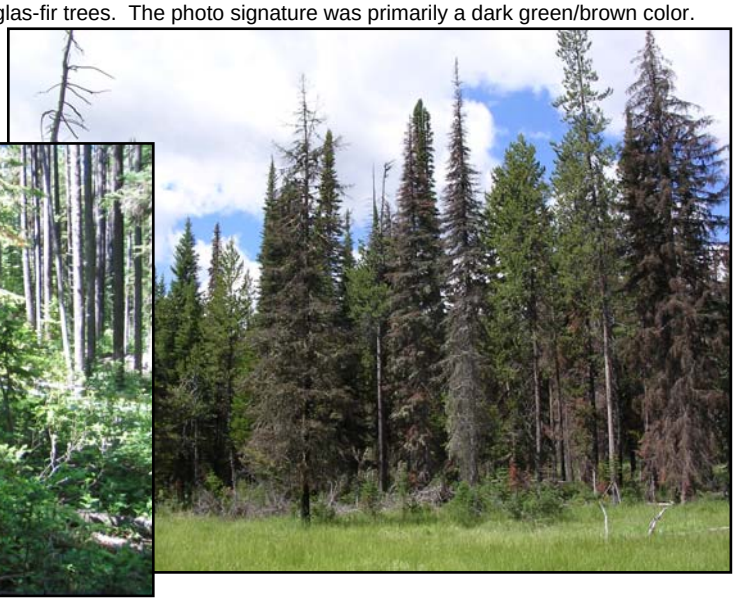




Range and Distribution

Description:
This map class was primarily used to describe evenly-mixed composition stands of primarily lodgepole pine and spruce-fir found throughout the Park. It was also used to map other mixed type such as Douglas-fir and limber pine. By default, this map class was only used when no clearly dominant tree species could be determined. It was also used to map successional stands that contained a mix of older lodgepole and young spruce-fir. This type can easily be confused with lodgepole pine and spruce-fir since they mix in varying degrees. On the aerial photography this type was characterized by having both sharp, pointy crowns typical of spruce-fir and large bushy lodgepole, limber pine, or Douglas-fir trees. The photo signature was primarily a dark green/brown color.

Ground Photo:



FJ *Juniperus scopulorum* Woodland Stand
Rocky Mountain Juniper Woodland

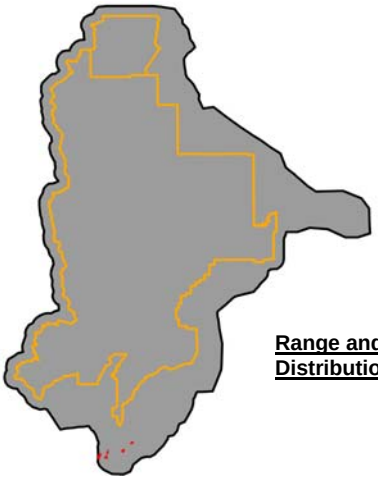
Associations:
(Local stands – no associations)

Common species:
Juniperus scopulorum

Project Specifics:
Frequency: 10 polygons (0 GRTE)
Average Aspect: 156° (0 GRTE)
Average Slope: 21° (0 GRTE)
Minimum Elevation: 6,302 ft. (0 ft. GRTE)
Maximum Elevation: 6,718 ft. (0 ft. GRTE)
Average Elevation: 6,538 ft. (0 ft. GRTE)
Average Size: 7.6 acres (0 acres GRTE)
Total Size: 76.0 acres (0 acres GRTE)

Description:
This map class was only found in the southern portions of the study area in and around the National Elk Refuge.
This class was mapped based on known locations although other small stands may exist. On the photography this type appeared as small, dark olive green trees occurring on light colored soils. Typically this type was sparse and was located on dry south, east facing slopes.

Photo Signature Example



Range and Distribution

Ground Photos:

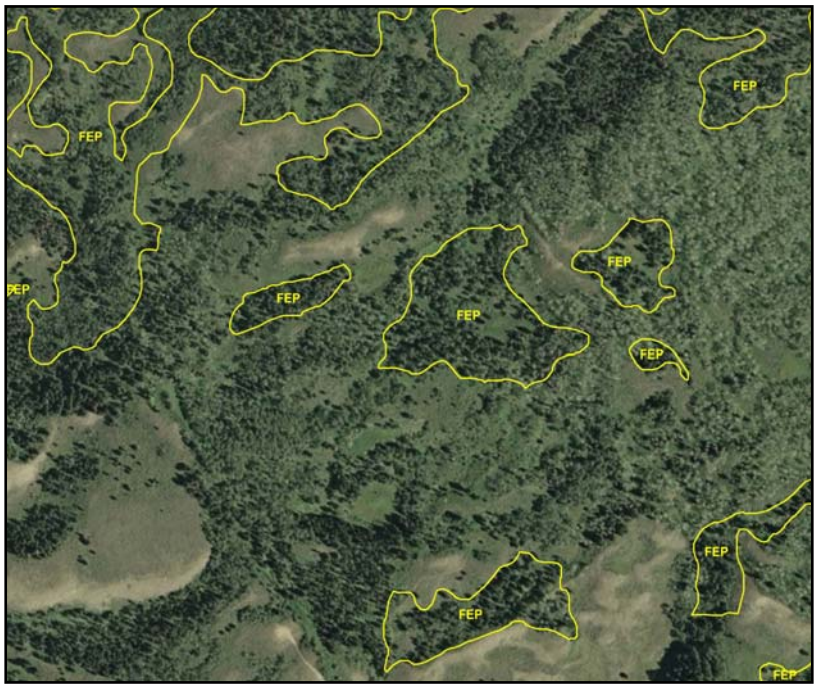
FEP Mixed Evergreen - *Populus* spp. Forest
Mixed Evergreen - Poplar Forest

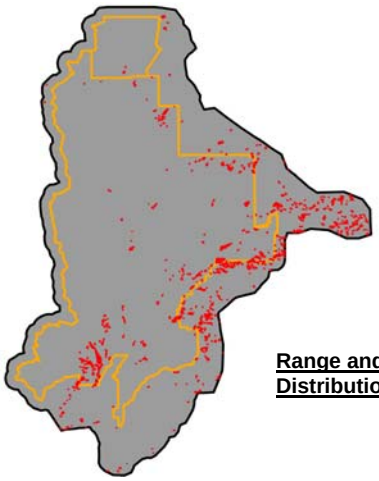
Association:
Populus tremuloides - Abies lasiocarpa / Carex geyeri - Calamagrostis rubescens Forest
Populus tremuloides - Abies lasiocarpa / Tall Forbs Forest
Populus tremuloides - Pinus contorta / Carex geyeri - Calamagrostis rubescens Forest
Populus tremuloides - Pinus contorta / Symphoricarpos oreophilus Forest
Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia Forest

Common species:
Populus tremuloides, Abies lasiocarpa, Pinus contorta, Pseudotsuga menziesii

Project Specifics:
Frequency: 686 polygons (259 GRTE)
Average Aspect: 207° (193° GRTE)
Average Slope: 7° (6° GRTE)
Minimum Elevation: 6,191 ft. (6,419 ft. GRTE)
Maximum Elevation: 8,925 ft. (7,958 ft. GRTE)
Average Elevation: 7,210 ft. (6,986 ft. GRTE)
Average Size: 5.8 acres (6.9 acres GRTE)
Total Size: 3,968.9 acres (1792.1 acres GRTE)

Photo Signature Example





Range and Distribution

Ground Photos:

Description:
This map class represents very evenly mixed upland woodland stands comprised primarily of lodgepole pine, aspen, Douglas-fir, and sub-alpine fir found throughout the montane portions of GRTE. This map class has many species in common with other woodland types and may be confused with other mixed forest and riparian types. This type differed from the FRM type in that it includes aspen rather than cottonwoods, and occurred mainly in upland areas. On the photos this map class appeared as an even mix between dark green conifers and light green deciduous trees.

:

FCW *Populus angustifolia - P. balsamifera* Riparian Forest
Cottonwood Riparian Forest

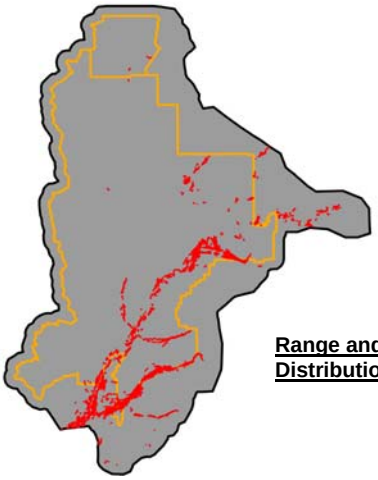
Photo Signature Example

Associations:
Populus angustifolia / Artemisia tridentata var. vasyana / Eriogonium umbellatum Outwash Woodland
Populus angustifolia / Poa pratensis Woodland
Populus angustifolia / Shepherdia canadensis Forest
Populus angustifolia / Symphoricarpos (albus, occidentalis, oreophilus) Forest
Populus balsamifera (spp. trichocarpa, ssp. balsamifera) / Symphoricarpos (albus, occidentalis, oreophyllus) Forest
Populus balsamifera (ssp. trichocarpa, ssp. balsamifera) / Mixed Herbs Forest
Populus balsamifera (ssp. trichocarpa, ssp. balsamifera) / Prunus virginiana Forest
Populus balsamifera (ssp. trichocarpa, ssp. balsamifera) / Cornus sericea Forest

Common species:
Populus angustifolia, Populus balsamifera (spp. trichocarpa, ssp. balsamifera), Artemisia tridentata var. vasyana, Poa pratensis, Shepherdia Canadensis, Symphoricarpos spp., Prunus virginiana

Project Specifics:
Frequency: 1079 polygons (587 GRTE)
Average Aspect: 216° (233° GTRE)
Average Slope: 2° (2° GRTE)
Minimum Elevation: 6,191 ft. (6,324 ft. GRTE)
Maximum Elevation: 7,300 ft. (7,266 ft. GRTE)
Average Elevation: 6,619 ft. (6,707 ft. GRTE)
Average Size: 5.3 acres (5.7 acres GRTE)
Total Size: 5,739.6 acres (3,324.2 acres GRTE)

Ground Photos:



Range and Distribution

Description:
Cottonwoods are found throughout the lower floodplains of the Snake River and its tributaries. Cottonwoods oftey mix with other riparian tree and shrub species and cottonwood seedlings/saplings often occur on sandbars of the Snake River where their photo-signatures are easily confused with willows. On the aerial photography cottonwoods appear as large, bushy light green trees. Younger and decadent cottonwoods have a feathery signature whereas mature cottonwoods appear as continuous large clumps.

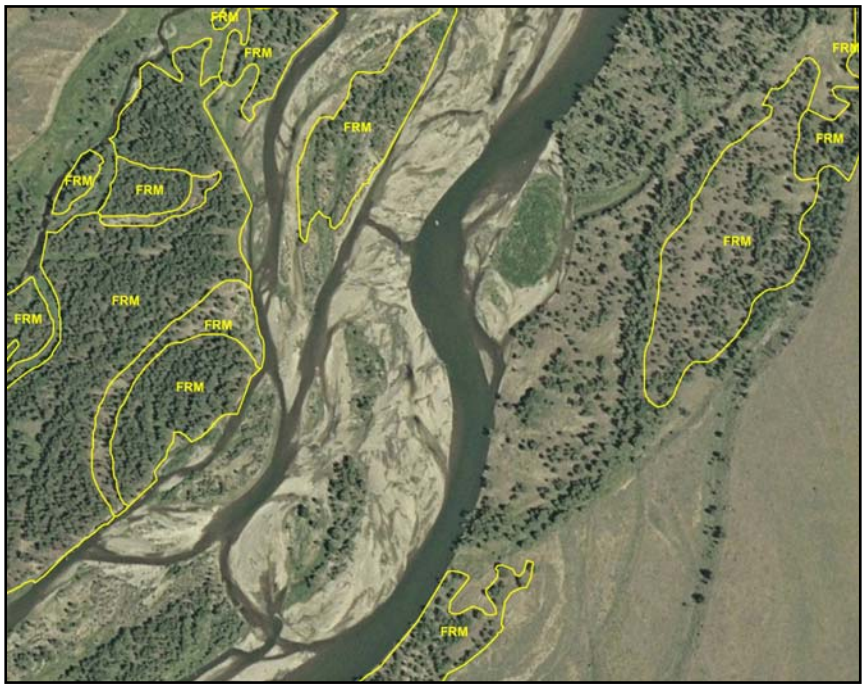
FRM Mixed Conifer - *Populus* spp. Riparian Forest
MixedConifer - Cottonwood Riparian Forest

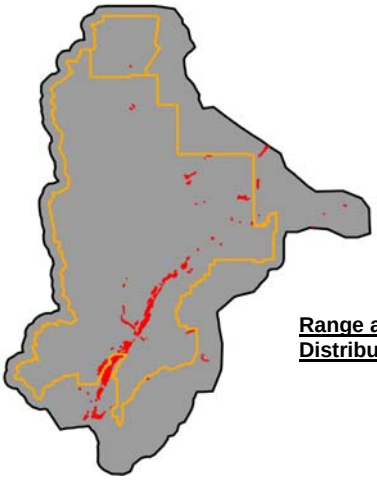
Associations:
Populus angustifolia - Picea pungens / Poa pratensis Forest
Populus angustifolia - Picea pungens / Shepherdia canadensis Forest

Common species:
Populus angustifolia, Picea pungens, Poa pratensis, Shepherdia canadensis

Project Specifics:
Frequency: 262 polygons (185 GRTE)
Average Aspect: 217° (247° GRTE)
Average Slope: 1° (1° GRTE)
Minimum Elevation: 6,241 ft. (6,424 GRTE)
Maximum Elevation: 7,319 ft. (7,319 GRTE)
Average Elevation: 6,612 ft. (6,664 ft. GRTE)
Average Size: 12.7 acres (10.2 acres GRTE)
Total Size: 3,326.1 acres (1,880.4 acres GRTE)

Photo Signature Example





Range and Distribution

Ground Photos:

Description:
This map class was used to delineate even stands of conifer and deciduous trees found along the Snake River and its tributaries. Primary species included in this type are blue spruce and cottonwood. Other trees such as aspen, lodgepole, and Douglas-fir may have also been included in this type. This map class was only used to map truly mixed riparian stands and thus this type had species overlap with other riparian and mixed types. On the photos this type appeared as an even mix between dark green conifers and light green deciduous trees. Often these types were successional and the conifers appeared to be growing up through the cottonwoods or vice versa.

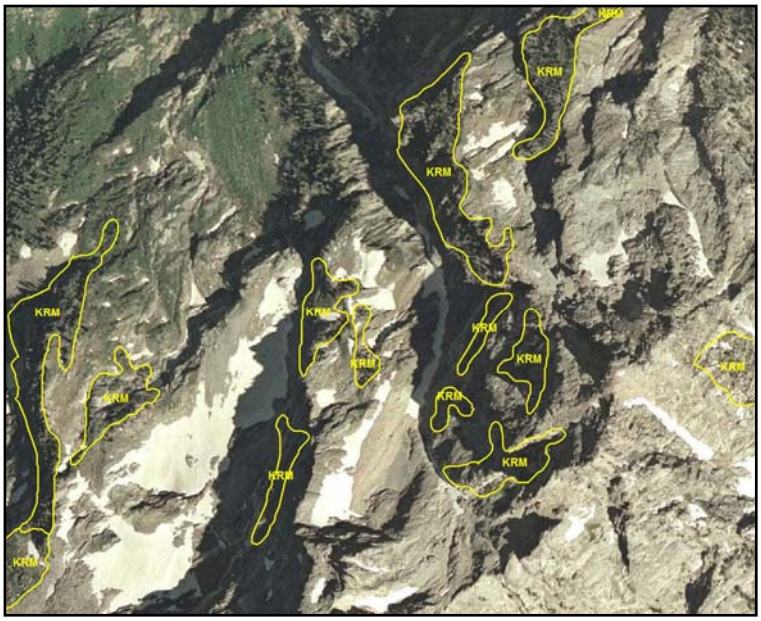
KRM Krummholz Woodland

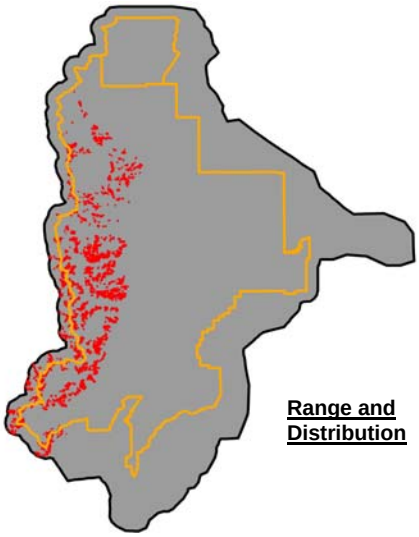
Association:
Abies lasiocarpa Krummholz Shrubland

Common species:
Pinus albicaulis
Abies lasiocarpa
Picea engelmannii

Project Specifics:
Frequency: 1,543 polygons (1,288 GRTE)
Average Aspect: 179° (170° GRTE)
Average Slope: 30° (32° GRTE)
Minimum Elevation: 7,887 ft. (7,887 ft. GRTE)
Maximum Elevation: 11,176 ft. (11,176 ft. GRTE)
Average Elevation: 9,852 ft. (9,847 ft. GRTE)
Average Size: 2.8 acres (2.6 acres GRTE)
Total Size: 4,261.0 acres (3,400.1 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
Stunted spruce-fir and whitebark pine trees are common throughout the high-country where they form the tree-line boundary. This type has the same tree species as the spruce-fir and whitebark pine forest classes. Other tundra and high alpine species may also be present in this map class. On the aerial photography this type appeared as small, dark brown to black trees contrasted against bare rock, talus or tundra. Some pockets of this type contained snow in the understory or were located next to glaciers and permanent snow field.

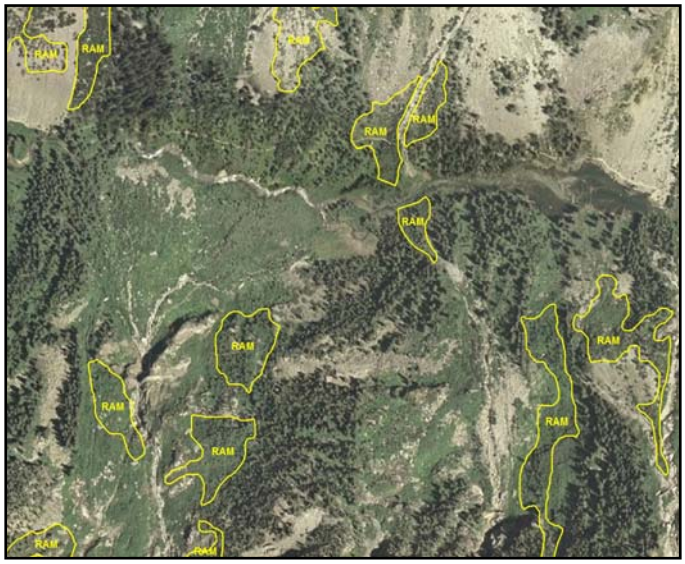
Ground Photos:

REGENERATION

RAM **Mixed *Abies lasiocarpa - Picea engelmannii* Woodland - Deciduous Shrubland Regeneration**
Mixed Subalpine Fir - Engelmann Spruce Woodland - Deciduous Shrubland Regeneration

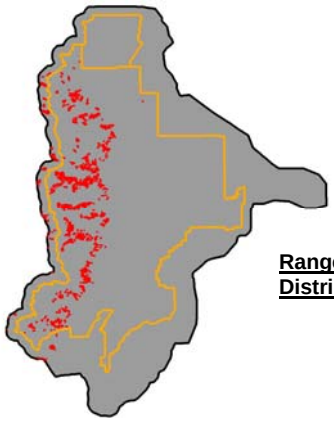
Associations:
Abies lasiocarpa - Picea engelmannii / Acer glabrum Forest
Abies lasiocarpa - Picea engelmannii / Actaea rubra Forest
Abies lasiocarpa - Picea engelmannii / Arnica cordifolia Forest
Abies lasiocarpa - Picea engelmannii / Arnica latifolia Forest
Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis Forest
Abies lasiocarpa - Picea engelmannii / Calamagrostis rubescens Forest
Abies lasiocarpa - Picea engelmannii / Carex geyeri Forest
Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Forest
Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea Forest
Abies lasiocarpa - Picea engelmannii / Ribes (montigenum, lacustre, inerme) Forest
Abies lasiocarpa - Picea engelmannii / Ribes lacustre Forest
Abies lasiocarpa - Picea engelmannii / Shepherdia canadensis Forest
Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest
Abies lasiocarpa - Picea engelmannii / Symphoricarpos albus Forest
Abies lasiocarpa - Picea engelmannii / Thalictrum occidentale Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum Rocky Mountain Forest
Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium Forest
Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium Woodland
Abies lasiocarpa - Pseudotsuga menziesii - Pinus contorta Forest
Picea engelmannii / Equisetum arvense Forest
Picea engelmannii / Galium triflorum Forest

Photo Signature Example



Common species:
Abies lasiocarpa, Picea engelmannii, Acer glabrum
Arnica spp, *Populus tremuloides*, *Ribes* spp.,
Vaccinium membranaceum, Vaccinium scoparium

Project Specifics:
Frequency: 762 polygons (677 GRTE)
Average Aspect: 165° (158° GRTE)
Average Slope: 27° (28° GRTE)
Minimum Elevation: 6,808 ft. (6,808 ft. GRTE)
Maximum Elevation: 10,324 ft. (10,324 ft. GRTE)
Average Elevation: 8,522 ft. (8,508 ft. GRTE)
Average Size: 6.7 acres (6.8 acres GRTE)
Total Size: 5,106 acres (4,582.6 acres GRTE)



Range and Distribution

Description:
This common map class represents the regeneration that commonly occurs after avalanche activity throughout the subalpine and the upper montane zones at GRTE. This map class contains similar species to the other regeneration classes along with the spruce-fir forest type and is comprised of seedling and sapling trees with lush forb and shrub cover. This type was especially prevalent on the canyon slopes and canyon bottoms. On the aerial photography this type appeared as a bright green understory with dark green/brown trees. Trees in this map class looked very small on the photos and often individual trees could not be distinguished from one another.

Ground Photos:

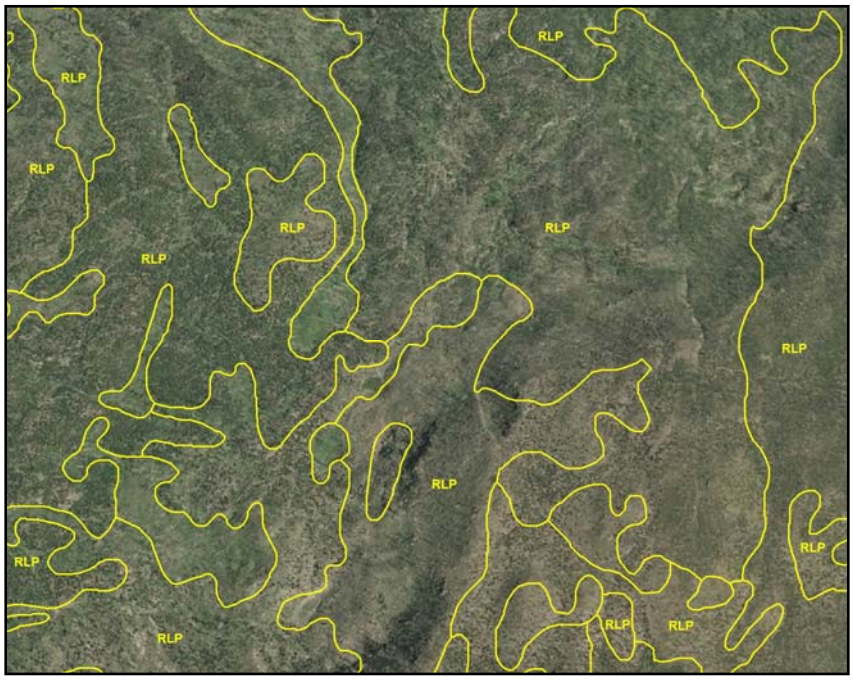
RLP *Pinus contorta* Woodland Regeneration
Lodgepole Pine Woodland Regeneration

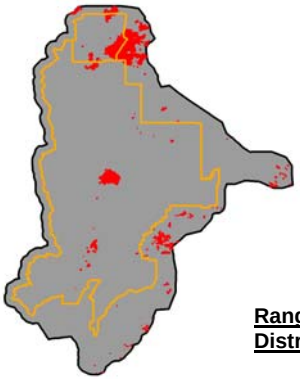
Associations:
Pinus contorta / Calamagrostis canadensis Forest
Pinus contorta / Calamagrostis rubescens Forest
Pinus contorta / Carex geyeri Forest
Pinus contorta / Carex rossii Forest
Pinus contorta / Dasiphora floribunda Forest
Pinus contorta / Hierochloe hirta Forest
Pinus contorta / Shepherdia canadensis Forest
Pinus contorta / Spiraea betulifolia Forest
Pinus contorta / Vaccinium membranaceum Rocky Mountain Forest
Pinus contorta / Vaccinium scoparium Forest

Common species:
Pinus contorta, Vaccinium membranaceum
Vaccinium scoparium

Project Specifics:
Frequency: 573 polygons (279 GRTE)
Average Aspect: 237° (248° GRTE)
Average Slope: 7° (4° GRTE)
Minimum Elevation: 6,284 ft. (6,478 ft. GRTE)
Maximum Elevation: 9,228 ft. (8,153 ft. GRTE)
Average Elevation: 7,385 ft. (7,070 ft. GRTE)
Average Size: 18.0 acres (14.7 acres GRTE)
Total Size: 10,319.1 acres (4,096.7 acres GRTE)

Photo Signature Example

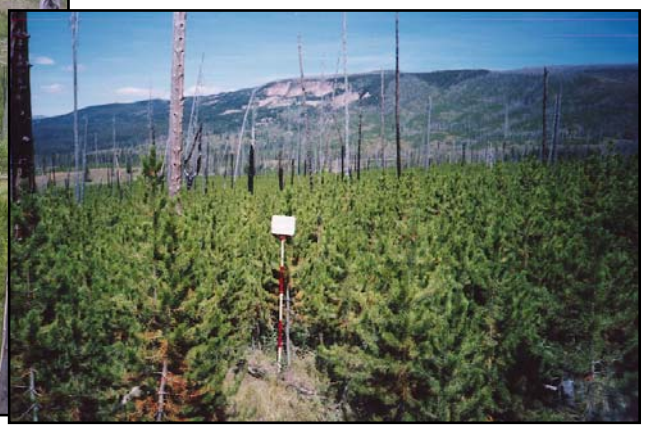




Range and Distribution

DDescription:
The lodgepole pine regeneration map class is present throughout the Park in recently burned areas and to a lesser extent in some avalanche chutes and other disturbed sites. This map class is similar to the other lodgepole pine regeneration type except it lacks ceanothus. It may also look similar to other conifer regeneration types. This type is comprised of seedling and sapling trees with sparse shrub cover. The understory is primarily grasses and forbs and may contain weedy annuals and invasive plants such as Canada thistle. On the aerial photography this type appeared as a mottled, olive green signature with some recently burned areas still appearing black. Trees in this map class looked very small on the photos and often individual trees could not be distinguished from one another.

Ground Photos:



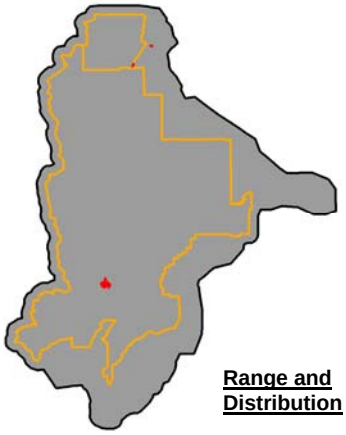
RLC *Pinus contorta - Ceanothus velutinus* Woodland Regeneration
Lodgepole Pine - Ceanothus Woodland Regeneration

Association:
Pinus contorta / Ceanothus velutinus Forest

Common species:
Pinus contorta, Ceanothus velutinus

Project Specifics:
Frequency: 12 polygons (11 GRTE)
Average Aspect: 175° (166° GRTE)
Average Slope: 4° (3° GRTE)
Minimum Elevation: 6,655 ft. (6,655 ft. GRTE)
Maximum Elevation: 7,566 ft. (7,566 ft. GRTE)
Average Elevation: 6,927 ft. (6,873 ft. GRTE)
Average Size: 23.6 acres (24.0 acres GRTE)
Total Size: 283.3 acres (263.8 acres GRTE)

Photo Signature Example



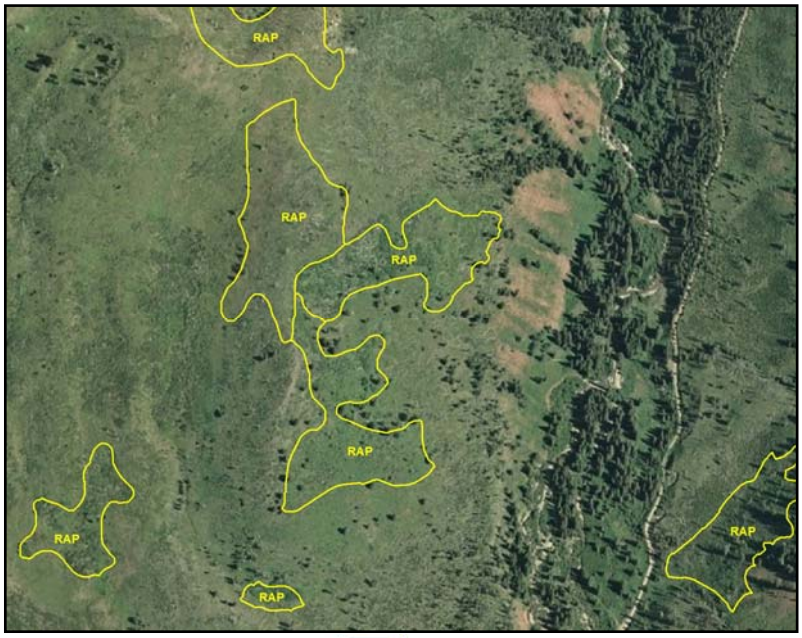
Range and Distribution

Description:
This map class represents recently burned areas that are coming back in a mix of lodgepole pine and ceanothus. This type is relatively isolated around Bradley and Taggart Lakes. This map class contains similar species to the other lodgepole regeneration class and to the ceanothus shrubland type. On the aerial photos ceanothus has a distinctive olive green signature and sapling lodgepole pines occur as small brown, pointed trees. Together the pine and ceanothus exhibit a very speckled signature that often contains patches of bare ground and brown grasslands.

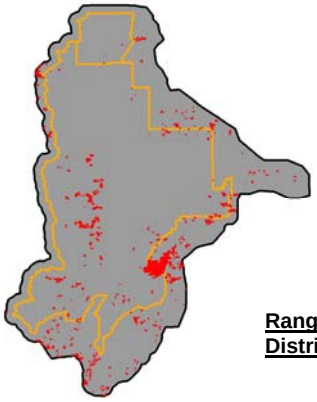
Ground Photos:

RAP Populus tremuloides Woodland Regeneration
Aspen Woodland Regeneration

Photo Signature Example



Association:
Populus tremuloides - Abies lasiocarpa / Carex geyeri - Calamagrostis rubescens Forest
Populus tremuloides - Abies lasiocarpa / Tall Forbs Forest
Populus tremuloides - Pinus contorta / Carex geyeri - Calamagrostis rubescens Forest
Populus tremuloides - Pinus contorta / Symphoricarpos oreophilus Forest
Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Amelanchier alnifolia / Carex geyeri Forest
Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum Forest
Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland
Populus tremuloides / Calamagrostis rubescens Forest
Populus tremuloides / Ceanothus velutinus Forest
Populus tremuloides / Salix scouleriana Forest
Populus tremuloides / Shepherdia canadensis Forest
Populus tremuloides / Symphoricarpos albus Forest
Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens Forest
Populus tremuloides / Symphoricarpos oreophilus / Tall Forbs Forest
Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Tall Forbs Forest
Populus tremuloides / Phleum pratense Semi-Natural Forest
Populus tremuloides / Poa pratensis Forest
Populus tremuloides / Thalictrum fendleri Forest

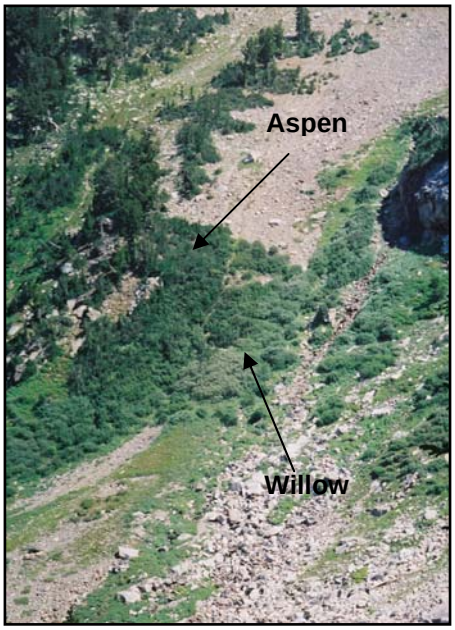


Range and Distribution

Common species:
Populus tremuloides, Carex geyeri, Pinus contorta
Symphoricarpos oreophilus, Amelanchier alnifolia
Thalictrum fendleri, Pteridium aquilinum,
Symphoricarpos oreophilus, Poa pratensis

Project Specifics:
Frequency: 725 polygons (279 GRTE)
Average Aspect: 184° (179° GRTE)
Average Slope: 13° (15° GRTE)
Minimum Elevation: 6,205 ft. (6,414 ft. GRTE)
Maximum Elevation: 9,223 ft. (9,223 ft. GRTE)
Average Elevation: 7,379 ft. (7,447 ft. GRTE)
Average Size: 5.4 acres (4.9 acres GRTE)
Total Size: 3,895.6 acres (1,369.0 acres GRTE)

Description:
This regeneration type is common in aspen areas that have recently burned and in avalanche chutes. This map class contains similar species to the other regeneration classes, tall deciduous shrub and the aspen forest types. This map class had a distinctive photo signature consisting of a dark green color intermixed with white speckles that corresponded to dead and down aspen logs.



Ground Photos

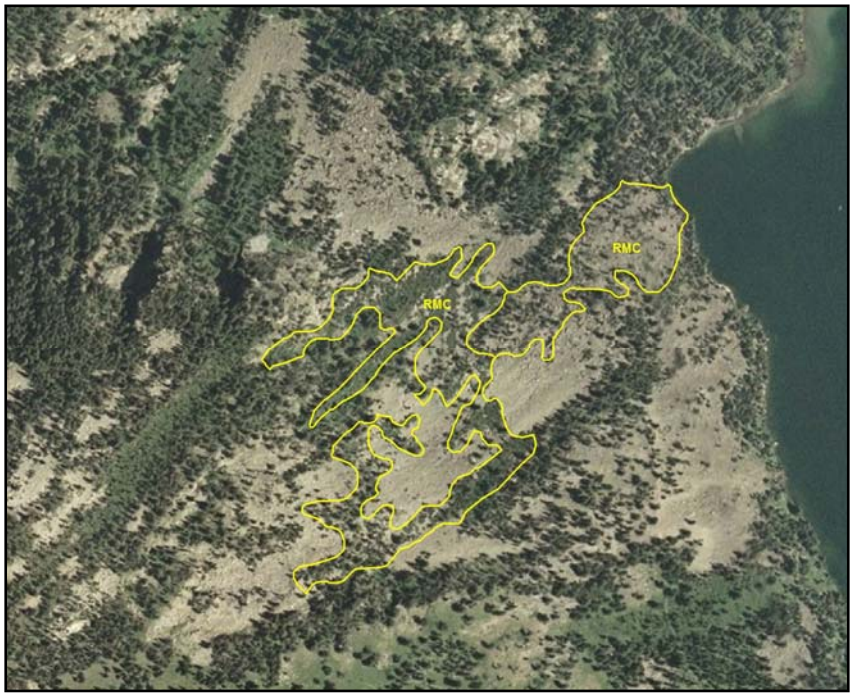
RMC Mixed Conifer Woodland Regeneration

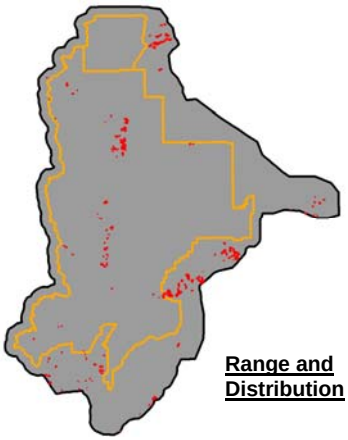
Associations:
Mixed Stands of the previously listed Conifer Associations)

Common species:
Pinus contorta, Abies lasicocarpa, *Picea engelmannii, Pseudotsuga menziesii*

Project Specifics:
Frequency: 226 polygons (78 GRTE)
Average Aspect: 159° (117° GRTE)
Average Slope: 12° (16° GRTE)
Minimum Elevation: 6,189 ft. (6,431 ft. GRTE)
Maximum Elevation: 9,623 ft. (9,623 ft. GRTE)
Average Elevation: 7,653 ft. (7,695 ft. GRTE)
Average Size: 7.1 acres (7.1 acres GRTE)
Total Size: 1,608.6 acres (551.0 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This map class occurred on a few sites where there was an even mix of small-stature conifers mostly Douglas-fir, lodgepole and sub-alpine fir. This map class is very similar to the other conifer regeneration types and contains many of the same species. The understory of this type ranged from mesic mixed forbs and deciduous shrubs to graminoids and bare ground. Often stands of this type were located in avalanche chutes with adjacent stands of dry and mesic exposures containing the same conifer species. On the aerial photography this type appeared as very small, dark brown/black conifers with an understory ranging from bright green to brown. The texture of this signature was often pebbly and broken.

Ground Photos:

SHRUBLAND

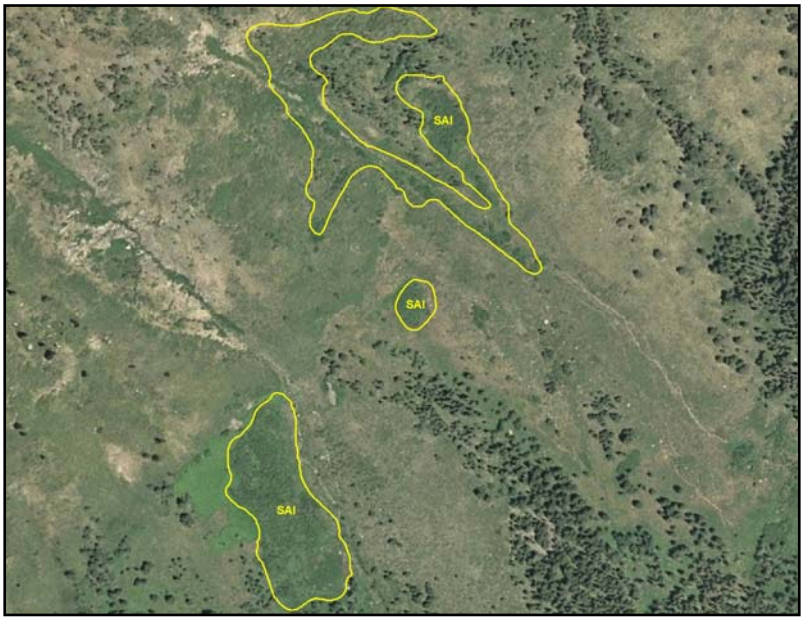
SAI *Alnus incana* Shrubland
Alder Shrubland

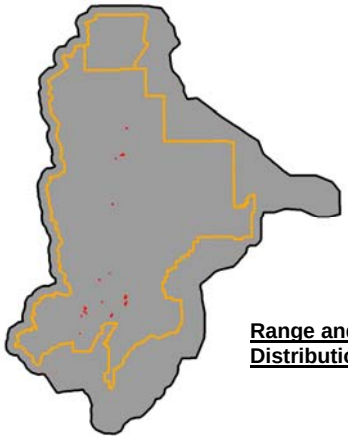
Associations:
Alnus incana / Equisetum arvense Shrubland
Alnus incana / Glyceria striata Shrubland
Alnus incana / Mesic Forbs Shrubland
Alnus incana / Mesic Graminoids Shrubland
Rhamnus alnifolia Shrubland

Common species:
Alnus incana, Rhamnus alnifolia,
Equisetum arvense, Glyceria striata

Project Specifics:
Frequency: 23 polygons (22 GRTE)
Average Aspect: 123° (121° GRTE)
Average Slope: 10° (9° GRTE)
Minimum Elevation: 6,496 ft. (6,496 ft. GRTE)
Maximum Elevation: 8,821 ft. (7,589 ft. GRTE)
Average Elevation: 7,013 t. (6,931 ft. GRTE)
Average Size: 4.8 acres (4.9 acres GRTE)
Total Size: 109.9 acres (108.7 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This map class was mapped on a "where known" basis and was limited to a few riparian and wetland sites. This map class was very similar to the mixed tall deciduous shrubland type. On the aerial photography this type had a signature similar to the Mixed Tall Deciduous Shrubland type; a dark green, rough color contrasted by a lighter green understory.

Ground Photos

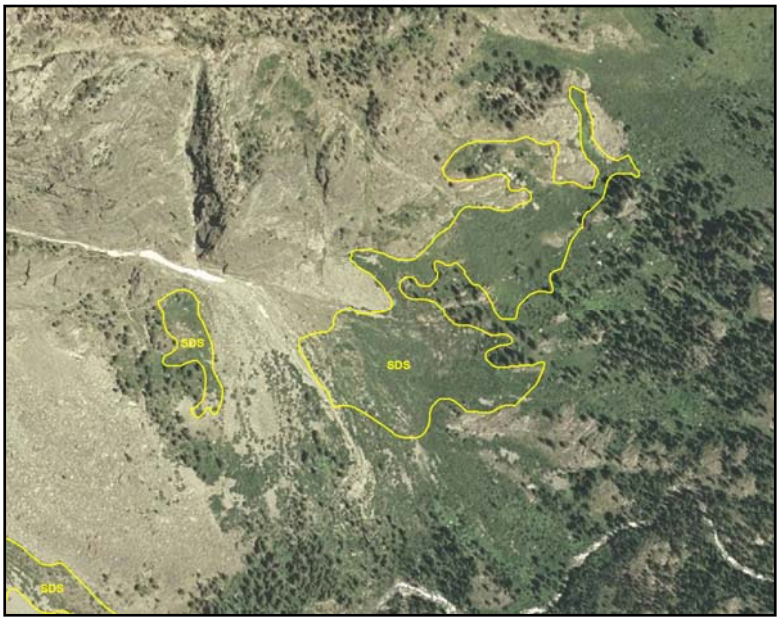
SDS Mixed Deciduous Shrubland

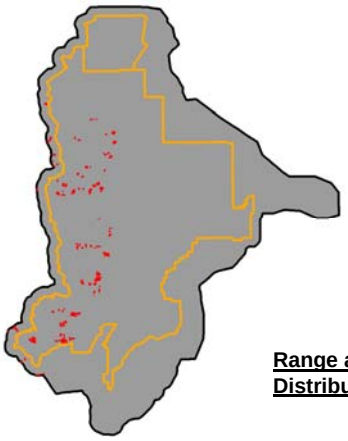
Associations:
Spiraea betulifolia Shrubland
Spiraea splendens Shrubland
Symphoricarpos oreophilus Shrubland
Vaccinium (caespitosum, scoparium) Dwarf-shrubland
Vaccinium membranaceum Shrubland

Common species:
Spiraea betulifolia, Spiraea splendens, Symphoricarpos oreophilus, Vaccinium caespitosum, Vaccinium scoparium, Vaccinium membranaceum, Apocynum androsaemifolium

Project Specifics:
Frequency: 178 polygons (155 GRTE)
Average Aspect: 142° (134° GRTE)
Average Slope: 27° (27° GRTE)
Minimum Elevation: 6,948 ft. (6,948 ft. GRTE)
Maximum Elevation: 9,446 ft. (9,379 ft. GRTE)
Average Elevation: 8,113 ft. (8,015 ft. GRTE)
Average Size: 4.5 acres (4.7 acres GRTE)
Total Size: 808.1 acres (734.1 acres GRTE)

Photo Signature Example





Range and Distribution

Ground Photos:

Description:
Mixed deciduous shrubs occurred in some of the canyons. This type represented a mix of common shrubs that could not be mapped separately from each other. Many of the species present in this type are also common to the other deciduous shrub and the aspen regeneration classes such as vaccinium and short willows. This type had a bright green to kelly green signature similar to tall forbs and other deciduous shrub types. Often patches of bare ground or talus were located adjacent to this map class.

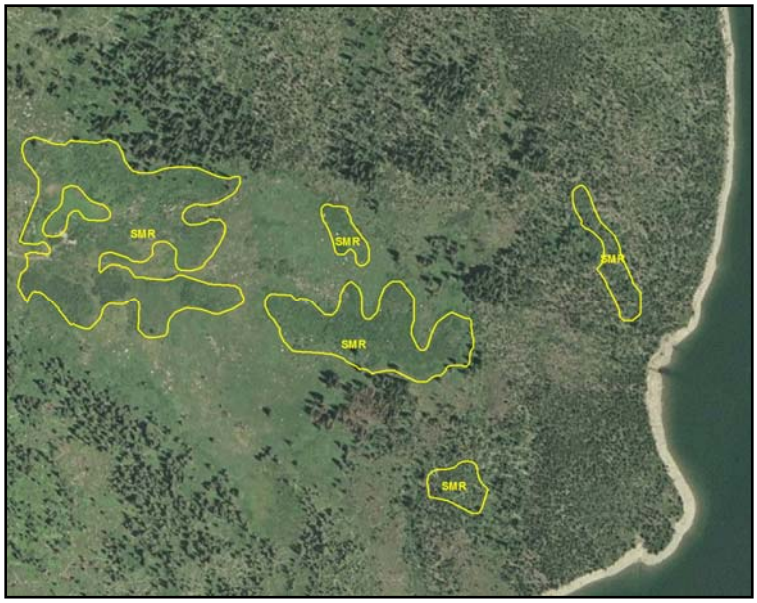
SMR Mixed Tall Deciduous Shrubland

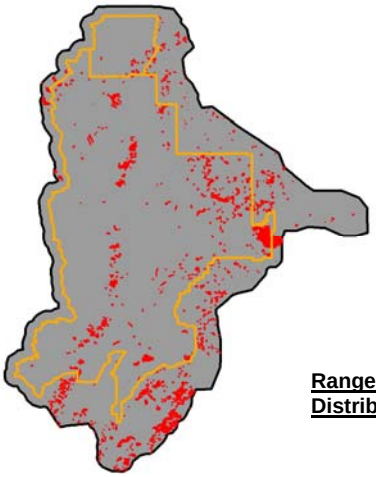
Association:
Prunus virginiana - (Prunus americana) Shrubland
Prunus virginiana / Carex geyeri
Cornus sericea Shrubland

Common species:
Prunus virginiana, Prunus Americana,
Acer glabrum, Cornus sericea

Project Specifics:
Frequency: 1,356 polygons (627 GRTE)
Average Aspect: 198° (172° GRTE)
Average Slope: 11° (11° GRTE)
Minimum Elevation: 6,197 ft. (6,428 ft. GRTE)
Maximum Elevation: 9,472 ft. (9,472 ft. GRTE)
Average Elevation: 7,272 ft. (7,202 ft. GRTE)
Average Size: 5.2 acres (5.8 acres GRTE)
Total Size: 7,112.5 acres (3,636.2 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This map class was fairly common throughout the Park, occurring as small stands primarily on mesic sites. This type is similar in composition to the aspen regeneration type and the other mixed deciduous shrub map class but typically it contains taller shrubs, and frequently an aspen component. On the aerial photography this type exhibited a characteristic very dark green color intermixed with a lighter bright green. This mottled signature corresponded to the dark green clumps of shrubs with a contrasting light green forb understory. The tall shrubs often had a very rough texture.

Ground Photos:

SCV *Ceanothus velutinus* Shrubland
Ceanothus Shrubland

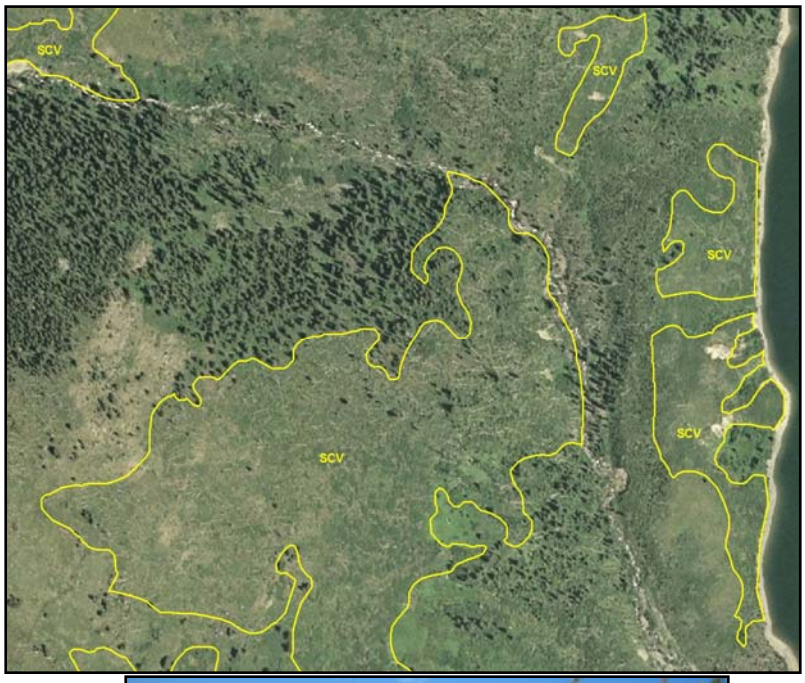
Association:
Ceanothus velutinus Shrubland

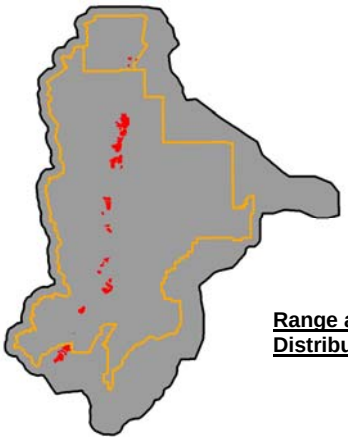
Common species:
Ceanothus velutinus, Pinus contorta

Project Specifics:
Frequency: 81 polygons (62 GRTE)
Average Aspect: 121° (114° GRTE)
Average Slope: 19° (18° GRTE)
Minimum Elevation: 6,684 ft. (6,684 ft. GRTE)
Maximum Elevation: 8,516 ft. (8,516 ft. GRTE)
Average Elevation: 7,464 ft (7,379 ft. GRTE)
Average Size: 24.9 acres (28.7 acres GRTE)
Total Size: 2,019.6 acres (1,778.7 acres GRTE)

Description:
Ceanothus is a widespread shrub occurring throughout the foothills and lower slopes of the Tetons. It was especially prevalent around Jenny, Taggart, and Bradley Lakes. This map class was fairly distinct but may have been confused with the lodgepole regeneration types. On the aerial photos this type had very dark gray/green mottled signature. In some places dead wood and bare soils intermixed with this type.

Photo Signature Example





Range and Distribution

Ground Photos:

SSD *Artemisia* spp. Dry Shrubland
Sagebrush Dry Shrubland

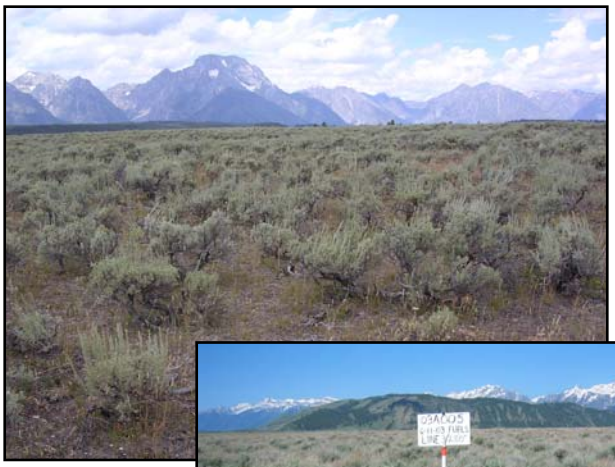
Associations:
Artemisia cana (ssp. bolanderi, ssp. viscidula) / Poa pratensis Semi-natural Shrubland
Artemisia tridentata ssp. vaseyana / Bromus carinatus Shrubland
Artemisia tridentata ssp. vaseyana / Bromus inermis Shrubland
Artemisia tridentata ssp. vaseyana / Carex geyeri Shrub Herbaceous Vegetation
Artemisia tridentata ssp. vaseyana / Festuca idahoensis Shrub Herbaceous Vegetation
Artemisia tridentata ssp. vaseyana / Hesperostipa comata Shrubland
Artemisia tridentata ssp. vaseyana / Poa pratensis Shrubland
Artemisia tridentata ssp. vaseyana / Pseudoroegneria spicata Shrubland
Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Carex geyeri Shrubland
Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Bromus carinatus Shrubland
Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Festuca idahoensis Shrubland
Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Hesperostipa comata Shrubland
Artemisia tridentata ssp. vaseyana - Symphoricarpos oreophilus / Pseudoroegneria spicata Shrubland
Artemisia tridentata ssp. spiciformis Shrub Herbaceous Vegetation [Provisional]
Artemisia tripartita ssp. tripartita / Hesperostipa comata Shrub Herbaceous Vegetation

Photo Signature Example

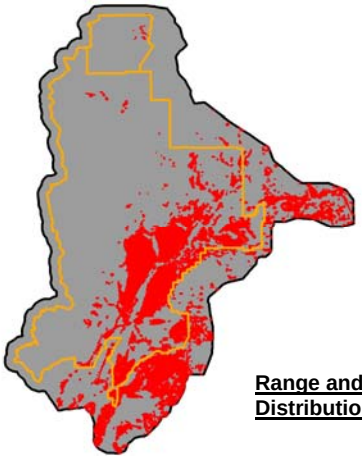
Common species:
Artemisia cana (ssp. bolanderi, ssp. viscidula), Artemisia tridentata ssp. vaseyana, Artemisia tripartita ssp. tripartite, Poa pratensis, Pseudoroegneria spicata, Symphoricarpos oreophilus, Carex geyeri, Festuca idahoensis, Hesperostipa comata, Pseudoroegneria spicata, Bromus inermis

Project Specifics:
Frequency: 2,541 polygons (1,051 GRTE)
Average Aspect: 216° (217° GRTE)
Average Slope: 6° (3° GRTE)
Minimum Elevation: 6,203 ft, (6,340 ft. GRTE)
Maximum Elevation: 9,374 ft. (8,822 ft. GRTE)
Average Elevation: 7,023 ft. (6,827 ft. GRTE)
Average Size: 23.3 acres (38.0 acres GRTE)
Total Size: 59,274.0 acres (39,957.3 acres GRTE)

Ground Photos:



Description:
This was one of the most common map classes occurring across the valley floor and up some of the lower foothills. This type is very similar to the grassland, sagebrush-bitterbrush, and the low sagebrush types. The dry sagebrush type had a very mottled signature consisting of gray shrubs with brown herbaceous and bare ground understory. This type occurred on large flat plains where it exhibited a semi-coarse texture and a venation pattern.



Range and Distribution

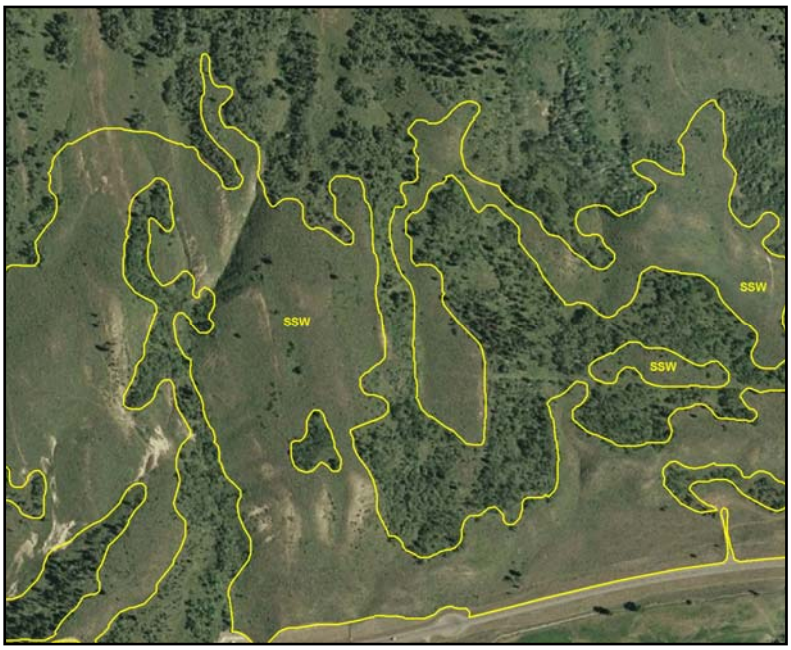
SSW Artemisia spp. / Dasiphora floribunda Mesic Shrubland
Sagebrush / Shrubby Cinquefoil Mesic Shrubland

Association:
Dasiphora floribunda / Carex spp. Shrubland
Dasiphora floribunda / Deschampsia caespitosa Shrubland

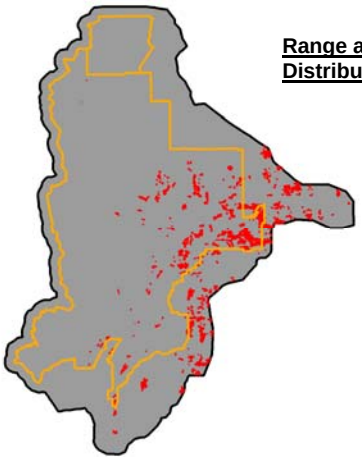
Common species:
Artemisia tridentata ssp. vaseyana, Dasiphora floribunda, Carex spp., Deschampsia caespitosa

Project Specifics:
Frequency: 724 polygons (323 GRTE)
Average Aspect: 207° (201° GRTE)
Average Slope: 6° (3° GRTE)
Minimum Elevation: 6,268 ft. (6,350 ft. GRTE)
Maximum Elevation: 9,190 ft. (7,486 ft. GRTE)
Average Elevation: 7,333 ft. (6,881 ft. GRTE)
Average Size: 8.4 acres (10.5 acres GRTE)
Total Size: 6,060.4 acres (3,395.2 acres GRTE)

Photo Signature Example



Range and Distribution



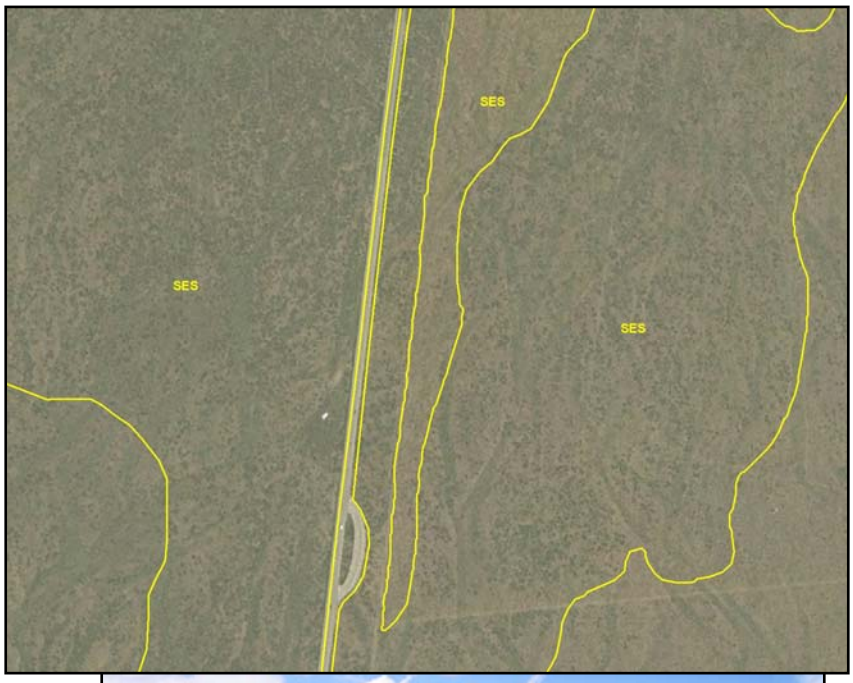
Description:

This was a fairly restricted type that tended to occur only on more mesic areas on the east side of the project area. This type is very similar to the grassland, sagebrush-bitterbrush, dry sagebrush and the low sagebrush types. This map class was used to distinguish sagebrush shrublands that had a very lush understory and high cover. Usually other shrubs such as *Dasiphora floribunda* were present. On the aerial photography this type exhibited a very distinct signature consisting of a gray-green, heavily textured, bumpy pattern. Some variation was usually present caused by small bare ground, herbaceous and dry sagebrush inclusions.

Ground Photos:

SES *Artemisia* spp. - *Purshia tridentata* Mixed Shrubland
Sagebrush - Antelope bitterbrush Mixed Shrubland

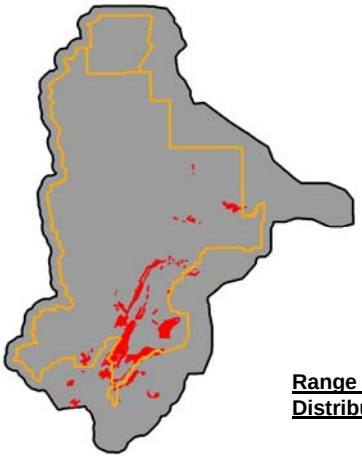
Photo Signature Example



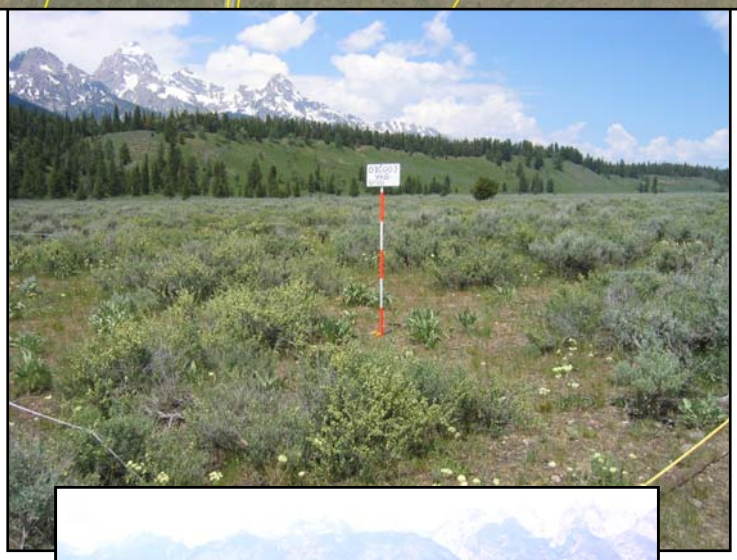
Associations:
Artemisia tridentata ssp. vaseyana - Pursha tridentata / Festuca idahoensis Shrubland
Artemisia tridentata ssp. vaseyana - Pursha tridentata / Balsamorhiza sagittata Shrubland
Artemisia tridentata ssp. vaseyana - Pursha tridentata / Bromus inermis - Poa pratensis Shrubland

Common species:
Artemisia tridentata ssp. vaseyana, Pursha tridentate, Festuca idahoensis, Balsamorhiza sagittata, Bromus inermis, Poa pratensis

Project Specifics:
Frequency: 232 polygons (165 GRTE)
Average Aspect: 213° (219° GRTE)
Average Slope: 2° (2° GRTE)
Minimum Elevation: 6,208 ft. (6,372 ft. GRTE)
Maximum Elevation: 7,925 ft. (7,165 ft. GRTE)
Average Elevation: 6,646 ft. (6,656 ft. GRTE)
Average Size: 37.3 acres (44.2 acres GRTE)
Total Size: 8,654.4 acres (7,287.2 acres GRTE)



Range and Distribution



Description:
This map class represented areas dominated by sagebrush and bitterbrush. Bitterbrush is usually more than 10% but less than 50% of the shrub cover. This type occurs on the valley floor, and is more common in the southern portions of the study area. This type contains many of the same species found in the sagebrush dry shrubland type. On the aerial photography this type usually had a very distinct mottled signature probably caused by the growing pattern of the large bitterbrush shrubs. The gray shrubs were contrasted with the brown soils and herbaceous vegetation.
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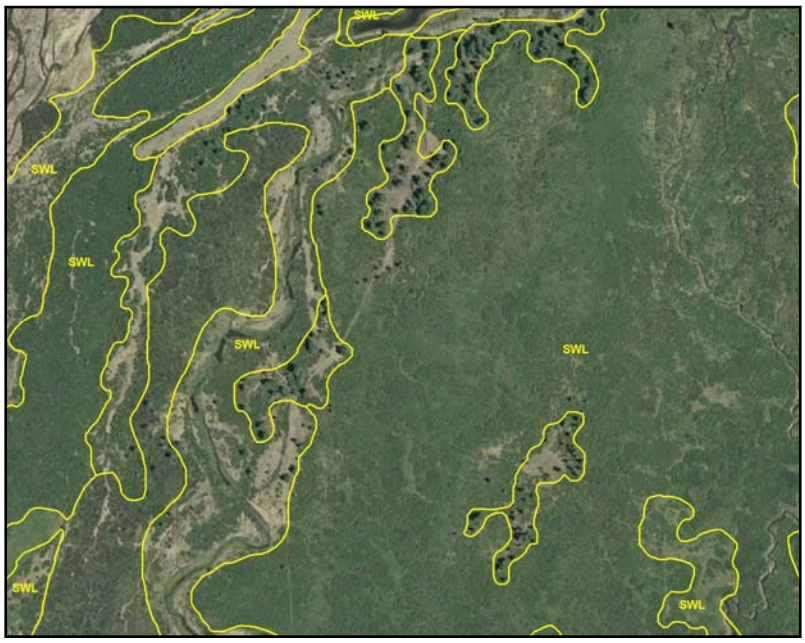
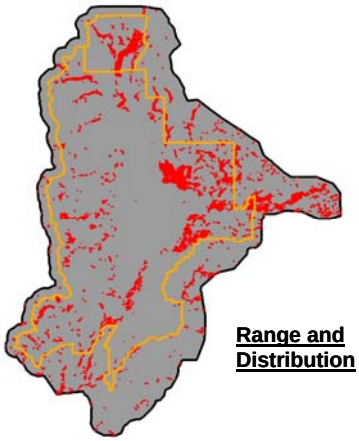
Ground Photos:

SWL *Salix spp.* Shrubland
Willow Shrbland

Associations:
Salix lemmonii / Mesic Tall Forbs Shrubland
Salix lemmonii / Mesic Graminoids Shrubland
Salix lemmonii / Carex pellita Shrubland
Salix lutea / Mesic Graminoids Shrubland
Salix planifolia / Carex utriculata Shrubland
Salix planifolia / Mesic Forbs Shrubland [Provisional]
Salix wolfii / Calamagrostis canadensis Shrubland
Salix wolfii / Carex aquatilis Shrubland
Salix wolfii / Carex pellita Shrubland
Salix wolfii / Carex pragracilis Shrubland
Salix wolfii / Carex utriculata Shrubland
Salix wolfii / Deschampsia caespitosa Shrubland
Salix wolfii / Mesic Forbs Shrubland
Salix boothii / Carex utriculata Shrubland
Salix boothii / Mesic Forbs Shrubland
Salix boothii / Mesic Graminoids Shrubland
Salix drummondiana / Carex utriculata Shrubland
Salix drummondiana / Mesic Forbs Shrubland
Salix drummondiana / Mesic Graminoid Shrubland
Salix eastwoodiae Shrubland [Provisional]
Salix geyeriana - Salix wolfii / Mesic Graminoid Shrubland
Salix geyeriana / Calamagrostis canadensis Shrubland
Salix geyeriana / Carex praticola Shrubland
Salix geyeriana / Carex utriculata Shrubland
Salix geyeriana / Mesic Graminoids Shrubland

Photo Signature Example





Range and Distribution

Common species:
Salix lemmoni, Salix lutea, Salix planifolia, Salix wolfii,Salix boothii, Salix drummondiana Salix eastwoodiae, Salix geyeriana

Project Specifics:
Frequency: 2,384 polygons (1,500 GRTE)
Average Aspect: 193° (189° GRTE)
Average Slope: 7° (8° GRTE)
Minimum Elevation: 6,187 ft. (6,401 ft. GRTE)
Maximum Elevation: 9,818 ft. (9,818 ft. GRTE)
Average Elevation: 7,248 ft. (7,249 ft. GRTE)
Average Size: 5.9 acres (6.8 acres GRTE)
Total Size: 14,146.8 acres (10,180.0 acres GRTE)

Description:
Willows occur from the upper sub-alpine to the valley floor, occurring along streams, seeps and springs. Patch size varies from large, broad flats by Jackson Lake to very small clumps along mountain streams. This type was distinct but may have been partially confused with the tall deciduous map class, young cottonwoods along streams, and with deciduous shrubs and short aspen in the mountains. Willows appeared on the photography as mixed bright green and dark, Kelly green signatures. They also had a characteristic texture.

Ground Photos

DWARF-SHRUBLAND

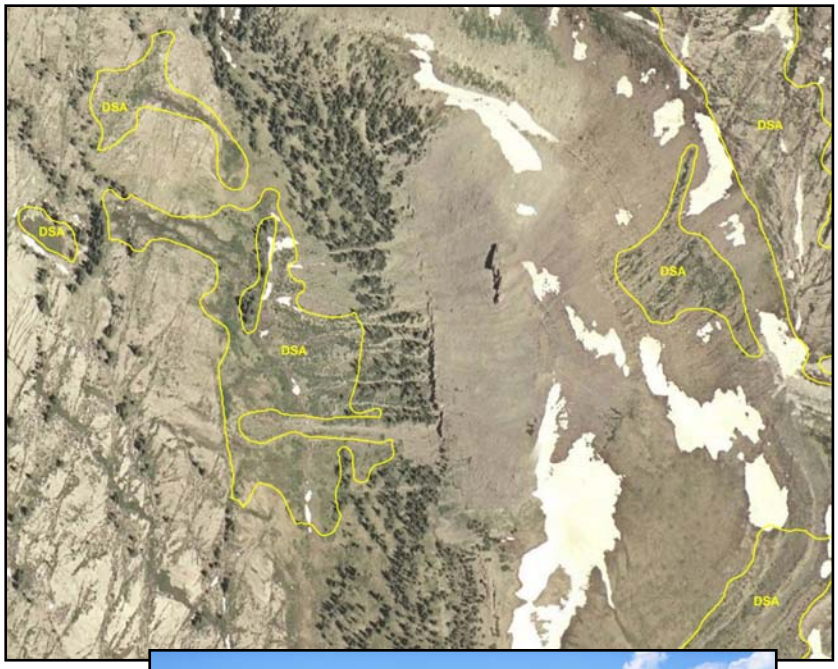
DSA *Salix artica* Dwarf Shrubland
Arctic Willow Dwarf Shrubland

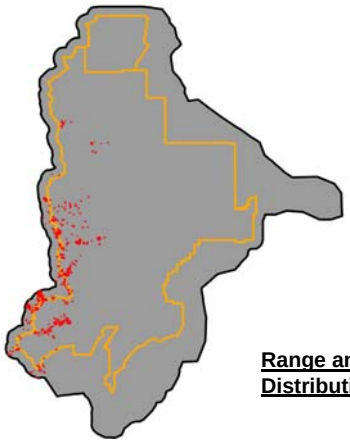
Associations:
Salix arctica / Caltha leptosepala Dwarf-shrubland
Salix arctica / Polygonum bistortoides Dwarf-shrubland
Salix glauca / Deschampsia caespitosa Shrub Herbaceous Vegetation
Salix glauca Shrubland

Common species:
Salix arctica, Caltha leptosepala, Salix glauca

Project Specifics:
Frequency: 312 polygons (222 GRTE)
Average Aspect: 190° (174° GRTE)
Average Slope: 26° (27° GRTE)
Minimum Elevation: 9,049 ft. (9,049 ft. GRTE)
Maximum Elevation: 11,080 ft. (11,080 ft. GRTE)
Average Elevation: 10,014 ft. (10,022 ft. GRTE)
Average Size: 3.6 acres (3.0 acres GRTE)
Total Size: 1131.4 acres (672.2 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This map class occurs in alpine meadows or on high mountain peaks ranging in elevation from 9000 – 11,000 feet. Arctic willow is often interspersed with alpine tundra and krummholz map classes. Small patches of arctic willow may occur in mostly barren talus and rock outcrops. On the aerial photography this type is characterized by grayish-green clumps mixed with bare ground and snow.

Ground Photos:

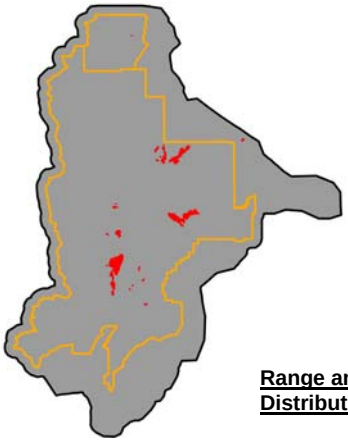
DSE *Artemisia arbuscula* Dwarf Shrubland
Low Sagebrush Dwarf Shrubland

Association:
Artemisia arbuscula ssp. arbuscula / Festuca idahoensis Shrub Herbaceous Vegetation
Artemisia arbuscula ssp. arbuscula / Pseudoroegneria spicata Shrub Herbaceous Vegetation

Common species:
Artemisia arbuscula ssp. arbuscula, Festuca idahoensis,, Pseudoroegneria spicata

Project Specifics:
Frequency: 82 polygons (80 GRTE)
Average Aspect: 177° (178° GRTE)
Average Slope: 3° (3° GRTE)
Minimum Elevation: 6,610 ft. (6,610 ft. GRTE)
Maximum Elevation: 7,879 ft. (7,879 ft. GRTE)
Average Elevation: 6,980 ft. (6,974 ft. GRTE)
Average Size: 34.2 acres (34.9 GRTE)
Total Size: 2,806.7 acres (2,792.1 GRTE)

Photo Signature Example



Range and Distribution

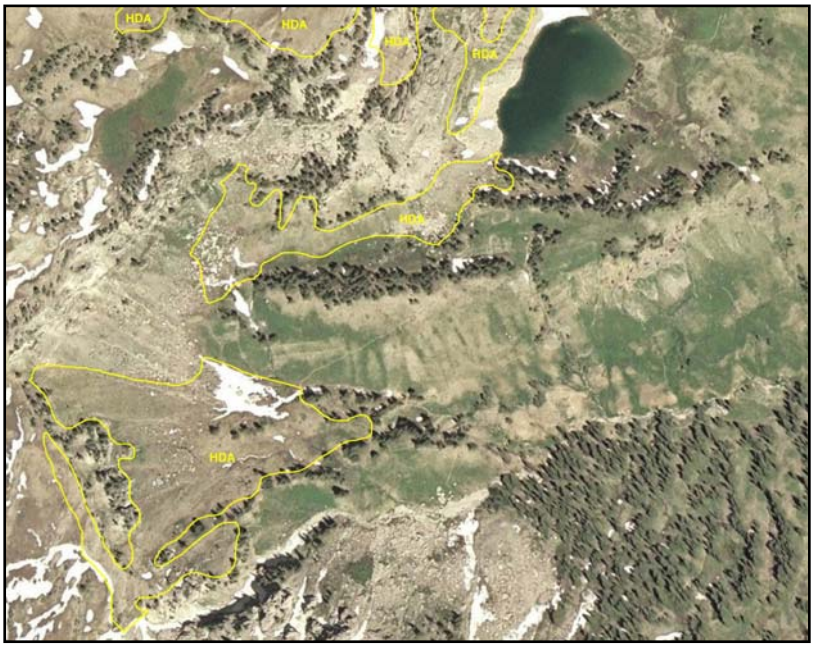
Description:
Low or dwarf sagebrush occurs at GRTE on dry, exposed moderate slopes, on undulating to rolling topography, lower mountain toeslopes, ridges, and on very steep canyon talus slopes. Low sagebrush is often present with big sagebrush and bitterbrush. It may occur in sparse enough patches to be confused with grassland or dry herbaceous types. Low sagebrush had a similar signature to herbaceous grassland types, a grayish-brown smooth signature with a slight mottled texture. This type was extensively ground-truthed and mapped based on its known distribution.

Ground Photos:

HERBACEOUS

HDA Alpine Herbaceous Vegetation

Photo Signature Example

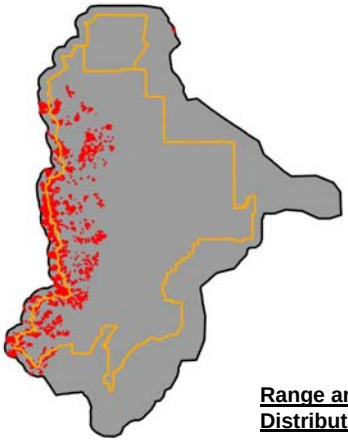


Association:
Dryas octopetala - Carex spp. Dwarf-shrub Herbaceous Vegetation
Juncus parryi Herbaceous Vegetation
Leucopoa kingii / Phlox pulvinata Herbaceous Vegetation
Ivesia gordonii - Eriogonum caespitosum Herbaceous Vegetation
Carex paysonis - Sibbaldia procumbens Herbaceous Vegetation
Phlox multiflora Alpine Cushion Herbaceous Vegetation
Pteryxia hendersonii Alpine Herbaceous Vegetation

Common species:
Dryas octopetala, Juncus parryi, Leucopoa kingii, Phlox pulvinata, Ivesia gordonii, Eriogonum caespitosum, Carex paysonis, Sibbaldia procumbens Phlox multiflora, Pteryxia hendersonii

Project Specifics:
Frequency: 815 polygons (675 GRTE)
Average Aspect: 170° (165° GRTE)
Average Slope: 27° (28° GRTE)
Minimum Elevation: 8,612 ft. (8,612 ft. GRTE)
Maximum Elevation: 12,338 ft. (12,338 ft. GRTE)
Average Elevation: 9,894 (9,946 GRTE)
Average Size: 14.2 acres (10.4 acres GRTE)
Total Size: 11,547.1 acres (7,051.5 acres GRTE)

Ground Photos:

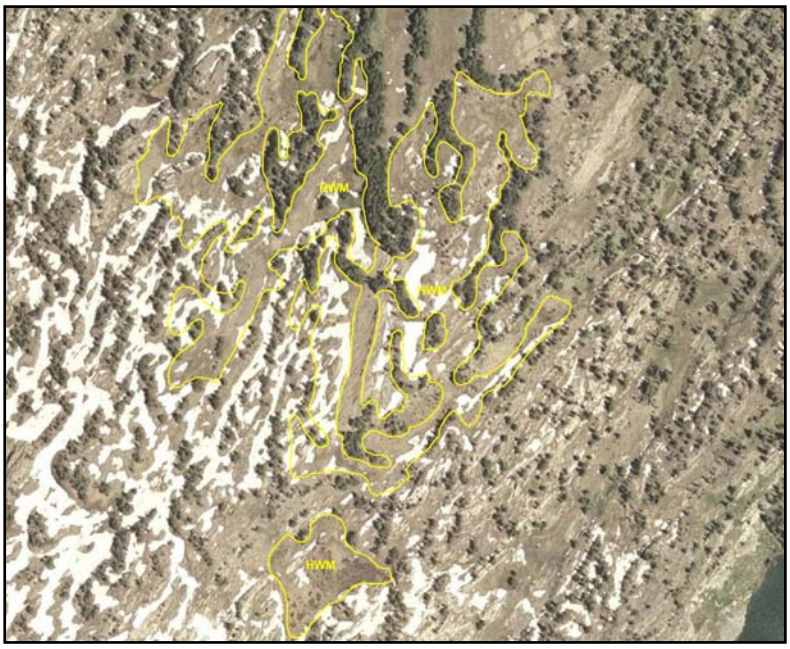


Range and Distribution

Description:
This map class represents the alpine tundra found across the highest reaches of GRTE. Due to its short nature, this map class was likely confused with barren rock and talus. This map class contains dwarf shrubs, small cushion plants, low growing forbs and small graminoids. On the true-color aerial photography tundra's signature ranged from brown and gray to light green in color. Often a high percentage of bare ground and rocks that are associated with this type that could be seen on the photography. In wet areas the signature was greener and was located near snow and ice. The tundra map class was mapped based on the presence of vegetation and its location in the alpine zone.

HWM Alpine Mesic Meadows

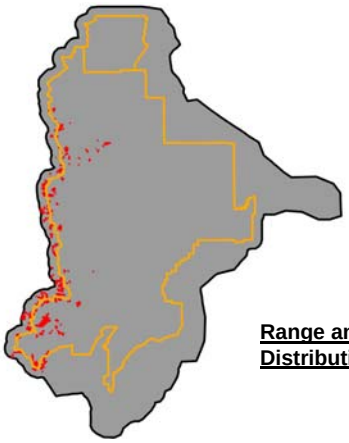
Photo Signature Example



Association:
Deschampsia caespitosa Herbaceous Vegetation
Carex nardina Scree Herbaceous Vegetation
Juncus drummondii Herbaceous Vegetation

Common species:
Deschampsia caespitosa, Carex nardina, Juncus drummondii

Project Specifics:
Frequency: 213 polygons (117 GRTE)
Average Aspect: 197° (174° GRTE)
Average Slope: 19° (20° GRTE)
Minimum Elevation: 9,013 ft. (9,013 ft. GRTE)
Maximum Elevation: 10,915 ft. (10,915 ft. GRTE)
Average Elevation: 9,761 ft. (9,781 ft. GRTE)
Average Size: 9.9 acres (8.9 acres GRTE)
Total Size: 2110.0 acres (1046.4 acres GRTE)



Range and Distribution

Description:
This map class occurs on semi-flat wet basins and meadows in the upper reaches of GRTE located near krummholz and other alpine map classes. This map class usually occurs adjacent to the alpine tundra and may have similar species although this type is often more lush and contains more graminoids. This type was almost always brown in color and has a very smooth signature. Alpine mesic meadows were used to map fairly wet areas in the alpine and upper sub-alpine that were semi-flat

Ground Photos:

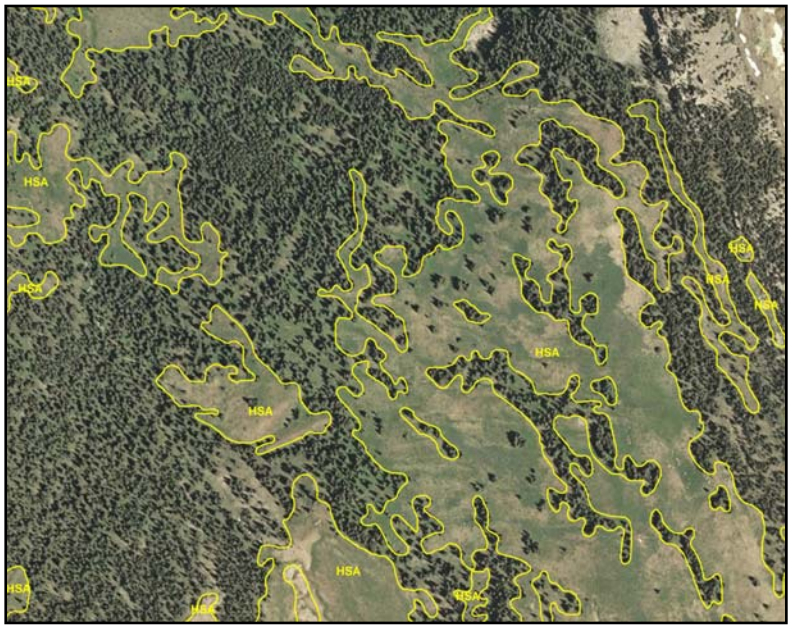
HSA Subalpine Mixed Herbaceous Vegetation

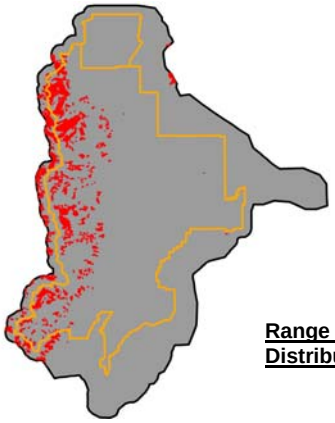
Associations:
Apocynum androsaemifolium Herbaceous Vegetation
Arnica longifolia Herbaceous Vegetation
Symphyotrichum ascendens Herbaceous Vegetation
Erigeron peregrinus Herbaceous Vegetation
Eucephalus engelmannii Herbaceous Vegetation
Helianthella uniflora Herbaceous Vegetation

Common species:
Apocynum androsaemifolium, Arnica longifolia Symphyotrichum ascendens, Erigeron peregrinus,Eucephalus engelmannii, Helianthella uniflora

Project Specifics:
Frequency: 1,288 polygons (923 GRTE)
Average Aspect: 163° (152° GRTE)
Average Slope: 23° (24° GRTE)
Minimum Elevation: 6,467 ft. (6,914 ft. GRTE)
Maximum Elevation: 10,024 ft. (10,024 ft. GRTE)
Average Elevation: 8,809 ft. (8,756 ft. GRTE)
Average Size: 7.1 acres (6.5 acres GRTE)
Total Size: 9,159.0 acres (6,022.1 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This herbaceous type is very common throughout the sub-alpine zone of GRTE where it occurs on rocky slopes, in forest openings, and along riparian corridors. This type contains the same species as some of the other herbaceous map classes and intergrades with them at the edge of the sub-alpine zone. This type may also resemble short deciduous shrublands. On the aerial photography this type usually had a kelly-green appearance with small inclusions of brown bare soil and tan graminoid stands. The texture was smooth; proximity to other sub-alpine classes and lelevation were used in identifying this map class.

Ground Photos:

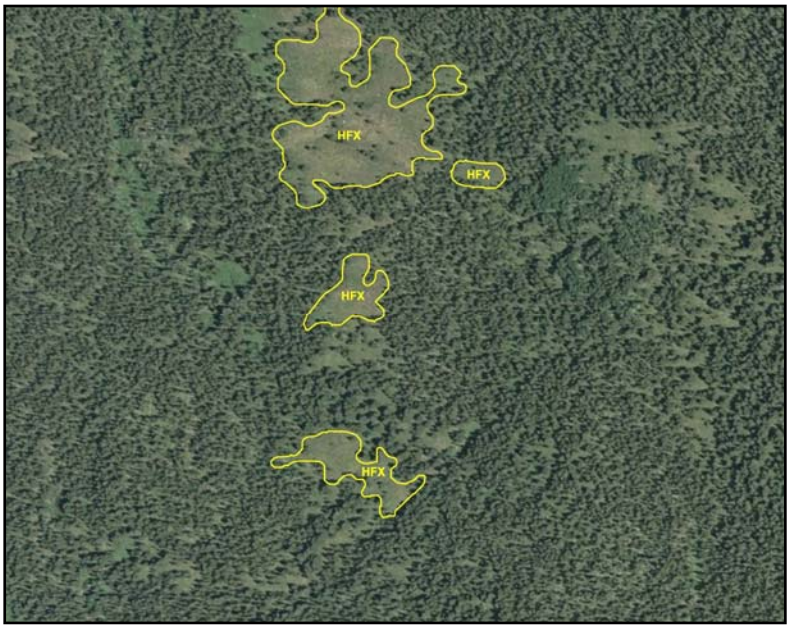
HFX Montane Xeric Forb Herbaceous Vegetation

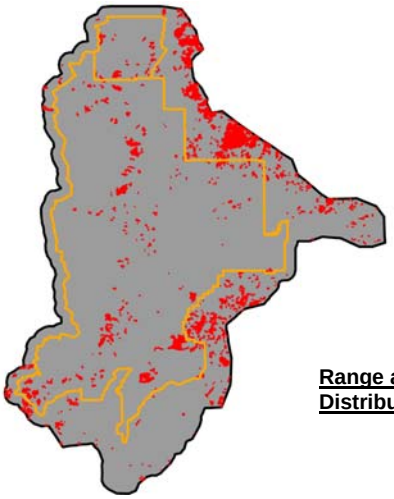
Associations:
(Balsamorhiza serrata) - Poa secunda Herbaceous Vegetation

Common species:
Balsamorhiza serrata, Poa secunda, Phleum pretense, Poa pratensis, Bromus inermis, Poa palustris, Pseudoroegneria spicata

Project Specifics:
Frequency: 1,422 polygons (467 GRTE0
Average Aspect: 199° (165° GRTE)
Average Slope: 11° (12° GRTE)
Minimum Elevation: 6,218 ft. (6,483 ft. GRTE)
Maximum Elevation: 9,432 ft. (9,432 ft. GRTE)
Average Elevation: 7,808 ft. (7,515 ft. GRTE)
Average Size: 7.3 acres (7.3 acres GRTE)
Total Size: 10,364.5 acres (3,424.2 acres GRTE)

Photo Signature Example





Range and Distribution

Description:
This class is common throughout the montane zone, occurring as openings in the canopy and on dry slopes. This type is very similar to the grassland and sparse hillside classes and may have some of the same species. On the aerial photography this type did not have the bright green signature common to the mesic forb map class. Instead this type almost always had a gray-green color with a smooth texture and occurred in a forest or woodland setting, or on nearby slopes.

Ground Photos:

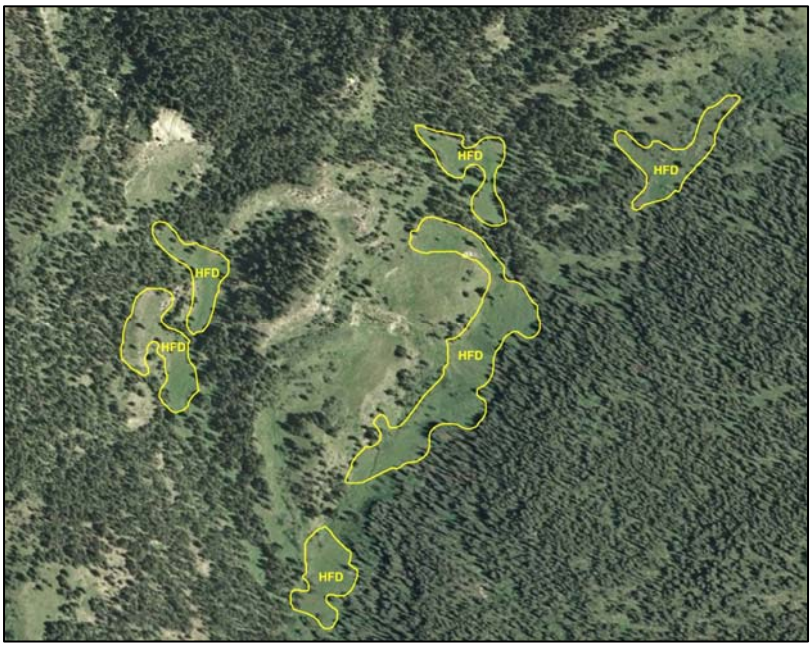
HFD Montane Mesic Forb Herbaceous Vegetation

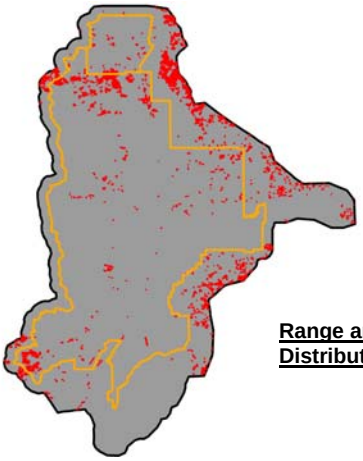
Association:
Mertensia ciliata Herbaceous Vegetation
Ligusticum filicinum - Delphinium X occidentale Herbaceous Vegetation
Heracleum maximum - Rudbeckia occidentalis Herbaceous Vegetation
Geranium viscosissimum Herbaceous Vegetation

Common species:
Mertensia ciliata, Ligusticum filicinum, Delphinium X occidentale, Heracleum maximum, Rudbeckia occidentalis, Geranium viscosissimum

Project Specifics:
Frequency: 1,361 polygons (500 GRTE)
Average Aspect: 193° (167° GRTE)
Average Slope: 11° (12° GRTE)
Minimum Elevation: 6,210 ft. (6,452 ft. GRTE)
Maximum Elevation: 9,508 ft. (9,508 ft. GRTE)
Average Elevation: 7,831 ft. (7,550 ft. GRTE)
Average Size: 5.3 acres (5.4 acres GRTE)
Total Size: 7,205.9 acres (2,708.3 acres GRTE)

Photo Signature Example





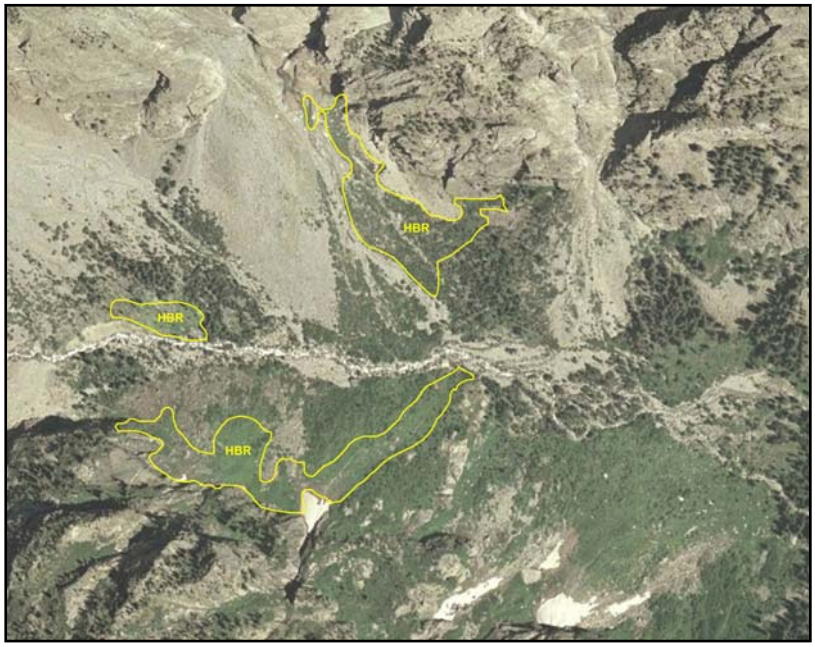
Range and Distribution

Description:
This map class consists of wet pockets spread throughout the montane forests and woodlands. These areas are dominated by a high diversity and density of forbs. This type is similar to the dry xeric forb and grassland classes and may have similar species present. On the aerial photography this type appeared bright green and often occurred as semi-flat pockets within forested types. In slightly drier areas the color switched to greenish-gray and the overall texture was smooth.

Ground Photos:

HBR *Pteridium aquilinum* Herbaceous Vegetation
Braken Fern Herbaceous Vegetation

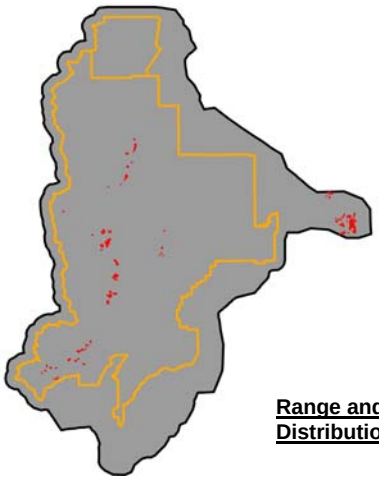
Photo Signature Example



Association:
Pteridium aquilinum Herbaceous Vegetation

Common species:
Pteridium aquilinum

Project Specifics:
Frequency: 133 polygons (81 GRTE)
Average Aspect: 164° (118° GRTE)
Average Slope: 15° (21° GRTE)
Minimum Elevation: 6,664 ft (6,664 ft. GRTE)
Maximum Elevation: 9,313 ft. (9,313 ft. GRTE)
Average Elevation: 7,704 ft. (7,721 GRTE)
Average Size: 2.9 acres (2.8 acres GRTE)
Total Size: 382.8 acres (225.9 acres GRTE)



Range and Distribution

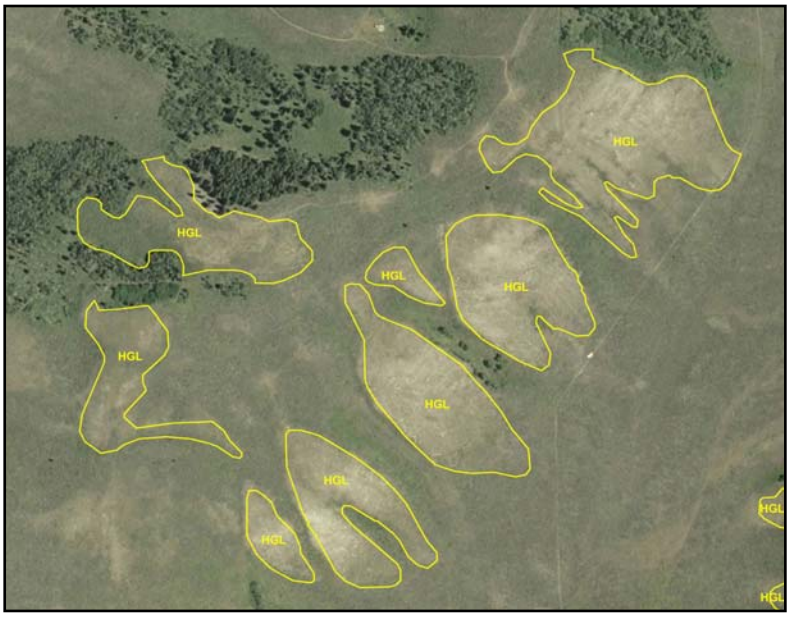
Description:
Bracken fern dominated slopes were found on mesic north and east facing exposures in limited locations across GRTE. This type was likely confused with other mesic herbaceous types and possibly even mesic shrublands. On the aerial photography this type appeared bright green and often occurred next to talus and rocky slopes. Bracken fern slopes were mapped based on known locations.

Ground Photos:

HGL Mixed Grassland Herbaceous Vegetation

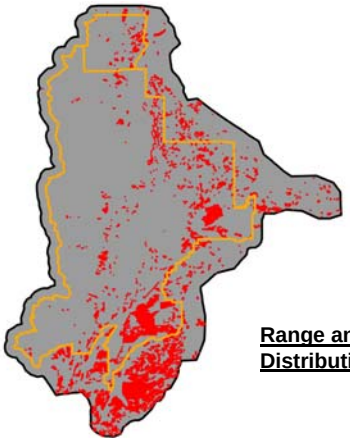
Associations:
Calamagrostis canadensis Western Herbaceous Vegetation
Calamagrostis rubescens Herbaceous Vegetation
Danthonia spicata Herbaceous Vegetation
Deschampsia caespitosa - Carex microptera Herbaceous Vegetation
Deschampsia caespitosa Herbaceous Vegetation
Eleocharis acicularis Herbaceous Vegetation
Eleocharis palustris Herbaceous Vegetation
Festuca idahoensis - Danthonia intermedia Herbaceous Vegetation
Festuca idahoensis - Geranium viscosissimum Herbaceous Vegetation
Festuca idahoensis - Helianthella uniflora Herbaceous Vegetation
Hesperostipa comata Herbaceous Vegetation
Leucopoa kingii / Phlox pulvinata Herbaceous Vegetation
Phleum pratense - Poa pratensis - Bromus inermis Herbaceous Vegetation
Poa palustris Herbaceous Vegetation
Pseudoroegneria spicata - Balsamorhiza sagittata - Poa secunda Herbaceous Vegetation
Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation
Pseudoroegneria spicata Herbaceous Vegetation

Photo Signature Example



Common species:
Calamagrostis canadensis, Calamagrostis rubescens, Danthonia spicata, Deschampsia caespitosa, Eleocharis palustris, Festuca idahoensis,Hesperostipa comata, Phleum pretense, Poa pratensis, Bromus inermis, Poa palustris, Pseudoroegneria spicata

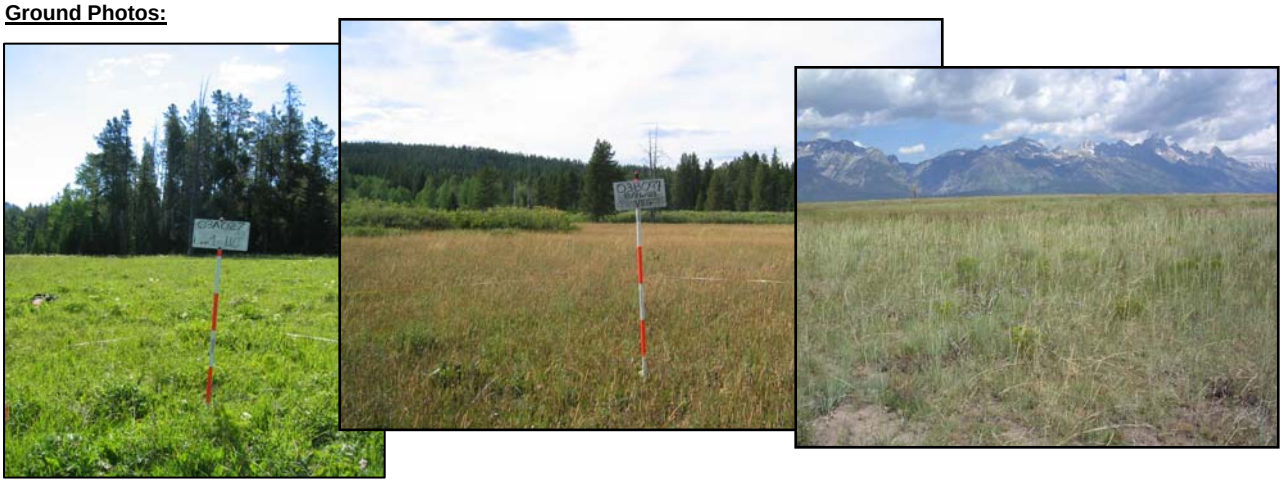
Project Specifics:
Frequency: 2,165 polygons (1,011 GRTE)
Average Aspect: 204° (194° GRTE)
Average Slope: 6° (6° GRTE)
Minimum Elevation: 6,182 ft. (6,333 ft. GRTE)
Maximum Elevation: 9,336 ft. (9,054 ft. GRTE)
Average Elevation: 7,040 ft. (7,020 ft. GRTE)
Average Size: 12.0 acres (11.1 acres GRTE)
Total Size: 25,873.3 acres (11,247.0 acres GRTE)



Range and Distribution

Description:
Grasslands occur throughout the lower elevations of the project areat. This type is especially common on the valley floor where it mixes with the sagebrush types. This map class is also common in old agricultural fields, pastures, road-sides, and other disturbed areas. The patchiness of semi-natural grasses yields a mottled photo signature. This can vary from bright green in high moisture, high growth areas to dark brown and gray in arid and dormant sites. Typically this map class may be confused with other herbaceous types especially the flooded wet meadow and forb types. Sparse sagebrush types may have been labeled as grasslands and some of the forb-dominated types may actually have more grass cover than forb cover..

Ground Photos:

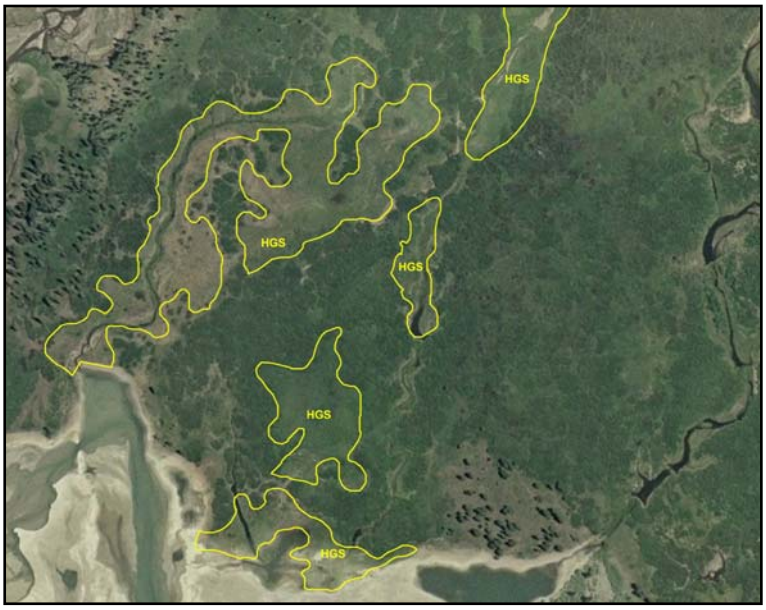


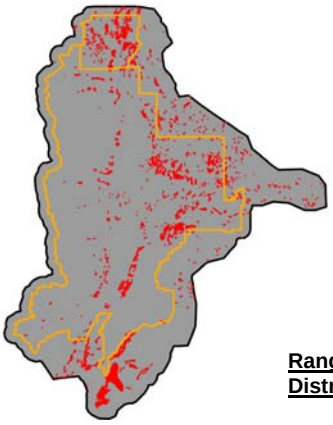
HGS Flooded Wet Meadow Herbaceous Vegetation

Association:
Carex aquatilis Herbaceous Vegetation
Carex buxbaumii Herbaceous Vegetation
Carex nebrascensis Herbaceous Vegetation
Carex paysonis - Sibbaldia procumbens Herbaceous Vegetation
Carex geyeri Herbaceous Vegetation
Carex hoodii Herbaceous Vegetation
Carex illota Herbaceous Vegetation
Carex microptera Herbaceous Vegetation
Carex nardina Scree Herbaceous Vegetation
Carex pellita Herbaceous Vegetation
Carex rossii Herbaceous Vegetation
Carex utriculata Herbaceous Vegetation
Carex vesicaria Herbaceous Vegetation
Juncus balticus Herbaceous Vegetation
Juncus drummondii Herbaceous Vegetation
Juncus parryi Herbaceous Vegetation

Common Species:
Carex aquatilis, Carex buxbaumii, Carex nebrascensis
Carex geyeri, Carex hoodii, Carex illota, Carex microptera, Carex nardina, Carex pellita, Carex rossii, Carex utriculata,Carex vesicaria, Juncus balticus, Juncus drummondii

Photo Signature Example





Range and Distribution

Project Specifics:
Frequency: 1,476 polygons (975 GRTE)
Average Aspect: 191o (181o GRTE)
Average Slope: 4o (4o GRTE)
Minimum Elevation: 6,201 ft. (6,356 ft. GRTE)
Maximum Elevation: 9,526 ft. (9,526 ft. GRTE)
Average Elevation: 7,043 ft. (6,993 ft. GRTE)
Average Size: 5.8 acres (4.3 acres GRTE)
Total Size: 8,580.9 acres (4,154.2 acres GRTE)

Description:
This type is fairly common on the valley floor where it occurs on saturated soils. Wet meadows are commonly found along the Snake River and its tributaries. Wet meadows may be confused with herbaceous aquatics and mesic forbs in very wet locations and conversely with grasslands and xeric forbs in dry locations. On the aerial photography this type ranged from light brown where the vegetation had dried out to bright green where it was growing. This type was mapped partially based on its location in floodplains and low lying areas. Pockets of open water and small streams were usually located in or near this type.

Ground Photos:

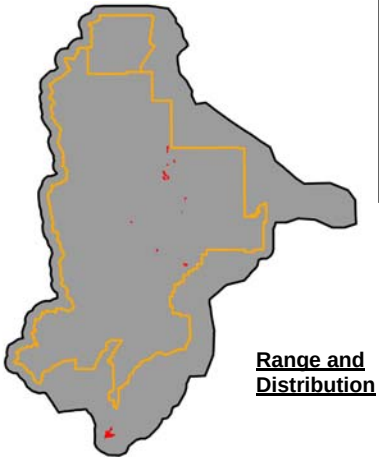
HA Herbaceous Aquatics

Associations:
Caltha leptosepala Herbaceous Vegetation
Menyanthes trifoliata Herbaceous Vegetation
Nuphar lutea Floating Aquatic Vegetation

Common species:
Typha spp., Caltha leptosepala, Menyanthes trifoliate, Nuphar lutea

Project Specifics:
19 polygons (15 GRTE)
Average Aspect: 242° (223° GRTE)
Average Slope: 1° (1° GRTE)
Minimum Elevation: 6,220 ft. (6,671 ft. GRTE)
Maximum Elevation: 7,165 ft. (7,165 ft. GRTE)
Average Elevation: 6,754 ft. (6,896 ft. GRTE)
Average Size: 13.4 acres (5.2 acres GRTE)
Total Size: 254.5 acres (77.9 acres GRTE)

Photo Signature Example



Range and Distribution

Description:
This map class was restricted to cat-tail, lily pads, and other submerged and floating aquatic plants. This type was found primarily along the edges of ponds and small lakes. Herbaceous aquatics were mapped on a where-known basis but some stands may have been confused with the flooded wet meadow type. On the aerial photography this type was identified by the presence of standing water and bright green vegetation. Often pockets or ribbons of dark open water intermixed with this map class.

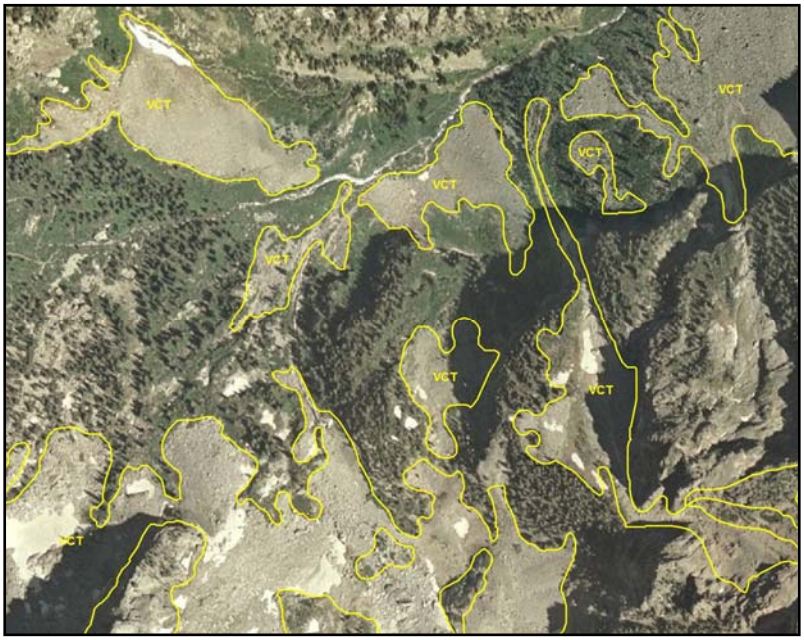
Ground Photos:

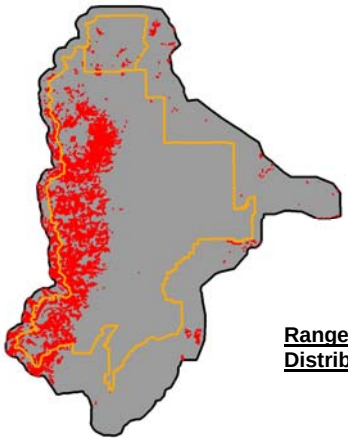
SPARSE VEGETATION

VCT Cliff and Talus Sparse Vegetation

Project Specifics:
Frequency: 2,066 polygons (1,560 GRTE)
Average Aspect: 170° (15° GRTE)
Average Slope: 25° (27° GRTE)
Minimum Elevation: 6,388 ft. (6,618 ft. GRTE)
Maximum Elevation: 11,652 ft. (11,652 ft. GRTE)
Average Elevation: 8,706 ft. (8,769 ft. GRTE)
Average Size: 13.9 acres (13.8 acres GRTE)
Total Size: 28,741.7 acres (21,587.4 acres GRTE)

Photo Signature Example





Range and Distribution

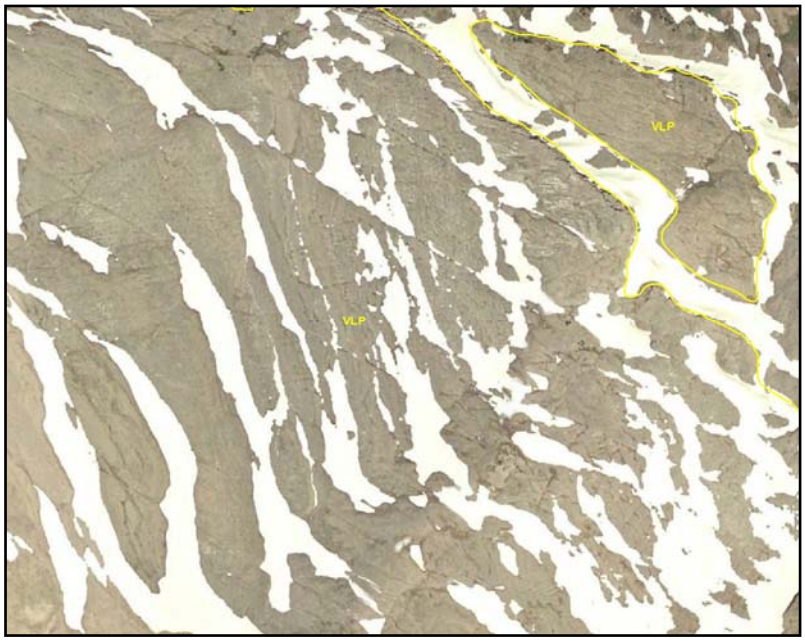
Description:
This map unit is common throughout the Teton Mountains where it occurs as talus slopes, fell fields, and rock outcrops. This type is similar to the limestone pavement map class and may contain some of the same grass and forb species found in other sparse and alpine map classes. Vegetation was usually very sparse and did not occur in discreet stands. On the aerial photos this type appeared gray to tan and demonstrated a pebbly signature. Large individual boulders and rock outcrops were visible on the photography.

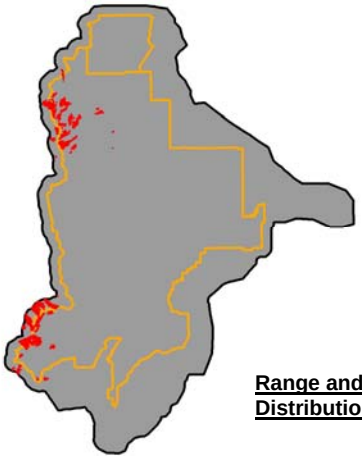
Ground Photos:

VLP Limestone Pavement Sparse Vegetation

Project Specifics:
Frequency: 114 polygons (83 GRTE)
Average Aspect: 187° (144° GRTE)
Average Slope: 16° (16° GRTE)
Minimum Elevation: 8,154 ft. (8,336 ft. GRTE)
Maximum Elevation: 10,208 ft. (10,165 ft. GRTE)
Average Elevation: 9,201 ft. (9,207 ft. GRTE)
Average Size: 30.9 acres (22.7 acres GRTE)
Total Size: 3,524.0 acres (1,883.7 acres GRTE)

Photo Signature Example





Range and Distribution

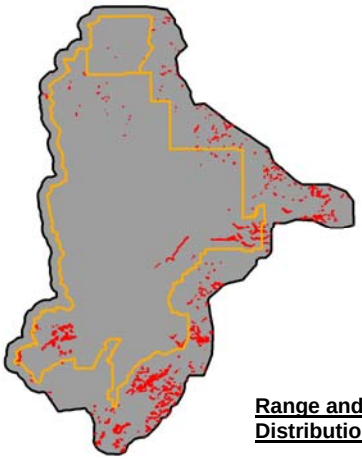
Description:
The limestone pavement is only found in some alpine and sub-alpine locations in the Teton Range. The type was common in the southwest and northwest portions of the study area. This map unit is similar to the other sparsely vegetated classes found in the alpine and may have some of the same grass, forb, and shrub species as the other tundra map classes. The limestone features in this class occurred as fractured, large, semi-smooth blocks similar to pavement. The limestone appeared gray to tan and often contained bands of snow and ice. The photo signature was smoother than the cliff and talus map class since it did not contain large rocks or boulders.

Ground Photo:

VEH Exposed Hillside Sparse Vegetation

Project Specifics:
Frequency: 834 polygons (188 GRTE)
Average Aspect: 199° (169° GRTE)
Average Slope: 12° (15° GRTE)
Minimum Elevation: 6,284 ft. (6,601 ft. GRTE)
Maximum Elevation: 10,352 ft. (10,352 ft. GRTE)
Average Elevation: 7,500 ft. (7,883 ft. GRTE)
Average Size: 4.9 acres (6.6 acres GRTE)
Total Size: 4,067.5 acres (1,233.5 acres GRTE)

Photo Signature Example

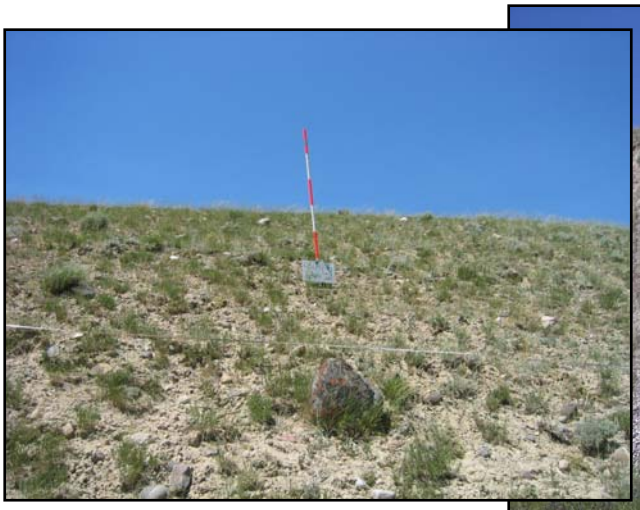


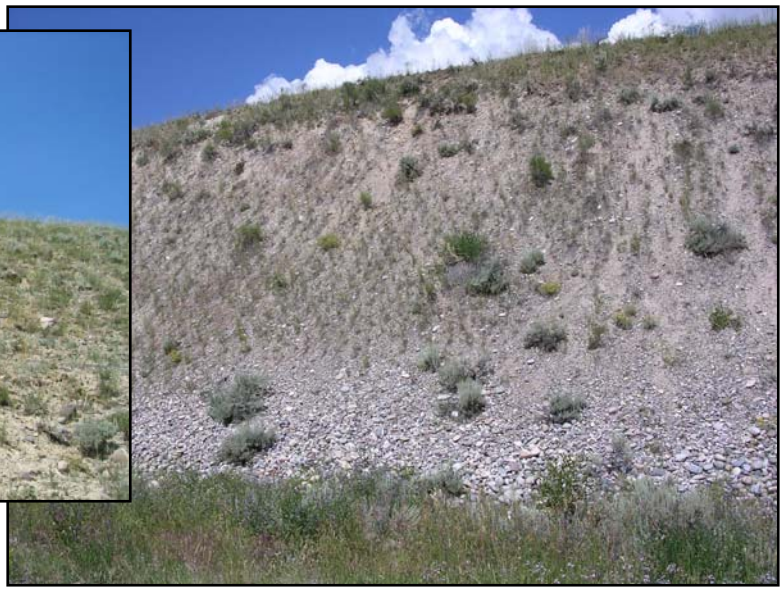
Range and Distribution

Description:

This map unit is found throughout the foothills and valley floor where it occurs on eroding hillside slopes. Vegetation is sparse and limited to small stands of grasses, forbs, and short shrubs. This map unit is similar to the other sparsely vegetated classes and may have some of the same grass and forb species as other map classes. On the aerial photography this type often reflected the white or gray substrates and the vegetation appeared as small dark gray/brown spots.

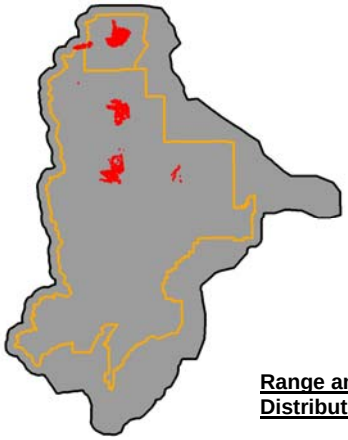
Ground Photos:





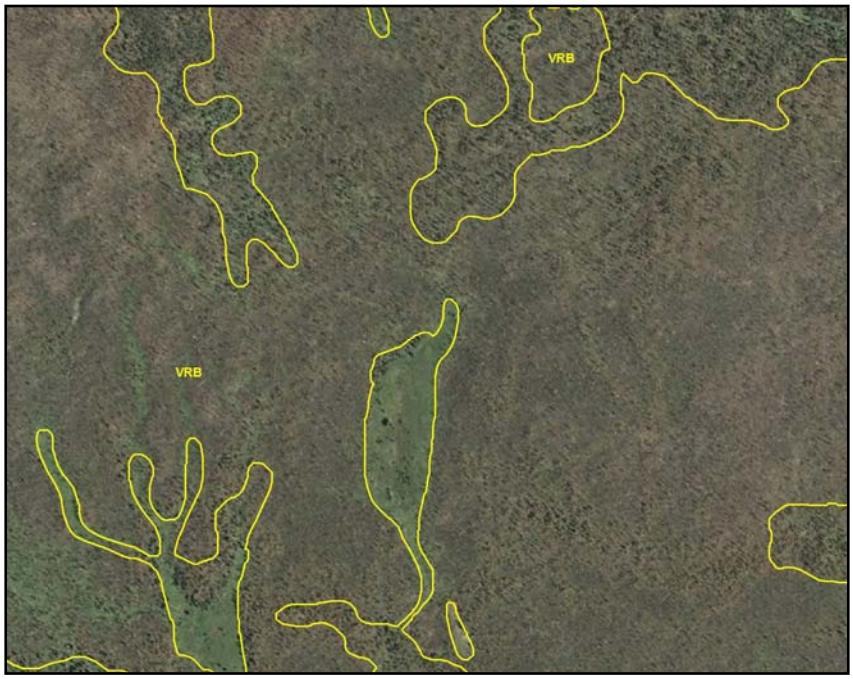
VRB Recently Burned Sparse Vegetation

Project Specifics:
Frequency: 76 polygons (76 GRTE)
Average Aspect: 144° (144° GRTE)
Average Slope: 9° (9° GRTE)
Minimum Elevation: 6,807 ft. (6,807 ft. GRTE)
Maximum Elevation: 9,061 ft. (9,061 ft. GRTE)
Average Elevation: 7,380 ft. (7,379 ft. GRTE)
Average Size: 65.0 acres (64.2 acres GRTE)
Total Size: 4,941.7 acres (4,882.1 acres GRTE)



Range and Distribution

Photo Signature Example

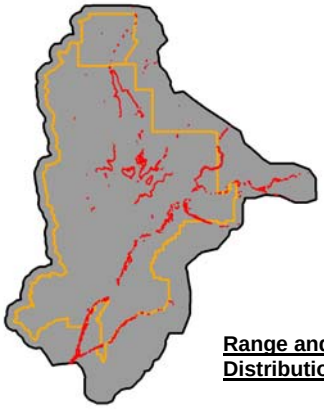


Description:
Burned areas were found in patches throughout the project area and were mapped using this class only when very little living vegetation was present. This map class appeared as black smudges on the photography with standing dead and down trees. No living vegetation was seen on the aerial photos but may have re-established since the time of the fire and the photography.

Ground Photos:

VSL Exposed Lake Shoreline – Stream Deposit Sparse Vegetation

Project Specifics:
Frequency: 578 polygons (365 GRTE)
Average Aspect: 200° (217° GRTE)
Average Slope: 2° (2° GRTE)
Minimum Elevation: 6,213 ft. (6,335 ft. GRTE)
Maximum Elevation: 9,185 ft. (9,185 ft. GRTE)
Average Elevation: 6,769 ft. (6,775 ft GRTE)
Average Size: 4.8 acres (4.9 acres GRTE)
Total Size: 2,749.7 acres (1,796.5 acres GRTE)



Range and Distribution

Photo Signature Example

Description:
This class was used to map the transitional areas adjacent to the streams, lakes, and ponds found throughout the study area. This type was also used to map the sparse annual vegetation that occurs on the mud and sand flats. Some early successional species such as cottonwoods and willows may have been included in this map class. On the aerial photography this type was usually restricted to the white and gray bathtub rings formed around the larger lakes and the white shorelines adjacent to the major streams. The photo-signature was smooth and often contained different hues of brown and gray where pools of standing water or wet soil/sand occurred.

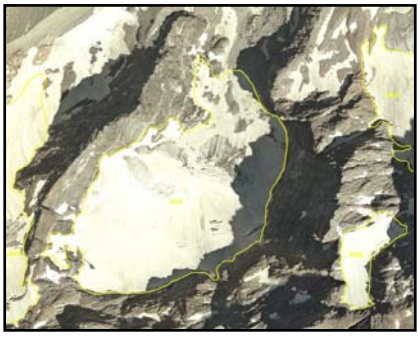
Ground Photos:

NON-VEGETATED MAP CLASSES

Range and Distribution | **Photo Signature Examples**

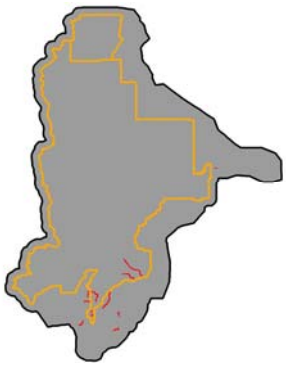
NGS Perennial Snow - Glaciers

Project Specifics:
Frequency: 55 polygons (53 GRTE)
Average Aspect: 135° (130° GRTE)
Average Slope: 31° (31° GRTE)
Minimum Elevation: 9,045 (9,045 ft. GRTE)
Maximum Elevation: 12,175 ft. (12,175 ft. GRTE)
Average Elevation: 10,506 ft. (10,506 ft. GRTE)
Average Size: 26.7 acres (26.6 acres GRTE)
Total Size: 1,468.8 acres (1,408.8 acres GRTE)



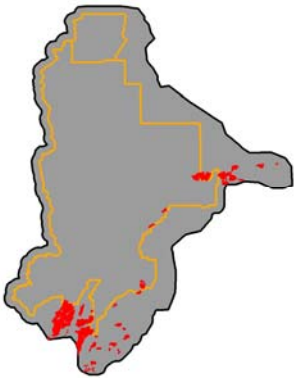
NID Irrigation Canals

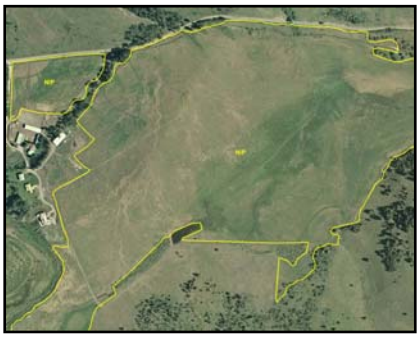
Project Specifics:
Frequency: 23 polygons (12 GRTE)
Average Aspect: 204° (222° GRTE)
Average Slope: 2° (2° GRTE)
Minimum Elevation: 6,361 ft. (6,361 ft. GRTE)
Maximum Elevation: 6,961 ft. (6,961 ft. GRTE)
Average Elevation: 6,552 ft. (6,589 ft. GRTE)
Average Size: 3.5 acres (3.2 acres GRTE)
Total Size: 80.6 acres (38.4 acres GRTE)



NIP Cropland and Pasture

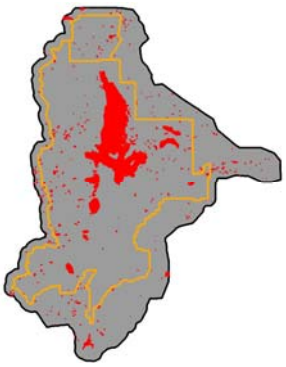
Project Specifics:
Frequency: 119 polygons (18 GRTE)
Average Aspect: 214° (220° GRTE)
Average Slope: 3 (3° GRTE)
Minimum Elevation: 6,186 ft. (6,330 ft. GRTE)
Maximum Elevation: 7,143 ft. (7,091 ft. GRTE)
Average Elevation: 6,499 ft. (6,776 ft. GRTE)
Average Size: 69.9 acres (38.3 acres GRTE)
Total Size: 8,313.0 acres (689.1 acres GRTE)

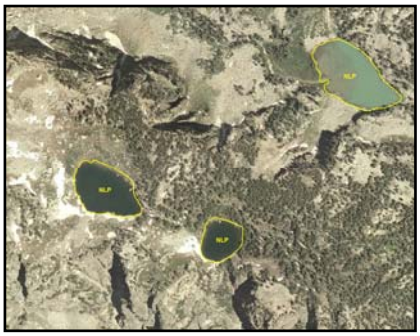




NLP Lakes and Reservoirs

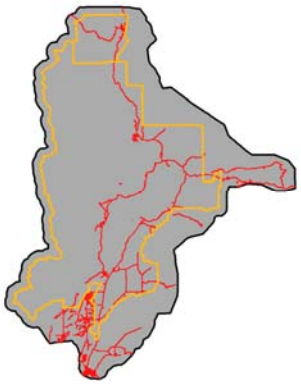
Project Specifics:
Frequency: 548 polygons (276 GRTE)
Average Aspect: 180° (167° GRTE)
Average Slope: 8° (10° GRTE)
Minimum Elevation: 6,192 ft. (6,415 ft. GRTE)
Maximum Elevation: 10,761 ft. (10,761 ft. GRTE)
Average Elevation: 7,784 ft. (8,019 ft. GRTE)
Average Size: 59.4 acres (114.5 acres GRTE)
Total Size: 32,525.7 acres (31,593.6 acres GRTE)





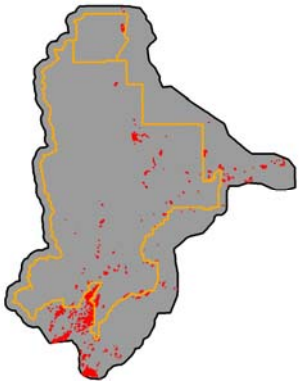
NRD Transportation, Communications, and Utilities

Project Specifics:
Frequency: 15 polygons (11 GRTE)
Average Aspect: 162° (237° GRTE)
Average Slope: 7° (6° GRTE)
Minimum Elevation: 6,209 ft. (6,425 ft. GRTE)
Maximum Elevation: 7,789 ft. (6,844 ft. GRTE)
Average Elevation: 6,619 ft. (6,758 ft. GRTE)
Average Size: 121.2 acres (82.9 acres GRTE)
Total Size: 1,818.0 acres (912.0 acres GRTE)



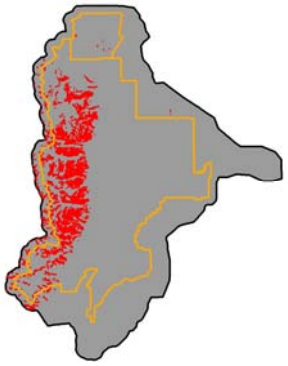
NRF Mixed Urban or Built-up Land

Project Specifics:
Frequency: 941 polygons (182 GRTE)
Average Aspect: 200° (210° GRTE)
Average Slope: 3° (3° GRTE)
Minimum Elevation: 6,190 ft. (6,335 ft. GRTE)
Maximum Elevation: 10,882 ft. (10,882 ft. GRTE)
Average Elevation: 6,551 ft. (6,820 ft. GRTE)
Average Size: 4.0 acres (6.7 acres GRTE)
Total Size: 3,762.9 acres (1,225.3 acres GRTE)



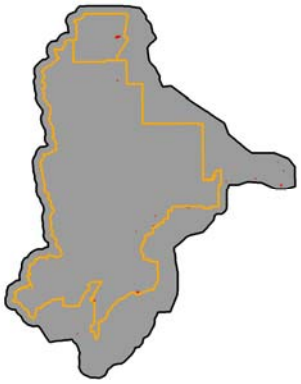
NRK Bare Exposed Rock

Project Specifics:
Frequency: 1,161 polygons (970 GRTE)
Average Aspect: 174° (161° GRTE)
Average Slope: 27° (29° GRTE)
Minimum Elevation: 6,832 ft. (6,832 ft. GRTE)
Maximum Elevation: 13,770 ft. (13,770 ft. GRTE)
Average Elevation: 9,271 ft. (9,295 ft. GRTE)
Average Size: 14.1 acres (15.5 acres GRTE)
Total Size: 16,427.1 acres (15,038.2 acres GRTE)



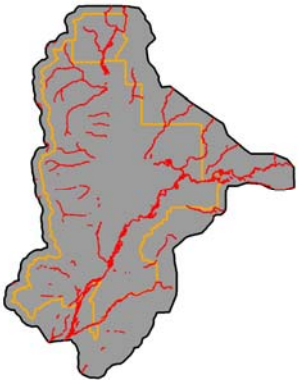
NSM Strip Mines, Quarries, and Gravel Pits

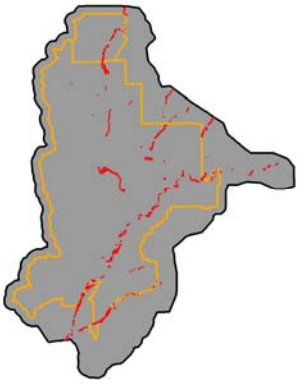
Project Specifics:
Frequency: 16 polygons (10 GRTE)
Average Aspect: 202° (223° GRTE)
Average Slope: 3° (2° GRTE)
Minimum Elevation: 6,254 ft. (6,462 ft. GRTE)
Maximum Elevation: 7,734 ft. (7,247 ft. GRTE)
Average Elevation: 6,966 ft. (6,824 ft. GRTE)
Average Size: 6.7 acres (7.4 acres GRTE)
Total Size: 107.9 acres (73.6 acres GRTE)



NST Streams

Project Specifics:
Frequency: 144 polygons (125 GRTE)
Average Aspect: 183° (195° GRTE)
Average Slope: 7° (7° GRTE)
Minimum Elevation: 6,197 ft. (6, 352 ft. GRTE)
Maximum Elevation: 9,401 ft. (9,058 ft. GRTE)
Average Elevation: 7,125 ft. (7,048 ft. GRTE)
Average Size: 29.6 acres (21.6 acres GRTE)
Total Size: 4,269.4 acres (2,705.4 acres GRTE)



NVS Non-vegetated Sand Bars

Project Specifics:
Frequency: 472 polygons (323 GRTE)
Average Aspect: 202° (207° GRTE)
Average Slope: 3° (3° GRTE)
Minimum Elevation: 6,213 ft. (6,353 ft. GRTE)
Maximum Elevation: 8,677 ft. (8,677 ft. GRTE)
Average Elevation: 6,811 ft. (6,778 ft. GRTE)
Average Size: 3.4 acres (3.4 acres GRTE)
Total Size: 1,592.4 acres (1,096.4 acres GRTE)