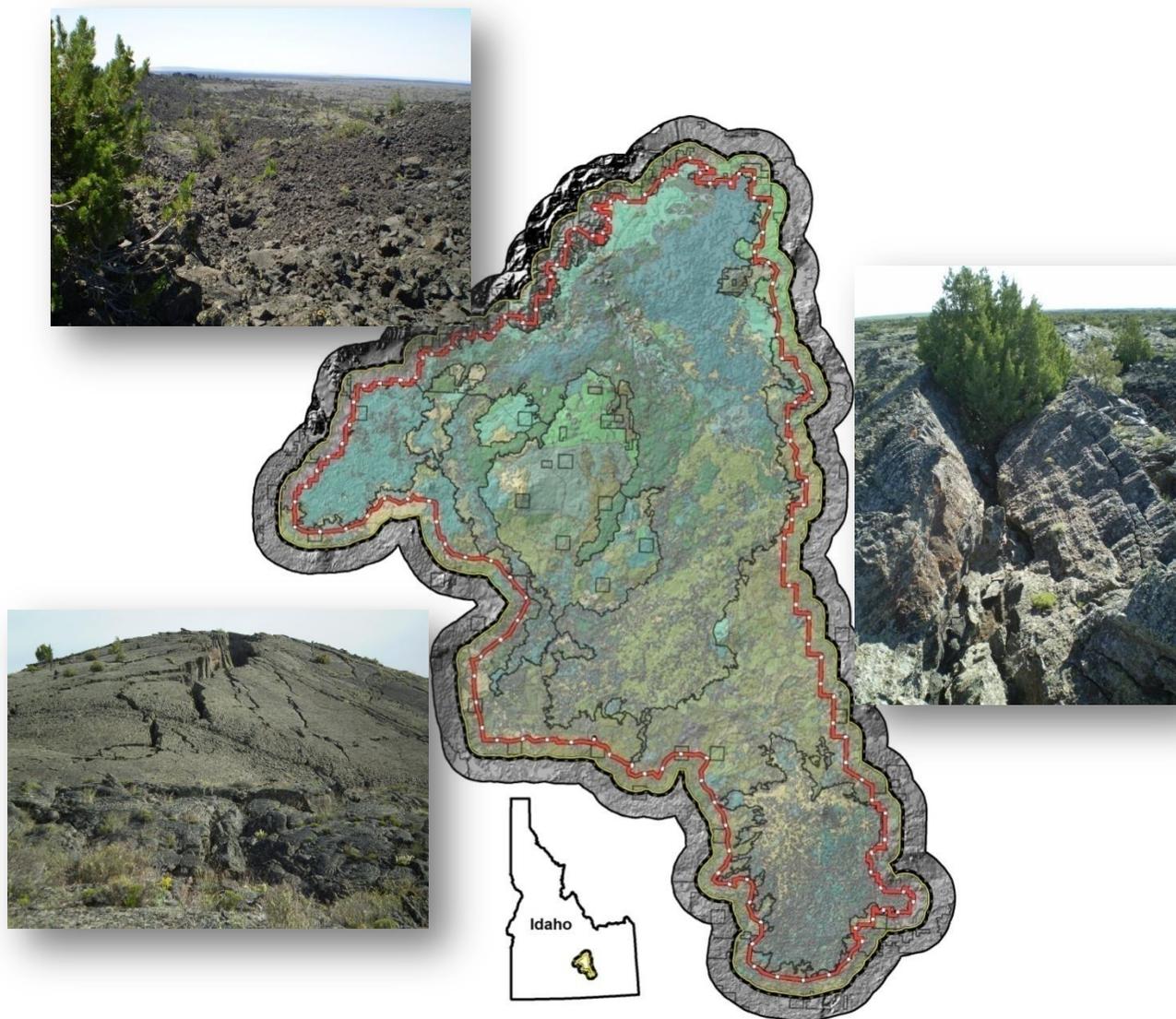




Vegetation Inventory Project

Craters of the Moon National Monument and Preserve

Natural Resource Technical Report NPS/UCBN/NRTR—2009/277



ON THE COVER

Map of Craters of the Moon National Monument and Preserve with pictures of areas in the park.
Photograph by: John A. Erixson

Vegetation Inventory Project

Craters of the Moon National Monument and Preserve

Natural Resource Technical Report NPS/UCBN/NRTR—2009/277

Jack Bell
Northwest Management, Inc.
Moscow, Idaho

Dan Cogan
Cogan Technology, Inc.
Galena, Illinois

John A. Erixson
Northwest Management, Inc.
Moscow, Idaho

Jim Von Loh
Cogan Technology, Inc.
Galena, Illinois

December 2009

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

The National Park Service, Natural Resource Program Center publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Technical Report Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report are those of the author(s) and do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the National Park Service.

This report is available from Upper Columbia Basin Inventory & Monitoring Network website (<http://www.nature.nps.gov/im/units/UCBN>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/NRPM>).

Please cite this publication as:

Bell, J., D. Cogan, J. Erixson, and J. Von Loh. 2009. Vegetation inventory project report, Craters of the Moon National Monument and Preserve. Natural Resource Technical Report NPS/UCBN/NRTR—2009/277. National Park Service, Fort Collins, Colorado.

Contents

Figures.....	v
Tables.....	vii
Acknowledgements.....	ix
Executive Summary.....	xii
Introduction.....	1
Background.....	1
NPS-USGS Vegetation Inventory Program.....	2
Upper Columbia Basin Network.....	3
Craters of the Moon National Monument and Preserve.....	4
Natural Setting.....	8
Vegetation.....	14
Craters of the Moon Vegetation Inventory Project.....	16
Scope of Work.....	17
Methods.....	19
Planning, Data Gathering and Coordination.....	19
Field Surveys.....	21
Vegetation Classification.....	25
Digital Imagery and Interpretation.....	26
Accuracy Assessment.....	32
Results.....	37
Vegetation Classification.....	37
Digital Imagery and Interpretation.....	47
Vegetation Map.....	54
Accuracy Assessment.....	58
Discussion.....	61
Field Survey.....	62
Classification.....	62
Digital Imagery and Interpretation.....	62
Accuracy Assessment.....	63
Future Recommendations.....	63
Research Opportunities.....	64
Literature Cited.....	65
List of Abbreviations and Acronym.....	69

Appendix A – Components and Flow Diagram of the Vegetation Classification and Mapping Program.....	71
Appendix B – Field Data Forms and Instructions	73
Appendix C – Dichotomous Key to CRMO Plant Associations	89
Appendix D – Vegetation Association Descriptions	97
Appendix E – Species List.....	285
Appendix F – Photo Interpretation Mapping Conventions and Visual Key.....	299
Appendix G – Final CRMO Vegetation Map.....	341

Figures

Figure 1. Map of UCBN showing the location of the park units in the network.....	4
Figure 2. Map of CRMO vegetation inventory project area.	6
Figure 3. Map of CRMO shaded by land ownership.	7
Figure 4. Physiographic setting of CRMO in Idaho.	8
Figure 5. Map of lava flows in CRMO with youngest to oldest shaded light to dark.	11
Figure 6. Example of kipukas in CRMO.	12
Figure 7. Map of BLM range allotments in and surrounding CRMO.	13
Figure 8. Project boundary for vegetation inventory at CRMO.	18
Figure 9. Vegetaton plot and observation point locatsions at CRMO.	24
Figure 10. Examples of the 2007 imagery for CRMO (upper is true color and lower is color infrared).	27
Figure 11. Examples of the CRMO segmentation.	29
Figure 12. Location of the accuracy assessment (AA) points in CRMO.....	35
Figure 13. CRMO endemic plant associations.	37
Figure 14. Example of the CRMO vegetation map layer.	58

Tables

Table 1. Project Timeline for CRMO Vegetation Inventory Project.....	20
Table 2. Plot Sizes Used for Classification Sampling at CRMO.....	22
Table 3. Polygon attribute items and descriptions used in the CRMO vegetation map GIS coverage.....	31
Table 4. Sampling protocol for AA points.....	33
Table 5. Statistics used in AA analysis.....	36
Table 6. List of plant associations for CRMO.....	38
Table 7. List of ecological systems found in CRMO.....	46
Table 8. Assignment of map classes and relationships to plant associations and other maps units.	49
Table 9. Summary statistics for map class polygons in CRMO.....	55
Table 10. Final Contingency Table for CRMO	60

Acknowledgements

A project of this size and complexity required the enthusiasm and energy of many people over several years. The dedication of all involved helped to produce a product that we, the authors, thankfully acknowledge. Below is just a sample of the many contributions made on this venture.

First, we would like to specifically thank Lisa Garrett and her Upper Columbia Basin Inventory and Monitoring Network (UCNB) staff (including Tom Rodhouse and Gordon Dicus) who provided contracting, data management, and technical review through all aspects of this project. Special recognition also goes to Karl Brown and Tammy (Hammer) Cook with the NPS Vegetation Inventory Program for prioritizing this project and providing funding. Without the financial support from the NPS Vegetation Inventory Program this project would not have been possible.

This project benefited greatly from the planning and ecological expertise contributed by many different individuals including Klara Varga of Grand Teton National Park, Leona Svancara formally with the UCBN, Julie Hilty and Kasey Prestwich of the U.S. Bureau of Land Management, Gwen Kittel of the Western Region office of NatureServe, Amy Foreman and Roger Blew with S.M. Stoller Corporation, and Steve Rust of the Idaho Conservation Data Center.

We would like to especially acknowledge all of the long days, busted hiking boots and hard work put in by our field crew members. In addition to the authors, these include Drake Barton, Tom Richards, Jim Cancroft, Steve Fugate, and Jack Gunderman from Northwest Management, Inc. and Matt Smith and Pete Williams from Engineering-Environmental Management, Inc.

We could not have asked for a better partner on this project than the resource staff at Craters of the Moon National Monument and Preserve. John Apel, Paige Wolken, Doug Owen, and Steven Bekedam went out of their way to assist the field crews, answer questions and review all of the draft deliverables. They were always timely, professional and extremely helpful throughout the process.

Executive Summary

Craters of the Moon National Monument and Preserve (CRMO) encompasses approximately 753,222 acres in south central Idaho. CRMO is located approximately 84 miles west of Idaho Falls, ID and 90 miles northeast from Twin Falls, ID. This unique unit of the National Park Service (NPS) includes volcanic cones, craters, lava flows, and kipukas characteristic of the Great Rift on the broad Eastern Snake River Plain. The park is cooperatively managed by the NPS and Bureau of Land Management and consists of three main lava flows, the Craters of the Moon, Kings Bowl and Wapi lava fields. This unique, moon-like, terrain supports approximately 701 species of vascular plants and includes examples of native plant communities common to cinder fields and lava beds. To better understand the distribution of the plant assemblages located at CRMO, the NPS Vegetation Mapping Program funded an effort, beginning in 2006, to map the vegetation at CRMO. The Upper Columbia Basin's Inventory and Monitoring Network (UCBN) coordinated the vegetation inventory effort.

A four-year, 4-phase program was initiated to complete the task of mapping and classifying the vegetation at CRMO. Phase one, directed by CRMO and UCBN staff in conjunction with Northwest Management Incorporated (NMI) and the Idaho Conservation Data Center (ICDC) developed a vegetation classification using the National Vegetation Classification System (NVCS). To classify the vegetation, 506 representative plots located throughout the approximately 928,373 acre project area (753,222 acres + 2km environs buffer) were sampled during the summer of 2006. Analysis of the plot data by Idaho Conservation Data Center in the winter of 2006-2007 produced 93 distinct plant associations and 47 plant alliances. Vegetation descriptions and a field key for all of the unique plant assemblages for CRMO are included in this report.

Phase two, directed by NMI and Cogan Technology, Inc (CTI) produced a digital vegetation map. Mapping was done using a new ortho-photo product acquired in May 2007 specifically for this project by Furgo Horizons Incorporated (Rapid City, SD). The imagery was collected using an airborne, Leica ADS40 digital sensor that collected multi-spectral (4-band), 12 bit data at 1-meter resolution. The resulting tiles were then rectified, mosaiced and processed into an 8-bit, 1:12,000-scale ortho-image. In part, using the vegetation-specific signatures from the new imagery, CTI was able to discern 50 individual map units through image segmentation and manual digitizing. All of the interpreted and remotely sensed data were converted to Geographic Information System (GIS) databases using ArcGIS[®] software. The final map layer contained vegetation and land-use polygons based on the minimum mapping unit of 0.5 hectares (1.24 ac) and these were attributed with appropriate map class, NVC and modifier information. Draft maps were printed, field tested, reviewed, and revised. After verifying the map and accessing the accuracy the final number of map units was refined to 54, including 38 vegetation, 3 bare geology, and 13 land-use/land cover types.

The phase 3 accuracy assessment (AA) was conducted in 2008 by placing 772 random point locations throughout the study area based on frequency and abundance of the map units. These were visited by NMI field crews and the vegetation at the targets was keyed to the proper association. The field data was then compared to the vegetation map and after final revisions and removal of 10 points from analysis (due to recent fire and agricultural field expansion) the assessment revealed an overall thematic accuracy of 82%.

Completion of the project in phase 4 included producing the standard project deliverables as described and presented in this report, as well as stored on the accompanying DVD. These include:

- A *Final Report* that includes keys to the vegetation and imagery signatures, AA information, and all of the methods and results of the project;
 - A *Spatial GIS Database* containing spatial data for the vegetation, plots, and AA points;
 - *Digital Photos* from sample plots and miscellaneous park views;
 - *Metadata* for all spatial data [Federal Geographic Data Committee (FGDC)-compliant];
 - *Vegetation Descriptions and Photo Signature Key* to the map classes and associations/alliances.
-

A Summary of the projects statistics is included below:

Field Work:

- *Vegetation Descriptions and Photo Signature Key* to the map classes and associations/alliances.
- 2006 Plot Sampling = 506 Plots:
401 Vegetation Plots and 105 Observation Points
- 2008 Accuracy Assessment = 772 Points

Classification:

- 93 NVC Plant Associations and 47 Vegetation Alliances

GIS Database:

- Project Size = 928,373 acres
 - Craters of the Moon National Monument and Preserve = 753,222 acres
 - NPS Land = 469,601 acres
 - Environs = 175,558 acres
- Base Imagery = 2007, 4-band, 12 bit, 1-meter, 1:12,000-scale ortho-image
- 50 Map Units = 34 Vegetated, 3 Geology, and 13 Land-use/Land-cover
- Minimum Mapping Unit = ½ hectare, modified to ¼ acre for kipukas, wetlands and riparian polygons.
- Total Size = 18,991 Polygons
- Average Polygon Size = 49 acres
- Overall Thematic Accuracy = 82%

Introduction

Background

In 1994, the U.S. Geological Survey (USGS) and National Park Service (NPS) formed the USGS-NPS Vegetation Mapping Program to cooperatively inventory and map the vegetation in the United States National Parks. The goals of this program are to provide baseline ecological data for park resource managers, obtain data that can be examined in a regional and national context, and provide opportunities for future inventory, monitoring, and research activities (FGDC 1997, Grossman et al. 1998).

In the same year, the USGS-NPS Vegetation Mapping Program also adopted the U.S. National Vegetation Classification (USNVC) (The Nature Conservancy and Environmental Systems Research Institute 1994a, Grossman et al. 1998) as a basis for the *a priori* definition of vegetation units to be inventoried. The Federal Geographic Data Committee (FGDC) adopted a modified version of the upper (physiognomic) levels as a federal standard (FGDC-STD-005) (FGDC 1997). This standard was hereafter termed the National Vegetation Classification Standard (NVCS). The NVCS established a federal standard for a complete taxonomic treatment of vegetation in the United States at physiognomic levels. It also established conceptual taxonomic levels for the floristic units of alliance and association, largely following the USNVC, but did not offer a taxonomic treatment for the floristic levels because of the immense scope of establishing robust floristic units for the entire United States. The FGDC standard requires that federally funded vegetation classification efforts collect data in a manner that enables crosswalking the data to the NVCS (i.e., the physiognomic levels) and sharing between agencies, but does not require use of that standard by agencies for internal mission needs. NatureServe maintains a treatment of floristic units (alliances and associations), which, though not a federal standard, are used as classification and mapping units by the vegetation inventory program whenever feasible. For purposes of this document, the federal standard (FGDC 1997) is denoted as the NVCS; the USNVC will refer exclusively to NatureServe's treatment for vegetation floristic units (alliances and associations only).

Use of the NVCS as the standard vegetation classification system is central to fulfilling the goals of this national program. This system:

- is vegetation based;
- uses a systematic approach to classify a continuum;
- emphasizes natural and existing vegetation;
- uses a combined physiognomic-floristic hierarchy;
- identifies vegetation units based on both qualitative and quantitative data; and
- is appropriate for mapping at multiple scales.

The use of the NVCS and the USGS-NPS vegetation mapping protocols facilitate effective resource stewardship by ensuring compatibility and widespread use of the information throughout the NPS as well as by other federal and state agencies. These vegetation maps and associated information support a wide variety of resource assessment, park management, and planning needs. In addition they can be used to provide a structure for framing and answering

critical scientific questions about vegetation communities and their relationship to environmental conditions and ecological processes across the landscape.

The NVCS has primarily been developed and implemented by The Nature Conservancy (TNC) and the network of State Natural Heritage Programs over the past twenty years (TNC 1994a; Grossman et al. 1998). The NVCS is currently supported and endorsed by multiple federal agencies, the FGDC, NatureServe, State Heritage Programs, and the Ecological Society of America. Refinements to the classification occur in the process of application, which lead to ongoing revisions that are reviewed both locally and nationally. TNC and NatureServe have made available a 2-volume publication presenting the standardized classification, providing a thorough introduction to the classification, its structure, and the list of vegetation types found across the United States as of April 1997 (Grossman et al. 1998). *Volume I: The National Vegetation Classification Standard* can be found on the Internet at: <http://www.natureserve.org/publications/library.jsp>.

NatureServe has since superseded *Volume II* of the publication (the classification listing), providing regular updates to ecological communities in the United States and Canada. This online database server, NatureServe Explorer®, can also be found on the Internet at: <http://www.natureserve.org/explorer>.

NPS-USGS Vegetation Inventory Program

The Director of the NPS approved the Natural Resource Challenge in 1999 to encourage national parks to focus on the preservation of the nation's natural heritage through science, natural resource inventories, and expanded resource monitoring (NPS 1999). The Natural Resource Challenge provided funding for 12 baseline inventories to be completed in each of 270 parks with significant natural resources. The vegetation mapping inventory is considered one of these 12 baseline inventories. Through the Challenge, 270 parks in the national park system were organized into 32 networks for the purpose of accomplishing natural resource inventory and monitoring projects.

The Vegetation Inventory is a cooperative effort between the NPS and the USGS to classify, describe, and map vegetation communities in more than 270 national park units across the United States. Vegetation species and communities are unique from park to park. The inventory of these resources helps park managers conserve plant biodiversity; manage challenges such as exotic species, insect outbreaks, and diseases; and understand resources and processes such as wildlife habitat relationships and wildland fires.

The primary objective of the Vegetation Inventory is to produce high-quality, standardized maps and associated data sets of vegetation and other land cover occurring within parks. This information fills datgaps and complements a wide variety of resource assessments, park management, and conservation needs. For example, in Sequoia and Kings Canyon national parks, the 2007 vegetation map and digital database provided the parks with tools to better manage foxtail pines (*Pinus balfouriana ssp. austrina*), an endemic species to the southern Sierra Nevada. Foxtail pines live more than 1,000 years and their tree rings contain valuable information about past climate fluctuations. In the Rocky Mountain National Park, vegetation

map and inventory data aid in the study of elk damage to aspen and willow trees within elk wintering grounds.

NPS vegetation inventory follows well-established procedures that are compatible with other agencies and organizations. The inventory uses the National NVCS, a system that is integrated with the major scientific efforts in the taxonomic classification of vegetation, and is a FGDC standard. In addition, stringent quality control procedures ensure the reliability of the vegetation data and encourage the use of resulting maps, reports, and databases at multiple scales.

A complete vegetation mapping project for a park includes the following products:

- Detailed vegetation report
- Digital vegetation map
- Vegetation plot data
- Accuracy assessment data & analysis
- Dichotomous vegetation key
- Photo-interpretation key

Maps are produced in Universal Transverse Mercator (UTM) coordinates (NAD 83) with a 1:24,000 scale and a minimum mapping unit of 0.5 hectares. The vegetation maps must meet the National Map Accuracy Standards for positional accuracy, and the minimum class accuracy goal across all vegetation and land cover classes of 80 percent.

Upper Columbia Basin Network

The specific decision to classify and map the vegetation at CRMO was made in response to guidelines set forth by the NPS Natural Resources Inventory and Monitoring Program and implemented by the Upper Columbia Basin Network (UCBN). The UCBN consists of nine National Park units spread across 4 states in the Inland Northwest (Figure 1). This network of parks was organized to inventory and monitor that status and trend in select natural resources. The network organization facilitates collaboration, information sharing, and economies of scale in natural resource monitoring. The inventory and monitoring information is used by park resource managers to guide management decisions, to inform scientific research, and for educating the public. One of the goals of the NPS servicewide monitoring program is to provide data to better understand the dynamic nature and condition of park ecosystems and to provide reference points for comparisons with other, altered environments. The development of a vegetation classification to the plant community level and associated GIS map and database for each park is viewed as a high priority in reaching this goal.

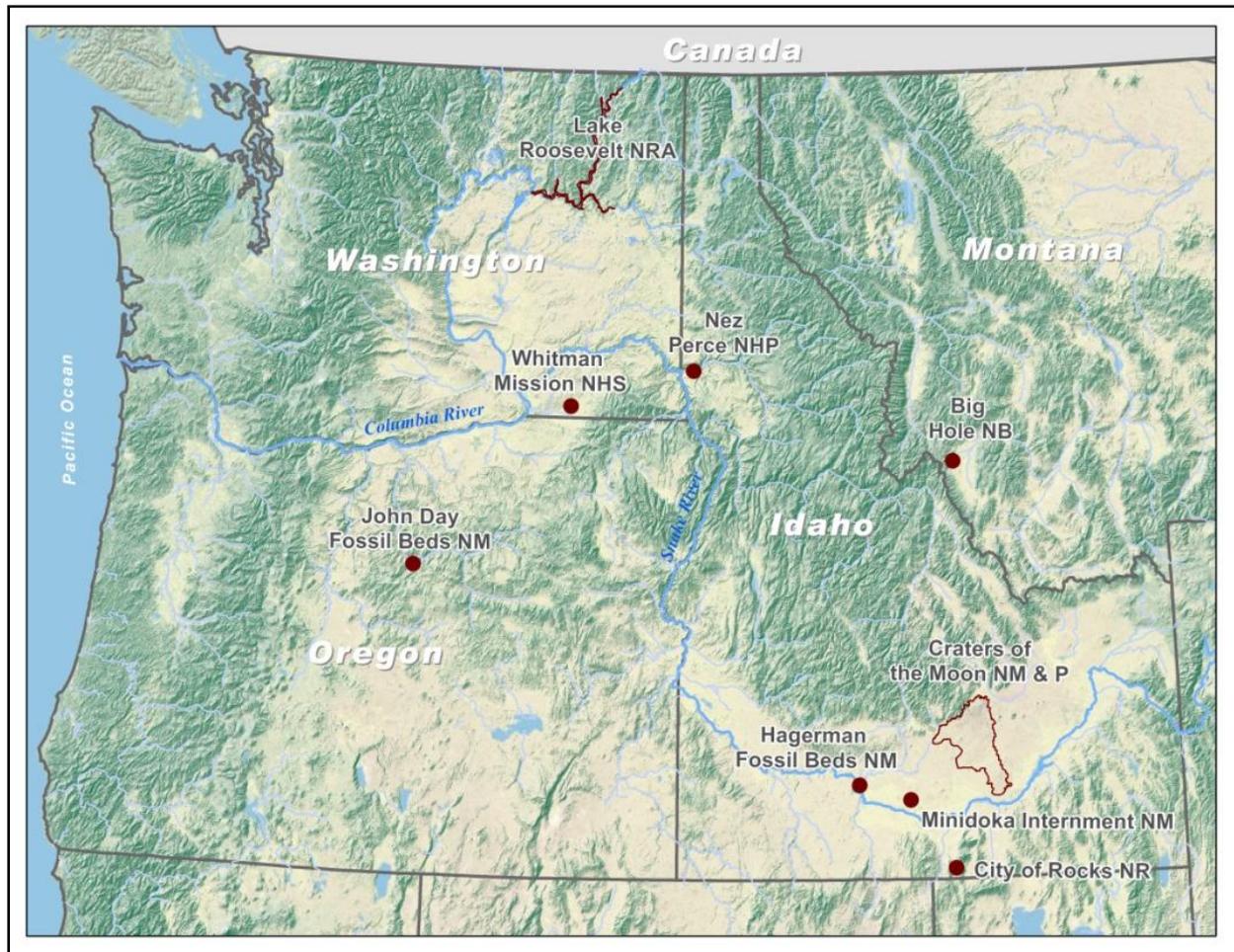


Figure 1. Map of UCBN showing the location of the park units in the network.

Craters of the Moon National Monument and Preserve

In 1924, the original Craters of the Moon National Monument (53,495-acre) was established by proclamation of President Calvin Coolidge (NPS-CRMO 2009). In 2000, CRMO was expanded by President William J. Clinton under the National Monument designation (Proclamation 7373) to include over 753,222 acres managed cooperatively by the NPS and the U.S. Bureau of Land Management (Figure 2). In 2002, additional federal legislation (PL 107-213, 116 Statute 1052) made one further adjustment by designating the area within the expanded NPS boundaries as a National Preserve to authorize hunting.

CRMO was created to preserve a unique area of volcanic cones, craters, lava flows, and lava tube caves and now includes almost the entire Great Rift, the best-developed example of a volcanic rift zone in the U.S. The Monument and Preserve is located on the broad Eastern Snake River Plain (NPS-CRMO 2009) and consists of three major lava fields and about 400 mi² of sagebrush-steppe grasslands to cover a total area of 1,117 mi². All three lava fields lie along the Great Rift of Idaho, with some of the best examples of open rift cracks in the world, including the deepest known on Earth at 800 feet. There are excellent examples of almost every variety of

basaltic lava as well as tree molds (cavities left by lava-incinerated trees), lava tubes (a type of cave), and many other volcanic features.

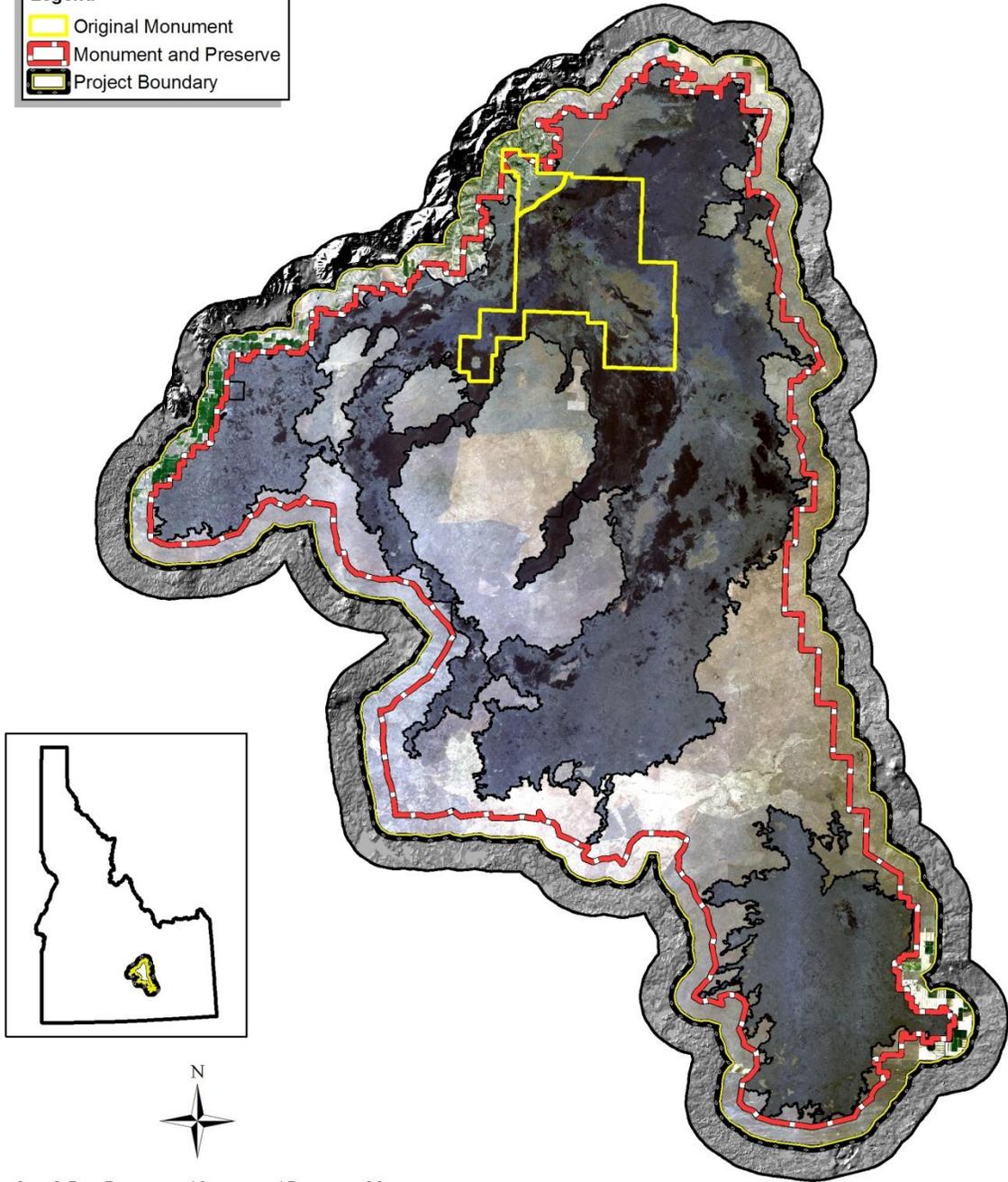
CRMO is located in Blaine, Butte, Lincoln, Minidoka, and Power counties in south-central Idaho on the Snake River Plain south of the Pioneer Mountain Range. The nearest towns include Cary (2 miles to the northwest), Arco (8 miles to the northeast), and Minidoka (15 miles to the south). The nearest cities are Twin Falls (65 miles to the southwest), Pocatello (90 miles to the southeast), and Idaho Falls (80 miles to the east). CRMO is located on State Highway 93/26/20 and is bordered by public lands managed by the Bureau of Land Management, Upper Snake River District (Figure 3).



Vegetation Inventory Project Area

Legend

- Original Monument
- Monument and Preserve
- Project Boundary



Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

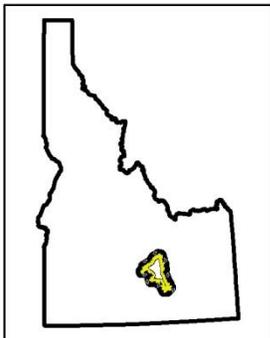
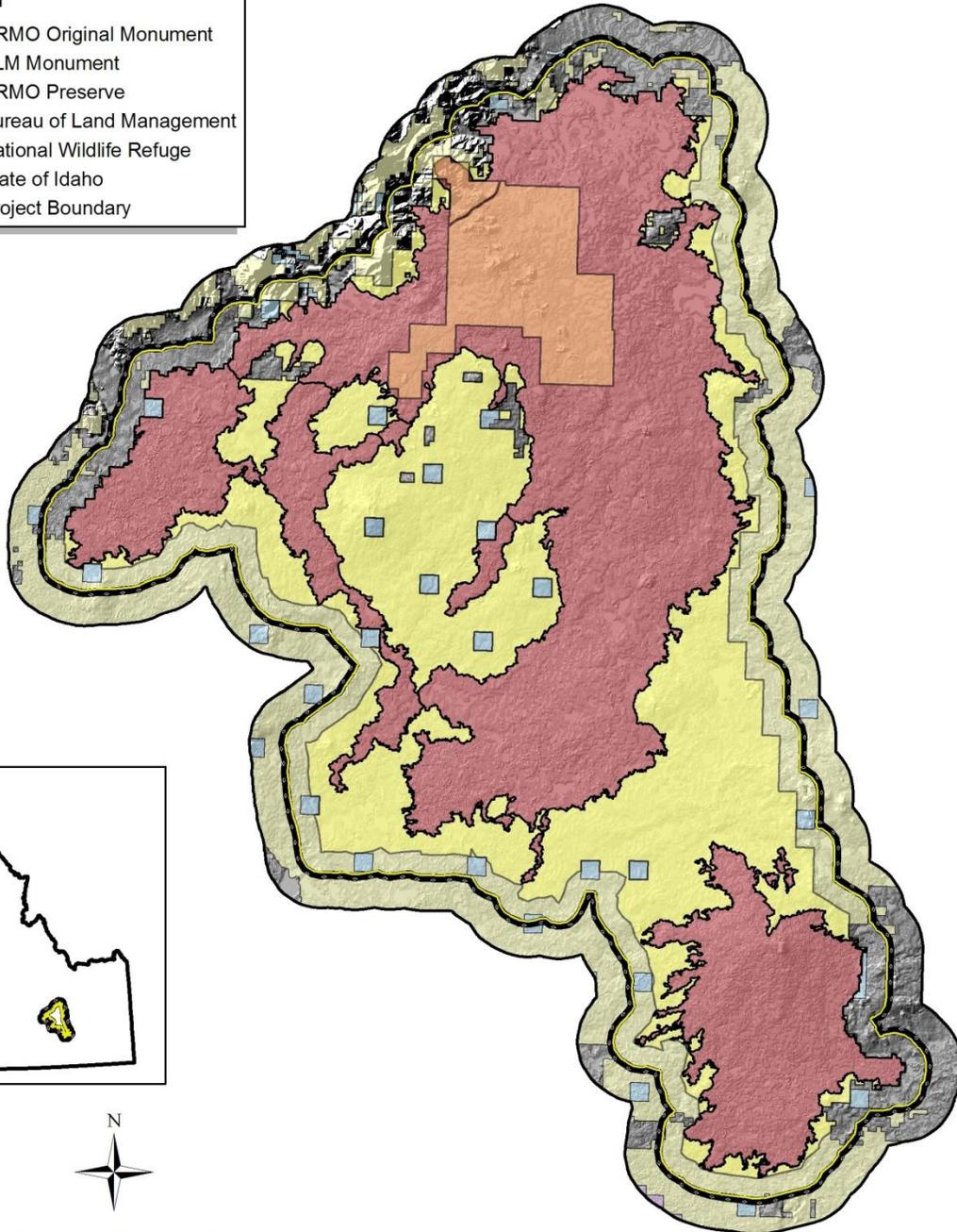
FILE: crmo_veg_inventory.mxd

Figure 2. Map of CRMO vegetation inventory project area.



Land Owership and Management

- Legend**
- CRMO Original Monument
 - BLM Monument
 - CRMO Preserve
 - Bureau of Land Management
 - National Wildlife Refuge
 - State of Idaho
 - Project Boundary



0 2.5 5 10 15 20 Miles

Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

FILE: crmo_veg_inventory.mxd

Figure 3. Map of CRMO shaded by land ownership.

Natural Setting

CRMO is located on the Snake River Plain at the foot of the Pioneer Mountains in south central Idaho (Owen 2008). This broad plain spans nearly all (10,000 mi²) of southern Idaho and in places it can be up to 60 miles wide. The Snake River Plain extends from the Yellowstone Plateau and Teton Mountains to the Idaho/Oregon border (Figure 4). CRMO drops ~1700 feet in elevation over a distance of about 3 miles from the northern park boundary in the Pioneer Mountains to the area near the visitor center. The geology of the rocks over this same distance also changes dramatically. The northern end of the Monument contains Eocene (~50 million years old) age intrusives of biotite granite and hornblende quartz monzonite and several types of Challis volcanics. It also contains Mississippian (~350 million years old) age sedimentary rocks of the Copper Basin Formation. These much older and lithologically different rocks provide a far different substrate than the much younger and less weathered basaltic rocks found in most of the rest of the monument.

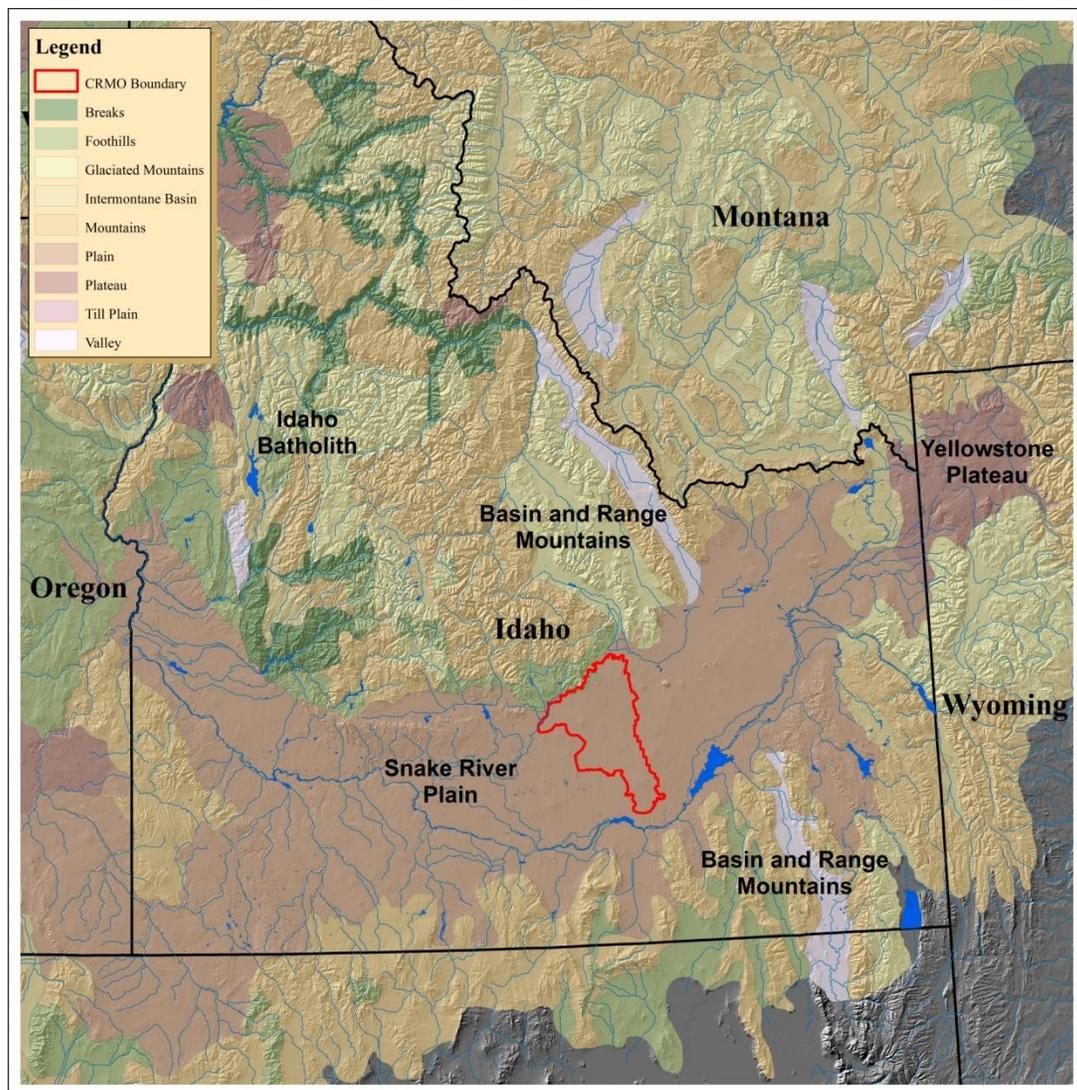


Figure 4. Physiographic setting of CRMO in Idaho.

From a physiographic perspective, CRMO lies in the Intermountain Plateau division, Snake River Basin - High Desert and Basin and Range physiographic provinces (Omernik 1986). The landscape within CRMO is characterized by shield volcanoes, cinder (tephra) cones (100-700 ft tall), spatter cones, pressure ridges/flow ridges, pressure plateaus, lava flows {(aa, block lava, pahoehoe (shelly, spiny, and slabby))}, faults and fault scarps, eruptive and non-eruptive fissures, longitudinal sand dunes, and loess flats and plains. CRMO encompasses rugged to nearly flat topography at an average elevation of approximately 6,305ft. Elevations within the Monument range from 4,300 ft on the southeastern boundary to 7,730 ft in the foothills of the Pioneer Mountains.

CRMO is characterized by a plateau/continental interior climate, averaging 15.4 inches of precipitation, which includes 79 inches of snow annually (WRCC 2009). Temperatures range from an average of 84.9 °F in July to an average low 19 °F in January. Hottest days can approach or exceed 100 °F and soil and rock temperatures can reach ≥ 150 °F. The growing season for this region is approximately 125 days.

CRMO is known for its dramatic, volcanic scenery due to the expansive lava flows and cinder cones created during eight major volcanic eruptive periods over the last 15,000 years. The relative newness of the land (the most recent eruption occurring approximately 2,100 years ago in CRMO) has created a stark, other-worldly landscape with vistas highlighted by large plains of intertwined, rugged lava (NPS-CRMO 2009). The origin of the younger landscape is related to the The Great Rift, a volcanic rift zone that varies in width between approximately 1-5 miles and consists of open cracks, eruptive fissures, shield volcanoes, and cinder cones. It runs southeasterly from about 6 miles north of the CRMO visitors center for more than 50 miles (80 km) to south of Pillar Butte on the southern edge of CRMO (Kuntz, et al, 1982 in Owen 2008).

CRMO is generally separated into three major lava fields with the northernmost Craters of the Moon lava field being by far the largest of the three. Of the more than 60 individual lava flows comprising the Craters of the Moon lava field, 20 have been dated and ages range from about 2,100 years to about 15,000 years before present. These flows were laid down during eight distinct eruptive periods that recurred on an average of every 2,000 years. Directly south and east of the Craters of the Moon lava field lies the much smaller Kings Bowl lava field and to the south and west of this lies the large Wapi lava field (Figure 5).

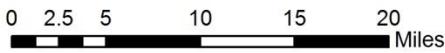
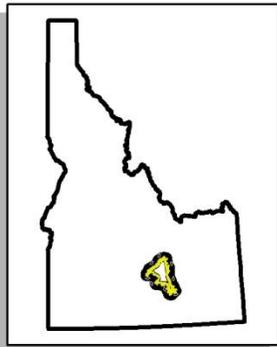
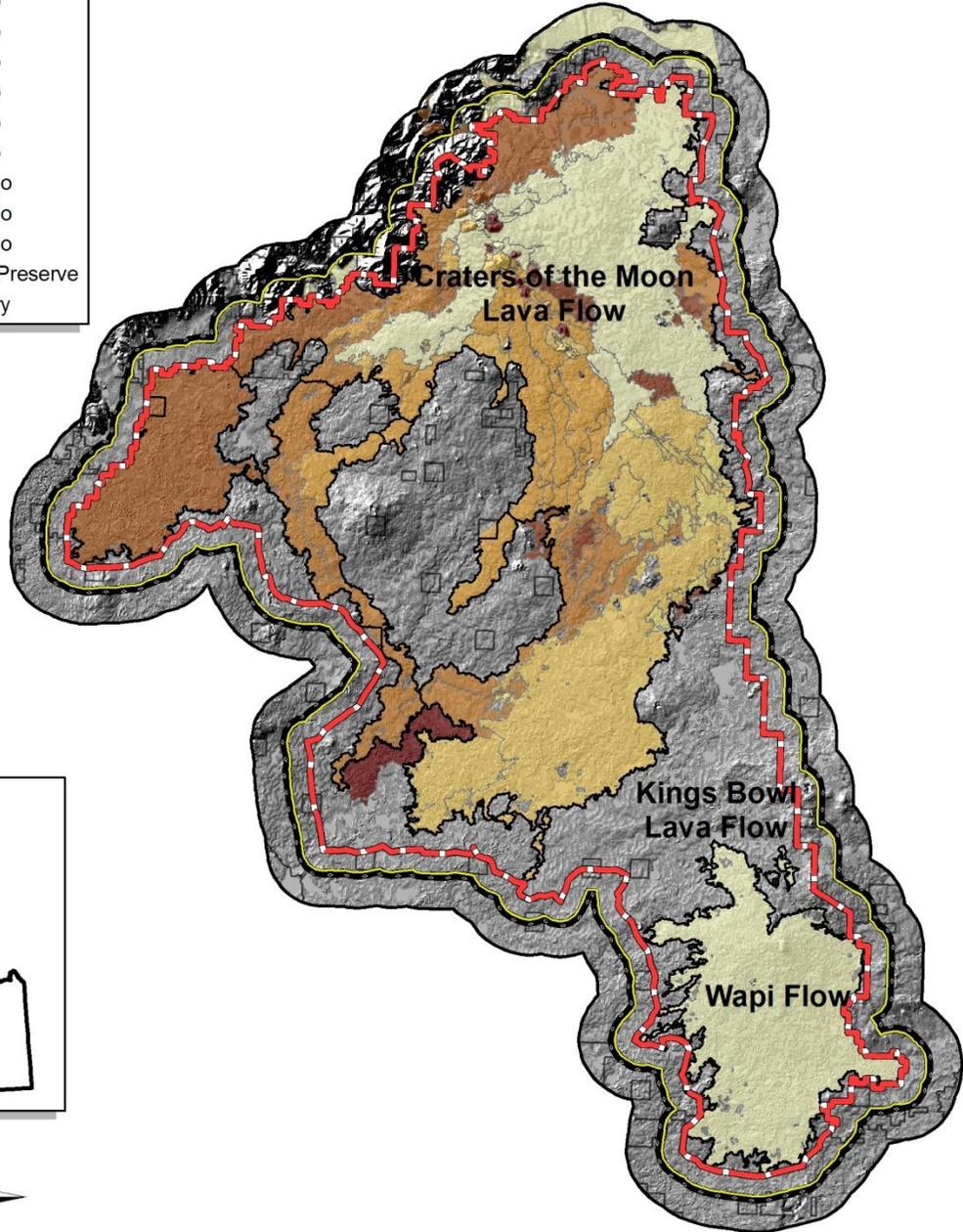
All of the basaltic lava at CRMO is classified as either aa or pahoehoe lava. Aa lava has a rough and coarse texture consisting of clinkers and rubble with sharp points. Another very rough lava related to aa is block lava that has a surface of angular blocks and forms from very dense lava. Pahoehoe lava is more fluid before hardening, spreads into sheets with smooth, glistening surfaces that are often billowy or twisted into ropelike wrinkles, pleats, and folds. Three kinds of pahoehoe may be observed at CRMO. These include: 1) slabby pahoehoe consisting of jumbled plates or slabs of broken pahoehoe crust; 2) shelly pahoehoe, which forms from gas-charged lava, contains small open tubes, blisters, and thin crusts; and 3) spiny pahoehoe, which was very thick and pasty and contains elongated gas bubbles forming spines on the surface. Lava tubes and caves are common to pahoehoe lava flows forming when the surface of a lava flow, much like water below the ice on a river in winter, and can form a hollow conduit or tube if the tube is no longer fed by the eruption and the liquid rock within the tube drains away.

Intermixed with the lava flows, especially in the Craters of the Moon lava field along the Great Rift are cinder cones and fields of various sizes. Cinders are formed from highly gas charged lava expelled from a vent. As cinder deposits build up, they take on a characteristic cone shape. Many of the cinder cones in CRMO are lopsided or asymmetrical because it was windy when the cones formed and more material was deposited in the down wind direction. The tallest cinder cone at CRMO, Big Cinder Butte, is between 700-800 ft. high.

Most of the remaining areas between or around young lava fields in CRMO are made up of Pleistocene-age pahoehoe and aa flows, tephra and cinder deposits, lava cones, and shield volcanoes (Kuntz, et al, 1988 in Owen 2008). The older volcanic rocks are typically mantled with loess deposits (windblown silt) and in some places by eolian (wind-transported) sand. Older areas surrounded by younger flows are called kipukas (and often support “islands” of more abundant vegetation) (Figure 6).



Lava Flows



Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

Figure 5. Map of lava flows in CRMO with youngest to oldest shaded light to dark.

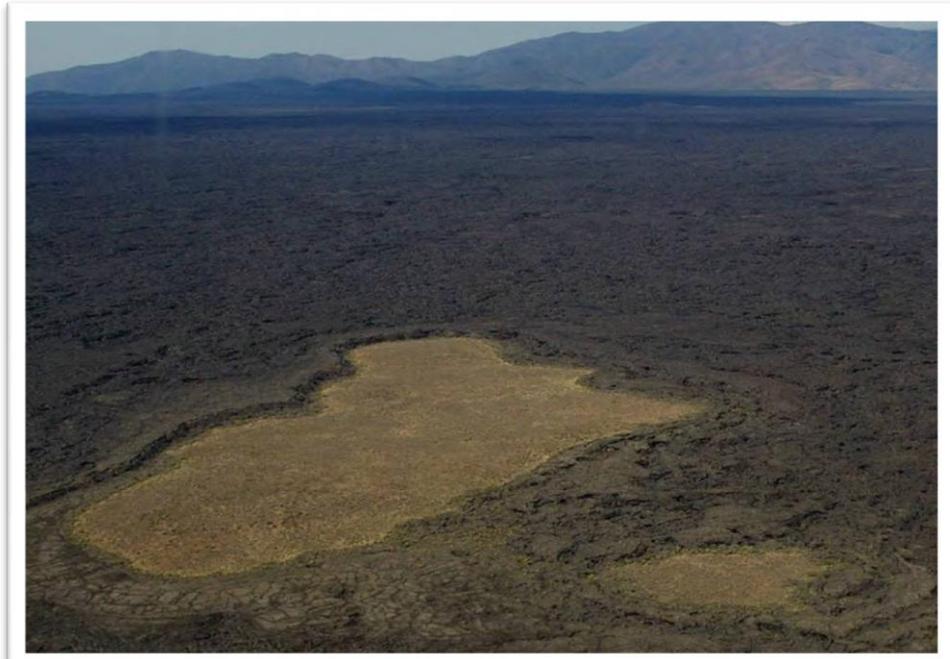


Figure 6. Example of kipukas in CRMO.

CRMO soils are primarily developed in wind-blown loess or are developed from the basaltic lava. In general the Pioneer Mountain foothill soils are better developed than those in the rest of the Monument. Soils on the lava fields are directly dependent on the deposition of wind-blown loess in cracks and crevices and the erosion of the lava over time. Soil textures within CRMO range from fine-to-coarse-textured, with silt loams and sandy loams very common outside of the recent lava flows and in kipukas. The presence of soil crusts (a complex community of cyanobacteria, green algae, lichens, mosses, microfungi, and other true bacteria) and moss cover on these soils likely indicates lack of disturbance and could be an important indicator on the health of local plant communities (Belnap et al. 2001). Moss and lichens are also common on the lava flows where the lichens help break down and dissolve the rock into soil and moss beds help hold this new soil in place (Slaton and Novey 2007).

Water in this arid landscape is limited and many of the available sources are used in a variety of ways ranging from drinking water, irrigation, livestock watering, and recreational opportunities (e.g. thermal springs). Surface water primarily occurs as small perennial streams in the foothills of the Pioneer Mountains and as shallow seasonal playas in the surrounding areas.

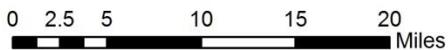
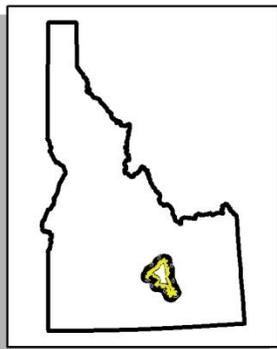
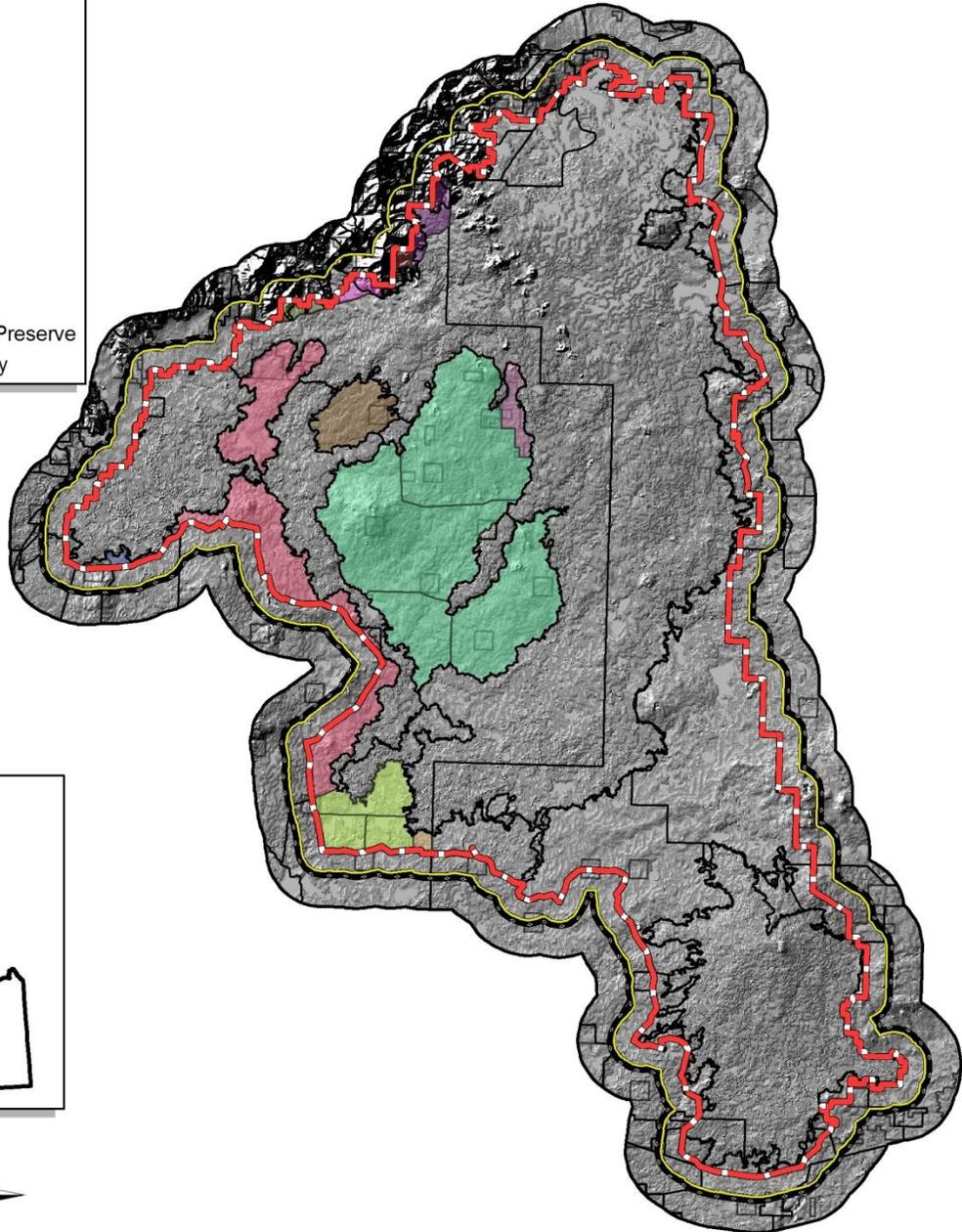
Historical use of the CRMO area was likely discouraged due to the rough nature of the landscape although some specific areas in and around the lava fields have likely seen some sporadic use for over 11,000 years (NPS 2009). By the middle of 19th century, the Oregon Trail including the route known as Goodale's Cutoff, brought new settlers to the area introducing mining and livestock grazing (Louter 1995). Livestock grazing continues to this day on the BLM-managed portions of the Monument as authorized under Proclamation 7373. There are currently 12 grazing allotments that include portions of CRMO and are managed and monitored under allotment management plans by the BLM (Figure 7).



BLM Range Allotments

Legend

- Bowl Crater
- Cottonwood
- Crater
- Kimama
- Laidlaw Park
- Lava Lake
- Little Park
- Pagari
- Pagarit
- Poison Lake
- Timber Butte
- Wildhorse
- Monument and Preserve
- Project Boundary



Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

Figure 7. Map of BLM range allotments in and surrounding CRMO.

Vegetation

CRMO is located in the Snake River Basin/High Desert (Omernik, 1986) and encompasses a small portion of the Idaho Batholith/Foothill Shrublands-Grassland ecoregion and a large portion of the Snake River Plain/Lava Fields ecoregion (McGrath, et al., 2002). Extant vegetation is broadly characterized as belonging to either montane, foothill, steppe, or plain formations and includes mostly dry and some mesic forest, woodland, shrubland, herbaceous vegetation, and sparse vegetation within volcanic, foothill, and plateau settings. Vegetation distribution is likely driven in large part by elevation, aspect, substrate, and disturbance history with the most obvious being the lava substrate. From a casual perspective most of the lava at CRMO appears to be unvegetated but the Gap Analysis of Idaho Land Cover from 1996, shows approximately 33 percent of the Monument to be vegetated lava compared to just 20 percent exposed or non-vegetated lava flows (Landscape Dynamics Lab 1999). In fact the volcanic geology and its complex interaction of rock outcrops, slope exposure, colluvium, soils, hydrology, and disturbance creates many unique niches for vegetation that would likely not occur on a more homogenous site.

The diversity of vegetation can be evidenced by more than 700 documented vascular plant species known to occur at CRMO (NPS, unpubl. data) and by estimates of the plant communities ranging from 26 (Day and Wright 1985; Whipple 1992; Jurs and Sands 2004) to 35 (NPS, unpubl. data). Based on these studies and others CRMO's native vegetation tends to occur in the following pattern based on location and substrate:

- 1) Location: North Environs - Pioneer Mountain Foothills
Substrate: Paleozoic Sedimentary Rocks
Dominate Species: Douglas fir (*Pseudotsuga menziesii*), Limber Pine (*Pinus flexilis*), Quaking Aspen (*Populus tremuloides*), Low Sagebrush (*Artemisia arbuscula*), Mountain Big Sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Bluebunch Wheatgrass (*Pseudoroegneria spicata*), Needle-and-thread (*Hesperostipa comata*)
- 2) Location: North CRMO - Craters of the Moon Lava Field
Substrate: Basaltic Lava with Soil Deposits (Silt, Eolian Sands)
Dominate Species: Limber Pine, Mountain Big Sagebrush, Antelope Bitterbrush (*Purshia tridentata*), Idaho Fescue (*Festuca idahoensis*)
- 3) Location: North CRMO - Craters of the Moon Lava Field
Substrate: Basaltic Lava (Pahoehoe and Aa Lava)
Dominate Species: Antelope Bitterbrush, Fern Bush (*Chamaebatiaria millefolium*), Ocean Spray (*Holodiscus discolor*), Mock Orange (*Philadelphus lewisii*), Dwarf Goldenbush (*Haplopappus nanus*), Mountain Big Sagebrush, Sandberg Bluegrass (*Poa secunda*)
- 4) Location: North and Central CRMO - Craters of the Moon Lava Field
Substrate: Cinders
Dominate Species: Cushion Buckwheat (*Eriogonum ovalifolium* var. *depressum*), Silverleaf Phacelia (*Phacelia hastata*), Douglas Dustymaiden (*Chaenactis douglasii*), Bitterroot (*Lewisia rediviva*)

- 5) Location: Central Environs and CRMO Kipukas
 Substrate: Various
 Dominate Species: Wyoming Big Sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), Threetip Sagebrush (*Artemisia tripartita*), Basin Big Sagebrush (*Artemisia tridentata* ssp. *tridentata*), Rabbitbrush (*Chrysothamnus* sp.), Western Wheatgrass (*Pascopyrum smithii*), Idaho Fescue, Cheatgrass (*Bromus tectorum*), Crested Wheatgrass (*Agropyron cristatum*)

- 6) Location: South CRMO - Wapi and Kings Bowl Lava Fields
 Substrate: Basaltic Lava (Pahoehoe and Aa Lava)
 Dominate Species: Rocky Mountain Juniper (*Juniperus scopulorum*), Utah Juniper (*Juniperus osteosperma*)
 Antelope Bitterbrush, Wyoming Big Sagebrush, Dwarf Goldenbush, Sandberg Bluegrass

- 7) Location: South Environs
 Substrate: Various
 Dominate Species: Wyoming Big Sagebrush, Rabbitbrush, Cheatgrass, Crested Wheatgrass

- 8) Location: CRMO - Riparian
 Substrate: Various:
 Dominate Species: Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*), Chokecherry (*Prunus virginiana*), Speckled Alder (*Alnus incana*), Baltic Rush (*Juncus arcticus* ssp. *balticus*), Cheatgrass

Another way to examine CRMO's vegetation was presented by Slaton and Novey (2007) in their work on interpreting the monument's biological diversity. They focused on vital sign monitoring and identified the following vegetation units as important indicators for the health and condition of CRMO ecosystems: Aspen, Invasive/Exotic plants, Land cover and use, Limber pine, Riparian vegetation, and Sagebrush-steppe vegetation. The use of land cover and use presented a further breakdown in the plant communities resulting in 9 vegetation types occurring at CRMO. These included: Low-elevation Sagebrush-steppe (157,000 acres), Annual Exotic Grassland (31,000 acres), Perennial Seeded and Native Grassland (153,000 acres), Mid-elevation Sagebrush-steppe (9,400 acres), Bare and Vegetated Lava (399,000 acres), Mountain Shrub (400 acres), Aspen (60 acres), Conifer (140 acres), and Riparian (670 acres).

As evidenced from these inventories non-native exotic plants are unfortunate widespread contributors to the vegetation diversity at CRMO. Human activities on the CRMO landscape over the past century have caused changes in the composition of native vegetation. Post-settlement livestock grazing, infrastructure development, visitation of CRMO, and wildfires have all contributed to the establishment and spread of a number of non-native plant species. Of these impacts, fire has recently been one of the more devastating consuming over 300,000 acres of habitat within CRMO between 1970 and 2005 (mostly on BLM-managed lands). Noxious and exotic non-native species have been discussed in the CRMO Fire Management Plan (2008) and are scarce in some fire management units and common in others. Vectors for introduction include the U.S. Highway 93/20/26 corridor and the numerous 2-track and other roads surrounding CRMO. As of 2006, 91 of the 701 plant taxa (13%) known to occur or likely to occur within CRMO are non-native (UCBN 2006).

Among the most invasive are 10 confirmed plant species found at CRMO designated by the state of Idaho as noxious weeds. These include spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), Russian knapweed (*Acroptilon repens*), rush skeletonweed (*Chondrilla juncea*), leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), Scotch thistle (*Onopordum acanthium*), dalmatian toadflax (*Linaria dalmatica*), field bindweed (*Convolvulus arvensis*), and Dyer's woad (*Isatis tinctoria*) (Slaton and Novey 2007). Other invasive/exotic plants, such as cheatgrass and crested wheatgrass are extremely widespread especially in the sagebrush-steppe habitats. Cheatgrass is a common and widespread invader throughout the West and was likely introduced in the early 1900s when domestic sheep grazed the area (Slaton and Novey 2007) Cheatgrass is extremely competitive and readily invades and dominates disturbed land. It can also be a component of undisturbed or otherwise healthy sagebrush-steppe (CRMO 2005). Crested wheatgrass is also common on the land surrounding CRMO where it was likely introduced through seeding.

Finally, there are two special status plant species found at CRMO. The first is the Obscure Phacelia (*Phacelia inconspicua*) and the other is Picabo Milkvetch (*Astragalus onicifomis*). Obscure Phacelia is one of Idaho's rarest plants, with only six area occurrences statewide. It occurs on the north and east-facing slopes of volcanic mountains and buttes (Slaton and Novey 2007). Picabo Milkvetch can be found in sandy soils in the north-central portion of the Eastern Snake River Plain (CRMO 2005). Areas of likely habitat within and surrounding the Monument have been systematically surveyed for both obscure phacelia and picabo milkvetch buttes (CRMO 2005).

Craters of the Moon Vegetation Inventory Project

CRMO is one of nine parks served by the UCBN Inventory & Monitoring Program. The UCBN initiated a vegetation mapping inventory for CRMO in the spring of 2006 as part of a larger effort to complete vegetation inventory maps for each of the 9 parks in the network. An initial multi-year work plan was developed for the UCBN by Cogan Technology, Inc. (CTI). This work plan provided recommendations for completing the plant community classification, digital database, and map products for each of the 9 UCBN parks. The work plan received approval from the Washington Area Service Office (WASO) Inventory Coordinator in May 2006.

Once approved UCBN staff contracted with NMI to complete vegetation plot field data collection during the summer of 2006. The Idaho Conservation Data Center (IDCDC) was retained to provide the preliminary and final vegetation classification as part of a cooperative agreement with the UCBN. In September 2007, the UCBN entered into a contract with NMI to provide all of the vegetation mapping services designated by the work plan and to administer and coordinate the UCBN vegetation mapping projects for all 9 park units. Subsequently, CTI was retained by NMI as a sub-contractor to assist on the project.

The team's objectives were to secure or create the following:

Spatial Data

- Aerial and ortho-photography
- Map classification based on CRMO-specific requirements
- Map classification description and key
- Spatial database of vegetation communities of CRMO's vegetation
- Digital and hardcopy maps of vegetation communities
- Metadata for spatial databases
- Complete accuracy assessment of spatial data

Vegetation Information

- Vegetation classification
- Dichotomous field key of vegetation classes
- Formal description for each vegetation class
- Ground photos of vegetation classes
- Field data in database format

Scope of Work

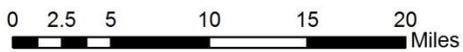
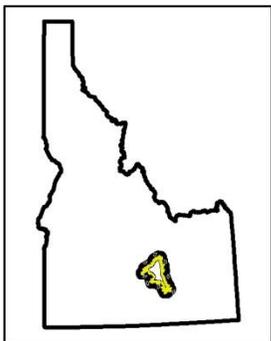
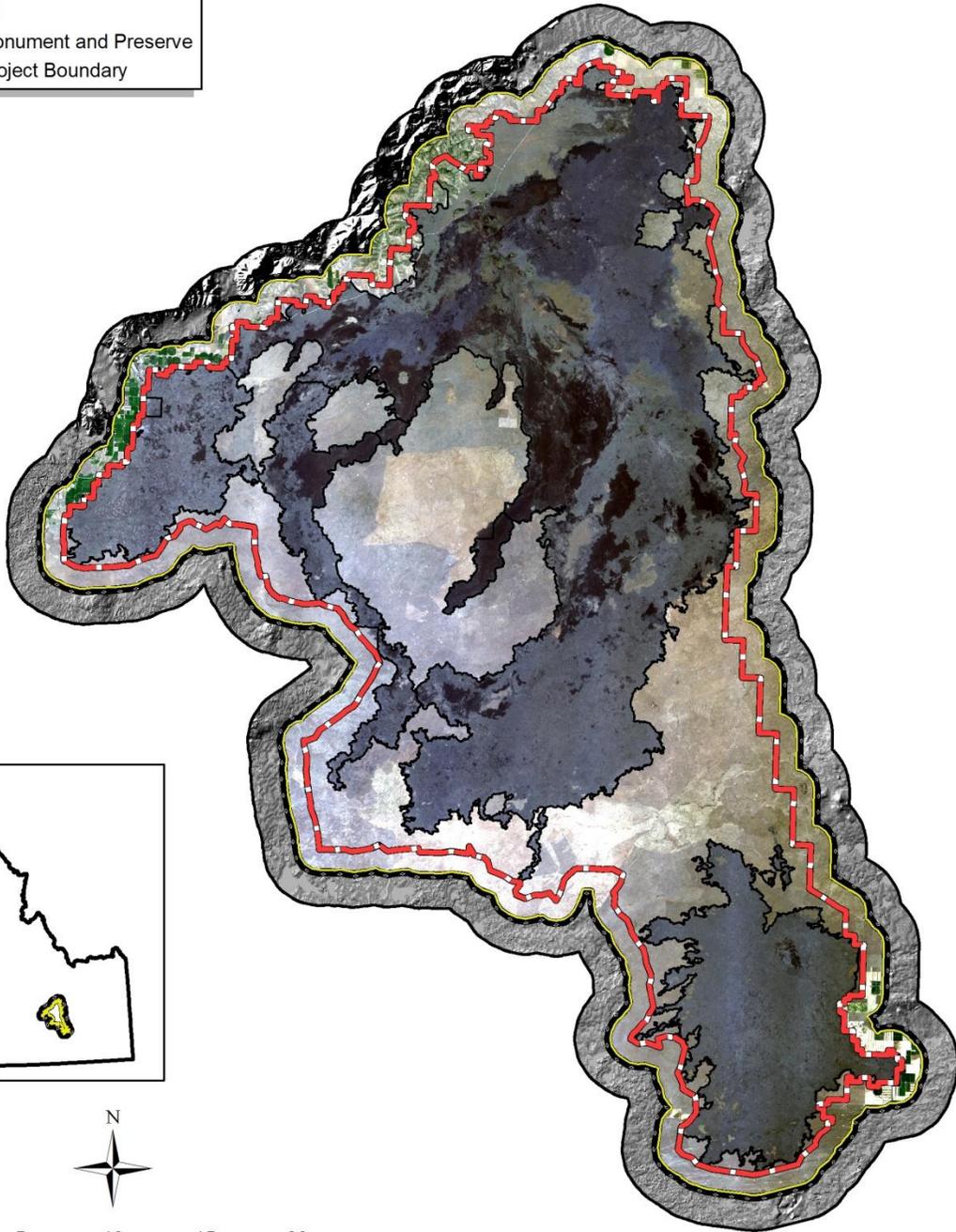
Vegetation inventory for CRMO occurred within an approximate 928,373 acre project area, encompassing the boundary of CRMO (as provided by UCBN) and a general 2-km environ radius (Figure 8).. The final project area determination was based on management needs, financial constraints, and time limitations. The 2-km environs area was used in this project for inventory and monitoring purposes and to capture various management considerations such as exotic weed dispersal. Also the size of the environs corresponded to the size proposed in the work plan and matches the other vegetation mapping protocols in the UCBN.



Project Boundary

Legend

- Monument and Preserve
- Project Boundary



Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

FILE: crmo_veg_inventory.mxd

Figure 8. Project boundary for vegetation inventory at CRMO.

Methods

The vegetation mapping project at CRMO was considered to be in the “very large park” category based on the overall size of the project area (TNC 1994b). As such, the standard methodology is to separate the park into the different subsets based on location and the presence of different ecoregions. For CRMO this included a southern study area comprised of the Kings Bowl and Wapi lava fields plus surrounding environs and a larger, northern section including the Craters of the Moon lava field plus environs. Also included in the north were the large kipukas, principally Laidlaw Park. Each of these regions were treated as an informal "Large" park to help with planning and separate CRMO into more manageable units for sampling and mapping. Based on this approach the assignment of responsibilities was divided into five major steps following the flowchart of major steps produced for the national program by the USGS (Appendix A). These responsibilities included the following:

1. Plan, gather data, and coordinate tasks;
2. Survey CRMO to understand and sample the vegetation;
3. Classify the vegetation using the field data to NVCS standard associations and alliances and crosswalk these to recognizable map units;
4. Acquire current digital imagery and interpret the vegetation from this using the classification scheme and NVCS crosswalk;
5. Assess the accuracy of the final map product; and
6. Create the final project deliverables

All protocols for this project as outlined in the following sections can be found in documents produced by The Nature Conservancy (1994a, 1994b, and 1994c) for the USGS-NPS Vegetation Mapping Program and are found at this website: <http://biology.usgs.gov/npsveg>.

Planning, Data Gathering and Coordination

Based on the workplan and the contract commitments by UCBN, a series of preliminary project conference calls were held in 2005 and 2006 culminating in a scoping meeting at CRMO’s visitor center in May, 2006. This meeting was attended by representatives from all of the principle team members (including NMI, CTI, UCBN, BLM NPS, IDCDC, NatureServe and CRMO staff) along with many interested neighbors and potential cooperators. The goals of the scoping meeting were to 1) provide an overview of National Vegetation Inventory Program, 2) learn about CRMO’s management issues and concerns, 3) discuss availability of existing data, 4) develop a schedule, 5) discuss procedural issues and data, (6) define potential cooperators, and 7) finalize the scope of the project.

From this meeting participants learned that CRMO is extremely interested in getting vegetation data and documentation for all of the kipukas, regardless of size. Resource managers are also interested in the distribution of cheatgrass and other exotics and would like to see the various types of lava delineated for wildlife habitat analyses. Also they expressed interest in learning more about the vegetation communities and their distribution in the newly acquired lands of the preserve. Interest in the project was high among the neighbors and most wanted copies of the final report and data.

The 2-km environs was approved as the project boundary and review of the existing vegetation data and imagery yielded the following datasets to review 1) BLM fuels, 2) 2003 Laidlaw Park vegetation inventory, 3) herpetology study sites, 4) Land-cover mapping, and 5) National Agricultural Imagery Program (NAIP) imagery. A reasonable schedule was set with the project completion scheduled for the end 2009 (Table 1).

Table 1. Project Timeline for CRMO Vegetation Inventory Project.

Task Description	2006			2007			2008			2009		
Planning and Scoping												
Acquire Aerial Imagery												
Field Data Collection												
Image Interpretation												
Vegetation Classification												
Local & Global Descriptions												
Spatial Database												
Plant Association Field Key												
Accuracy Assessment												
Final Report and Products												

Specific work responsibilities were assigned to the following participants:

CRMO-UCBN-NPS Responsibilities

- Provide oversight and project funding;
- Provide CRMO plant list;
- Supply digital boundary files and ancillary data files;
- Assist with fieldwork and logistical considerations;
- Work with Idaho Conservation Data Center to develop the vegetation classification;
- Compile, review, and update drafts of the vegetation map, classification and report;
- Accept the final products and close the project.

NMI Responsibilities

- Provide project management,
- Coordinate the field work with CRMO;
- Collect representative plot data;
- Collect less detailed observations about the draft vegetation map;
- Write descriptions of the vegetation types found at CRMO;
- Write a field key to the vegetation types found at CRMO;
- Collect accuracy assessment data;
- Provide a final report describing all aspects of the project;
- Create a DVD with reports, metadata, guides, vegetation classification, plot data, spatial data, vegetation database (map), graphics, and ground photos.

Idaho Conservation Data Center (ICDC)

- Work with NPS to develop a vegetation classification for the study area based on the NVCS using quantitative analysis and ecological interpretation of the field data;
- Provide guidance regarding the crosswalk of vegetation types to map units;
- Review the local vegetation descriptions and field key;
- Review the final database containing the field data.

CTI Responsibilities

- Help with overall project facilitation and coordination;
- Verify vegetation and land use/land cover signatures on the imagery;
- Develop map units linked to the NVCS;
- Provide field maps and GIS support to the field crews;
- Interpret and delineate the final vegetation and land use types;
- Transfer and automate interpreted data to a digital spatial database;
- Produce spatial layers of plot and accuracy assessment site locations;
- Assist with the accuracy assessment by picking the stratified random target points, creating field maps and providing GIS support;
- Provide final report sections describing the mapping aspects of the project;
- Provide a visual guide to the photo signatures of each map unit;
- Document FGDC-compliant metadata for all vegetation data;
- Assist in creating the project DVD.

Field Surveys

Field methods used in this project followed NVMP standards (e.g., TNC and ESRI 1994a, 1994b). Data gathered during this project contributed to understanding vegetation relationships across broader landscapes beyond the boundaries of the Monument. The plot dataset was enhanced by collecting observation point data, whose primary purpose was to support digital image interpretation. In addition to the basic vegetation data collected at each plot, the UCBN and Monument staff defined summary data fields and made suggestions for including additional information like noting lava tubes and lava caves on the forms. Plot forms and individual data field descriptions appear in Appendix B.

The sampling area included the entire Monument in addition to BLM and any other public lands in the environs. Private lands in the environs as well as any private inholdings within the Monument were not visited. Because the project area was large, somewhat complex, and access could be difficult, general areas to be sampled were selected in advance of the 2006 field season. The sampling design was based on accessing kipukas wherever possible and using the existing land-cover map to inform the sampling per Lea (2006). A stratification of the existing land-cover map was made and where the map units represented more than one vegetation type environmental variables were applied to guide sampling. Also considered were the locations of vehicle and hiking access relative to the distribution of impenetrable lava flows. Sampling was scheduled to begin in the northern half of CRMO and proceed to the south half as crews became available.

Field crews were trained and led by ecologists with experience sampling plant communities in national parks and other landscapes. The list of ecological systems, vegetation alliances, and component plant associations prepared by NatureServe (2006) provided a starting point for naming communities sampled in the field. The sampling goal was to collect between three and five classification plots in every vegetation alliance/association within the CRMO project area. However, some common associations were sampled more often and some rare types were sampled less often. An effort was made to achieve good spatial distribution of plots across the landscape and to capture the full range of variation of each association.

Once a stand of vegetation was located that appeared to be representative of the plant communities in the area, a Relevé macroplot was laid out to capture its characteristics. In this manner, transitional areas such as ecotones were avoided. Highly disturbed areas were also avoided unless they supported a distinct plant community. Classification plots were generally located in stands exceeding the minimum mapping unit (MMU) of 0.5 hectares. A few classification plots were sampled in smaller patches of distinctive vegetation or communities of rare species. Plot size and shape requirements were consistent with National Vegetation Mapping Program guidelines (TNC and ESRI 1994a). Classification plot size was determined by the physiognomy of the community being sampled (Table 2) and measuring tapes were used to outline the sampling area. CRMO plot shape was adjusted as needed to sample linear bands of vegetation in drainage bottoms or other confined sites. Plot size and shape were recorded for all plots.

Table 2. Plot Sizes Used for Classification Sampling at CRMO.

Vegetation Class	Area (m²)	Radius (m)
Forest and Woodland	400	22.6
Shrubland	400	22.6
Herbaceous	100	11.3

After a plot was laid out environmental data was first recorded. These included: elevation, slope, aspect, landform, topographic position, soil texture and drainage, hydrologic (flooding) regime, and evidence of disturbance or wildlife use. The unvegetated surface was recorded as percent cover of each of the following: bedrock, litter and duff, wood, bare soil, large rocks (>10 cm), small rocks (0.2-10 cm), sand (0.1-2 mm), lichens, mosses, and fungi.

Next vegetation was visually divided into strata, with the height and canopy cover of vegetation estimated for each stratum. Physiognomic class, leaf phenology, and type of dominant stratum were recorded. The species of each stratum were then listed and percent canopy cover estimated using a twelve-point cover scale (e.g. <1%, 1-5%, >5-15% ...) (Daubenmire 1959). Additional species within the vegetation unit that occurred outside of sampled plots were listed separately. No attempt was made to identify individual non-vascular plant species. Species that were not identifiable in the field were collected for later identification. Species were recorded by scientific epithet familiar to researchers. Finally, a provisional vegetation type was assigned to the plot.

Field staff collected the information for each of the vegetation plots in two ways. First, a species list was developed and recorded on field forms by the team botanist. GPS coordinates, field notes header information (Identifiers/Locators), environmental descriptions and a plot map were recorded on this form. All other field data was collected with mobile Archer Field PCs.

After all the physiognomic and environmental information was collected, researchers used a Garmin GPS 76CSX receiver to record the southeast corner of the plot (no permanent markers were used). UTM NAD83 X-Y coordinates and elevation were recorded both manually on the plot forms and stored as waypoints in the GPS unit. Finally, four representative photos were taken facing the four cardinal directions (N, E, S, and W) from the edge of the quadrat facing plot center.

In addition to vegetation plots, field crews collected vegetation and environmental data at 105 observation points. Data collected at observation points reflected the vegetation of a loosely undefined area around the point (the “stand”) rather than a measured plot, and were less detailed (Appendix B). Overall conditions at each observation point were documented by one or more digital photographs. These data were intended primarily to support modeling and interpretation of the aerial imagery, but were also used to help describe plant associations. Field crews could choose to sample an observation point instead of a classification plot when:

- They were sampling the environs outside the Monument boundary
- The vegetation was highly disturbed, ecotonal, or otherwise anomalous and therefore unlikely to be classified under the NVC
- Project photointerpreters requested documentation of a specific photo signature or area
- They wished to document special features as requested by Monument staff such as fuels concentrations or weed patches
- They wanted to document a vegetation type that consistently occurred in stands smaller than the 0.5 ha (1.24 acres) minimum mapping unit (MMU).

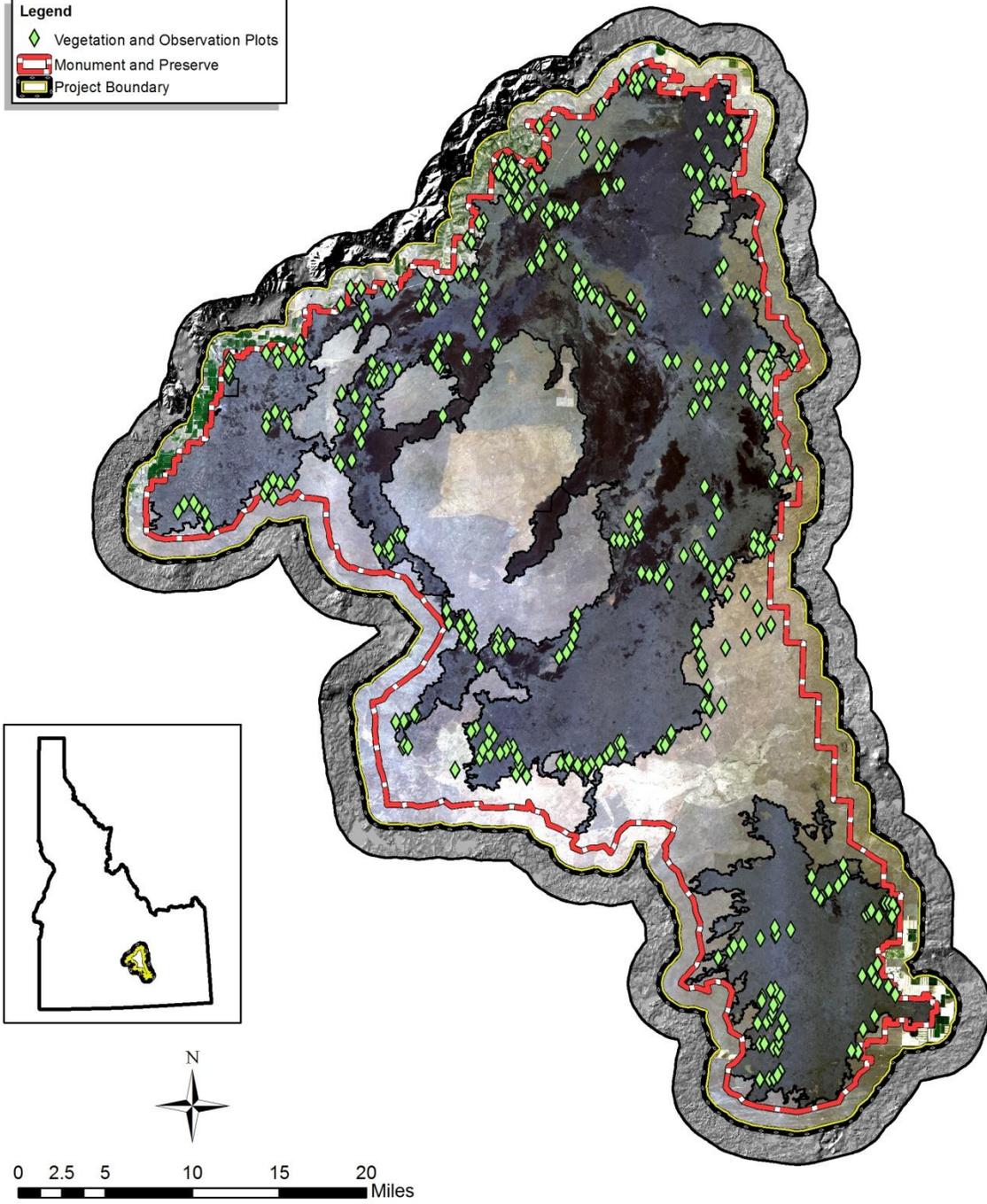
The data collection was conducted between May and July, 2006. Four hundred-one vegetation plots and 105 observation points were sampled (Figure 9).



Vegetation and Observation Plots

Legend

- ◆ Vegetation and Observation Plots
- ▭ Monument and Preserve
- ▭ Project Boundary



Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

FILE: crmo_veg_inventory.mxd

Figure 9. Vegetaton plot and observation point locatsions at CRMO.

Vegetation Classification

Field data was collected on Archer Field PC's with Windows Mobile 5.0 operating systems using DataPlus software. All data from these units was transferred and managed in a Microsoft Access database. Electronic data was transferred directly from the data recorders (NMI created data dictionaries as needed) into Database Files (DBF). DBF files were reviewed by field crews for accuracy each night, then converted and stored in the appropriate database on a laptop computer. All additional field data not recorded electronically (such as field notes) was entered manually into the database for this project. Separate databases were established as necessary. Upon completion of field surveys, all recorded data were entered into a MS Access relational database. The database is a modified PLOTS2 database initially developed specifically for the NPS vegetation and mapping program, so that the electronic data entry fields mirrored the standard field form. Data entry was facilitated by utilizing drop down menus for each plant scientific name. Scientific names were updated according to the vascular plant list provided to the crews on the date of sampling found on the UCBN website: <http://science.nature.nps.gov/im/units/ucbn/inventory/index.cfm#table> and Appendix E.

After data entry, checking was performed to minimize errors associated with duplicate entries or erroneously selected plant names. Problems regarding unknown species, especially those with high cover, were resolved, as were other taxonomic issues such as grouping subspecies and varieties judged to be ecologically similar. Data was regularly compiled and at the completion of the field work the final database was supplied to IDCDC for quantitative analysis. A GIS data layer was also developed at this time to document classification plot and observation point locations.

Quantitative analysis of the vegetation included preparing the CRMO data for use in analytical programs by the conducting the following steps:

- 1). Standardize strata for certain taxa. Some taxa are listed in different strata in different plots even though they should all be the same, especially if there are multiple field crews. For example, cacti may sometimes be listed as shrubs and sometimes listed as herbaceous;
- 2). Create "pseudospecies" for each taxon by appending the stratum in which it was found in each plot to a code for the taxon.
- 3) The species lists were updated to include changes in the scientific names.
- 4). Remove plots with grossly incomplete or missing data.

Analytical methods were employed in a manner consistent with the objective of identifying natural associations of existing vegetation (The Nature Conservancy and Environmental Systems Research Institute 1994b; Tart *et al.* 2005; Jennings *et al.* 2006). Multivariate statistical analyses were conducted using PC-ORD (McCune and Mefford 1999). Initial plant community groups were identified using hierarchical cluster analysis. Plant community groups were successively partitioned to optimize within-group homogeneity, between-group difference, and the number of

groups. These three factors were evaluated using statistics generated by indicator species analysis (the mean p-value and number of significant [$p < 0.05$] indicator species) and multi-response permutation procedures (T, a measure of separation between groups; the chance-corrected within-group agreement [A], a measure of within-group homogeneity; and the compositional similarity of samples within a group [as measured by average relative Sorensen distance]). Environmental relations, within-group homogeneity, and between-group difference were evaluated graphically using indirect gradient analysis through detrended correspondence analysis (McCune and Grace 2002). Final decisions regarding the naming of plant associations were informed by cross-walking candidate community groupings to the NVCS (NatureServe 2007). Classification and regression tree analysis (recursive partitioning) was employed in the development of dichotomous keys and the evaluation of classification results using the rpart package in R Development Core Team (2007).

Plant nomenclature of the Integrated Taxonomic Information System (ITIS) as reflected by the PLANTS Database (USDA, NRCS 2007) was employed in the naming of plant associations. This was the National Vegetation Classification Standard and is necessary to discriminate differences among associations currently reported within the NVCS (Rust and Wolken 2008).

CRMO plant associations were named for the indicator (dominant or diagnostic) species of the vegetative strata present. The indicator species of the upper strata was listed first, followed by successively lower strata. Species that occurred in the same strata (or were the same lifeform) are separated by a hyphen (-). Indicator species that occurred in different strata (or are a different lifeform) were separated by a slash (/). Alliance names were concluded with the word “Alliance” to differentiate them from association names. Plant association names incorporated the physiognomic class in which the association was classified (e.g., Forest, Woodland, or Herbaceous (FGDC 1997, 2006 in Rust and Wolken 2008).

The final product of the classification stage was the creation of a field key and local descriptions. The dichotomous field key to CRMO’s plant associations was developed to assist users in identifying vegetation associations in the field (Appendix C). The local descriptions were based on the field data and provides CRMO characteristics for each association (Appendix D)..

Digital Imagery and Interpretation

Since CRMO represented a very large site existing sources of imagery were evaluated and rejected since most did not cover the entire study area, had coarse resolution, was out-dated, or just did not meet the needs of this project. Based on these findings UCBN decided to fund a new ortho-image acquisition. After weighing their options, UCBN contracted Furgo Horizons Incorporated (Rapid City, SD) to acquire and rectify new imagery for the entire project area. This was accomplished in late May 2007 using an airborne, Leica ADS40 digital sensor that collected multi-spectral (4-band), 12 bit data at a 1-meter resolution.

After receiving the 2007 imagery, CTI worked with Furgo Horizons to mosaic, sharpen, edge-match and color balance the final imagery. This process helped remove unwanted sensor lines, improve the rectification, and produce a more visually appealing product. The final result were three products currently stored at the UCBN offices in Moscow, ID. They included a 4-band 8-bit mosaic, a 4-band 12-bit mosaic, and individual 4-band 12-bit tiles (Figure 10).

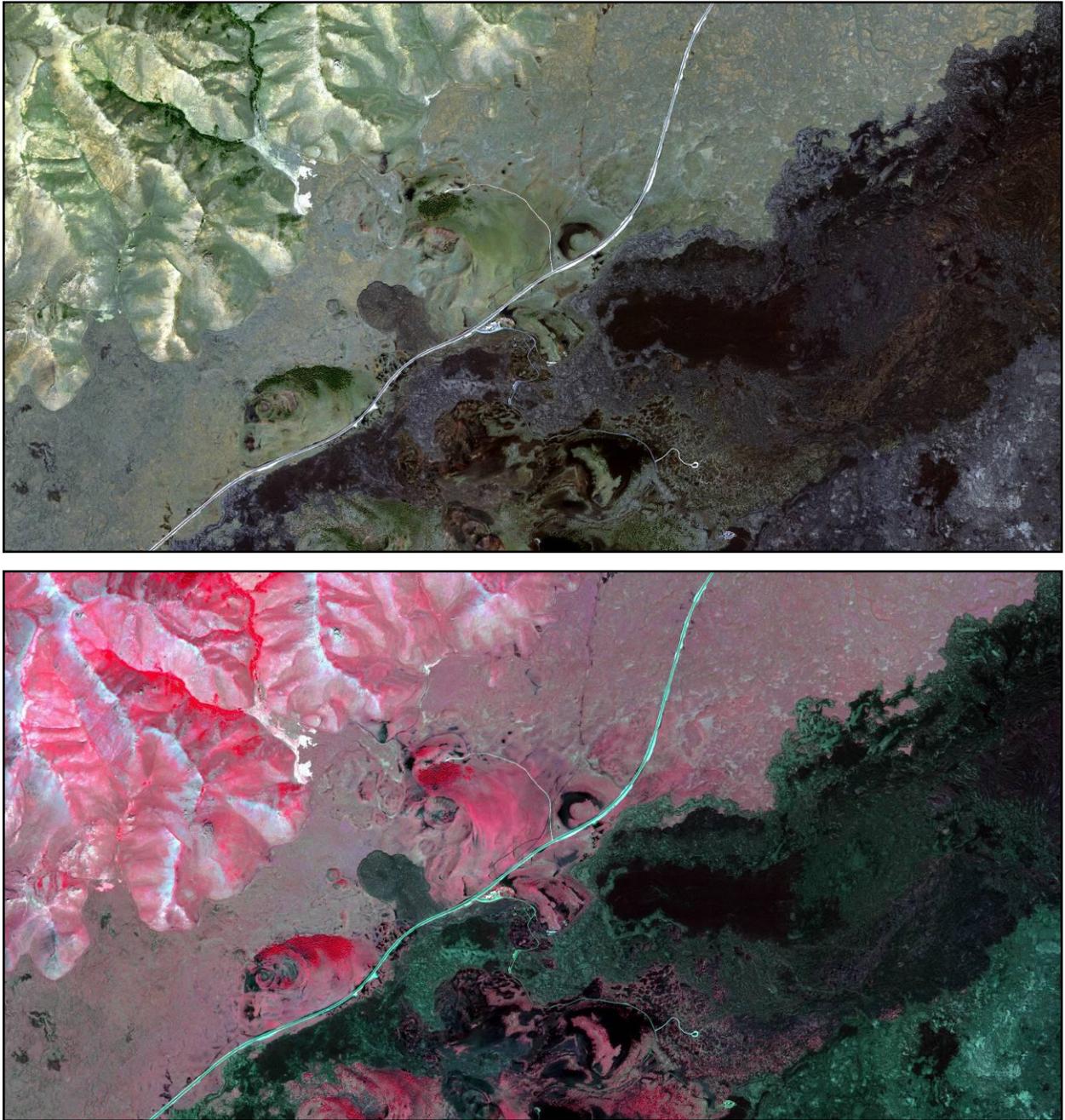


Figure 10. Examples of the 2007 imagery for CRMO (upper is true color and lower is color infrared).

Mapping and interpretation at CRMO involved a four step process consisting of: 1) field reconnaissance, 2) map class development, 3) image processing and interpretation, and 4) spatial database development. First, field reconnaissance was initiated by CTI and NMI staff during the field portion of the scoping meeting. The goal of this step was to quickly familiarize the mappers with the vegetation patterns and distribution at CRMO. Then as the plot data collection progressed in 2006, feedback on the dominate vegetation was solicited from the field crews as they traveled to unique areas of the Monument.

All of the ground information obtained in 2006 was documented and summarized in anticipation of obtaining the new ortho-imagery and the final list of NVC associations for CRMO in 2007. While the imagery was being acquired and processed, CTI created preliminary map classes based on the CRMO plot data and past projects completed in the UCBN (Erixson and Cogan 2009). Also at this time, the existing 2004 NAIP imagery for CRMO was reviewed and all developed areas, roads, streams, lava field boundaries and other obvious features were manually digitized and incorporated with the project boundary into a draft GIS layer.

In the fall of 2007, CTI compared the initial map classes to both the new imagery and a draft of the classification. Emphasis was placed on the ability to accurately delineate homogenous polygons from the base ortho-imagery. In general, the level of detail possible in a vegetation map is limited by the imagery, the skill and experience of the interpreter and mapper, and the availability of supporting information. The relationships between the map classes and plant associations are complex. In most cases, the CRMO map classes were derived on a 1 association or alliance to 1 map class basis. However due to the limitations of the imagery some of the associations could not be recognized consistently. This issue was addressed by either scaling up the NVCS to the alliance level or combining similar associations/alliances into complexes or mosaics. Complexes were used when associations/alliances could not be discerned from each other. Conversely, mosaics were used when associations/alliances could be discerned but were so small and intertwined that mapping would prove to be impractical.

All of the resulting map classes were reviewed by UCBN and CRMO staff. Based on their recommendations some additional park-specific or “Park Specials” were defined. These included:

- Wetlands and riparian stands below the minimum mapping unit (mmu) (e.g. birch, alder, cottonwood, etc)
- Limber pine communities below the minimum mapping unit and including sagebrush understories
- All sagebrush types with cheatgrass understories
- Separation of Aa Lava, Pahoehoe Lava, Cinder Beds

In some cases, NVCS alliances were later matched to these new units. In addition to the map classes, CRMO staff also wanted emphasis placed on noting burned areas, delineating areas with cheatgrass or crested wheatgrass, and going below the mmu of 0.5 ha for kipukas. To round-out the mapping scheme, map classes were created for land use types based on a mapping system

developed by Anderson et al. (1976). This included areas not covered by the NVCS, such as roads, facilities, and agricultural fields.

Mapping began in earnest in 2007 by re-sampling the new imagery to a 3-meter pixel resolution and then segmenting it using eCognition software. Initial segments were created to delineate obvious landforms (e.g. open water and fields) and physiognomic features (e.g. grasslands versus woodlands). The objective of the segmentation was to create a system of lines with as coarse a scale as possible without omitting most of the small, important and obvious land cover patches. By incrementally increasing segmentation size within the program, small image objects (i.e. preliminary polygons) were continuously merged into larger ones. Completion of the segmentation was based on visual judgment of the analyst when obvious, distinct features were lost. At this point in the process, the previous segmentation was adopted as the final treatment (Figure 11)

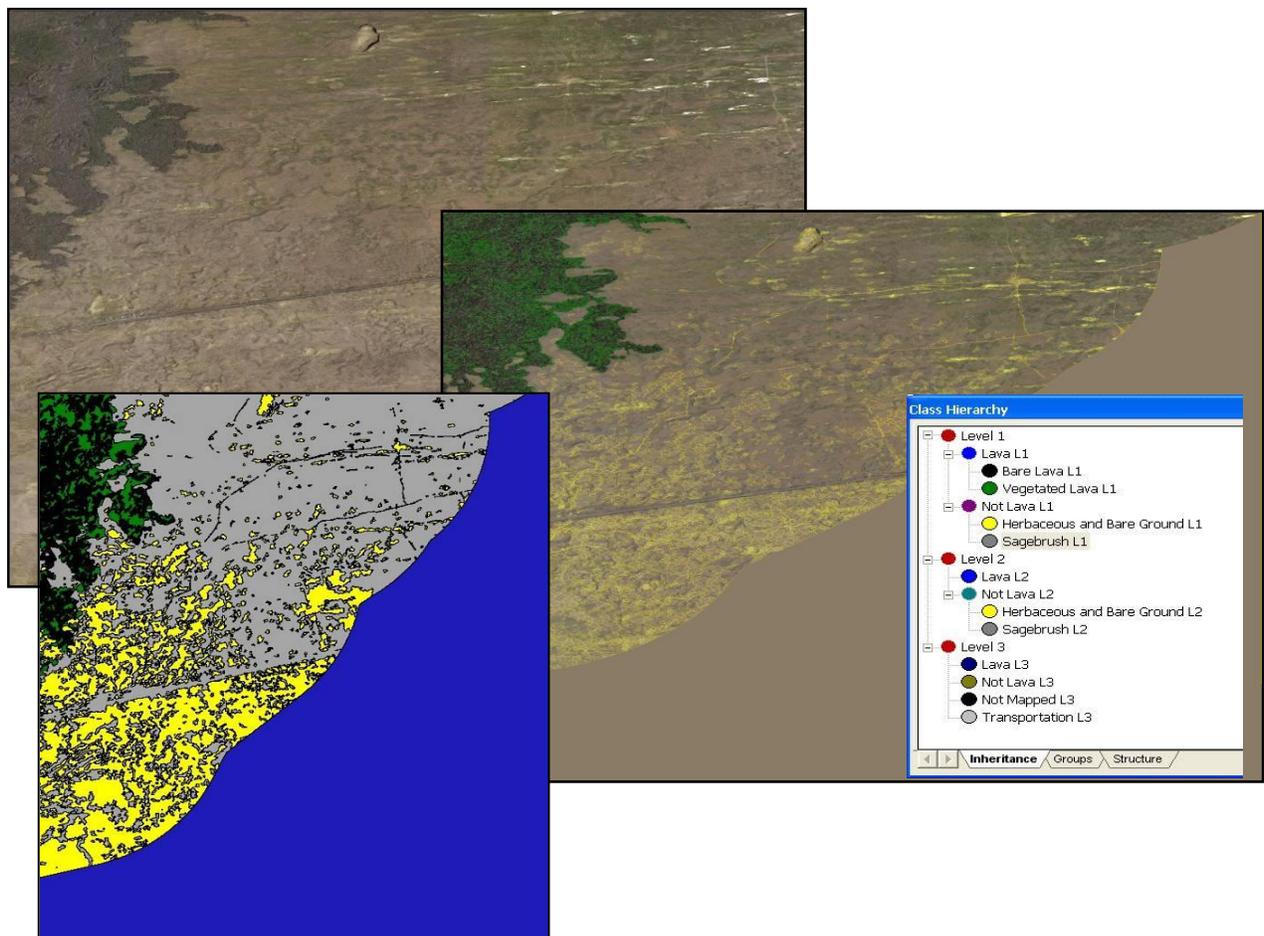


Figure 11. Examples of the CRMO segmentation.

Following segmentation, the lines were exported as ArcInfo shapefiles and converted to ArcInfo coverages. The resulting coverages were run through a series of smoothing routines until no obvious artificial or relict breaks in the lines were visible. Following smoothing, the line-work was manually cleaned to remove extraneous lines, small polygons, and polygons that obviously split a homogenous stand of vegetation.

The cleaned lines were combined with the draft GIS layer created from the 2004 NAIP imagery and visually inspected for completeness. At this stage the mapping switched from an automated process to a manual interpretation effort. Using plot data, field notes and ancillary GIS data polygons were edited, split, and merged through on-screen digitizing to create consistent, homogenous polygons that matched the mapping scheme.

When the interpretation effort was considered complete, topology for the final polygon layer was built and attributed and then imported into a spatial database (geodatabase). Each polygon was attributed with its own appropriate map unit name, code, and modifier. Polygon specific modifiers included additional data on the height, density, and patterns of the dominate vegetation. Also kipuka polygons were identified along with the substrate type if the polygon occurred in a lava field. Finally other map class data such as the NVCS crosswalk, land-use classes and comments were added (Table 3).

Table 3. Polygon attribute items and descriptions used in the CRMO vegetation map GIS coverage.

<u>ATTRIBUTE</u>	<u>DESCRIPTION</u>
AREA*	Surface area of the polygon in meters squared
PERIMETER*	Perimeter of the polygon in meters
CRMO_VEG#*	Unique code for each polygon
CRMO_VEG-ID*	Unique identification code for each polygon
VEG_CODE	Final Map Unit Codes – Project specific
MAP_DESC	Map Unit Common Description Name – Project specific
DENS_MOD	Modifier - Percent cover of the upper stratum layer in the polygon Percent cover classes: Very Sparse < 10% , Sparse 10 - 25% , Open 25 - 60% , Discontinuous - Closed > 60%
PTRN_MOD	Modifier - Vegetation pattern within the polygon Vegetation pattern classes: Evenly Dispersed = Homogeneous Grouped Stands of Vegetation = Bunched / Clumped , String of Vegetation = Linear
HT_MOD	Modifier - Height range of the dominant vegetation layer Height classes: < 1, 1-5, 5-15, 15-30 & >30 meters
CES_CODE	Ecological Systems Code – NVCS derived (NatureServe)
CES_NAME	Ecological Systems Name – NVCS derived (NatureServe)
NVC_ELCODE	Corresponding Association Code – NVCS derived (NatureServe) Association = Community Element Global Code – Elcode link to the NVCS
ASSN_NAME	Project Community Name - NVCS Association(s)
ASSN_CNAME	Project Common Community Name - synonym name of Association(s)
NVCS_CODE	NVCS Code - to NVCS Formation level
ALL_CODE	Alliance Name Code – NVCS derived (NatureServe) Alliance = Alliance Global Code – Alliance Link to the NVCS
ALL_NAME	Project Alliance Name = NVCS Alliance(s)
ALL_CNAME	Project Common Alliance Name = NVCS Alliance(s)
FORMATION	NVCS Formation = Formation name NVCS Code – Formation name
SUBGROUP	NVCS Formation Subgroup = NVCS Code – Subgroup name
GROUP	NVCS Formation Group = NVCS Code – Group name
SUBCLASS	NVCS Formation Subclass = NVCS Code – Subclass name
CLASS	Formation Class = NVCS Code – Class name
LUC_II_GEN	General Land Use and Land Cover Classification System Name Project specific based on Level I or II of Anderson et al. (1976)
LUC_II	Specific Land Use and Land Cover Classification System Name Project specific Level II or Level III of Anderson et al. (1976)
SUBSTRATE	Type of Lava if in a lava field = Aa, Pahoehoe, or Cinders
KIPUKA	Indicates if Polygon is a Kipuka or not
COMMENTS	Additional Comments about the Vegetation in Individual Polygons
ACRES	Surface area of the polygon in acres

(*ArcInfo[®] default items)

Accuracy Assessment

Once the mapping was completed and finalized the accuracy assessment (AA) was conducted. AA is a statistical test of how well the vegetation map represents vegetation on the ground. The AA compares field observations with the map class assignment. Errors occur when mapped polygon labels differ from field observations. Results of the AA allow users to evaluate the utility of the vegetation mapping data for particular applications. Accuracy assessment results come in two forms (Hop et al. 2005): “producer’s accuracy” (the probability that an AA point was mapped correctly, also referred to as “errors of omission”), and “user’s accuracy” (the probability that the map represents what was found on the ground, also referred to as “errors of commission”). High producer’s accuracy combined with low user’s accuracy indicates that the map class is under-mapped. Conversely, low producer’s accuracy combined with high user’s accuracy indicates that a type is over-mapped.

The thematic accuracy of the vegetation map was assessed using the methodology following the standards provided by the national program’s Accuracy Assessment Procedures manual (TNC 1994c). This methodology included a four step process consisting of a sample design, sample site selection, data collection, and data analysis.

The design of the AA process followed the five possible scenarios provided in the field manual with stratified random targets placed in each map class based on their respective frequency and abundance. The AA included most vegetation map classes and was limited to lands within the CRMO boundary (both BLM and NPS); private inholdings and private lands outside of the Monument were not included in the accuracy evaluation. Sample sizes for each evaluated map class were selected using the NVMP guidelines (TNC et al. 1994). The design of the AA process followed the five possible scenarios provided in the guidelines with stratified random targets placed in each map class based on their respective frequency and abundance (Table 4).

Table 4. Sampling protocol for AA points.

Scenario	Description	# Polygons	Area (ac)	Recommended # of Samples
A	The class is abundant. It covers more than 50 hectares of the total area and consists of at least 30 polygons. In this case, the recommended sample size is 30.	> 30	> 125	30
B	The class is relatively abundant. It covers more than 50 hectares of the total area but consists of fewer than 30 polygons. In this case, the recommended sample size is 20. The rationale for reducing the sample size for this type of class is that sample sites are more difficult to find because of the lower frequency of the class.	< 30	> 125	20
C	The class is relatively rare. It covers less than 50 hectares of the total area but consists of more than 30 polygons. In this case, the recommended sample size is 20. The rationale for reducing the sample size is that the class occupies a small area. At the same time, however, the class consists of a considerable number of distinct polygons that are possibly widely distributed. The number of samples therefore remains relatively high because of the high frequency of the class.	> 30	< 125	20
D	The class is rare. It has more than 5 but fewer than 30 polygons and covers less than 50 hectares of the area. In this case, the recommended number of samples is 5. The rationale for reducing the sample size is that the class consists of small polygons and the frequency of the polygons is low. Specifying more than 5 sample sites will therefore probably result in multiple sample sites within the same (small) polygon. Collecting 5 sample sites will allow an accuracy estimate to be computed, although it will not be very precise.	5-30	< 125	5
E	The class is very rare. It has fewer than 5 polygons and occupies less than 50 hectares of the total area. In this case, it is recommended that the existence of the class be confirmed by a visit to each sample site. The rationale for the recommendation is that with fewer than 5 sample sites (assuming 1 site per polygon) no estimate of level of confidence can be established for the sample (the existence of the class can only be confirmed through field checking).	< 5	< 125	Visit all and confirm

These parameters were loaded into a custom GIS program along with the vegetation layer and the program picked the random target locations, buffered them 10 meters away from any polygon boundary, and 50 meters away from any other point. Being able to choose minimum distance to polygon boundaries helped to minimize confusion and accounted for the horizontal

error typically encountered in common GPS receivers (± 5 m). The resulting target locations were restricted to only within the boundaries of CRMO due to private land access constraints. Fifteen land-use and geologic map classes were excluded because they are essentially unvegetated or occur exclusively outside of the Monument boundary.

Accuracy assessment point data were collected at CRMO during the 2008 field season. Once the target locations were selected, ecologists were provided with draft field maps, overview maps, map unit definitions, the field key to the associations (Appendix C), and digital GPS files containing the location of the AA targets. The ecologists traveled to the AA target sites and determined the vegetation association using the field key. At each target they recorded the primary, secondary or tertiary associations that occurred within a roughly 50-meter radius. They also recorded height and cover of vegetative strata, environmental data, and percent canopy cover of the major species (see field form Appendix B). Other nearby vegetation types outside the 50-meter radius and any recent disturbance were also recorded. To better assist the analysis 4 photographs were taken at each AA point, in the sequence of cardinal directions, N-E-S-W.

Data from 772 AA points were imported from the database into a GIS layer (Figure 12) where they were visually compared in two stages to the vegetation map coverage. The first step was to compare the AA points to the original target locations to check for erroneous points and remove these from further analysis. General errors in the data were recorded at this time, including documenting points that had GPS and location errors. The most common GPS receiver error included transposing two UTM coordinate numbers. Location errors involved having the final AA point occur in the wrong target polygon either due to bad GPS satellite positioning or the point occurred too close to a polygon boundary. Nomenclature standards and other data management procedures were the same as for the classification plot data.

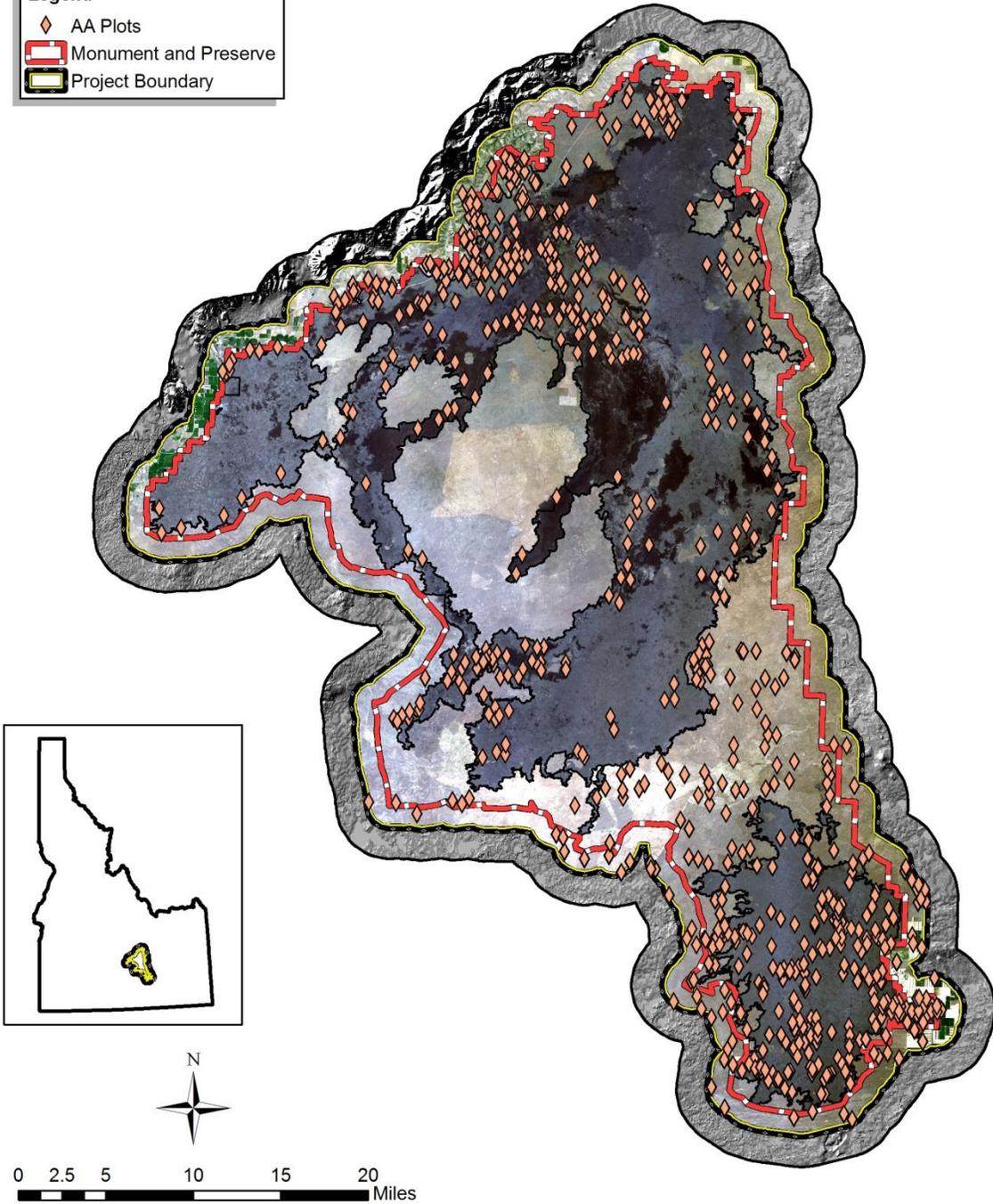
The second review step involved deciding between the primary and secondary call for the plant association as recorded by the field crew. In larger vegetation mapping projects such as Rocky Mountain National Park (Salas et al. 2004), AA analysis has involved fuzzy logic which assigns different levels of accuracy based on the primary, secondary and tertiary calls. However due to the confusion that fuzzy logic can cause, a simple binary assessment was conducted. CTI assigned a final map unit for every point by choosing between the primary and secondary calls. This was accomplished by first adding a new attribute to the point layer labeled "Final_Code and then by comparing the assigned field names of the point with its corresponding location on the digital imagery. In most cases the primary vegetation map unit name assigned by the field crew was used. However some points were assigned their secondary field call based on one of the following reasons: 1) it appeared that the second call was the better choice due to the overhead perspective (e.g. a stand judged to be sparse woodland on the imagery vs. herbaceous vegetation in the field), 2) the data were actually recorded in a stand that was too small (i.e. inclusion), or 3) the second call better matched the ecological context (e.g. riparian woodland located next to a stream vs. upland woodland located next to a stream).



Accuracy Assessment Plot Locations

Legend

- AA Plots
- Monument and Preserve
- Project Boundary



Produced by Northwest Management, Inc., Moscow, Idaho
FILE: crmo_veg_inventory.mxd

December 2009

Figure 12. Location of the accuracy assessment (AA) points in CRMO.

Once the data were reviewed the accuracy analysis was conducted. In the case of CRMO, the process was streamlined using methods developed from previous studies at Rocky Mountain National Park (Salas et al. 2004) and Wupatki National Monument (Hansen et al. 2004). Specifically many of the in-house GIS programs developed for these projects were used to compare the AA data, generate confidence intervals, Kappa statistics, and error matrices (contingency tables). Through this automated process, the final map units in the AA layer were compared to the map unit designations for their corresponding polygons. All of the statistics and calculations used to analyze these data are described at length in the program manuals (TNC 1994c) and are summarized in Table 5. Final assessments for each point were recorded using an error matrix.

Table 5. Statistics used in AA analysis.

Statistic	Formula	Description
User's - accuracy:	$\frac{n_{ii}}{n_{i+}}$	Where i is the land cover type, n_{ii} is the number of matches between map and reference data and n_{i+} is the total number of samples of i in the map. This formula is the number of "correct" observations divided by the sum of the row.
Producer's accuracy	$\frac{n_{ii}}{n_{+i}}$	Where n_{+i} = total number of sample of i in the reference data. This formula is the number of "correct" observations divided by the sum of the column.
Confidence Interval	$\hat{p} \pm \left\{ z_{\alpha} \sqrt{\frac{\hat{p}(1-\hat{p})}{n} + \frac{1}{(2n)}} \right\}$	Where $z_{\alpha} = 1.645$ (this comes from a table of the z-distribution at the significance level for a two-sided limit with a 90% confidence interval). The term $1/(2n)$ is the correction for continuity. The correction should be applied to account for the fact the binomial distribution describes discrete populations \hat{p} = the sample accuracy (0 -1.0), n = the number of sites sampled.
Kappa Index	$k = \frac{N \sum_{i=1}^r x_{ii} - \sum_{i=1}^r (x_{i+} \times x_{+i})}{N^2 - \sum_{i=1}^r (x_{i+} \times x_{+i})}$	Where N is the total number of sites in the matrix, r is the number of rows in the matrix, x_{ii} is the number in row i and column i , x_{+i} is the total for row i , and x_{i+} is the total for column i .

Results

Vegetation Classification

701 individual plant species belonging to about 60 families were documented during the course of the field data collection (Appendix E). Based on the dominates and other factors the vegetation was further classified into 93 community types (Rust and Wolken 2008) (Table 6). Of these, 92 were described at the plant association level and one was described at the alliance level. Forty-seven plant associations identified for CRMO were listed in the NVC of NatureServe (2009). The classification included 44 NVC alliances and 14 ecological systems. Sixty-one of the communities are shrubland types, including 59 upland shrubland associations, and two riparian shrubland types. Thirteen communities are classified as woodlands (six riparian), and 17 as herbaceous vegetation types (one wetland). Eighteen plant associations were considered semi-natural, dominated by non-native plant species. Table 6 lists all associations by scientific name, common name, code, and number of plots/association. They are ordered by physiognomy: forests and woodlands, shrublands, herbaceous, and sparse vegetation.

Less than half of the plant communities sampled at CRMO fit into existing NVC association concepts. The remaining plant communities were considered significant enough to create new NVC associations for them by Rust and Wolken (2008). Two vegetation types were considered endemic to the Monument and are discussed further below (Figure 13). One vegetation type fit into an alliance concept (*Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance) but lacked sufficient justification for creating a new association



Figure 13. CRMO endemic plant associations.

Table 6. List of plant associations for CRMO.

Scientific Name	Common Name	Code	Elcode	N
Forest and Woodland				
<i>Juniperus (osteosperma, scopulorum) / Artemisia tridentata ssp. wyomingensis - Chamaebatiaria millefolium</i> Woodland	Juniper (Utah, Rocky Mountain) / Wyoming Big Sagebrush - Fernbush Woodland	JUOS-JUSC2/ARTRW8/CHMI2		7
<i>Juniperus scopulorum / Poa secunda / Penstemon deustus</i> Woodland	Rocky Mountain Juniper / Sandberg Bluegrass / Scabland Penstemon Woodland	JUSC2/POSE/PED E4		14
<i>Pinus flexilis / Purshia tridentata</i> Woodland	Limber Pine / Antelope Bitterbrush Woodland	PIFL2/PUTR2	CEGL000814	16
<i>Populus balsamifera ssp. trichocarpa</i> Temporarily Flooded Woodland Alliance	Black Cottonwood Temporarily Flooded Woodland Alliance	POBAT	A.635	2
<i>Populus tremuloides - Pinus flexilis</i> Forest	Quaking Aspen - Limber Pine Forest	POTR5-PIFL2	CEGL000540	1
<i>Populus tremuloides / Artemisia tridentata</i> Forest	Quaking Aspen / Big Sagebrush Forest	POTR5/ARTR	CEGL000572	2
<i>Populus tremuloides / Calamagrostis rubescens</i> Forest	Quaking Aspen / Pinegrass Forest	POTR5/CARU	CEGL000575	6
<i>Populus tremuloides / Prunus virginiana</i> Forest	Quaking Aspen / Chokecherry Forest	POTR5/PRVI	CEGL000596	4
<i>Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens</i> Forest	Quaking Aspen / Mountain Snowberry / Pinegrass Forest	POTR5/SYOR2/CARU	CEGL000612	8
<i>Populus tremuloides</i> / Tall Forbs Forest	Quaking Aspen / Tall Forbs Forest	POTR5/TALL FORBS	CEGL000618	1
<i>Pseudotsuga menziesii / Carex geyeri</i> Forest	Douglas-fir / Geyer's Sedge Forest	PSME/CAGE2	CEGL000430	2
<i>Pseudotsuga menziesii / Symphoricarpos oreophilus</i> Forest	Douglas-fir / Mountain Snowberry Forest	PSME/SYOR2	CEGL000462	8
Shrubland				
<i>Alnus incana</i> / Mesic Forbs Shrubland	Gray Alder / Mesic Forbs Shrubland	ALIN2/Mesic Forbs	CEGL001147	4
<i>Artemisia arbuscula ssp. arbuscula / Bromus tectorum</i> Semi-natural Shrubland	Low Sagebrush / Cheatgrass Semi-natural Shrubland	ARARA/BRTE		3

Scientific Name	Common Name	Code	Elcode	N
<i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Hesperostipa comata</i> Shrubland	Low Sagebrush / Needle and Thread Shrubland	ARARA/HECO26		3
<i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Poa secunda</i> Shrub Herbaceous Vegetation	Low Sagebrush / Sandberg Bluegrass Shrub Herbaceous Vegetation	ARARA/POSE	CEGL001411	8
<i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	Low Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation	ARARA/PSSP6	CEGL001412	7
<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	Early Low Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation	ARARL/FEID	CEGL001522	3
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Festuca idahoensis</i> Shrubland	Basin Big Sagebrush / Idaho Fescue Shrubland	ARTRT/FEID	CEGL001014	1
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Leymus cinereus</i> Shrubland	Basin Big Sagebrush / Basin Wildrye Shrubland	ARTRT/LECI4	CEGL001016	5
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Poa secunda</i> Shrubland	Basin Big Sagebrush / Sandberg Bluegrass Shrubland	ARTRT/POSE	CEGL001008	6
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	Basin Big Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation	ARTRT/PSSP6	CEGL001018	1
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Shrubland	Mountain Big Sagebrush - Fernbush / Scabland Penstemon Shrubland	ARTRV-CHMI2/PEDE4		5
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland	Mountain Big Sagebrush - Antelope Bitterbrush / Sandberg Bluegrass Shrubland	ARTRV-PUTR2/POSE		5
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Shrubland	Mountain Big Sagebrush - Antelope Bitterbrush / Bluebunch Wheatgrass Shrubland	ARTRV-PUTR2/PSSP6	CEGL001032	5
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Symphoricarpos oreophilus</i> / <i>Pseudoroegneria spicata</i> Shrubland	Mountain Big Sagebrush - Mountain Snowberry / Bluebunch Wheatgrass Shrubland	ARTRV-SYOR2/PSSP6	CEGL001038	2
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	Mountain Big Sagebrush / Cheatgrass Semi-natural Shrubland	ARTRV/BRTE		24

Scientific Name	Common Name	Code	Elcode	N
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	Mountain Big Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation	ARTRV/FEID	CEGL001533	9
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Hesperostipa comata</i> Shrubland	Mountain Big Sagebrush / Needle and Thread Shrubland	ARTRV/HECO26	CEGL002931	4
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Leymus cinereus</i> Shrubland	Mountain Big Sagebrush / Basin Wildrye Shrubland	ARTRV/LECI4	CEGL001027	1
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Poa secunda</i> Shrubland	Mountain Big Sagebrush / Sandberg Bluegrass Shrubland	ARTRV/POSE	CEGL001029	15
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland	Mountain Big Sagebrush / Bluebunch Wheatgrass Shrubland	ARTRV/PSSP6	CEGL001030	32
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum hymenoides</i> Shrubland	Wyoming Big Sagebrush / Indian Ricegrass Shrubland	ARTRW8/ACHY	CEGL001046	5
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum thurberianum</i> - <i>Bromus tectorum</i> Semi-natural Shrubland	Wyoming Big Sagebrush / Thurber's Needlegrass - Cheatgrass Semi-natural Shrubland	ARTRW8/ACTH7-BRTE		28
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum thurberianum</i> Shrubland	Wyoming Big Sagebrush / Thurber's Needlegrass Shrubland	ARTRW8/ACTH7	CEGL001052	13
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Agropyron cristatum</i> Semi-natural Shrubland	Wyoming Big Sagebrush / Crested Wheatgrass Semi-natural Shrubland	ARTRW8/AGCR		5
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	Wyoming Big Sagebrush / Cheatgrass Semi-natural Shrubland	ARTRW8/BRTE		70
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Festuca idahoensis</i> Shrubland	Wyoming Big Sagebrush / Idaho Fescue Shrubland	ARTRW8/FEID		11
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Hesperostipa comata</i> Shrubland	Wyoming Big Sagebrush / Needle and Thread Shrubland	ARTRW8/HECO26	CEGL001051	33
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation	Wyoming Big Sagebrush / Western Wheatgrass Shrub Herbaceous Vegetation	ARTRW8/PASM	CEGL001047	9
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Poa secunda</i> - <i>Bromus tectorum</i> Semi-natural Shrubland	Wyoming Big Sagebrush / Sandberg Bluegrass - Cheatgrass Semi-natural Shrubland	ARTRW8/POSE-BRTE		76

Scientific Name	Common Name	Code	Elcode	N
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Poa secunda</i> Shrubland	Wyoming Big Sagebrush / Sandberg Bluegrass Shrubland	ARTRW8/POSE	CEGL001049	76
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria spicata</i> Shrubland	Wyoming Big Sagebrush / Bluebunch Wheatgrass Shrubland	ARTRW8/PSSP6	CEGL001009	15
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Achnatherum thurberianum</i> Shrubland	Threetip Sagebrush / Thurber's Needlegrass Shrubland	ARTRT2/ACTH7		30
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	Threetip Sagebrush / Cheatgrass Semi-natural Shrubland	ARTRT2/BRTE		40
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	Threetip Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation	ARTRT2/FEID	CEGL001536	14
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Hesperostipa comata</i> Shrub Herbaceous Vegetation	Threetip Sagebrush / Needle and Thread Shrub Herbaceous Vegetation	ARTRT2/HECO26	CEGL001539	8
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Koeleria macrantha</i> Shrubland	Threetip Sagebrush / Prairie Junegrass Shrubland	ARTRT2/KOMA		9
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Leymus cinereus</i> Shrub Herbaceous Vegetation	Threetip Sagebrush / Basin Wildrye Shrub Herbaceous Vegetation	ARTRT2/LECI4	CEGL002994	1
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pascopyrum smithii</i> - <i>Bromus tectorum</i> Semi-natural Shrubland	Threetip Sagebrush / Western Wheatgrass - Cheatgrass Semi-natural Shrubland	ARTRT2/PASM-BRTE		11
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pascopyrum smithii</i> Shrubland	Threetip Sagebrush / Western Wheatgrass Shrubland	ARTRT2/PASM		19
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Poa secunda</i> - <i>Bromus tectorum</i> Semi-natural Shrubland	Threetip Sagebrush / Sandberg Bluegrass - Cheatgrass Semi-natural Shrubland	ARTRT2/POSE-BRTE		59
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Poa secunda</i> Shrubland	Threetip Sagebrush / Sandberg Bluegrass Shrubland	ARTRT2/POSE		17
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	Threetip Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation	ARTRT2/PSSP6	CEGL001538	21
<i>Cercocarpus ledifolius</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland	Curl-leaf Mountain Mahogany - Antelope Bitterbrush / Sandberg Bluegrass Shrubland	CELE3-PUTR2/POSE		2

Scientific Name	Common Name	Code	Elcode	N
<i>Chrysothamnus viscidiflorus</i> / <i>Agropyron cristatum</i> Shrubland	Yellow Rabbitbrush / Crested Wheatgrass Shrubland	CHVI8/AGCR		8
<i>Chrysothamnus viscidiflorus</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	Yellow Rabbitbrush / Cheatgrass Semi-natural Shrubland	CHVI8/BRTE		39
<i>Chrysothamnus viscidiflorus</i> / <i>Hesperostipa comata</i> Shrubland	Yellow Rabbitbrush / Needle and Thread Shrubland	CHVI8/HECO26	CEGL002799	1
<i>Chrysothamnus viscidiflorus</i> / <i>Pascopyrum smithii</i> Shrubland	Yellow Rabbitbrush / Western Wheatgrass Shrubland	CHVI8/PASM		3
<i>Chrysothamnus viscidiflorus</i> / <i>Poa secunda</i> - <i>Bromus tectorum</i> Semi-natural Shrubland	Yellow Rabbitbrush / Sandberg Bluegrass - Cheatgrass Semi-natural Shrubland	CHVI8/POSE-BRTE		5
<i>Chrysothamnus viscidiflorus</i> / <i>Pseudoroegneria spicata</i> Shrubland	Yellow Rabbitbrush / Bluebunch Wheatgrass Shrubland	CHVI8/PSSP6		1
<i>Ericameria nana</i> - <i>Holodiscus dumosus</i> / <i>Penstemon deustus</i> Shrubland	Dwarf Goldenbush - Rockspirea / Scabland Penstemon Shrubland	ERNA7-HODU/PEDE4		11
<i>Juniperus osteosperma</i> / <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Hesperostipa comata</i> Wooded Shrubland	Utah Juniper / Wyoming Big Sagebrush / Needle and Thread Wooded Shrubland	JUOS/ARTRW8/H ECO26		6
<i>Prunus virginiana</i> / <i>Leymus cinereus</i> Shrubland	Chokecherry / Basin Wildrye Shrubland	PRVI/LECI4		8
<i>Purshia tridentata</i> - <i>Ericameria nana</i> / <i>Penstemon deustus</i> Shrubland	Antelope Bitterbrush - Dwarf Goldenbush / Scabland Penstemon Shrubland	PUTR2-ERNA7/PEDE4		15
<i>Purshia tridentata</i> - <i>Philadelphus lewisii</i> / <i>Poa secunda</i> Shrubland	Antelope Bitterbrush - Lewis' Mock Orange / Sandberg Bluegrass Shrubland	PUTR2-PHLE4/POSE		4
<i>Purshia tridentata</i> / <i>Achnatherum thurberianum</i> Shrubland	Antelope Bitterbrush / Thurber's Needlegrass Shrubland	PUTR2/ACTH7		3
<i>Purshia tridentata</i> / <i>Leymus cinereus</i> Shrub Herbaceous Vegetation	Antelope Bitterbrush / Basin Wildrye Shrub Herbaceous Vegetation	PUTR2/LECI4	CEGL001497	4
<i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	Antelope Bitterbrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation	PUTR2/PSSP6	CEGL001495	1

Scientific Name	Common Name	Code	Elcode	N
Herbaceous Vegetation				
<i>Achnatherum nelsonii</i> / <i>Lupinus argenteus</i> Herbaceous Vegetation	Columbia Needlegrass / Silvery Lupine Herbaceous Vegetation	ACNE9/LUAR3		1
<i>Achnatherum thurberianum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	Thurber's Needlegrass - Cheatgrass Semi- natural Herbaceous Vegetation	ACTH7-BRTE		9
<i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi- natural Herbaceous Vegetation	Crested Wheatgrass - Cheatgrass Semi- natural Herbaceous Vegetation	AGCR-BRTE		38
<i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	Cheatgrass Semi-natural Herbaceous Vegetation	BRTE	CEGL003019	52
<i>Elymus lanceolatus</i> / <i>Lupinus argenteus</i> Herbaceous Vegetation	Streambank Wheatgrass / Silvery Lupine Herbaceous Vegetation	ELLA3/LUAR3		4
<i>Festuca idahoensis</i> - <i>Pseudoroegneria spicata</i> Herbaceous Vegetation	Idaho Fescue - Bluebunch Wheatgrass Herbaceous Vegetation	FEID-PSSP6	CEGL001624	3
<i>Hesperostipa comata</i> - <i>Poa secunda</i> Herbaceous Vegetation	Needle and Thread - Sandberg Bluegrass Herbaceous Vegetation	HECO26-POSE	CEGL001704	3
<i>Juncus balticus</i> Herbaceous Vegetation	Baltic Rush Herbaceous Vegetation	JUBA	CEGL001838	1
<i>Juniperus (scopulorum, osteosperma)</i> / <i>Ericameria nana</i> Wooded Herbaceous Vegetation	Juniper (Rocky Mountain, Utah) / Dwarf Goldenbush Wooded Herbaceous Vegetation	JUSC2- JUOS/ERNA7		14
<i>Leymus cinereus</i> Herbaceous Vegetation	Basin Wildrye Herbaceous Vegetation	LECI4	CEGL001479	4
<i>Pascopyrum smithii</i> Herbaceous Vegetation	Western Wheatgrass Herbaceous Vegetation	PASM	CEGL001577	2
<i>Poa secunda</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	Sandberg Bluegrass - Cheatgrass Semi-natural Herbaceous Vegetation	POSE-BRTE		99
<i>Poa secunda</i> Herbaceous Vegetation	Sandberg Bluegrass Herbaceous Vegetation	POSE		8
<i>Pseudoroegneria spicata</i> - <i>Melica bulbosa</i> Herbaceous Vegetation	Bluebunch Wheatgrass - Oniongrass Herbaceous Vegetation	PSSP6- MEBU/ARAC2		2
<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> / <i>Balsamorhiza sagittata</i> Herbaceous Vegetation	Bluebunch Wheatgrass - Sandberg Bluegrass / Arrowleaf Balsamroot Herbaceous Vegetation	PSSP6- POSE/BASA3	CEGL001662	3

Scientific Name	Common Name	Code	Elcode	N
<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> Herbaceous Vegetation	Bluebunch Wheatgrass - Sandberg Bluegrass Herbaceous Vegetation	PSSP6-POSE	CEGL001677	11
<i>Pseudoroegneria spicata</i> / <i>Crepis acuminata</i> Herbaceous Vegetation	Bluebunch Wheatgrass / Tapertip Hawksbeard Herbaceous Vegetation	PSSP6/CRAC2		6
<i>Sisymbrium altissimum</i> / <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	Tall Tumblemustard / Cheatgrass Semi-natural Herbaceous Vegetation	SIAL2/BRTE		24
Sparse Vegetation				
<i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Sparse Vegetation	Fernbush / Scabland Penstemon Sparse Vegetation	CHMI2/PEDE4		5
<i>Ericameria nana</i> / <i>Poa secunda</i> / <i>Penstemon deustus</i> Sparse Vegetation	Dwarf Goldenbush / Sandberg Bluegrass / Scabland Penstemon Sparse Vegetation	ERNA7/POSE/PE DE4		11
<i>Eriogonum ovalifolium</i> var. <i>depressum</i> Sparse Vegetation	Cushion Buckwheat Sparse Vegetation	EROVD	CEGL001401	4
<i>Philadelphus lewisii</i> / <i>Penstemon deustus</i> Sparse Vegetation	Lewis' Mock Orange / Scabland Penstemon Sparse Vegetation	PHLE4/PEDE4		8
<i>Pinus flexilis</i> / <i>Chamaebatiaria millefolium</i> / <i>Poa secunda</i> Sparse Vegetation	Limber Pine / Fernbush / Sandberg Bluegrass Sparse Vegetation	PIFL2/CHMI2/POS E		4
<i>Poa secunda</i> / <i>Leptodactylon pungens</i> Sparse Vegetation	Sandberg Bluegrass / Granite Prickly Phlox Sparse Vegetation	POSE/LEPU		11

Forest and Woodland Associations

Woodlands and forests are relatively rare. Douglas fir, limber pine and aspen stands were distributed at higher elevations of the Pioneer Mountain footslopes, alluvial fans, and on north-facing exposures. They occupy slightly more mesic habitats and sites protected from the prevailing wind. Canopy density is open and generally controlled by the availability of soil moisture. Utah and Rocky Mountain juniper stands were common on the southern Wapi flow and to a lesser degree in the Craters of the Moon flow. In both areas junipers were commonly associated with Wyoming big sagebrush and fernbush. The 2 species of juniper could not be distinguished on the aerial photography by photographic interpretation. Many of the juniper communities might also be called wooded shrublands or wooded herbaceous types due to low cover, at or below 10% cover. Some stands of juniper were found to be dead likely due to fire or disease.

Shrubland Associations

Shrublands were the most extensive and diverse community types within the mapping area. Some communities established on cinders and other volcanic exposures are extremely sparse, while others on deep soils were relatively dense. The upland shrubland associations of CRMO are characterized by low sagebrush and mountain big sagebrush in the north, trending to threetip, and basin big sagebrush in the central portions, and Wyoming big sagebrush and rabbitbrush in the south. Antelope bitterbrush was relatively common through the entire study and fernbush, mock orange and dwarf goldenbush were common on lava fields. Curl-leaf mountain mahogany was restricted to a few stands in the southern Wapi flow. Most of the upland shrubland species found outside of the lava fields tended to be effected in part by drought, insects, fire, invasive grasses, and grazing/browsing of livestock. Perhaps the least-affected shrubland stands occurred within kipukas that are generally protected from outside influences.

Herbaceous Associations

Grass and forb associations were uncommon and restricted in their distribution within the mapping area. Most grassland occupied broad flats, alluvial fans, slopes, and kipukas and dominated by bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, needle-and-thread, Thurber's needlegrass (*Achnatherum thurberiana*), cheatgrass, and crested wheatgrass. Fire did not appear to be a major factor in creating or maintaining most of the grassland communities at CRMO, but there were some signs of encroachment by woody species and patches of non-native grasses and forbs. Forb-dominated types tended to result from severe disturbance and were generally weed-dominated, including tall tumbled mustard (*Sisymbrium altissimum*).

Riparian and Wetland Forest and Woodland Associations

Mesic riparian woodlands were restricted in their distribution to the drainages of the Pioneer Mountain foothill drainages and associated seeps and springs. Stands varied according to the availability of water and tended to be dominated by quaking aspen, black cottonwood, and Douglas-fir on slopes and canyon bottoms. Associated mesic shrubs often included chokecherry, mountain snowberry (*Symphoricarpos oreophilus*), and mountain big sagebrush, in addition to pinegrass (*Calamagrostis rubescens*).

Riparian and Wetland Shrubland Associations

Mesic riparian and wetland shrub communities were very limited in their size and distribution within the Monument, most occurred in the foothills of the Pioneer Mountains. All were

restricted to areas with high water tables, including streambanks, seeps, and springs that are associated with Little Cottonwood, Big Cottonwood, Leech, Fish, and Little Wood creeks. Riparian and wetland shrubland associations of CRMO were characterized by speckled alder, chokecherry, and rubber rabbitbrush (*Chrysothamnus nauseosus*). The channels of intermittent washes supported sparse shrub communities dominated by rubber rabbitbrush and basin big sagebrush. Diversity can be high in these shrub types, but most stands occurred in patches smaller than the minimum mapping unit.

Riparian and Wetland Herbaceous Associations

Mesic riparian and wetland herbaceous associations at CRMO were uncommon, limited in their distribution, and were represented by Baltic rush, basin wildrye (*Leymus cinereus*), and western wheatgrass. All stands were restricted to areas with water at or near the surface for some or all of the growing season as occur along some perennial drainages, Lava and Huff lakes and Carey Lake Marsh. Some seasonal playas may also be ringed by mesic graminoids if the timing of saturation is sufficient to provide such support. Diversity can be high in these herbaceous types, but most stands occurred in patches smaller than the minimum mapping unit.

All of the plant associations were placed into an ecological system to provide a broader more landscape perspective. The ecological system classification only addresses natural landscapes and land-use categories used to identify developed areas were not included. Fourteen ecological systems were found to occur within the CRMO vegetation mapping project area (Rust and Wolken 2008) (Table 7).

Table 7. List of ecological systems found in CRMO.

Ecological System	NVC Code
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	CES306.959
Rocky Mountain Aspen Forest and Woodland	CES306.813
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	CES304.776
Columbia Basin Foothill Riparian Woodland and Shrubland	CES304.768
Inter-Mountain Basins Juniper Savanna	CES304.782
Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland	CES306.994
Inter-Mountain Basins Montane Sagebrush Steppe	CES304.785
Columbia Plateau Low Sagebrush Steppe	CES304.080
Inter-Mountain Basins Big Sagebrush Shrubland	CES304.777
Inter-Mountain Basins Big Sagebrush Steppe	CES304.778
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	CES306.040
North American Arid West Emergent Marsh	CES300.729
Inter-Mountain Basins Semi-Desert Grassland	CES304.787
Inter-Mountain Basins Volcanic Rock and Cinder Land	CES304.791

NatureServe and its network of state natural heritage programs indicate the rarity and degree of imperilment of plant communities by assigning state and global conservation status ranks to each. The rank scale ranges from 1 to 5; a rank of 1 indicates critical imperilment due to rarity, endemism, and/or threats, while a rank of 5 indicates little or no risk of extirpation of the plant community. Two G1 (critically imperiled) associations are considered endemic to Idaho and are known only from the Monument, they are *Eriogonum ovalifolium* var. *depressum* Sparse Vegetation and *Purshia tridentata* / *Leymus cinereus* Shrub Herbaceous Vegetation (Rust and Wolken 2008).

An additional three CRMO plant associations are considered critically imperiled (G1) and seven are considered imperiled (G2) (NatureServe 2009). The remaining G1 plant associations are: (1) *Pinus flexilis* / *Purshia tridentata* Woodland, (2) *Artemisia tridentata* ssp. *tridentata* / *Pseudoroegneria spicata* Shrubland, and (3) *Artemisia tripartita* ssp. *tripartita* / *Hesperostipa comata* Shrub Herbaceous Vegetation. The G2 plant associations are: (1) *Artemisia tridentata* ssp. *tridentata* / *Leymus cinereus* Shrubland, (2) *Artemisia tridentata* ssp. *wyomingensis* / *Acnatherum thurberianum* Shrubland, (3) *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland, (4) *Artemisia arbuscula* ssp. *longiloba* / *Festuca idahoensis* Shrub Herbaceous Vegetation, (5) *Artemisia tripartita* ssp. *tripartita* / *Pseudoroegneria spicata* Shrubland, (6) *Leymus cinereus* Herbaceous Vegetation, and (7) *Pseudoroegneria spicata* – *Balsamorhiza sagittata* – *Poa secunda* Herbaceous Vegetation.

All other plant associations classified during this project are ranked vulnerable to secure (G3, G4, and G5) or have not yet been accepted into the NVC. Those plant associations potentially new to the NVC are: (1) *Artemisia tripartita* ssp. *tripartita* / *Achnatherum thurberianum* Shrubland, (2) *Artemisia tripartita* ssp. *tripartita* / *Koeleria macrantha* Shrubland, (3) *Artemisia tripartita* ssp. *tripartita* / *Pascopyrum smithii* Shrubland, (4) *Artemisia tripartita* ssp. *tripartita* / *Poa secunda* Shrubland, (5) *Artemisia tridentata* ssp. *vaseyana* – *Chamaebatiaria millefolium* / *Penstemon deustus* Shrubland, (6) *Artemisia tridentata* ssp. *vaseyana* – *Purshia tridentata* / *Poa secunda* Shrubland, (7) *Artemisia tridentata* ssp. *wyomingensis* / *Festuca idahoensis* Shrubland, (8) *Chamaebatiaria millefolium* / *Penstemon deustus* Sparse Vegetation, (9) *Ericameria nana* – *Holodiscus dumosus* / *Penstemon deustus* Shrubland, (10) *Ericameria nana* / *Poa secunda* – *Penstemon deustus* Sparse Vegetation, (11) *Juniperus (osteosperma, scopulorum)* / *Artemisia tridentata* ssp. *wyomingensis* - *Chamaebatiaria millefolium* Wooded Shrubland, (12) *Juniperus osteosperma* / *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Wooded Shrubland, (13) *Juniperus (osteosperma, scopulorum)* / *Ericameria nana* Wooded Herbaceous Vegetation, (14) *Juniperus scopulorum* / *Poa secunda* – *Penstemon deustus* Woodland, (15) *Philadelphus lewisii* / *Penstemon deustus* Sparse Vegetation, (16) *Pinus flexilis* / *Chamaebatiaria millefolium* / *Poa secunda* Sparse Vegetation, (17) *Poa secunda* / *Leptodactylon pungens* Sparse Vegetation, (18) *Prunus virginiana* / *Leymus cinereus* Shrubland, (19) *Purshia tridentata* – *Ericameria nana* / *Penstemon deustus* Shrubland, and (20) *Purshia tridentata* – *Philadelphus lewisii* / *Poa secunda* Shrubland.

Digital Imagery and Interpretation

For CRMO, 54 original map units (38 vegetated, 3 geology, and 13 land-use/land-cover) were developed. Based on low accuracy assessment values and recommendations from CRMO staff four of the vegetated map units were combined yielding a total of 50 map. (Note: All of the

information related to the original map classes was retained for these polygons in the comments field in the GIS layer.) The following is a list of changes made to the map units:

- **Map Unit 6** - *Juniperus (osteosperma, scopulorum) / Artemisia tridentata* ssp. *wyomingensis* Woodland Complex -combined with
Map Unit 5 - *Juniperus (scopulorum, osteosperma) / Ericameria nana* Wooded Herbaceous Vegetation -forming

Map Unit 5 - *Juniperus (osteosperma, scopulorum) / Mixed Shrub Complex*

- **Map Unit 23** - *Chrysothamnus* spp. / *Bromus tectorum* - (*Agropyron cristatum*) Shrubland Complex -combined with
Map Unit 22 - *Ericameria (Chrysothamnus)* spp. Shrubland Complex -forming

Map Unit 22 - *Ericameria (Chrysothamnus)* spp. Shrubland Complex

- **Map unit 31** - *Bromus tectorum* Semi-natural Herbaceous Vegetation Complex – combined with
- **Map Unit 33** - Wet Meadow Herbaceous Vegetation Mosaic -and
- **Map Unit 34** - Mixed Weedy Forbs Herbaceous Vegetation -forming

Map Unit 31 - **Mixed Weedy Herbaceous Vegetation Complex**

The final list of map classes units were directly cross-walked or matched to corresponding plant associations and land use classes (Table 8). CRMO map classes represent a compromise between the detail of the NVCS, the needs of the park, and the limitations of the imagery. As a result, the mapping scheme does not exactly match the NVCS. Rather, the vegetation map units were linked (i.e. “crosswalked”) to the NVCS plant associations or alliances when possible. When the NVCS link was not feasible, other map units were created.

The following were the possible map scenarios that were encountered at CRMO:

1. **One-to-one relationship** = When a plant association or alliance had a unique photo signature and could be readily delineated on the photos, the map unit adopted the plant association/alliance name.
2. **One-to-many relationship** = When several plant associations could be seen on the imagery but occurred in intermixed stands too small to map a mosaic was created; or when related plant associations shared the same signature and could not be distinguished on the photos, several plant associations were collapsed into a single complex unit.
3. **Park Specials** = When unique stands of vegetation did not have a corresponding NVCS association or alliance.
4. **Land Use – Land Cover** = Non-vegetated areas and vegetation types not recognized by the NVCS received Anderson et al. (1976) map unit designations.

Please reference Appendix F for detailed descriptions and representative photos for all vegetation map units.

Table 8. Assignment of map classes and relationships to plant associations and other maps units.

Map Class #	Map Class Name	Description or Associations Assigned to Map Class	Relation
1	<i>Pseudotsuga menziesii</i> Forest Alliance	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest	1 : 1
2	<i>Pinus flexilis</i> / <i>Chamaebatiaria millefolium</i> / <i>Poa secunda</i> Sparse Vegetation	<i>Pinus flexilis</i> / <i>Chamaebatiaria millefolium</i> / <i>Poa secunda</i> Sparse Vegetation	1 : 1
3	<i>Pinus flexilis</i> / <i>Purshia tridentata</i> Woodland	<i>Pinus flexilis</i> / <i>Purshia tridentata</i> Woodland	1 : 1
4	<i>Pinus flexilis</i> / <i>Artemisia</i> spp. Woodland		Park Special
5	<i>Juniperus (osteosperma, scopulorum)</i> / Mixed Shrub Complex	<i>Juniperus osteosperma</i> / <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Hesperostipa comata</i> Wooded Shrubland <i>Juniperus (osteosperma, scopulorum)</i> / <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> – <i>Chamaebatiaria millefolium</i> Woodland <i>Juniperus (scopulorum, osteosperma)</i> / <i>Ericameria nana</i> Wooded Herbaceous Vegetation <i>Juniperus (osteosperma, scopulorum)</i> / <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> – <i>Chamaebatiaria millefolium</i> Woodland	1 : many
7	<i>Juniperus scopulorum</i> / <i>Poa secunda</i> / <i>Penstemon deustus</i> Woodland	<i>Juniperus scopulorum</i> / <i>Poa secunda</i> – <i>Penstemon deustus</i> Woodland	1 : 1
8	<i>Populus tremuloides</i> / Mixed Herbaceous Forest Complex	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Forest	1 : 1
9	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Forest	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Forest	1 : 1
10	<i>Populus tremuloides</i> / Mixed Shrub Woodland Complex	<i>Populus tremuloides</i> – <i>Pinus flexilis</i> Forest <i>Populus tremuloides</i> / <i>Prunus virginiana</i> Forest <i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i> / <i>Calamagrostis rubescens</i> Forest	1 : many
11	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Woodland Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Woodland Alliance	1 : 1
12	<i>Cercocarpus ledifolius</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland	<i>Cercocarpus ledifolius</i> – <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland	1 : 1
13	<i>Artemisia arbuscula</i> Shrubland Alliance	<i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Hesperostipa comata</i> Shrubland <i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Poa secunda</i> Shrub Herbaceous Vegetation <i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Peudoroegneria spicata</i> Shrub Herbaceous Vegetation <i>Artemisia arbuscula</i> ssp. <i>arbuscula</i> / <i>Bromus tectorum</i> Semi-natural Shrubland <i>Artemisia arbuscula</i> ssp. <i>longiloba</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	1 : many

Map Class #	Map Class Name	Description or Associations Assigned to Map Class	Relation
14	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> Shrubland Alliance	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Festuca idahoensis</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Leymus cinereus</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Poa secunda</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pseudoroegneria spicata</i> Shrubland	1 : many
15	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	1 : 1
16	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrubland Alliance	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Poa secunda</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> – <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> – <i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Hesperostipa comata</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Leymus cinereus</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Poa secunda</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland	1 : many
17	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	1 : 1
18	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> Shrubland Alliance	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum hymenoides</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum thurberianum</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum thurberianum</i> – <i>Agropyron cristatum</i> Semi-natural Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Festuca idahoensis</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Hesperostipa comata</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Poa secunda</i> Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria spicata</i> Shrubland	1 : many
19	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Bromus tectorum</i> - (<i>Agropyron cristatum</i>) Shrubland Complex	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Achnatherum thurberianum</i> – <i>Bromus tectorum</i> Semi-natural Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Bromus tectorum</i> Semi-natural Shrubland <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Poa secunda</i> – <i>Bromus tectorum</i> Semi-natural Shrubland	1 : many

Map Class #	Map Class Name	Description or Associations Assigned to Map Class	Relation
20	<i>Artemisia tripartita</i> Shrubland Alliance	<p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Achnatherum thurberianum</i> Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Hesperostipa comata</i> Shrub Herbaceous Vegetation</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Koeleria macrantha</i> Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Leymus cinereus</i> Shrub Herbaceous Vegetation</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pascopyrum smithii</i> – <i>Bromus tectorum</i> Semi-natural Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pascopyrum smithii</i> Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Poa secunda</i> – <i>Bromus tectorum</i> Semi-natural Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Poa secunda</i> Shrubland</p> <p><i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation</p>	1 : many
21	<i>Artemisia tripartita</i> / <i>Bromus tectorum</i> Shrubland Complex	<i>Artemisia tripartita</i> ssp. <i>tripartita</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	1 : 1
22	<i>Ericameria (Chrysothamnus)</i> spp. Shrubland Complex	<p><i>Chrysothamnus viscidiflorus</i> / <i>Agropyron cristatum</i> Semi-natural Shrubland</p> <p><i>Chrysothamnus viscidiflorus</i> / <i>Hesperostipa comata</i> Shrubland</p> <p><i>Chrysothamnus viscidiflorus</i> / <i>Pascopyrum smithii</i> Shrubland</p> <p><i>Chrysothamnus viscidiflorus</i> / <i>Pseudoroegneria spicata</i> Shrubland</p> <p><i>Ericameria nauseosa</i> / <i>Achnatherum hymenoides</i> Sparse Vegetation</p> <p><i>Chrysothamnus viscidiflorus</i> / <i>Bromus tectorum</i> Semi-natural Shrubland</p> <p><i>Chrysothamnus viscidiflorus</i> / <i>Poa secunda</i> – <i>Bromus tectorum</i> Semi-natural Shrubland</p>	1 : many
24	<i>Grayia spinosa</i> Shrubland Alliance	<i>Grayia spinosa</i> / <i>Bromus tectorum</i> Semi-natural Sparse Vegetation	1 : 1
25	<i>Betula occidentalis</i> Shrubland Alliance	N/A	1 : 1
26	<i>Prunus virginiana</i> / <i>Leymus cinereus</i> Shrubland	<i>Prunus virginiana</i> / <i>Leymus cinereus</i> Shrubland	1 : 1
27	<i>Purshia tridentata</i> Mixed Shrubland Complex	<p><i>Purshia tridentata</i> / <i>Achnatherum thurberianum</i> Shrubland</p> <p><i>Purshia tridentata</i> / <i>Bromus tectorum</i> Semi-natural Shrubland</p> <p><i>Purshia tridentata</i> / <i>Leymus cinereus</i> Shrub Herbaceous Vegetation</p> <p><i>Purshia tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation</p>	1 : many

Map Class #	Map Class Name	Description or Associations Assigned to Map Class	Relation
28	<i>Alnus incana</i> / Mesic Forbs Shrubland	<i>Alnus incana</i> / Mesic Forbs Shrubland	1 : 1
29	<i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	<i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	1 : 1
30	<i>Bromus inermis</i> - <i>Elymus cinereus</i> Herbaceous Vegetation	<i>Leymus cinereus</i> Herbaceous Vegetation	1 : 1
31	Mixed Weedy Herbaceous Vegetation Complex	<i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation <i>Achnatherum thurberianum</i> – <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation <i>Poa secunda</i> – <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation <i>Sisymbrium altissimum</i> – <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	1 : many
32	Dry Meadow Mixed Herbaceous Vegetation Mosaic	<i>Acnatherum nelsonii</i> / <i>Lupinus argenteus</i> Herbaceous Vegetation <i>Elymus lanceolatus</i> / <i>Lupinus argenteus</i> Herbaceous Vegetation <i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation <i>Hesperostipa comata</i> – <i>Poa secunda</i> Herbaceous Vegetation <i>Pascopyrum smithii</i> Herbaceous Vegetation <i>Poa secunda</i> Herbaceous Vegetation <i>Pseudoroegneria spicata</i> – <i>Melica bulbosa</i> Herbaceous Vegetation <i>Pseudoroegneria spicata</i> – <i>Poa secunda</i> – <i>Balsamorhiza sagittata</i> Herbaceous Vegetation <i>Pseudoroegneria spicata</i> – <i>Poa secunda</i> Herbaceous Vegetation <i>Pseudoroegneria spicata</i> – <i>Crepis acuminata</i> Herbaceous Vegetation <i>Juncus balticus</i> Herbaceous Vegetation	1 : many
35	Pahoehoe Lava Sparsely Vegetated Herbaceous Vegetation Complex	<i>Eriogonum ovalifolium</i> var. <i>depressum</i> Dwarf-shrubland Sparse Vegetation <i>Poa secunda</i> / <i>Leptodactylon pungens</i> Sparse Vegetation	1 : many
36	Pahoehoe Lava Sparsely Vegetated Shrubland Complex	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Shrubland <i>Ericameria nana</i> – <i>Holodiscus dumosus</i> / <i>Penstemon deustus</i> Shrubland <i>Ericameria nana</i> / <i>Poa secunda</i> - <i>Penstemon deustus</i> Sparse Vegetation <i>Philadelphus lewisii</i> / <i>Penstemon deustus</i> Sparse Vegetation <i>Purshia tridentata</i> – <i>Ericameria nana</i> / <i>Penstemon deustus</i> Shrubland <i>Purshia tridentata</i> – <i>Philadelphus lewisii</i> / <i>Poa secunda</i> Shrubland	1 : many
37	Sparsely Vegetated Cinders	<i>Phacelia hastata</i> Cinder Garden Sparse Vegetation	1 : 1
38	Aa Lava Sparsely Vegetated Shrubland Complex	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Shrubland	1 : many

Map Class #	Map Class Name	Description or Associations Assigned to Map Class	Relation
		<i>Ericameria nana</i> – <i>Holodiscus dumosus</i> / <i>Penstemon deustus</i> Shrubland <i>Ericameria nana</i> / <i>Poa secunda</i> - <i>Penstemon deustus</i> Sparse Vegetation <i>Philadelphus lewisii</i> / <i>Penstemon deustus</i> Sparse Vegetation <i>Chamaebatiaria millefolium</i> / <i>Penstemon deustus</i> Sparse Vegetation <i>Purshia tridentata</i> – <i>Ericameria nana</i> / <i>Penstemon deustus</i> Shrubland <i>Purshia tridentata</i> – <i>Philadelphus lewisii</i> / <i>Poa secunda</i> Shrubland <i>Poa secunda</i> / <i>Leptodactylon pungens</i> Sparse Vegetation	
39	Barren Pahoehoe Lava	Unvegetated pahoehoe lava beds and exposures	N/A
40	Barren Aa Lava	Unvegetated aa lava fields and exposures	N/A
41	Barren Cinders	Unvegetated cinder cones	N/A
42	Stream / River	Natural linear drainage features	N/A
43	Canal / Ditch	Man-made linear water conveyance systems	N/A
44	Lake / Pond	Natural and small human-made water impoundments	N/A
45	Reservoir	Large human-made water impoundment	N/A
46	Residential	Single-family housing	N/A
47	Agricultural Business	Ranch/Farm facilities	N/A
48	Transportation	Paved and Earthen Roads	N/A
49	Quarries / Strip Mines / Gravel Pits	Sites disturbed by humans to extract sand, gravel, rock or other minerals	N/A
50	Bare Rock / Sand / Other Bare Ground	Unvegetated bare rock / sand / bare ground	N/A
51	Planted / Cultivated	Tilled and cropped agricultural fields	N/A
52	Airstrip	Paved or earthen landing strip	N/A
53	Orchards, Groves, Vineyards, Nurseries, and Horticultural Areas	Planted woody vegetation used for fruit production	N/A
54	NPS Facilities	Visitor center, Headquarters, Housing, Maintenance yard, etc.	N/A

Vegetation Map

The CRMO vegetation map consisted of 18,991 polygons totaling 928,373 acres (Table 9). Average polygon size was 49 acres. Lands managed by NPS (i.e. lava fields) consisted of 469,601 acres or 51% of the total project area, BLM lands within the monument boundary totaled 30% and the remaining 20% represented a mix of BLM, other public lands, and privately owned lands in the 2km environs.. Of the total, 15,161 polygons (80%) represented natural or semi-natural vegetation map classes. Map classes representing non-vegetated rock outcrops and developed areas account for the remaining 3,830 polygons or 20% of the project area. The polygon count includes adjacent polygons that have the same map code but different density or height attributes. The most common map class in CRMO was *Artemisia tridentata ssp. wyomingensis* / *Bromus tectorum* Shrubland Complex (Map Class 19) with 2,248 polygons covering 8% of the project area.

Table 9. Summary statistics for map class polygons in CRMO.

Map Code	Map Unit Description	NPS Lands			Total Project Area		
		# of Polygons	Acres	Hectares	# of Polygons	Acres	Hectares
1	<i>Pseudotsuga menziesii</i> Forest Alliance	12	87.5	35.4	15	117.2	47.5
2	<i>Pinus flexilis</i> / <i>Chamaebatiaria millefolium</i> / <i>Poa secunda</i> Sparse Vegetation	142	7,565.5	3,064.0	144	7,634.9	3,092.1
3	<i>Pinus flexilis</i> / <i>Purshia tridentata</i> Woodland	144	5,185.3	2,100.0	145	5,187.3	2,100.9
4	<i>Pinus flexilis</i> / <i>Artemisia</i> spp. Woodland	158	9,995.9	4,048.3	166	10,014.8	4,056.0
5	<i>Juniperus (osteosperma, scopulorum)</i> / Mixed Shrub Complex	880	16,161.0	6,545.2	884	16,232.7	6,574.2
7	<i>Juniperus scopulorum</i> / <i>Poa secunda</i> / <i>Penstemon deustus</i> Woodland	340	6,402.3	2,592.9	350	6,738.5	2,729.1
8	<i>Populus tremuloides</i> / Mixed Herbaceous Forest Complex	5	7.5	3.0	61	227.5	92.1
9	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Forest	14	22.4	9.1	102	166.5	67.4
10	<i>Populus tremuloides</i> / Mixed Shrub Woodland Complex	14	59.6	24.1	131	607.6	246.1
11	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Woodland Alliance	3	1.2	0.5	45	22.5	9.1
12	<i>Cercocarpus ledifolius</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland	11	168.0	68.0	11	168.0	68.0
13	<i>Artemisia arbuscula</i> Shrubland Alliance	68	405.5	164.2	343	6,151.8	2,491.5
14	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> Shrubland Alliance	248	8,022.8	3,249.2	299	18,882.3	7,647.3
15	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	281	4,873.4	1,973.7	432	23,932.9	9,692.8
16	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrubland Alliance	496	37,439.3	15,162.9	579	52,715.9	21,349.9
17	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Bromus tectorum</i> Semi-natural Shrubland	103	1,549.0	627.3	154	7,863.3	3,184.6
18	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> Shrubland Alliance	1,185	11,0701.3	4,4834.0	1285	14,9297.7	60,465.6
19	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Bromus tectorum</i> - (<i>Agropyron cristatum</i>) Shrubland Complex	2,241	13,454.4	5,449.0	2,448	77,171.1	31,254.3
20	<i>Artemisia tripartita</i> Shrubland Alliance	753	1,633.6	661.6	1,148	37,679.1	15,260.0
21	<i>Artemisia tripartita</i> / <i>Bromus tectorum</i> Shrubland Complex	373	1,431.0	579.6	488	20,241.1	8,197.6
22	<i>Ericameria (Chrysothamnus)</i> spp. Shrubland Complex	537	2,181.5	883.5	1,001	53,302.5	21,587.5
24	<i>Grayia spinosa</i> Shrubland Alliance	0	0.0	0.0	1	7.3	3.0
25	<i>Betula occidentalis</i> Shrubland Alliance	2	0.8	0.3	4	12.1	4.9
26	<i>Prunus virginiana</i> / <i>Leymus cinereus</i> Shrubland	34	52.4	21.2	244	503.7	204.0
27	<i>Purshia tridentata</i> Mixed Shrubland Complex	642	4,129.4	1,672.4	900	18,617.2	7,540.0

Map Code	Map Unit Description	NPS Lands			Total Project Area		
		# of Polygons	Acres	Hectares	# of Polygons	Acres	Hectares
28	<i>Alnus incana</i> / Mesic Forbs Shrubland	1	10.4	4.2	4	20.2	8.2
29	<i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation	255	698.9	283.1	435	41792.6	16,926.0
30	<i>Bromus inermis</i> - <i>Elymus cinereus</i> Herbaceous Vegetation	2	0.6	0.2	3	26.1	10.6
31	Mixed Weedy Herbaceous Vegetation Complex	1,537	3,252.5	1,317.3	2,424	84,806.4	34,346.6
32	Dry Meadow Mixed Herbaceous Vegetation Mosaic	231	750.2	303.8	369	28,042.1	11,357.1
35	Pahoehoe Lava Sparsely Vegetated Herbaceous Vegetation Complex	118	896.5	363.1	187	1,359.7	550.7
36	Pahoehoe Lava Sparsely Vegetated Shrubland Complex	1,006	143,985.3	58,314.0	1,006	14,5297.8	58,845.6
37	Sparsely Vegetated Cinders	150	687.6	278.5	157	695.6	281.7
38	Aa Lava Sparsely Vegetated Shrubland Complex	1,324	36,816.1	14,910.5	1,380	37,220.5	15,074.3
39	Barren Pahoehoe Lava	561	8,098.6	3,279.9	584	8,137.4	3,295.6
40	Barren Aa Lava	2,028	41,880.7	16,961.7	2,055	42,029.7	17,022.0
41	Barren Cinders	21	357.7	144.9	21	357.7	144.9
42	Stream / River	0	0.0	0.0	9	26.1	10.6
43	Canal / Ditch	10	190.0	77.0	53	387.8	157.1
44	Lake / Pond	7	2.7	1.1	331	410.8	166.4
45	Reservoir	0	0.0	0.0	4	175.0	70.9
46	Residential	0	0.0	0.0	24	37.3	15.1
47	Agricultural Business	4	1.6	0.6	147	407.1	164.9
48	Transportation	180	317.1	128.4	336	2,874.7	1,164.3
49	Quarries / Strip Mines / Gravel Pits	0	0.0	0.0	3	15.4	6.2
50	Bare Rock / Sand / Other Bare Ground	13	21.6	8.7	348	620.4	251.3
51	Planted / Cultivated	45	95.2	38.6	201	20,084.3	8,134.1
52	Airstrip	0	0.0	0.0	4	28.8	11.7
53	Orchards, Groves, Vineyards, Nurseries, and Horticultural Areas	0	0.0	0.0	17	15.9	6.4
54	NPS Facilities	5	7.5	3.0	5	7.7	3.1
	Total Natural Vegetation	13,310	418,628.7	169,544.6	15,161	852,756.5	345,366.4
	Total Barren Lava and Cinders	2,610	50,337.0	20,386.5	2,660	50,524.8	20,462.5
	Total Land use / Land Cover	264	635.7	257.5	1,170	25,091.3	10,162.0
	Totals	16,184	469,601.4	190,188.6	18,991	928,372.6	375,990.9

Normally the standard minimum mapping unit for NPS vegetation mapping projects is defined as 0.5 hectare. However, this is a nominal unit and due to the resolution of the imagery, it was reduced to ¼ acre for kipukas, wetland and other rare classes. This size allowed for more detail in the mapping and allowed for better delineation of sites deemed important for CRMO management. This ability to recognize small patches of vegetation is reflected in the high number of polygons created and the average size of the polygons for some of the rarer types.

The CRMO vegetation map should more appropriately be considered a spatial database that also contains many additional polygon attributes not presented in the preceding table (i.e. density, height, pattern, substrate and kipuka locations). All of this data is hard to convey in a table or a two-dimensional map, but it should be noted that these different attributes can be combined in many different ways and at different scales and resolutions to produce other products representing the full spectrum of the vegetative diversity. Figure 14 is an example of a fine scale (1:12,000) CRMO vegetation map centered on the visitors center created from the GIS spatial database with false color aerial photography as the background.



Example of Vegetation Map Classes

Map Code	Map Unit Description
1	<i>Pseudotsuga menziesii</i> Forest Alliance
2	<i>Pinus flexilis</i> / <i>Chamaebatiaria millefolium</i> / <i>Poa secunda</i> Sparse Vegetation
3	<i>Pinus flexilis</i> / <i>Purshia tridentata</i> Woodland
4	<i>Pinus flexilis</i> / <i>Artemisia</i> spp. Woodland
5	<i>Juniperus</i> (<i>osteosperma</i> , <i>scopulorum</i>) / Mixed Shrub Complex
7	<i>Juniperus scopulorum</i> / <i>Poa secunda</i> / <i>Penstemon deustus</i> Woodland
8	<i>Populus tremuloides</i> / Mixed Herbaceous Forest Complex
9	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Forest
10	<i>Populus tremuloides</i> / Mixed Shrub Woodland Complex
11	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Woodland Alliance
12	<i>Cercocarpus ledifolius</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland
13	<i>Artemisia arbuscula</i> Shrubland Alliance
14	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> Shrubland Alliance
15	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Bromus tectorum</i> Semi-natural Shrubland
16	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrubland Alliance
17	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Bromus tectorum</i> Semi-natural Shrubland
18	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> Shrubland Alliance
19	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Bromus tectorum</i> - (<i>Agropyron cristatum</i>) Shrubland Complex
20	<i>Artemisia tripartita</i> Shrubland Alliance
21	<i>Artemisia tripartita</i> / <i>Bromus tectorum</i> Shrubland Complex
22	<i>Ericameria</i> (<i>Chrysothamnus</i>) spp. Shrubland Complex
24	<i>Grayia spinosa</i> Shrubland Alliance
25	<i>Betula occidentalis</i> Shrubland Alliance
26	<i>Prunus virginiana</i> / <i>Leymus cinereus</i> Shrubland
27	<i>Purshia tridentata</i> Mixed Shrubland Complex
28	<i>Alnus incana</i> / <i>Mesic</i> Forbs Shrubland
29	<i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation
30	<i>Bromus inermis</i> - <i>Elymus cinereus</i> Herbaceous Vegetation
31	Mixed Weedy Herbaceous Vegetation Complex
32	Dry Meadow Mixed Herbaceous Vegetation Mosaic
35	Pahoehoe Lava Sparsely Vegetated Herbaceous Vegetation Complex
36	Pahoehoe Lava Sparsely Vegetated Shrubland Complex
37	Sparsely Vegetated Cinders
38	Aa Lava Sparsely Vegetated Shrubland Complex
39	Barren Pahoehoe Lava
40	Barren Aa Lava
41	Barren Cinders
42	Stream / River
43	Canal / Ditch
44	Lake / Pond
45	Reservoir
46	Residential
47	Agricultural Business
48	Transportation
49	Quarries / Strip Mines / Gravel Pits
50	Bare Rock / Sand / Other Bare Ground
51	Planted / Cultivated
52	Airstrip
53	Orchards, Groves, Vineyards, Nurseries, and Horticultural Areas
54	NPS Facilities



0 0.05 0.1 0.2 0.3 0.4 Miles
(1:12,000)

Produced by Northwest Management, Inc., Moscow, Idaho

December 2009

Figure 14. Example of the CRMO vegetation map layer.

Accuracy Assessment

The 2008 accuracy assessment effort yielded 772 points distributed throughout CRMO. Initial analysis revealed 10 points that were sampled either in recently burned areas (not captured on the imagery) or in areas in the environ that were recently disturbed by agricultural activities. These 10 points were removed from further analysis. Also map unit 37 (sparsely vegetated cinders) did not receive any AA points since this class was added after the sampling started. In addition to using the AA points in the AA analysis, many of the points were also used to update the classification and to revise the local descriptions. These data helped strengthen the classification for CRMO and added to the global perspective of the individual types.

Actual analysis of the AA points involved a point-by-point review in two stages. During stage one, an AA GIS point file was created from the AA point coordinates recorded in the field. These were then overlaid on the vegetation map and a comparison of the final AA field call versus the vegetation polygon label was conducted by CTI staff. This resulted in a preliminary error matrix that was reviewed by NMI and CTI. Adjustments were made to the field calls at this time based on the actual cover values recorded taking into account some errors in the field key. After these changes were made, results were presented to UCBN and CRMO staff during a conference call and recommendations were made on how to improve the accuracy of the map. These included combining 4 of the map units that had low user's accuracy into other map units (see Methods section of this report).

Stage two involved incorporating the NPS recommendations by combining similar classes and re-running the accuracy assessment. After the vegetation map was updated, a final error matrix was calculated (Table 10) and included any correct alternate second or third field calls. In most cases, the correct second and third calls were very closely related to the incorrect primary call. For example, mixed stands containing equal levels of sagebrush sub-species often had both listed as first and second calls. The final assessment revealed an overall accuracy of 82%.

Examination of the final error matrix showed concentrations of error among the different sparsely vegetated lava classes (Map Units 35, 36, and 38), among the different big sagebrush subspecies classes (Map Units 14 – 19), and between the juniper map units (Map Units 5 and 7) and the sparsely vegetated lava classes. These trends likely reflect the difficulty in accurately separating similar shrub species from an overhead perspective. The darkness of the lava on the imagery also helped mask the presence of vegetation. Another general trend reveals the difficulty in getting sufficient numbers of AA points for very rare or small stands. Having only a handful of AA points decreases the confidence levels and makes it difficult to assume the accuracy of these classes with any certainty. Finally, the differences between the woodland and shrubland types confused with the sparse vegetated lava can likely be explained by the difficulty in resolving the difference in scale and perspective between viewing the vegetation on the imagery and assessing it on the ground. For example, sampling could have occurred in inclusions or canopy openings that were a part of a larger woodland/shrubland polygon.

Table 10. Final Contingency Table for CRMO

		Observed AA Point (Reference AA Ground Data)																																Total	Users Accuracy	90% Conf. Interval	
Map Class		1	2	3	4	5	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	26	27	28	29	31	32	35	36	38	-	+					
P r e d i c t e d M a p U n i t s	1	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	100%	97%	100%
	2	0	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	21	71%	53%	90%
	3	0	0	37	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	93%	84%	100%
	4	0	0	2	20	0	1	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	30	67%	51%	82%	
	5	0	0	0	0	58	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	16	0	86	67%	58%	76%		
	7	0	0	0	0	1	21	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	26	81%	66%	95%		
	8	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	100%	90%	100%	
	9	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	100%	83%	100%	
	10	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	20	95%	84%	100%	
	12	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	100%	94%	100%	
	13	0	0	0	0	0	0	0	0	0	0	29	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	91%	81%	100%	
	14	0	0	0	0	0	0	0	0	0	0	0	24	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	29	83%	69%	96%	
	15	0	0	0	0	0	0	0	0	0	0	0	3	11	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0	0	18	61%	39%	83%	
	16	0	0	0	0	0	0	0	0	0	0	0	1	0	32	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	37	86%	76%	97%	
	17	0	0	0	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	12	58%	31%	86%	
	18	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	77%	63%	91%	
	19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	8	0	0	0	0	0	0	0	0	0	1	1	0	0	0	14	57%	32%	82%		
	20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	91%	72%	100%		
	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	1	7	86%	57%	100%	
	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	23	0	0	0	0	0	3	0	1	0	0	0	28	82%	71%	100%		
	26	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	8	75%	44%	100%		
	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3	67%	5%	100%	
	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	100%	75%	100%	
	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	1	0	0	0	0	37	97%	92%	100%		
	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	50	0	0	0	0	0	54	93%	86%	100%		
	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	5	60%	14%	100%		
	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	75%	27%	100%		
	36	0	0	0	0	6	0	0	0	0	0	0	0	0	2	0	2	1	0	0	0	0	0	0	0	0	1	6	94	1	113	83%	77%	89%			
	38	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	4	1	0	0	0	0	0	0	0	0	0	0	1	53	63	84%	76%	92%			
	Total		15	15	40	21	65	30	5	3	19	8	29	39	12	48	9	37	15	11	7	26	7	2	2	39	58	5	14	120	61	82% Overall Accuracy					
	Producers Accuracy		100%	100%	93%	95%	89%	70%	100%	100%	100%	100%	62%	92%	67%	78%	65%	53%	91%	86%	88%	86%	100%	100%	92%	86%	60%	21%	78%	87%	762 Total Points						
	90% Conf. Level -		97%	97%	84%	85%	82%	55%	90%	83%	97%	94%	98%	47%	74%	54%	49%	51%	29%	72%	57%	71%	57%	75%	75%	84%	79%	14%	0%	72%	79%	624 Correct Points					
	Level +		100%	100%	100%	100%	96%	85%	100%	100%	100%	100%	100%	76%	100%	79%	100%	79%	78%	100%	100%	100%	100%	100%	100%	100%	93%	100%	43%	85%	95%	80% Kappa Index					
																																	Overall 90% Conf. Intervals				

Note: Map Units 6, 23, 33 and 34 were combined with other map units after the initial analysis. Map Units 11, 24, 25, and 30 were found primarily on private lands or were mapped only where known. Map Unit 37 was developed after the AA analysis and was not sampled in the field.

Instructions on Using the Accuracy Assessment Contingency Table:

The contingency table or error matrix found above presents an array of numbers set out in rows and columns corresponding to a particular vegetation map unit relative to the actual vegetation type as verified on the ground. The column headings represent the vegetation classification as determined in the field and the row headings represent the vegetation classification taken from the vegetation map. The highlighted diagonal indicates the number of points assessed in the field that agree with the map label. Conversely, the inaccuracies of each map unit are described as both errors of inclusion (user's or commission errors) and errors of exclusion (producer's or omission errors). By reading across this table (i.e., rows) one can calculate the percent error of commission, or how many polygons for each map unit were incorrectly labeled when compared to the field data. By reading down the table (i.e., columns) one can calculate the percent error of omission, or how many polygons for that type were left off the map. Numbers "on the diagonal" tell the user how well the map unit was interpreted and how confident they can be in using it. Numbers "off the diagonal" yield important information about the deficiencies of the map including which types were: 1) over-mapped - commission errors on the right or 2) under-mapped - omission errors on the bottom.

Discussion

Craters of the Moon National Monument and Preserve is truly a special place combining an unique mix of volcanic geology, newly vegetating exposures, kipukas, native plant communities, and surrounding sites disturbed by exotic grasses and grazing. Across this broad and sometimes fragmented landscape an array of native and invasive plant species thrive in habitats typical of the Columbia Basin and Plateau. The multiple geologic exposures and land uses on and adjacent to this landscape made it very challenging to both classify and map the vegetation into meaningful context for all levels of interest (local, regional, and national). However, building on the legacy data with this project's new classification sampling and verifying efforts an accurate vegetation inventory and map was completed.

Mapping and conducting field work in the monuments and parks of the Upper Columbia Basin, including CRMO, is made more demanding by the lava and ash beds, sheer cliffs, and steep slopes that are a common features. The geologic exposures at CRMO especially made field access difficult, confound the generation of slope and aspect data, and create problematic shadows on the aerial imagery. The mapping process although largely successful, revealed opportunities for improvement that are discussed below.

Things that worked well: Field data and local descriptions of the associations provided by project ecologists were extremely important ancillary data sources used by the GIS contractor to delineate map classes. High-quality plot, observation point, and legacy data, as well as thorough local descriptions helped provide information for direct image interpretation. CRMO had a high density of vegetation plots, higher than any other medium to large park in the UCBN. Additional data collected by the project photointerpreter during field reconnaissance provided a stronger basis for conducting the interpretation and mapping. Timely and high resolution base imagery is also essential to produce detailed and accurate maps. For the vegetation mapping at CRMO, new, good quality ortho-photography allowed for both confident manual interpretation and a solid source for deriving physiognomic classes and vegetation density.

Areas for Improvement: The mapping concepts used at CRMO were based primarily on earlier mapping efforts and substrate, and secondarily on vegetation similarity. This concept created cross-walking problems once the new vegetation classification was finally completed. Basically the mapping focused on the different lava substrates first, then what was growing on them versus the classification that only looked at dominant species. In this manner some of the NVC associations occurred both on the lava fields and also on the very different surrounding upland sites and kipukas. This problem was resolved in most cases by defining additional map classes to separate the clearly distinct physiognomic types and using density modifiers to separate sparse types on lava from adjacent denser stands on developed soils.

Similar to the classification issue was defining the sparsely vegetated lava. At first glance much of CRMO appears to be unvegetated but most of the lava fields did have some vegetation growing in cracks, crevices and other areas where soil had been deposited. Mapping of all the small unvegetated sites proved to be too unwieldy so large polygons of sparsely vegetated lava resulted. More site specific mapping and verification would likely increase the amount of bare lava found at CRMO.

Field Survey

The vegetation data presented in this project should be used as a “baseline” to build upon. New survey work in a judicious timeframe would greatly improve both the classification and mapping efforts. Using the accuracy assessment as a guide, map classes with lower accuracy could be further surveyed in the field to create more accurate delineations. While it may appear that there are a large number of associations and alliances described for this study area, some of the associations/alliances were either only minimally sampled or not sampled at all due to access constraints. It is recommended that these types should receive additional survey work to further define their classification. For example, some of the herbaceous types could be examined throughout the growing season to document both the cool and warm season species in order to refine their composition. Also, accessing neighboring private lands would allow new plot samples to be obtained increasing the confidence in these types, thereby strengthening the classification.

Classification

In addition to private lands access the other main classification challenge at CRMO is documenting changes to plant life caused by drought, wildfire, erosion of geologic features by wind and water, prescribed burns, grazing, and other anthropogenic disturbance. Changes can include reduction of tree and shrub cover or outright removal and spread of invasive plant species, among other changes. At all times, but especially after these events, new data should be collected to document vegetation changes over time. Overall more specialized and targeted data collection in affected areas would help to document any changes and would greatly increase the understanding of the landscape in general.

Digital Imagery and Interpretation

The vegetation map for CRMO was based primarily on the 2007 ortho-imagery. Therefore, all of the resulting mapping products correspond to the May 2007 timing of the image acquisition (i.e. snapshot in time). As the data is used it should be remembered that any new fires or landscape altering events since May of 2007 are not included. In the future it may be beneficial to update the map based on newer imagery or from GPS locations (e.g. fire perimeters). Also any changes in the phenology of the vegetation throughout the growing season are not reflected in this map.

Inherent to all vegetation mapping projects is the need to produce both a consistent vegetation classification and a comprehensive set of map units. Typically the systems are very similar, but when using a national classification such as the NVC there is usually not a strict one-to-one correspondence. Nonconformity is due to the remote sensing nature of the interpretation and its ability to delineate map units based on complex photo signatures. Subtle vegetation characteristics that can be observed on the ground are not necessarily the same as those apparent on the imagery. Canopy closure, shadows, reflections and the timing of the imagery acquisition can all impact the vegetation signatures. At CRMO these issues can be offset not only by acquiring new imagery but also by conducting more map verification or ground-truthing. Increasing the amount of time and money budgeted for verification of the map would greatly improve the accuracy and level of detail. Similarly, this work should only be viewed as an initial mapping effort that needs to be refined and periodically updated. To perform field checking, the existing map could be examined in the field by qualified Monument or contract staff, changes could be made to the map, and these could be incorporated into new current versions.

Accuracy Assessment

An important and necessary aspect of this project is the accuracy assessment. Collecting independent ground data determines the usefulness of the vegetation map. As such, users of this product should remember that the GIS mapping and the classification portions of this project were conducted separately from both the plot and AA field data collection. Having these divisions in work created some challenges related to communication among all the teams, including: 1) adequately conveying changes to the vegetation classification based on finding potentially new types during the field portion of the AA, 2) thoroughly testing and adjusting the field key to remove confusing splits among similar types, 3) insuring that adequate sample sizes are collected for rare and infrequent types, and 4) avoiding having to collect more than the estimated 30 data points for common types.

Actual errors in the mapping likely stemmed from the limitations of the ortho-photography as previously described, natural changes in the vegetation between sampling and the acquisition date of the imagery, errors in the field key, or the difficulty in establishing an overhead perspective to exactly match the ground view. Although the accuracy for CRMO appears moderate to high, improvements can be made and users should fully explore and understand the sources of error as presented in the error matrix.

It is also important for users to remember that since the mapping portion of this project is primarily a remotely sensed exercise and the field work was conducted on site, all resulting products are scale dependent. In general the mapping portions should be viewed as a broader overview and the field data as more site specific. Although one can zoom in further than 1:12,000-scale using GIS software, the actual mapping was conducted at this scale. As such, any work performed with this product at a finer scale could lead to some uncertainty. In contrast, the field work was conducted at individual locations at one specific time and any extrapolation from these locations to out-lying areas or using them to determine what is there at different times is less reliable. Future users should fully appreciate these scale limitations and balance their efforts accordingly

Future Recommendations

In summary, this project represents the best efforts put forth by a multi-disciplined team over a moderate time period. In order to create the best possible “long-term” vegetation classification for CRMO and the most accurate and detailed GIS layer, this project should be viewed as a place to start rather than an end product. In other words, present and future NPS staff should be encouraged to scrutinize this project, building from its strengths and bolstering its weaknesses. By keeping in mind that this project was only a snapshot in time, future efforts can help complete our understanding of the vegetation in and around CRMO and how it changes. It is the hope of the producers that the products presented here will help focus and direct future efforts, as follows:

1. The diversity of plant species and dynamic nature of the park with respect to grazing, erosion, outside influences, and fire warrants periodic **field surveys** by experienced ecologists. Further, the inaccessibility of the private lands in the environs should be addressed by seeking permission to sample and verify the vegetation. In this way new plant associations could be discovered and existing types could be updated.

2. Remote sensing does not replace on-the-ground knowledge provided by GPS-linked plots, observations, and ground verification. Time, topographic features, and funding limitations curtailed the amount of map **ground-truthing** performed. As opportunities arise, maps should be examined in the field by experienced crews. Also GPS receiver data and other GIS layers should be used to improve and update the spatial data. This map product should not be viewed as static but should be updated with more current and accurate information.
3. To better understand the limitations of the map, the **accuracy assessment** data presented in Table 10 should be thoroughly reviewed by Monument staff. Map classes with low accuracy should be examined to see if they could be improved with future studies using ground-truthing or other remote-sensing formats (i.e. fine-scale imagery, hyperspectral, etc). Also, landscape modeling may help to tease out the location of specific types based on specific habitat information. Finally for some applications it may make sense to combine map classes into higher units, such as alliances or ecological systems to improve their accuracy.
4. For monitoring purposes, **change over time** could be addressed by similar remote sensing projects. New aerial photos or NAIP imagery acquired every year or as they are re-acquired, could be used in regular intervals to capture change. Specifically this new imagery could be used to create up-to-date vegetation layers that could be used to compare changes in both individual vegetation stands and across the entire park.
5. In the future, resource management personnel could link the habitat for **species of concern** to specific associations and map units. These map units could then be used to help locate potential sites of rare, endangered, or threatened species and communities in the field or identify areas for non-native plant removal or treatment.
6. Since this project was primarily a vascular plant inventory, **lichens and mosses** were largely overlooked. On the new 2007 imagery some areas (especially on the Wapi Lava Field) did present some promising signatures likely related to moss growth. Further work with this and other imagery could help create new monitoring GIS layers showing the distribution and density of moss and lichen cover and how they relate to air quality and soil development.

Research Opportunities

Having an accurate and current vegetation classification and map presents many new and exciting research opportunities. Research could include expanding or linking the GIS layer to derive other information including fire models, habitat monitoring locations, guides for rare plant surveys, wildlife habitat structural analyses, and inventorying areas that likely contain exotic or invasive species. The map could also be enhanced by overlaying other existing GIS layers such as geology, hydrology, elevation, and soils. In this manner complex interactions between these layers could be examined and yield important information about growth rates, regeneration after disturbance, biomass distribution, and stream morphology. Finally, through innovative analyses the vegetation layer could possibly be used as a springboard for other ecological studies including examining how the vegetation interacts with soil chemistry, pollution, archeological sites, weather patterns, etc.

Literature Cited

- Anderson, J.R., E. Hardy, J. Roach, and R. Witter. 1976. A land use and land cover classification system for use with Remote Sensor Data. Geological Survey Professional Paper 964. U.S. Government Printing Office, Washington, D.C.
- Belnap, J., J. H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge. 2001. Biological Soil Crusts: Ecology and Management. USDI, Bureau of Land Management Technical Reference TR-1730-2. Denver, CO. 119 p.
- Craters of the Moon National Monument. 2000. Wildland Fire Management Plan; CRMO, Idaho.
- Craters of the Moon National Monument and Preserve (CRMO). 2005. Craters of the Moon National Monument and Preserve Proposed Management Plan/Final Environmental Impact Statement (PMP). USDI National Park Service. Arco, ID.
- Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science. 23: 69-82.
- Day, T. A. and R. G. Wright. 1985. The Vegetation Types of CRMO. Bulletin Number 38: Forest, Wildlife, and Range Experiment Station, University of Idaho. Moscow, ID. 6pp.
- Environmental Systems Research Institute, National Center for Geographic Information and Analysis, and The Nature Conservancy [ESRI and TNC]. 1994. Final draft accuracy assessment procedures. NBS/NPS Vegetation Mapping Program. Prepared for the United States Department of Interior, Biological Resources Division and National Park Service.
- Erixson, J. A., and D. Cogan. 2009. Vegetation classification and mapping of Hagerman Fossil Beds National Monument. Natural Resource Technical Report NPS/UCBN/NRTR—2009/212. National Park Service, Fort Collins, Colorado. D-43
- Federal Geographic Data Committee [FGDC]. 1997. Vegetation classification standard. Online, <http://biology.usgs.gov/fgdc.veg/standards/vegstd.htm>. Accessed 1 May 2009.
- Federal Geographic Data Committee. 1998a. Content standard for digital geospatial metadata, FGDC-STD-001-1998. Online: <http://www.fgdc.gov/metadata/contstan.html>. Accessed 1 May 2009.
- Federal Geographic Data Committee. 2008. National Vegetation Classification Standard (Version 2). Document # FGDC-STD-005. Online, <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation>. Accessed 1 March 2007.
- 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, VA.

- Hansen, M., J. Coles, K. Thomas, D. Cogan, M. Ried, J. Von Loh, and K. Schulz. 2004. USGS-NPS National Vegetation Mapping Program: Wupatki National Monument, Arizona, Vegetation Classification and Distribution. Final Report. U.S. Geological Survey Southwest Biological Science Center. Flagstaff, AZ.
- Hop, K., S. Lubinski, and S. Menard. 2005. USGS-NPS Vegetation Mapping Program: Effigy Mounds National Monument, Iowa. USGS, Upper Midwest Environmental Sciences Center. LaCrosse, WI. 62 pp plus Appendices.
- Jennings, M.D., D. Farber-Langendoen, R.K. Peet, O.L. Loucks, D.C. Glew-Lewin, A. Damman, M.G. Barbour, R. Pfister, D.H. Grossman, D. Roberts and others. 2006. Description, documentation and evaluation of association and alliances within the U.S. National Vegetation Classification, Version 4.5. Ecological Society of America, Vegetation Classification Panel, Washington D.C.
- Jurs, L. P. and A. R. Sands. 2004. An Inventory, Assessment, and Recommended Management of Shrub-steppe Vegetation in Laidlaw Park, Little Park, and Paddelford Flat, CRMO. Unpublished report on file, BLM Shoshone Field Office, Shoshone, Idaho. 45 pp. plus appendices.
- Kuntz, M. A., D. E. Champion, E. C. Spiker, R. H. Lefebvre, and L. A. McBroome. 1982. Geologic Map of the Craters of the Moon, Kings Bowl, and Wapi lava fields, and the Great Rift volcanic rift zone, south-central Idaho: United States Geological Survey Miscellaneous Investigations Series Map I-1632. In Owen 2008.
- Landscape Dynamics Lab. 1999. Landcover. Spatial data in ArcInfo grid format, Version 2.1. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, Idaho. Online, http://wildlife.uidaho.edu/igap/idgap_data.asp. Accessed 1 May 2006.
- Lea, C. 2006. Electronic Mail to Dan Cogan Discussing Gradsect Applications for Sampling Design. NPS, National Vegetation Mapping Program. Denver, CO.
- Louter, D. 1995. CRMO Historic Context Statements. NPS-Pacific Northwest Region. Seattle, WA.
- McCune, B. and J. B. Grace. 2002. Analysis of Ecological Communities. With a Contribution by D. L. Urban. MjM Software. Glenden Beach, OR.
- McCune, B. and M. J. Mefford. 2006. PC-ORD; Multivariate Analysis of Ecological Data, Version 5.06. MjM Software. Glenden Beach, OR.
- McGrath, C. L., A. J. Woods, J. M. Omernik, S. A. Bryce, M. Edmonson, J. A. Nessen, J. Sheldon, R. C. Crawford, J. A. Comstock, and M. D. Plocher. 2002. Ecoregions of Idaho

(color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,175,000).

- National Park Service [NPS]. 1999. Natural Resource Challenge: The National Park Service's Action Plan for Preserving Natural Resources. In-house publication. U.S. Department of Interior, National Park Service, Washington, D.C. 21p.
- National Park Service. 2009. Craters of the Moon National Monument and Preserve – Park Information. Online, <http://www.nps.gov/crmo/.htm>. Accessed 1 May 2007
- NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classification, Ecological System of CRMO Vegetation Mapping and Classification Project Area. Gwen Kittel. Arlington, VA.
- NatureServe Explorer. 2009. An online encyclopedia of life [Web application]. Version 7.0. Arlington, VA. Online, <http://www.natureserve.org/explorer>. Accessed 1 March 2009.
- Omernik, J. M. 1986. Ecoregions of the Conterminous United States. *Annals of the Association of American Geographers* 77(1): 118-125.
- Owen, D. E. 2008. Geology of Craters of the Moon National Monument and Preserve. CRMO Natural History Association. ID.
- R Development Core Team. 2007. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Vienna, Austria. Online, <http://www.R-project.org>. Accessed 1 January 2007.
- Rust, S. K. and P. Wolken. 2008. Classification of the Plant Communities of CRMO, Idaho. Natural Resource Technical Report: NPS/UCBN/NRTR-2008/096. NPS, Natural Resources Program Center. Fort Collins, CO.
- Salas, D., J. Stevens, and K. Schulz. 2004. USGS-NPS National Vegetation Mapping Program: Rocky Mountain National Park. Final Report. U.S. Bureau of Reclamation Remote Sensing and GIS Group Technical Memorandum 8260-05-02. Denver, CO.
- Slaton, S.E. and L.T. Novey. 2007. Interpreting Biological Diversity at Craters of the Moon National Monument and Preserve. Natural Resource Report NPS/UCBN/NRR—2007/019. National Park Service, Fort Collins, Colorado.
- Tart, D., C. Williams, J. DiBenedetto, E. Crowe, M. Girard, H. Gordon, K. Sleavin, M. Manning, J. Haglund, B. Short and D. Wheeler. 2005. Section 2: Existing vegetation classification protocol. In: R. Broham and L Bryant, eds. Existing Vegetation Classification and Mapping Technical Guide. USDA Forest Service, Ecosystem Management Coordination Staff Gen. Tech. Rep. WO-67. Washington D.C.
- The Nature Conservancy and Environmental Systems Research Institute [TNC and ESRI]. 1994a. NBS/NPS Vegetation Mapping Program: Final Draft, Standardized National

Vegetation Classification System. Prepared for USDI – National Biological Survey and National Park Service. Arlington, VA.

The Nature Conservancy and Environmental Systems Research Institute. 1994b. NBS/NPS Vegetation Mapping Program: Final Draft, Field Methods for Vegetation Mapping. Prepared for USDI – National Biological Survey and National Park Service. Arlington, VA.

The Nature Conservancy and Environmental Research Systems Institute. 1994c. NBS/NPS Vegetation Mapping Program: Accuracy Assessment Procedures. Arlington, VA.

U.S. Department of Agriculture, National Agriculture Imagery Program, Farm Service Agency. 2008. Information Sheet. Online, <http://www.fsa.usda.gov>. Accessed 1 March 2009.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2007. The PLANTS Database. Online, <http://plants.usda.gov>. Accessed 1 May 2006.

U.S. Department of the Interior, National Park Service and Bureau of Land Management. 2005. Craters of the Moon National Monument and Preserve; Proposed Management Plan and Final Environmental Impact Statement. USDI-NPS, BLM. Arco, ID. Online, <http://parkplanning.nps.gov/>. Accessed 1 May 2006.

U.S. Geological Survey [USGS]. 1999. Map accuracy standards. Fact sheet FS-171-99 (November 1999). Online, <http://mac.usgs.gov/mac/isb/pubs/factsheets/fs17199.html>. Accessed 1 May 2006.

Western Regional Climate Center [WRCC]. 2009. Reno, NV. Craters of the Moon, Idaho Station (102260). Online, <http://www.wrcc.dri.edu/weather/npsc.html>. Accessed 1 March 2009.

Whipple, J. 1992. Review of Herbarium/plant list. Unpublished memo/report.

List of Abbreviations and Acronym

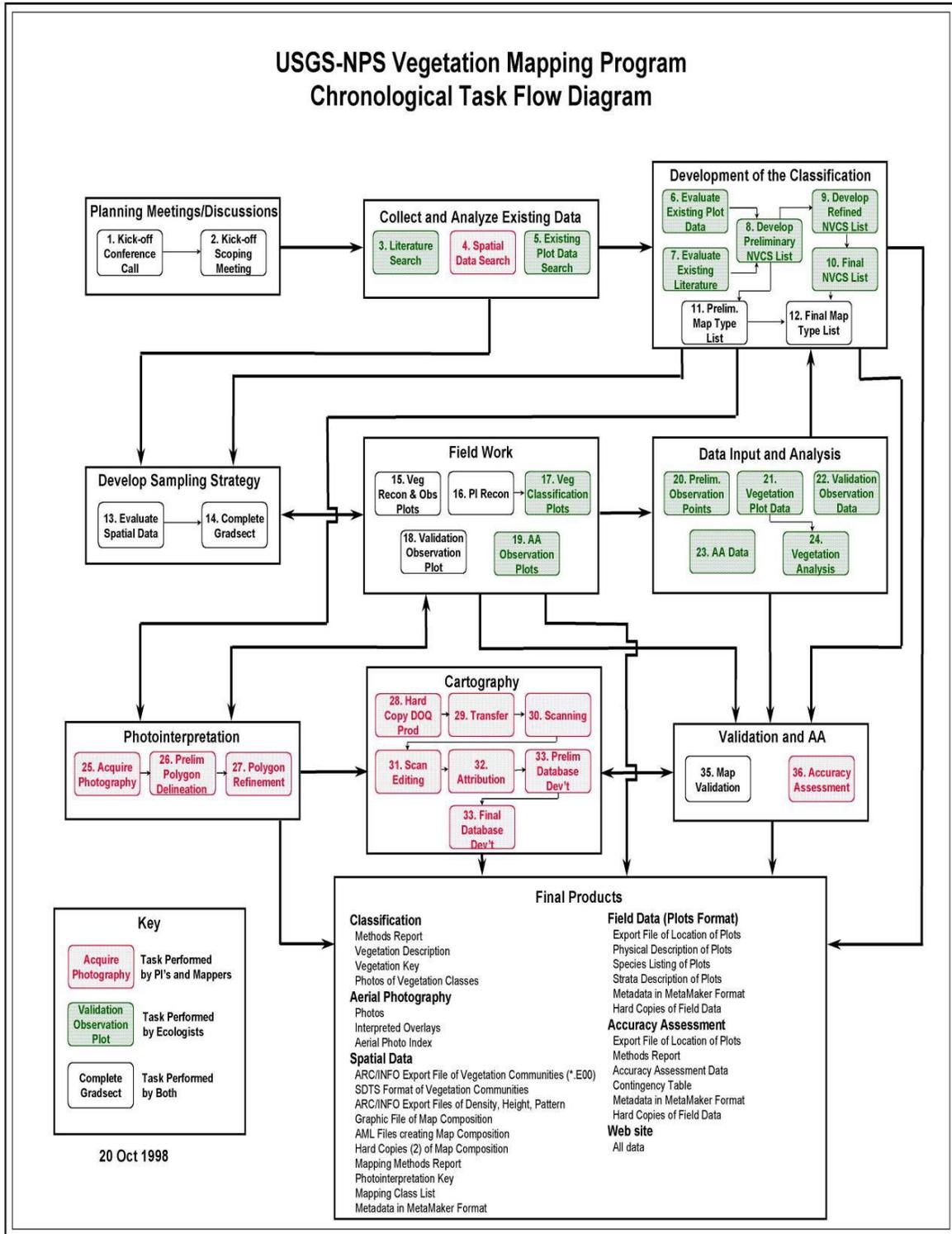
AA	Accuracy Assessment		
Ac	Acres	LC/LU	Land Cover/Land Use System
BPU	Biophysical Unit	MMU	Minimum Mapping Unit
CDC	Conservation Data Center, Idaho Department of Game and Fish	NAD	North American Datum
CEGL	Community Element Code	NAIP	National Agriculture Imagery Program
COM	Craters of the Moon Lava Flow	NBII	National Biological Information Infrastructure Program
CRMO	Craters of the Moon National Monument and Preserve	NMI	Northwest Management, Incorporated
CTI	Cogan Technology, Incorporated	NPS	National Park Service
DBH	Diameter at Breast Height (4.5 feet)	NPS FirePro	National Park Service Fire Program
DEM	Digital Elevation Model	NRCS	Natural Resources Conservation Service
DOQQ	Digital Orthophotograph Quarter Quadrangle	NRTR	Natural Resources Technical Report
e²M	engineering-environmental Management, Incorporated	NVC	National Vegetation Classification
ES	Ecological System	NVCS	National Vegetation Classification Standard
ESRI	Environmental Systems Research Institute	QA/QC	Quality Assurance/Quality Control
FGDC	Federal Geographic Data Committee	SCS	Soil Conservation Service
ft	Feet	TNC	The Nature Conservancy
GIS	Geographic Information System	TSN	Taxonomic Serial Number
GPS	Global Positioning System (Receiver)	UCBN	Upper Columbia Basin Network
ha	Hectare	USDA	United States Department of Agriculture
I&M	Inventory and Monitoring Program	USFS	United States Forest Service
ICDC	Idaho Conservation Data Center	USGS	United States Geological Survey
in	Inch	UTM	Universal Transverse Mercator
ITIS	Integrated Taxonomic Information System	WRCC	Western Region Climate Center

Links

<http://science.nature.nps.gov/im/units/ucbn>
<http://biology.usgs.gov/npsveg/index.html>
<http://www.nps.gov>
<http://usgs.gov>
<http://biology.usgs.gov/cbi>
<http://biology.usgs.gov/cbi/nbii>
<http://www.nps.gov/crmo>
<http://fishandgame.idaho.gov/cdc/>
<http://consulting-foresters.com>
<http://www.cogantech.com>
<http://www.natureserve.org/explorer>
<http://plants.usda.gov>

Upper Columbia Basin Inventory and Monitoring Network
 USGS-NPS Vegetation Mapping Program
 National Park Service
 United States Geologic Survey
 USGS Center for Biological Informatics
 National Biological Information Infrastructure
 Craters of the Moon NM and Preserve
 Idaho Conservation Data Center
 Northwest Management, Incorporated
 Cogan Technology Inc.
 NatureServe Explorer® online database server
 NRCS PLANTS Database

Appendix A – Components and Flow Diagram of the Vegetation Classification and Mapping Program



Appendix B – Field Data Forms and Instructions

General instructions for filling out fields in the PLOT SURVEY FORM (adapted from Salas et al. 2004)

IDENTIFIERS/LOCATORS

Plot Code

Code indicating the specific plot within the vegetation polygon.

Surveyors

Names of surveyors, with principal surveyor listed first.

Date

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

BPU Code

The biophysical unit identified.

Provisional Community Name

Using the provisional classification of the park that was provided, assign the name of the vegetation type which most closely resembles this type. Enter the finest level of the classification possible. If it's a new type, name it based on the two or three most dominant species in the plot.

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

Error is recorded from the GPS unit.

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.

Plot Permanent

Note if the plot has been permanently marked.

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 obtained from the GPS

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 watercourses 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, if needed.

Cowardin 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 debris on the edge of a 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 and 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 floodplain 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

Soil does not remain in a ball when squeezed.....sand

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. While 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 knowledge.

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.

Soil 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 are mixed.

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.

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

Any miscellaneous comments.

Species/Strata/Percent Cover Table

The main use of the strata information is to categorize the plots by life form, in order to subset the data into forest, woodland, shrublands, and herbaceous plots for analysis. 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) or N (nonvascular). Some species will be in more than one layer. For example, Cottonwoods 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.

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

Cover Scale for Species Percent Cover

Use the cover scales provided on the forms.

NATIONAL PARK VEGETATION MAPPING PROGRAM: PLOT SURVEY FORM

IDENTIFIERS/LOCATORS

Plot Code _____	Polygon Code _____
Provisional Community Name _____	
State ____	Park Name _____
Park Site Name _____	
Quad Name _____	Quad Code _____
GPS file name _____	Field UTMX _____ m E
	Field UTM Y _____ m N
	Error +/- _____ m
<i>please do not complete the following information when in the field</i>	
Corrected UTMX _____	m E Corrected UTM Y _____
	m N UTM Zone _____
Survey Date _____	Surveyors _____
Directions to Plot	
Plot length _____	Plot width _____
Plot Photos (y/n) ____	Roll Number _____
Frame Number _____	Plot Permanent (y/n) ____
Plot representativeness	

ENVIRONMENTAL DESCRIPTION

Elevation _____	Slope _____	Aspect _____
Topographic Position		
Landform		
Surficial Geology		

Cowardian System <input type="checkbox"/> Upland <input type="checkbox"/> Riverine <input type="checkbox"/> Palustrine <input type="checkbox"/> Lacustrine	<u>Non-Tidal</u>	
	<input type="checkbox"/> Permanently Flooded	<input type="checkbox"/> Saturated
	<input type="checkbox"/> Semipermanently Flooded	<input type="checkbox"/> Seasonally Flooded/Saturated
	<input type="checkbox"/> Seasonally/Temporarily Flooded	<input type="checkbox"/> Intermittently Flooded

Environmental Comments:	Soil Taxon/Description
	Unvegetated Surface: <i>(please use the cover scale on next page)</i>
	<input type="checkbox"/> Bedrock <input type="checkbox"/> Litter, duff <input type="checkbox"/> Wood (> 1 cm)
	<input type="checkbox"/> Large rocks (cobbles, boulders > 10 cm)
	<input type="checkbox"/> Small rocks (gravel, 0.2-10 cm)
	<input type="checkbox"/> Sand (0.1-2 mm) <input type="checkbox"/> Bare soil
	<input type="checkbox"/> Other: _____
Soil Texture <input type="checkbox"/> sand <input type="checkbox"/> loamy sand <input type="checkbox"/> sandy loam <input type="checkbox"/> loam <input type="checkbox"/> silt loam <input type="checkbox"/> silt <input type="checkbox"/> clay loam <input type="checkbox"/> silty clay <input type="checkbox"/> clay <input type="checkbox"/> peat <input type="checkbox"/> muck	Soil Drainage <input type="checkbox"/> Rapidly drained <input type="checkbox"/> Well drained <input type="checkbox"/> Moderately well drained <input type="checkbox"/> Somewhat poorly drained <input type="checkbox"/> Poorly drained <input type="checkbox"/> Very poorly drained

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class	Cover Scale for Strata & Unvegetated Surface		Height Scale for Strata	
<u>Trees and Shrubs</u>	<u>Broad-leaved</u>	<u>Forest</u>				
<u>Evergreen</u>	<u>Needle-leaved</u>	<u>Woodland</u>	01	5%	01	<0.5 m
<u>Cold-deciduous</u>	<u>Microphyllous</u>	<u>Shrubland</u>	02	10%	02	0.5-1m
<u>Drought-deciduous</u>	<u>Graminoid</u>	<u>Dwarf Shrubland</u>	03	20%	03	1-2 m
<u>Mixed evergreen - cold-deciduous</u>	<u>Forb</u>	<u>Herbaceous</u>	04	30%	04	2-5 m
<u>Mixed evergreen - drought-deciduous</u>	<u>Pteridophyte</u>	<u>Nonvascular</u>	05	40%	05	5-10 m
		<u>Sparse Vegetated</u>	06	50%	06	10-15 m
			07	60%	07	15-20 m
			08	70%	08	20-35 m
			09	80%	09	35 - 50 m
<u>Herbs</u>			10	90%	10	>50 m
<u>Annual</u>			11	100%		
<u>Perennial</u>						

Strata	Height Class	Cover Class	Diagnostic species (if known)
T1 Emergent	_____	_____	_____
T2 Canopy	_____	_____	_____
T3 Sub-canopy	_____	_____	_____
S1 Tall shrub	_____	_____	_____
S2 Short Shrub	_____	_____	_____
H Herbaceous	_____	_____	_____
N Non-vascular	_____	_____	_____
V Vine/liana	_____	_____	_____
E Epiphyte	_____	_____	_____
<i>please see above table for height and cover scales</i>			
Animal Use Evidence			
Natural and Anthropogenic Disturbance Comments			
Other Comments			

2009 ACCURACY ASSESSMENT POINT FORM – JOHN DAY FOSSIL BEDS NATIONAL MONUMENT
UPPER COLUMBIA BASIN NETWORK VEGETATION MAPPING PROJECT

VEGETATION DESCRIPTION

Leaf phenology (dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Height Class (m)	Cover Class
<u>Trees and Shrubs</u>		<u>Pick one</u>	T < 1ft.	t < 0.5%
_____ Evergreen	_____ Broad-leaved	_____ Forest	01 1-5ft.	T 0.5- 0.99%
_____ Deciduous	_____ Needle-leaved	_____ Woodland	05 5-15ft.	01 1-1.9%
_____ Mixed evergreen - deciduous	_____ Graminoid	_____ Shrubland	15 15-30ft.	02 2-4.9%
	_____ Forb		30 >30FT	05 5-9.9%
<u>Herbs</u>	_____ Pteridophyte	_____ Dwarf shrubland		10 10-14%
_____ Perennial	_____ Non Vascular	_____ Herbaceous		15 15-24%
_____ Annual	_____ Mixed	_____ Nonvascular		25 25-34%
		_____ Sparsely vegetated		35 35-49%
				50 50-74%
				75 75-94%
				95 >95%

Strata	Height Class	Cover Class	2 - Dominant species (mark any known diagnostic species with a *)	Individual Species Cover
T1 Emergent	_____	_____	_____	_____
T2 Canopy	_____	_____	_____	_____
T3 Sub-canopy	_____	_____	_____	_____
S1 Tall shrub	_____	_____	_____	_____
S2 Short Shrub	_____	_____	_____	_____
S3 Dwarf-shrub	_____	_____	_____	_____
H Herbaceous	_____	_____	_____	_____
N Non-vascular	_____	_____	_____	_____

Please check this box if AA point has more than one plant association (e.g. two or more species list at a point recorded on form)

Appendix C – Dichotomous Key to CRMO Plant Associations

The field key to plant communities of the Monument and Preserve follows. The key is structured into physiognomic classes (or lifeform groups). These classes do not constraint the classification *per se*, rather they are employed to assist in applying the classification. In the field, different expressions of a given plant association may occur as different physiognomic classes. For example, *Ericameria nana* - *Holodiscus dumosus* / *Penstemon deustus* Shrubland occurs in stands that are classified as a range of different physiognomies: herbaceous, shrubland, and sparse vegetation (approximately 18%, 36%, and 45% of observations, respectively). Given this, several associations may be found through multiple pathways within the key.

Use of the Key

To use the field key most effectively, identify a representative, homogeneous stand of vegetation. Work through the entire hierarchy of the key, beginning with Key to Lifeform Groups to each sequential dichotomous lead. Estimate plant cover on an area of approximately 405m². If a satisfactory determination is not made in stands with low total cover consider adjusting diagnostic species cover break-points downward. Assignment of individual species to lifeform follows USDA, NRCS (2007).

In the key the term relative cover is used. In this context relative cover refers to the proportional abundance of the given species (or group of species) with respect to the total abundance of the associated lifeform. The value is calculated by dividing the percent cover of the species (or group of species) under consideration by the total cover of the respective lifeform. For example, the relative cover of native grass species is calculated as follows: (sum of native grass species cover within the sample) / (total cover of all graminoids within the sample) = (relative native grass composition).

Key to Lifeform Groups

- 1a) Tree canopy cover (*Juniperus osteosperma*, *Juniperus scopulorum*, *Pinus flexilis*, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, or *Pseudotsuga menziesii* alone or combined) $\geq 10\%$, **Part A: Forest, Woodland, and Savannah**, lead 4a.
- 1b) Tree canopy cover $< 10\%$, lead 2a.
 - 2a) Shrub canopy cover $\geq 10\%$, **Part B: Shrublands and Shrub-steppe**, lead 17a.
 - 2b) Shrub canopy cover $< 10\%$, lead 3a.
 - 3a) Vascular plant cover $\geq 10\%$, **Part C: Herbaceous Vegetation**, lead 81a.
 - 3b) Vascular plant cover $< 10\%$, **Part D: Sparse Vegetation**, lead 106a.

Part A: Forest, Woodland, and Savannah

- 4a) *Populus balsamifera* spp. *trichocarpa* $\geq 10\%$ cover, **POBAT**.
- 4b) *Populus balsamifera* spp. *trichocarpa* $< 10\%$ cover, lead 5a.
 - 5a) *Populus tremuloides* $> 10\%$ cover, lead 6a.
 - 6a) *Pinus flexilis* $\geq 5\%$ cover, **POTR5-PIFL2**.
 - 6b) *Pinus flexilis* $< 5\%$ cover, lead 7a.
 - 7a) *Acer glabrum*, *Amelanchier alnifolia*, *Prunus virginiana*, or *Salix scouleriana* (alone or in combination) $\geq 10\%$ cover (occasionally less abundant in sparse stands), **POTR5/PRVI**.

- 7b) *Acer glabrum*, *Amelanchier alnifolia*, *Prunus virginiana*, or *Salix scouleriana* (alone or in combination) <10% cover, lead 8a.
- 8a) *Artemisia tridentata* ssp. *vaseyana* ≥10% cover, **POTR5/ARTR**.
- 8b) *Artemisia tridentata* ssp. *vaseyana* <10% cover, lead 9a.
- 9a) *Ribes aureum*, *Ribes cereum*, *Rosa woodsii*, or *Symphoricarpos oreophilus* (alone or in combination) ≥10% cover (occasionally less abundant in sparse stands), **POTR5/SYOR2/CARU**.
- 9a) *Ribes aureum*, *Ribes cereum*, *Rosa woodsii*, or *Symphoricarpos oreophilus* (alone or in combination) <10% cover, lead 10a.
- 10a) *Agastache urticifolia*, *Delphinium occidentale*, *Hackelia floribunda*, *Heracleum maximum*, *Mertensia ciliata*, *Osmorhiza occidentalis*, *Senecio serra*, or *Valeriana occidentalis* (alone or in combination) ≥10% cover (occasionally less abundant in sparse stands), **POTR5/TALL FORBS**.
- 10b) *Calamagrostis rubescens* or *Carex geyeri* (alone or in combination) ≥10% cover (occasionally less abundant in sparse stands), **POTR5/CARU**.
- 5b) *Populus tremuloides* ≤10, lead 11a.
- 11a) *Pinus flexilis* ≥5% cover, **PIFL2/PUTR2**.
- 11b) *Pinus flexilis* <5% cover, lead 12a.
- 12a) *Pseudotsuga menziesii* ≥5% cover, lead 13a.
- 13a) *Carex geyeri* ≥5% cover, **PSME/CAGE2**.
- 13b) *Carex geyeri* <5% and *Prunus virginiana* or *Symphoricarpos oreophilus* (alone or in combination) ≥5% cover (occasionally less abundant in sparse stands), **PSME/SYOR2**.
- 12b) *Pseudotsuga menziesii* <5% cover and *Juniperus osteosperma* or *Juniperus scopulorum* is the principal tree species, lead 14a.
- 14a) *Juniperus scopulorum* ≥10% cover, **JUSC2/POSE/PEDE4**.
- 14b) *Juniperus scopulorum* <10% cover, lead 15a.
- 15a) *Chamaebatiaria millefolium* is present, **JUOS-JUSC2/ARTRW8/CHMI2**.
- 15b) *Chamaebatiaria millefolium* is absent, lead 16a.
- 16a) *Ericameria nana* is present, **JUSC2-JUOS/ERNA7**.
- 16b) *Ericameria nana* is not present, **JUOS/ARTRW8/HECO26**.

Part B: Shrublands and Shrub-steppe

- 17a) *Alnus incana* or *Prunus virginiana* (alone or in combination) ≥10% cover, lead 18a.
- 18a) *Alnus incana* ≥10% cover, **ALIN2/Mesic Forbs**.
- 18a) *Alnus incana* <10% cover, **PRVI/LECI4**.
- 17b) *Alnus incana* or *Prunus virginiana* (alone or in combination) <10% cover, lead 19a.
- 19a) *Artemisia tripartita* spp. *tripartita* ≥8 % cover, lead 20a.
- 20a) Native grass composition <45% relative cover, **ARTRT2/BRTE**.
- 20b) Native grass composition ≥45% relative cover, lead 21a.
- 21a) *Hesperostipa comata* ≥18% of total graminoid cover, **ARTRT2/HECO26**.
- 21b) *Hesperostipa comata* <18% relative graminoid cover, lead 22a.
- 22a) Native grass composition ≥74% relative cover, lead 23a.

- 23a) *Pseudoroegneria spicata* $\geq 30\%$ relative graminoid cover, **ARTRT2/PSSP6.**
- 23b) *Pseudoroegneria spicata* $< 30\%$ relative graminoid cover, lead 24a.
 - 24a) *Poa secunda* $\geq 42\%$ relative graminoid cover, **ARTRT2/POSE.**
 - 24b) *Poa secunda* $< 42\%$ relative graminoid cover, lead 25a.
 - 25a) *Pascopyrum smithii* $< 28\%$ relative graminoid cover, lead 26a.
 - 26a) *Festuca idahoensis* $\geq 15\%$ relative cover¹, **ARTRT2/FEID.**
 - 26b) *Festuca idahoensis* $< 15\%$ relative cover, lead 27a.
 - 27a) *Koeleria macrantha* $< 20\%$ relative cover, **ARTRT2/ACTH7.**
 - 27b) *Koeleria macrantha* $\geq 20\%$ relative cover, **ARTRT2/KOMA.**
 - 25b) *Pascopyrum smithii* $\geq 28\%$ relative graminoid cover, **ARTRT2/PASM.**
- 22b) Native grass composition $< 74\%$ relative cover, lead 28a.
 - 28a) *Poa secunda* $\geq 15\%$ relative cover, **ARTRT2/POSE-BRTE.**
 - 28b) *Poa secunda* $< 15\%$ relative cover, lead 29a.
 - 29a) *Leymus cinereus* $\geq 30\%$ relative cover, **ARTRT2/LECI4.**
 - 29b) *Leymus cinereus* $< 30\%$ relative cover, **ARTRT2/PASM-BRTE.**
- 19b) *Artemisia tripartita* spp. *tripartita* $< 8\%$ cover, lead 30a.
 - 30a) *Artemisia tridentata* spp. *wyomingensis* $\geq 3\%$ cover, lead 31a.
 - 31a) Native grass composition $< 31\%$ relative cover, **ARTRW8/BRTE.**
 - 31b) Native grass composition $\geq 31\%$ relative cover, lead 32a.
 - 32a) *Juniperus osteosperma* or *Juniperus scopulorum* (alone or in combination) $\geq 2\%$ cover, lead 14a.
 - 32) *Juniperus osteosperma* or *Juniperus scopulorum* (alone or in combination) $< 2\%$ cover, lead 33a.
 - 33a) Native grass composition $> 50\%$ relative cover, lead 34a.
 - 34a) *Bromus tectorum* $\geq 10\%$ cover, lead 35a.
 - 35a) *Achnatherum thurberianum* $\geq 4\%$ cover, **ARTRW8/ACTH7-BRTE.**
 - 35b) *Achnatherum thurberianum* $< 4\%$, lead 36a.
 - 36a) *Hesperostipa comata* $\geq 5\%$ cover, **ARTRW8/HECO26.**
 - 36b) *Hesperostipa comata* $< 5\%$ cover, **ARTRW8/POSE-BRTE.**
 - 34b) *Bromus tectorum* $< 10\%$ cover, lead 37a.
 - 37a) *Hesperostipa comata* $\geq 1\%$ cover, **ARTRW8/HECO26.**
 - 37b) *Hesperostipa comata* $< 1\%$ cover, lead 38a.
 - 38a) *Pseudoroegneria spicata* $< 3\%$ lead 39a.
 - 39a) *Festuca idahoensis* $> 1\%$ cover, **ARTRW8/FEID.**
 - 39b) *Festuca idahoensis* $< 1\%$ cover, lead 40a.
 - 40a) *Achnatherum thurberianum* $\geq 2\%$ cover, **ARTRW8/ACTH7.**
 - 40b) *Achnatherum thurberianum* $< 2\%$ cover, lead 41a.

- 41a) *Achnatherum hymenoides* $\geq 1\%$ cover, **ARTRW8/ACHY.**
- 41b) *Achnatherum hymenoides* $< 1\%$ cover, lead 42a.
- 42a) *Pascopyrum smithii* $\geq 2\%$ cover, **ARTRW8/PASM.**
- 42b) *Pascopyrum smithii* $< 2\%$ cover, **ARTRW8/POSE.**
- 38b) *Pseudoroegneria spicata* $\geq 3\%$ cover, **ARTRW8/PSSP6.**
- 33b) Native grass composition $\leq 50\%$ relative cover, lead 43a.
 - 43a) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) $\geq 5\%$ cover, **ARTRW8/AGCR.**
 - 43a) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) $< 5\%$ cover, **ARTRW8/POSE-BRTE.**
- 30b) *Artemisia tridentata* spp. *wyomingensis* $< 3\%$ cover, lead 44a.
 - 44a) *Artemisia tridentata* ssp. *vaseyana* $\geq 3\%$ cover, lead 45a.
 - 45a) Native grass composition $< 43\%$ relative cover, **ARTRV/BRTE.**
 - 45b) Native grass composition $\geq 43\%$ relative cover, lead 46a.
 - 46a) *Pinus flexilis* $\geq 1\%$ cover, **PIFL2/PUTR2.**
 - 46b) *Pinus flexilis* $< 1\%$ cover, lead 47a.
 - 47a) *Chamaebatiaria millefolium* $\geq 2\%$ cover, **ARTRV-CHMI2/PEDE4.**
 - 47b) *Chamaebatiaria millefolium* $< 2\%$ cover, lead 48a.
 - 48a) *Symphoricarpos oreophilus* $\geq 10\%$ cover, **ARTRV-SYOR2/PSSP6.**
 - 48b) *Symphoricarpos oreophilus* $< 10\%$ cover, lead 49a.
 - 49a) *Purshia tridentata* $\geq 5\%$ cover, lead 50a.
 - 50a) *Pseudoroegneria spicata* ≥ 1 , **ARTRV-PUTR2/PSSP6.**
 - 50b) *Pseudoroegneria spicata* < 1 , **ARTRV-PUTR2/POSE.**
 - 49b) *Purshia tridentata* $< 5\%$ cover, lead 51a.
 - 51a) *Leymus cinereus* $\geq 10\%$ cover, **ARTRV/LECI4.**
 - 51b) *Leymus cinereus* $< 10\%$ cover, lead 52a.
 - 52a) *Hesperostipa comata* $\geq 1\%$ cover, **ARTRV/HECO26.**
 - 52b) *Hesperostipa comata* $< 1\%$ cover, lead 53a.
 - 53a) *Pseudoroegneria spicata* $< 2\%$ cover, lead 54a.
 - 54a) *Festuca idahoensis* $\geq 1\%$ cover, **ARTRV/FEID.**
 - 54b) *Festuca idahoensis* $< 1\%$ cover, **ARTRV/POSE.**
 - 53b) *Pseudoroegneria spicata* $\geq 2\%$ cover, **ARTRV/PSSP6.**
 - 44b) *Artemisia tridentata* ssp. *vaseyana* < 3 , lead 55a.
 - 55a) *Chrysothamnus viscidiflorus* $< 5\%$ cover, lead 56a.
 - 56a) *Artemisia arbuscula* ssp. *arbuscula* $\geq 3\%$ cover, lead 57a.
 - 57a) *Pseudoroegneria spicata* $\geq 2\%$ cover, **ARARA/PSSP6.**
 - 57b) *Pseudoroegneria spicata* $< 2\%$ cover, lead 58a.
 - 58a) *Hesperostipa comata* is present, **ARARA/HECO26.**
 - 58b) *Hesperostipa comata* is not present, lead 59a.

- 59a) *Poa secunda* $\geq 2\%$ cover, **ARARA/POSE.**
- 59b) *Poa secunda* $< 2\%$ cover, **ARARA/BRTE.**
- 56b) *Artemisia arbuscula* ssp. *arbuscula* $< 3\%$ cover, lead 60a.
- 60a) *Artemisia arbuscula* ssp. *longiloba* $\geq 10\%$ cover, **ARARL/FEID.**
- 60b) *Artemisia arbuscula* ssp. *longiloba* $< 10\%$ cover, lead 61a.
- 61a) *Artemisia tridentata* ssp. *tridentata* $\geq 5\%$ cover, lead 62a.
- 62a) *Festuca idahoensis* $\geq 2\%$ cover, **ARTRT/FEID.**
- 62b) *Festuca idahoensis* $< 2\%$ cover, lead 63a.
- 63a) *Leymus cinereus* $\geq 2\%$ cover, **ARTRT/LECI4.**
- 63b) *Leymus cinereus* $\leq 2\%$ cover, lead 64a.
- 64a) *Pseudoroegneria spicata* $\geq 2\%$ cover,
ARTRT/PSSP6.
- 64b) *Pseudoroegneria spicata* $< 2\%$ cover, **ARTRT/POSE.**
- 61b) *Artemisia tridentata* ssp. *tridentata* $< 5\%$ cover, lead 65a.
- 65a) *Artemisia tripartita* spp. *tripartita* $\geq 2\%$ cover, lead 20a
(ARTRT2).
- 65b) *Artemisia tripartita* spp. *tripartita* $< 2\%$ cover, lead 66a.
- 66a) *Ericameria nana* $\geq 3\%$ cover, lead 67a.
- 67a) Tree cover $\geq 2\%$, lead 14a.
- 67b) Tree cover $< 2\%$, lead 107a.
- 66b) *Ericameria nana* $< 3\%$ cover, lead 68a.
- 68a) *Philadelphus lewisii* $> 2\%$ cover, **PHLE4/PEDE4.**
- 68b) *Philadelphus lewisii* $\leq 2\%$ cover, lead 69a.
- 69a) *Cercocarpus ledifolius* $\geq 5\%$ cover, **CELE3-
PUTR2/POSE.**
- 69b) *Cercocarpus ledifolius* $< 5\%$ cover, lead 70a.
- 70a) *Pinus flexilis* $\geq 1\%$ cover, **PIFL2/PUTR2.**
- 70b) *Pinus flexilis* $< 1\%$ cover, lead 71a.
- 71a) *Achnatherum thurberianum* $\geq 2\%$ cover,
PUTR2/ACTH7.
- 71b) *Achnatherum thurberianum* $< 2\%$ cover,
lead 72a.
- 72a) *Leymus cinereus* present,
PUTR2/LECI4.
- 72b) *Leymus cinereus* is absent, lead 73a.
- 73a) *Pseudoroegneria spicata* $\geq 2\%$
cover, **PUTR2/PSSP6.**
- 73b) *Pseudoroegneria spicata* $< 2\%$
cover, lead 74a.
- 74a) *Philadelphus lewisii* $\geq 1\%$
cover, **PUTR2-PHLE4/POSE.**
- 74b) *Philadelphus lewisii* $< 1\%$
cover, **PUTR2-ERNA7/PEDE4.**
- 55b) *Chrysothamnus viscidiflorus* $\geq 5\%$ cover, lead 75a.
- 75a) *Artemisia tripartita* spp. *tripartita* $\geq 3\%$ cover, lead 20a (ARTRT2).
- 75b) *Artemisia tripartita* spp. *tripartita* $< 3\%$ cover, lead 76a.

- 76a) Native grass composition <70% relative cover, lead 77a.
 - 77a) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) $\geq 2\%$ cover, **CHVI8/AGCR**.
 - 77b) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) <2% cover, **CHVI8/BRTE**.
- 76b) Native grass composition $\geq 70\%$ relative cover, lead 78a.
 - 78a) *Hesperostipa comata* $\geq 5\%$ cover, **CHVI8/HECO26**.
 - 78b) *Hesperostipa comata* <5% cover, lead 79a.
 - 79a) *Pseudoroegneria spicata* $\geq 5\%$ cover, **CHVI8/PSSP6**.
 - 79b) *Pseudoroegneria spicata* <5% cover, lead 80a.
 - 80a) *Achnatherum thurberianum* or *Pascopyrum smithii* (alone or in combination) $\geq 5\%$ cover, **CHVI8/PASM**.
 - 80b) *Achnatherum thurberianum* or *Pascopyrum smithii* (alone or in combination) <5% cover, **CHVI8/POSE-BRTE**.

Part C: Herbaceous Vegetation

- 81a) Relative cover of trees, shrubs, and dwarf-shrubs (combined) $\geq 21\%$, lead 82a.
 - 82a) *Artemisia tridentata* spp. *wyomingensis* <3% cover, lead 83a.
 - 83a) *Artemisia tridentata* spp. *wyomingensis* and *Chrysothamnus viscidiflorus*, combined, <6% cover, lead 84a.
 - 84a) *Artemisia tripartita* spp. *tripartita* $\geq 3\%$ cover, lead 20a (ARTRT2).
 - 84b) *Artemisia tripartita* spp. *tripartita* <3% cover, lead 85a.
 - 85a) *Artemisia tridentata* ssp. *vaseyana* $\geq 3\%$ cover, lead 44a (ARTRV).
 - 85b) *Artemisia tridentata* ssp. *vaseyana* <3% cover, lead 86a.
 - 86a) *Artemisia arbuscula* ssp. *arbuscula* $\geq 4\%$ cover, lead 56a (ARARA).
 - 86b) *Artemisia arbuscula* ssp. *arbuscula* <4% cover, lead 87a.
 - 87a) *Ericameria nana* is present, lead 88a.
 - 88a) Total vegetative cover $\geq 10\%$, lead 67a.
 - 88b) Total vegetative cover <10%, lead 107a.
 - 87b) *Ericameria nana* is absent, lead 90a.
 - 83b) *Artemisia tridentata* spp. *wyomingensis* and *Chrysothamnus viscidiflorus*, combined, $\geq 6\%$ cover, lead 75a (CHVI8).
 - 82b) *Artemisia tridentata* spp. *wyomingensis* $\geq 3\%$ cover, lead 89a.
 - 89a) *Artemisia tridentata* spp. *wyomingensis* and *Chrysothamnus viscidiflorus*, combined, $\geq 6\%$ cover, lead 31a (ARTRW8).
 - 89b) *Artemisia tridentata* spp. *wyomingensis* and *Chrysothamnus viscidiflorus*, combined, <6% cover, lead 81b.
- 81b) Relative cover of trees, shrubs, and dwarf-shrubs (combined) <21%, lead 90a.
 - 90a) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) $\geq 3\%$ cover, **AGCR-BRTE**.
 - 90b) *Agropyron cristatum* or *Agropyron fragile* (alone or in combination) <3% cover, lead 91a.
 - 91a) Native grass composition <39% relative cover, lead 92a.
 - 92a) *Sisymbrium altissimum* $\geq 3\%$ cover, **SIAL2/BRTE**.
 - 92b) *Sisymbrium altissimum* <3% cover, lead 93a.

- 93a) Combined cover of native perennial grass species (*Achnatherum hymenoides*, *Achnatherum thurberianum*, *Elymus elymoides*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Pascopyrum smithii*, *Poa secunda*, or *Pseudoroegneria spicata*) $\geq 3\%$ cover, **POSE-BRTE**.
- 93b) Combined cover of native perennial grass species $< 3\%$ cover, **BRTE**.
- 91b) Native grass composition $\geq 39\%$ relative cover, lead 94a.
- 94a) *Hesperostipa comata* $\geq 10\%$ cover, **HECO26-POSE**.
- 94b) *Hesperostipa comata* $< 10\%$ cover, lead 95a.
- 95a) *Bromus tectorum* $\geq 2\%$ cover, lead 96a.
- 96a) *Achnatherum thurberianum* $\geq 5\%$ cover, **ACTH7-BRTE**.
- 96b) *Achnatherum thurberianum* $< 5\%$ cover, **POSE-BRTE**.
- 95b) *Bromus tectorum* $< 2\%$ cover, lead 97a.
- 97a) *Elymus lanceolatus* $\geq 3\%$ cover, **ELLA3/LUAR3**.
- 97b) *Elymus lanceolatus* $< 3\%$ cover, lead 98a.
- 98a) *Festuca idahoensis* $\geq 2\%$ cover, **FEID-PSSP6**.
- 98b) *Festuca idahoensis* $< 2\%$ cover, lead 99a.
- 99a) *Leymus cinereus* $\geq 2\%$ and *Pseudoroegneria spicata* $< 1\%$ cover, **LECI4**.
- 99b) *Leymus cinereus* $< 2\%$ cover, lead 100a.
- 100a) *Pascopyrum smithii* $\geq 3\%$ cover, **PASM**.
- 100b) *Pascopyrum smithii* $< 3\%$ cover, lead 101a.
- 101a) *Pseudoroegneria spicata* $\geq 3\%$ cover, lead 102a.
- 102a) *Melica bulbosa* $\geq 3\%$ cover, **PSSP6-MEBU/ARAC2**.
- 102b) *Melica bulbosa* $< 3\%$ cover, lead 103a.
- 103a) *Balsamorhiza sagittata* $\geq 5\%$ cover, **PSSP6-POSE/BASA3**.
- 103b) *Balsamorhiza sagittata* $< 5\%$ cover, lead 104a.
- 104a) *Poa secunda* $< 2\%$ cover, **PSSP6/CRAC2**.
- 104b) *Poa secunda* $\geq 2\%$ cover, **PSSP6-POSE**.
- 101b) *Pseudoroegneria spicata* $< 3\%$ cover, lead 105a.
- 105a) *Leptodactylon pungens* is present, **POSE/LEPU**.
- 105a) *Leptodactylon pungens* is not present, **POSE**.

Part D: Sparse Vegetation

- 106a) *Agropyron cristatum* $\geq 2\%$ cover, **AGCR**.
- 106b) *Agropyron cristatum* $< 2\%$ cover, lead 107a.
- 107a) *Ericameria nana* present, lead 108a.
- 108a) *Juniperus scopulorum* or *Juniperus osteosperma* (alone or in combination) $\geq 1\%$ cover, **JUSC2-JUOS/ERNA7**.
- 108b) *Juniperus scopulorum* or *Juniperus osteosperma* (alone or in combination) $< 1\%$ cover, lead 109a.
- 109a) *Holodiscus dumosus* $\geq 1\%$ cover, **ERNA7-HODU/PEDE4**.
- 109b) *Holodiscus dumosus* $< 1\%$ cover, lead 110a.
- 110a) *Purshia tridentata* $\geq 1\%$ cover, **PUTR2-ERNA7/PEDE4**.
- 110b) *Purshia tridentata* $< 1\%$ cover, **ERNA7/POSE/PEDE4**.

- 107b) *Ericameria nana* is not present, lead 111a.
 - 111a) *Philadelphus lewisii* is not present, lead 112a.
 - 112a) *Juniperus osteosperma* \geq 1% cover, **JUOS/ARTRW8/HECO26.**
 - 112b) *Juniperus osteosperma* <1% cover, lead 113a.
 - 113a) *Purshia tridentata* is present, lead 114a.
 - 114a) *Leymus cinereus* is present, **PUTR2/LECI4.**
 - 114b) *Leymus cinereus* is not present, **PUTR2-ERNA7/PEDE4.**
 - 113b) *Purshia tridentata* is not present, lead 115a.
 - 115a) *Eriogonum ovalifolium* var. *depressum* is present, **EROVD.**
 - 115b) *Eriogonum ovalifolium* var. *depressum* is not present, lead 116a.
 - 116a) *Chamaebatiaria millefolium* is present, **CHMI2/PEDE4.**
 - 116b) *Chamaebatiaria millefolium* is not present, lead 117a.
 - 117a) *Ericameria nana* and *Holodiscus dumosus* each are present, **ERNA7/POSE/PEDE4.**
 - 117b) *Ericameria nana* and *Holodiscus dumosus* each are not present, **POSE/LEPU.**
 - 111b) *Philadelphus lewisii* is present, lead 118a.
 - 118a) *Purshia tridentata* \geq 1% cover, **PUTR2-PHLE3/POSE.**
 - 118b) *Purshia tridentata* <1% cover, lead 119a.
 - 119a) *Pinus flexilis* \geq 1% cover, **PIFL2/CHMI2/POSE.**
 - 119b) *Pinus flexilis* <1% cover, **PHLE4/PEDE4.**

Appendix D – Vegetation Association Descriptions

U.S. NATIONAL VEGETATION CLASSIFICATION

Craters of the Moon National Monument and Preserve

February 19, 2009

By

S.M. Stoller Corporation
120 Technology Drive
Idaho Falls, Idaho 83402

Northwest Management, Inc.
PO Box 9748
Moscow, Idaho 83843

And

NPS – Upper Columbia Basin Network
University of Idaho
College of Natural Resources
Moscow, Idaho 83843

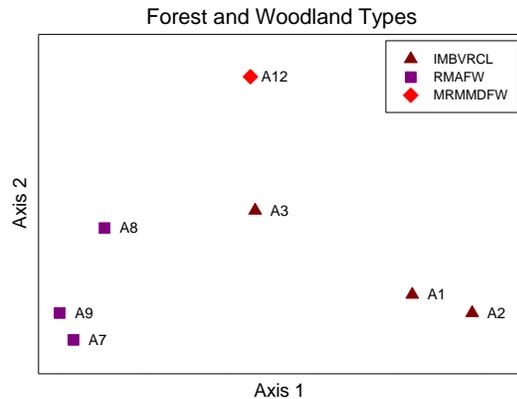


This subset of the U.S. National Classification covers vegetation associations and alliances attributed to Craters of the moon National Monument and Preserve. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications.

A1

Juniper (Utah, Rocky Mountain) / Wyoming Big Sagebrush - Fernbush Woodland

Juniperus (osteosperma, scopulorum) / Artemisia tridentata ssp. wyomingensis - Chamaebatiaria millefolium Woodland



Description

The vegetation in this association is characterized by an open tree canopy dominated by *Juniperus osteosperma* and/or *Juniperus scopulorum*. Tree canopy cover values are more than 5%, but are typically less than 20%, and canopy height is usually 2-10 m. *Artemisia tridentata* ssp. *wyomingensis* and *Chamaebatiaria millefolium* dominate the sparse to moderately dense shrub layer. Other shrubs, such as *Purshia tridentata*, *Ericameria nauseosa*, or *Ericameria nana*, may be present but generally with low cover. The sparse herbaceous layer is dominated by graminoids including *Poa secunda* and the introduced annual, *Bromus tectorum*. Associated forbs may include *Chaenactis douglasii*, *Leptodactylon pungens*, as well as other perennial and/or annual species. Forb cover is generally low and varies annually depending on precipitation levels.

This association is included in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System. This ecological system is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 7, AA)

Tree

Juniperus osteosperma (Utah juniper) V.11, *Juniperus scopulorum* (Rocky Mountain juniper) V.4

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.6, *Chamaebatiaria millefolium* (fernbush) V.2, *Purshia tridentata* (antelope bitterbrush) V.1, *Ericameria nauseosa* (rubber rabbitbrush) IV.1

Dwarf-shrub

Ericameria nana (dwarf goldenbush) V.2

Graminoid

Poa secunda (Sandberg bluegrass) V.5, *Bromus tectorum* (cheatgrass) V.2

Forb

Penstemon deustus (scabland penstemon) V.3, *Leptodactylon pungens* (granite prickly phlox) V.2, *Stephanomeria minor* (narrowleaf wirelettuce) V.1, *Chaenactis douglasii* (Douglas' dustymaiden) IV.1, *Lactuca serriola* (prickly lettuce) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is not common within Craters of the Moon and is restricted to the sparsely vegetated basalt from approximately Laidlaw Park and south.

Global

This association has the potential to occur throughout the range of Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System. This ecological system occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

Fires in this association are thought to be infrequent because smaller *Juniperus osteosperma* and *Artemisia tridentata* are easily killed by burns and do not resprout. In addition, many stands have an open canopy with insufficient understory to carry fire. This community may show immense variability in annual forb cover. Grazing, precipitation and other factors are likely to influence the presence and/or absence of annuals and invasives.

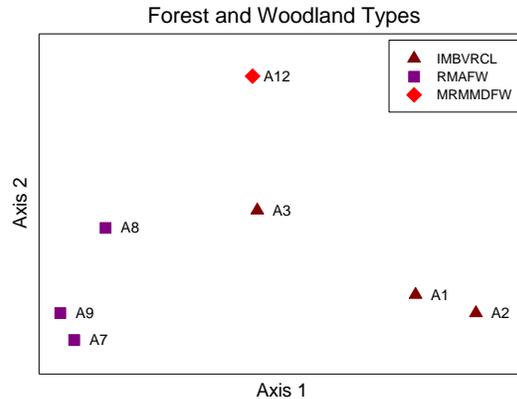
This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

Rocky Mountain Juniper / Sandberg Bluegrass / Scabland Penstemon Woodland

Juniperus scopulorum / *Poa secunda* / *Penstemon deustus* Woodland



Description

This association is characterized by an open tree canopy dominated by *Juniperus scopulorum*. *Juniperus osteosperma* is often present in the canopy as well, but with lower constancy and lower cover. Tree canopy cover values are more than 5%, but typically less than 20%, and canopy height is usually 2-10 m. Shrubs such as *Purshia tridentata*, *Ericameria nauseosa*, or *Ericameria nana* occur regularly in the shrub stratum but generally with very low cover. The sparse herbaceous layer is dominated by graminoids such as *Poa secunda* and the introduced annual, *Bromus tectorum*. Associated forbs may include *Potentilla glandulosa* and *Leptodactylon pungens*. *Penstemon deustus* is always present in the understory. However, total forb cover is generally sparse.

This association is included in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System. The ecological system is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 14, AA)

Tree

Juniperus scopulorum (Rocky Mountain juniper) V.20, *Juniperus osteosperma* (Utah juniper) III.4

Shrub

Ericameria nauseosa (rubber rabbitbrush) V.1, *Purshia tridentata* (antelope bitterbrush) IV.2

Dwarf-shrub

Ericameria nana (dwarf goldenbush) IV.1

Graminoid

Bromus tectorum (cheatgrass) V.1, *Poa secunda* (Sandberg bluegrass) V.1

Forb

Penstemon deustus (scabland penstemon) V.1, *Leptodactylon pungens* (granite prickly phlox) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is not common within Craters of the Moon and is restricted to sparsely vegetated volcanic flows consisting mainly of pahoehoe or block lava.

Global

This association has the potential to occur throughout the range of Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System. This ecological system occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Penstemon deustus*, is always present and is a characteristic species in this association. However, its cover is often very low, generally under 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

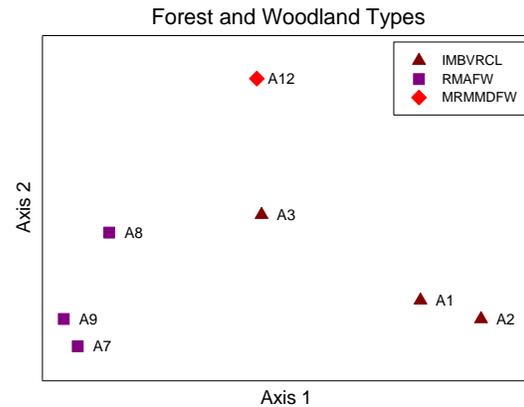
A3**Limber Pine / Antelope Bitterbrush Woodland***Pinus flexilis* / *Purshia tridentata* Woodland**Description**

This association is characterized by an open canopy of the needle-leaved, evergreen tree *Pinus flexilis*. These trees are of a lower stature than typical examples of this species, reaching only 5 m in height. A shrub layer is present in this vegetation type, and it is dominated by the broad-leaved, deciduous species *Purshia tridentata*, also growing in a shorter form than found in more favorable locations. Several other shrubs are also regularly associated with this plant community, including *Ericameria nauseosa*, *Ribes cereum*, *Chamaebatiaria millefolium*, and *Artemisia tridentata* ssp. *vaseyana*. Total shrub cover is generally moderate. The herbaceous layer is diverse but not abundant in terms of cover. The most important graminoid is the perennial bunchgrass *Poa secunda*. The most common forbs include perennials such as *Eriogonum umbellatum*, *Eriogonum ovalifolium*, *Delphinium andersonii*, and *Phacelia hastata*.

This plant association tends to occur on relatively recent mafic volcanic flow substrates. It may also occur on young to medium-aged cinder cones. The best stand development occurs on the highly fissured and mounded olivine pahoehoe basalt. The undulating terrain consists of alternating lava pressure ridges and valleys created through the collapse of lava tubes. Soils are poorly developed and consist of wind-blown sand or decomposed plant litter. The surface of the pahoehoe basalt is hot and dry. However, ameliorating effects of the thick basalt slabs on soil moisture and temperature may result in relatively mesic growing environments. Soil and snow collect in these depressions, and they provide reduced exposure to desiccating winds and solar radiation.

CONSERVATION RANK G1**DATABASE CODE** CEGL000814**CHARACTERISTIC SPECIES** (n = 16, AA)**Tree***Pinus flexilis* (limber pine) V.10**Shrub***Purshia tridentata* (antelope bitterbrush) V.9, *Ericameria nauseosa* (rubber rabbitbrush) V.3, *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) IV.10, *Ribes cereum* (wax currant) IV.1**Dwarf-shrub**

None

Graminoid*Poa secunda* (Sandberg bluegrass) V.1**Forb***Delphinium andersonii* (Anderson's larkspur) V.<1, *Eriogonum umbellatum* (sulphur-flower buckwheat) V.<1,

Phacelia hastata (silverleaf phacelia) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in the northern part of Craters of the Moon, and although it is not particularly common anywhere, it is more likely to be found within the old monument boundary associated with “cinder soils.”

Global

This narrowly endemic plant association occurs in a semi-arid climatic region, on recent, unweathered mafic volcanic flows of the Snake River Plain, Idaho. Several stands of the plant association occur within Craters of the Moon National Monument and Preserve.

COMMENTS

The conservation status ranking of this plant community designates it as critically imperiled. The range of this association is very limited. Most stands are believed to be in a stable, high-quality condition. This plant association may, however, be vulnerable to invasion by exotic grass species and some loss of limber pine to white pine blister rust is also occurring.

MAP UNITS

Enter CRMO-specific information.

A4

Black Cottonwood Temporarily Flooded Woodland Alliance

Populus balsamifera ssp. *trichocarpa* Temporarily Flooded Woodland Alliance



Description

This woodland community has an open canopy, ranging from 15-60% cover, which is dominated by *Populus balsamifera* ssp. *trichocarpa*. This Alliance can be quite variable in composition from one stand to another at Craters of the Moon. Shrub cover is generally low and the shrub layer may include *Artemisia tridentata* ssp. *vaseyana*, *Ericameria nauseosa*, *Symphoricarpos oreophilus*, and *Ribes aureum*. Herbaceous cover tends to be sparse and variable, consisting of primarily mesic forbs such as *Solidago canadensis*, *Angelica pinnata*, and *Galium bifolium*.

The Black Cottonwood Temporarily Flooded Woodland Alliance is a group of low-elevation plant communities associated with streams at and below lower treeline, including permanent, intermittent and ephemeral streams with woody riparian vegetation. This Alliance may also occur in temporarily flooded depressions on basalt at Craters of the Moon. These woodlands generally require flooding and some gravels for reestablishment. Sites are subject to temporary flooding during spring runoff. Underlying gravels may keep the water table just below the ground surface and are favored substrates for cottonwood.

CONSERVATION RANK N/A

DATABASE CODE A.635

CHARACTERISTIC SPECIES (n = 2, AA)

Tree

Populus balsamifera ssp. *trichocarpa* (black cottonwood) V.15

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.3, *Ribes aureum* (golden currant) V.1, *Ericameria nauseosa* (rubber rabbitbrush) V.<1

Dwarf-shrub

None

Graminoid

None

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is not common within Craters of the Moon and is found at sites with higher available moisture such as potholes or along drainages.

Global

This alliance is found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.

COMMENTS

This alliance is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This plant community was only classified to the alliance level at Craters of the Moon due to limited plot data and high variability among stands.

MAP UNITS

Enter CRMO-specific information.

A5

Quaking Aspen – Limber Pine Forest

Populus tremuloides – *Pinus flexilis* Forest



Description

Populus tremuloides dominates the tree overstory, and *Pinus flexilis* contributes substantial cover to this forest plant community. Other conifers may be present, but *Pinus flexilis* clearly contributes more cover. The composition of the undergrowth varies widely among stands, and no one understory species is constant across all stands. The large amount of *Pinus flexilis* in the overstory, relative to other conifers, sets this association apart from other *Populus tremuloides* - conifer associations.

Stands generally grow on fairly steep, south-facing slopes with a variety of geologic substrates.

CONSERVATION RANK G2

DATABASE CODE C EGL000540

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

Populus tremuloides (quaking aspen), *Pinus flexilis* (limber pine)

Shrub

N/A

Dwarf-shrub

N/A

Graminoid

N/A

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is very uncommon within Craters of the Moon, but may be found in the northern part of the park within the old monument boundary.

Global

This mixed deciduous-and-evergreen woodland is found primarily on the Colorado Plateau and in the Great Basin, from the Gros Ventre Mountains of northwestern Wyoming south to the Paunsaugunt Plateau of southern Utah, and west to the Snake Mountains of eastern Nevada.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

The conservation status of this association is ranked as imperiled and its ranking is based on the assumption that this association occurs over a fairly wide geographic range, but that there are few occurrences within that range and that the stands are small.

MAP UNITS

Enter CRMO-specific information.



Description

This association is characterized by *Populus tremuloides* as the dominant species in the tall-shrub or tree canopy. The canopy varies from 10-30 meters in height. Occasional emergent conifers may be present. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub. *Symphoricarpos oreophilus* may also be present in the shrub layer. Graminoid species are typically present at low cover values and may include *Poa secunda* and *Koeleria macrantha*. Forb cover is generally also low, but species composition may be diverse and variable. Component forbs may include *Lupinus arbustus*, *Achillea millefolium*, *Collomia linearis*, *Potentilla glandulosa*, *Taraxacum officinale*, and *Viola nuttallii*.

This association is typically found on seasonally saturated soils on lower to middle slopes.

CONSERVATION RANK G3

DATABASE CODE C EGL000572

CHARACTERISTIC SPECIES (n = 2, AA)

Tree

Populus tremuloides (quaking aspen) V.15

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.8, *Symphoricarpos oreophilus* (mountain snowberry) V.3

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.1, *Koeleria macrantha* (prairie Junegrass) V.<1

Forb

Lupinus arbustus (longspur lupine) V.1, *Achillea millefolium* (common yarrow) V.<1, *Collomia linearis* (tiny trumpet) V.<1, *Potentilla glandulosa* (sticky cinquefoil) V.<1, *Taraxacum officinale* (common dandelion) V.<1, *Viola nuttallii* (Nuttall's violet) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is very uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93.

Global

This association is known from the montane areas of the western United States including Wyoming, California, Utah, Nevada, and Idaho; it is fairly widespread but not very abundant.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

The conservation rank for this association is designated as vulnerable because there is concern about the long-term viability of this vegetation type.

MAP UNITS

Enter CRMO-specific information.

A7

Quaking Aspen / Pinegrass Forest

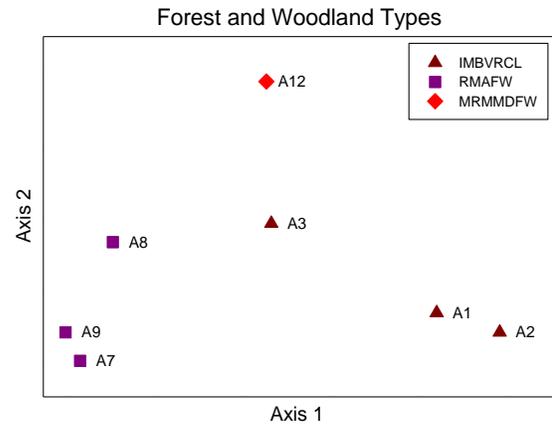
Populus tremuloides / *Calamagrostis rubescens* Forest



Description

Populus tremuloides strongly dominates the overstory of this plant community. The canopy varies from 10-30 meters in height. *Pinus flexilis* may occur with some regularity at very low cover. Shrubs such as *Symphoricarpos oreophilus*, *Artemisia tridentata* ssp. *vaseyana*, *Amelanchier alnifolia*, *Prunus virginiana*, and various *Salix* spp. may occasionally be present but sporadic resulting in a very sparse shrub layer. The herbaceous undergrowth is dominated by *Calamagrostis rubescens*. Other common graminoids include *Achnatherum nelsonii*, *Koeleria macrantha*, *Leymus cinereus*, and *Pseudoroegneria spicata*. Forb cover is generally also low, but species composition may be diverse and variable. Component forbs may include *Achillea millefolium*, *Asteraceae* spp., *Lupinus argenteus*, *Pteryxia terebinthina*, and *Taraxacum officinale*.

This association occurs on benches and slopes irrespective of slope steepness or aspect. Parent materials can be variable for soils supporting this association.



CONSERVATION RANK G5

DATABASE CODE CEGL000575

CHARACTERISTIC SPECIES (n = 6, AA)

Tree

Populus tremuloides (quaking aspen) V.20

Shrub

Symphoricarpos oreophilus (mountain snowberry) V.2, *Prunus virginiana* (chokecherry) IV.1

Dwarf-shrub

None

Graminoid

Calamagrostis rubescens (pinegrass) V.19

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93.

Global

This association is known from north-central Washington, Idaho, northern Utah, western Wyoming, and Montana, and may also occur in Nevada, Oregon and Alberta.

COMMENTS

This community is characterized by both high canopy cover and high cover of herbaceous plants, especially pinegrass. It is also found on neighboring property bordering Craters of the Moon.

MAP UNITS

Enter CRMO-specific information.

A8**Quaking Aspen / Chokecherry Forest***Populus tremuloides* / *Prunus virginiana* Forest**Description**

This association is co-dominated by *Populus tremuloides* and *Prunus virginiana*. The shrub layer can be a rich multilayered mixture of medium- and low-height shrubs. Additional shrub associates may include *Amelanchier alnifolia*, *Ribes aureum*, *Salix boothii*, and *Symphoricarpos oreophilus*. Herbaceous species may have low cover due to the well-developed shrub layer. Component graminoid species commonly include *Achnatherum nelsonii*, *Leymus cinereus*, and *Pseudoroegneria spicata*, *Agastache urticifolia*, *Angelica pinnata*, *Asteraceae* spp., *Galium bifolium*, *Maianthemum stellatum*, and *Taraxacum officinale* are the most constant forbs in this plant community.

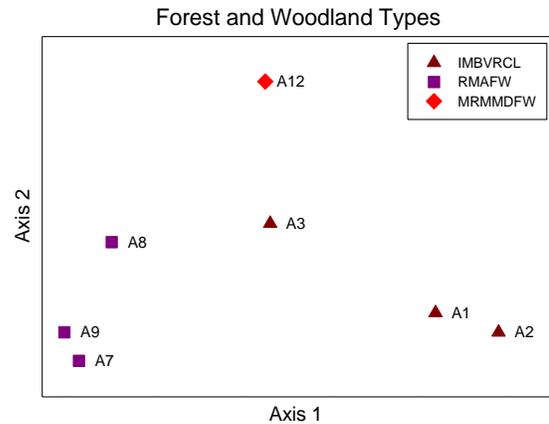
This aspen forest type occurs on slope crests and midslopes with sandy loam, loam, or clay loam soils. Aspects are highly variable, and slopes are primarily gentle (0-20%) but may be steep (50-100%).

CONSERVATION RANK G3**DATABASE CODE** C EGL000596**CHARACTERISTIC SPECIES** (n = 4, AA)**Tree***Populus tremuloides* (quaking aspen) V.19**Shrub***Prunus virginiana* (chokecherry) V.19, *Symphoricarpos oreophilus* (mountain snowberry) IV.4**Dwarf-shrub**

None

Graminoid*Pseudoroegneria spicata* (Bluebunch wheatgrass) III.2**Forb**

None



RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93.

Global

This aspen forest type is found in the Rocky Mountains and Black Hills of the western United States, ranging from South Dakota west to Wyoming, Idaho and Oregon, and south to Colorado and Utah.

COMMENTS

This community has a relatively restricted range. Stands are somewhat patchy on the landscape, with relatively small occurrences. They require a moderately specific set of abiotic factors, being found in drainage bottoms, with or without flowing streams. The restriction of this type to primarily riparian areas or moist drainages makes it susceptible to impacts caused by cattle grazing, especially at lower elevations.

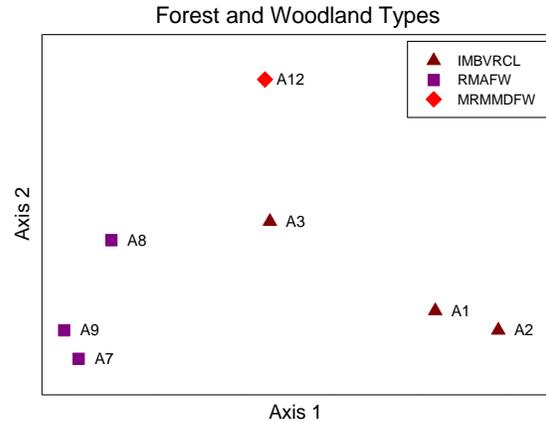
MAP UNITS

Enter CRMO-specific information.

A9**Quaking Aspen / Mountain Snowberry / Pinegrass Forest***Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest**Description**

The undergrowth of this association is much less complex than that of other *Populus tremuloides* associations. The simple herbaceous understory is dominated by graminoids. *Populus tremuloides* is generally the only tree species in the overstory and the canopy varies from 10-30 meters in height. Conifers, if present, are incidental. A shrub layer is prominent and is usually dominated by *Symphoricarpos oreophilus*. Other shrubs may occur in this plant community including *Rosa woodsii*, *Amelanchier alnifolia*, *Artemisia* spp., and *Prunus virginiana* which are frequently present but never abundant. The herbaceous layer is normally dense and is dominated by graminoids. *Calamagrostis rubescens* typically occurs with relatively high abundance. Other graminoids frequently occurring include *Achnatherum nelsonii*, *Koeleria macrantha*, *Leymus cinereus*, *Poa secunda*, and *Pseudoroegneria spicata*. Several forbs are usually present, but with much lower abundance than the graminoid species. Forb species composition may be diverse and variable and may include *Achillea millefolium*, *Asteraceae* spp., *Balsamorhiza sagittata*, *Crepis acuminata*, *Potentilla glandulosa*, and *Taraxacum officinale*.

Stands occur on slopes that are gentle to moderately steep, on any exposure, but never along stream bottoms.

**CONSERVATION RANK** G4**DATABASE CODE** CEGL000612**CHARACTERISTIC SPECIES** (n = 8, AA)**Tree***Populus tremuloides* (quaking aspen) V.25**Shrub***Symphoricarpos oreophilus* (mountain snowberry) V.11, *Prunus virginiana* (chokecherry) IV.1**Dwarf-shrub**

None

Graminoid*Calamagrostis rubescens* (pinegrass) IV.10, *Achnatherum nelsonii* (Columbia needlegrass) III.2**Forb***Achillea millefolium* (common yarrow) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93.

Global

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.

COMMENTS

None.

MAP UNITS

Enter CRMO-specific information.



Description

The vegetation of this association is structurally simple but may be compositionally complex. The canopy is dominated by *Populus tremuloides*, with occasional occurrences of conifer species. Shrubs are virtually absent from this type. The herbaceous layer is characterized by the presence of several species of mesic 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 tall-stature forbs, the absence of distinct shrub layers, and a lack of substantial amounts of conifers in the tree layer. No one member of the tall-forb functional group is consistently dominant or even present, but as a group they form the dominant cover of the herbaceous layer. Forb species in streambank stands can be different from hillside stands.

Stands occupy 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. They are generally found on concave landforms where moisture can accumulate, rarely on convex topography. Aspect is variable, but many easterly or northerly stands are reported in the literature. Soils underlying this community type are derived from alluvial deposition of a variety of parent materials. The soils are deep, well-drained loams, sandy loams to clay loams in texture.

CONSERVATION RANK G5

DATABASE CODE CEGL000618

CHARACTERISTIC SPECIES (n = 0, AA)

Tree

Populus tremuloides (quaking aspen)

Shrub

N/A

Dwarf-shrub

N/A

Graminoid

N/A

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is very uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93, with some occurrences on adjacent property.

Global

This deciduous forest association occurs in the southern and central Rocky Mountains and plateaus and mountains of the Colorado Plateau and extends into the Jarbridge and Independence Mountains of northeastern Nevada and into southwestern Montana.

COMMENTS

This plant community is believed to occur at Craters of the Moon National Monument and Preserve and was retained in the list of plant communities for the site although none of the sampled plots were specifically assigned to this association. Consequently, a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

MAP UNITS

Enter CRMO-specific information.

A11**Douglas-fir / Geyer's Sedge Forest***Pseudotsuga menziesii* / *Carex geyeri* Forest**Description**

This is an association dominated by the evergreen, needle-leaved tree, *Pseudotsuga menziesii*; other canopy trees may also be present. The canopy ranges from nearly closed to slightly more open, with larger, more widely spaced trees. There is no distinct shrub layer, although several shrub or dwarf-shrub species are often present with sparse cover. The herbaceous layer is dominated by the perennial sedge *Carex geyeri*. Generally, no other herbaceous species are well-represented, but many different forbs can occur at low abundance.

Stands occur at lower montane elevations on sites typically drier than most other *Pseudotsuga menziesii* associations. Slope and aspect of sites vary greatly. Slopes may vary from gentle to very steep but are generally moderate to steep. Soils are rapidly drained loamy sand to silty clay loams.

CONSERVATION RANK G4**DATABASE CODE** CEGL000430**CHARACTERISTIC SPECIES** (n = 0, AA)**Tree***Pseudotsuga menziesii* (Douglas-fir)**Shrub**

N/A

Dwarf-shrub

N/A

Graminoid*Carex geyeri* (Geyer's sedge)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is most likely to occur at the northern boundary of Craters of the Moon and at higher elevations within the Monument.

Global

This association has been found in the montane zone throughout much of the Rocky Mountains from Colorado to Montana, and west into Oregon and Washington.

COMMENTS

This plant community is believed to occur at Craters of the Moon National Monument and Preserve and was retained in the list of plant communities for the site although none of the sampled plots were specifically assigned to this association. Consequently a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

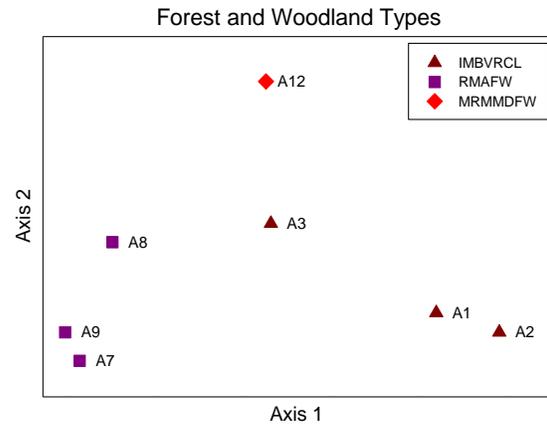
MAP UNITS

Enter CRMO-specific information.

A12**Douglas-fir / Mountain Snowberry Forest***Pseudotsuga menziesii* / *Symphoricarpos oreophilus* Forest**Description**

This forested vegetation type is characterized by a moderate to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with scattered large *Pinus flexilis*, *Populus tremuloides*, or *Juniperus scopulorum* individuals. *Symphoricarpos oreophilus* is present and usually dominates the sparse to moderately dense shrub layer. Shrub associates vary depending on location and may include sparse cover of *Amelanchier* spp., *Artemisia tridentata* ssp. *vaseyana*, *Prunus virginiana*, *Ribes aureum*, *Ribes cereum*, *Rosa woodsii*, and *Salix* spp. The generally sparse herbaceous layer is comprised of graminoids and scattered forbs. Associated graminoids may include *Bromus tectorum*, *Poa secunda*, and *Pseudoroegneria spicata*. The most common forb species is *Balsamorhiza sagittata*.

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 in narrow riparian areas in ravines, canyons, and up steep draws. It often continues upland on steep north-facing slopes in narrow canyons. Soils are variable and range from deep loamy sands, silt loams, silty clay loams, and sandy clay loams to shallow, rocky substrates. Parent materials are also variable. Most stands have abundant litter on the ground, and some have high rock cover.

**CONSERVATION RANK** G5**DATABASE CODE** CEGL000462**CHARACTERISTIC SPECIES** (n = 8, AA)**Tree***Pseudotsuga menziesii* (Douglas-fir) V.24**Shrub***Prunus virginiana* (chokecherry) III.13, *Symphoricarpos oreophilus* (mountain snowberry) III.5**Dwarf-shrub**

None

Graminoid*Pseudoroegneria spicata* (bluebunch wheatgrass) IV.1**Forb***Balsamorhiza sagittata* (arrowleaf balsamroot) III.5

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon within Craters of the Moon and may be found in the foothills to the north-northwest of State Highway 20/26/93.

Global

This widespread montane forest association occurs in foothills, mountains and plateaus from southwestern Montana through Wyoming and Colorado to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington.

COMMENTS

This association occurs over a wide range of environmental conditions. Where precipitation, soil moisture 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*. Often the coarse, colluvial substrates provide deep moisture for trees and shrubs but little near-surface moisture for an herbaceous layer.

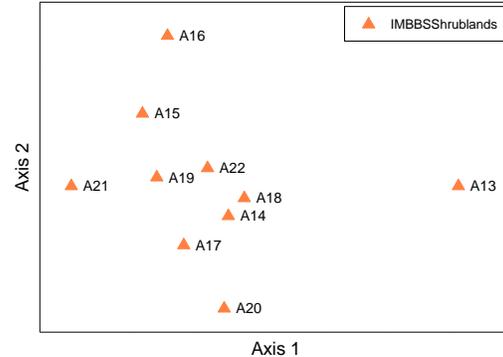
Both diagnostic species are tolerant of ground fire. *Pseudotsuga menziesii* develops thick fire-resistant bark with age and *Symphoricarpos oreophilus* resprouts after burning.

MAP UNITS

Enter-CRMO specific information.

A13**Wyoming Big Sagebrush / Indian Ricegrass Shrubland***Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum hymenoides* Shrubland

Inter-Mountain Basins Big Sagebrush Shrublands

**Description**

This association is characterized by an open to dense (10-75% cover) shrub canopy (to 1 m tall) dominated by *Artemisia tridentata* ssp. *wyomingensis*, with the bunchgrass *Achnatherum hymenoides* conspicuous in a patchy open herbaceous layer. Other shrub species may include *Artemisia tripartita*, *Chrysothamnus viscidiflorus*, *Purshia tridentata* and occasionally *Symphoricarpos oreophilus*. The herbaceous layer is diverse and variable, providing low to moderate cover. Associated graminoids generally include but are not limited to *Elymus elymoides*, *Hesperostipa comata*, *Poa secunda*, and the introduced grass *Bromus tectorum*. *Bromus tectorum* typically occurs at relatively low cover. Forbs are variable, provide sparse cover, and may include *Allium* spp., *Castilleja pallescens*, *Crepis acuminata*, *Leptodactylon pungens*, *Erigeron* spp., and *Phlox hoodii*. Mosses and lichens may also provide sparse to low cover.

This shrubland association occurs on slopes and terraces above drainages and ridges. Sites are gentle to steep colluvial slopes and alluvial benches often on warmer southeast to southwest aspects. Substrates are variable but are typically moderately deep, well-drained soils with sandy clay loam, sandy loam and loam textures. The ground surface has high cover of large and small rocks, low to moderate cover of litter, and occasionally high cover of bare ground.

CONSERVATION RANK G5**DATABASE CODE** CEGL001046**CHARACTERISTIC SPECIES** (n = 5, AA)**Tree**

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.12, *Artemisia tripartita* (threetip sagebrush) III.3, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.1

Dwarf-shrub

None

Graminoid

Achnatherum hymenoides (Indian ricegrass) V.1, *Poa secunda* (Sandberg bluegrass) IV.4, *Bromus tectorum* (cheatgrass) III.4

Forb

Allium spp. (onion) III.1

RANGE

Craters of the Moon National Monument and Preserve

This association can be found from approximately Laidlaw Park to the south, usually in locations with better soil development such as kipukas, but can also occur on well-vegetated basalt with minimal soil accumulation.

Global

This sagebrush shrubland association is known from the Gunnison River Valley and the Piceance Basin in western Colorado and the Columbia Basin in Oregon and Idaho, and possibly California. It is also recognized as occurring in the Upper Snake River Plain and Great Rift regions of southeast and south-central Idaho.

COMMENTS

Although *Achnatherum hymenoides* is always present in this association, other grass species, such as *Poa secunda*, may occasionally be more locally abundant in communities at Craters of the Moon.

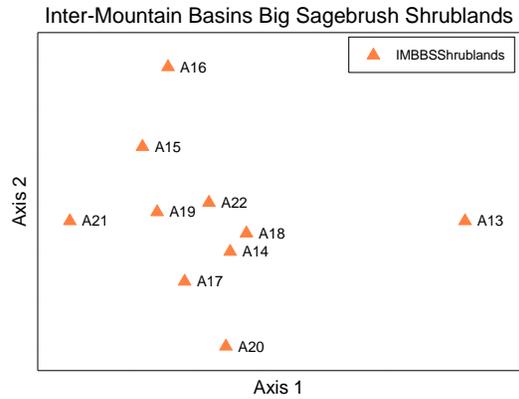
MAP UNITS

Enter CRMO-specific information.

A14

Wyoming Big Sagebrush / Thurber's Needlegrass Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Achnatherum thurberianum* Shrubland



Description

Artemisia tridentata ssp. *wyomingensis* forms an open, medium-tall shrub canopy in this shrubland association. *Achnatherum thurberianum* is abundant in the understory; *Poa secunda* and *Bromus tectorum* are also common to well-represented. *Bromus tectorum* typically occurs at relatively low cover levels. Commonly associated perennial forbs include *Phlox longifolia*, *Allium* spp., *Gayophytum* spp., *Orthocarpus* spp., and *Lomatium nudicaule*.

The association occurs on gentle slopes with convex or straight microtopography in mid- and upper-slope positions. Soils are typically silt loams.

CONSERVATION RANK G2

DATABASE CODE CEGL001052

CHARACTERISTIC SPECIES (n = 13, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.8, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.3

Dwarf-shrub

None

Graminoid

Achnatherum thurberianum (Thurber's needlegrass) V.5, *Bromus tectorum* (cheatgrass) V.4, *Poa secunda* (Sandberg bluegrass) V.4

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association occurs from approximately Laidlaw Park to the south in larger kipukas and adjacent to volcanic flows.

Global

This shrubland association occurs primarily in the Owyhee Uplands ecoregional section in southwestern Idaho, southeastern Oregon, and northern Nevada but also occurs in northeastern California and across southern Idaho.

COMMENTS

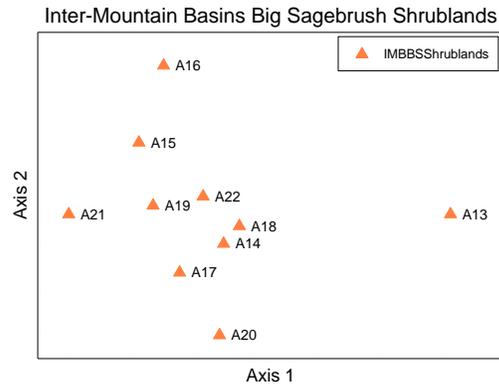
The composition of forb species in the understory may be quite variable across the range of this association.

MAP UNITS

Enter CRMO-specific information.

A15**Wyoming Big Sagebrush / Thurber's Needlegrass – Cheatgrass Semi-natural Shrubland**

Artemisia tridentata ssp. *wyomingensis* / *Achnatherum thurberianum* – *Bromus tectorum* Semi-natural Shrubland

**Description**

Artemisia tridentata ssp. *wyomingensis* forms an open, medium-tall shrub canopy. *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, and *Artemisia tripartita* are also often present in the shrub layer. The herbaceous layer is dominated by *Bromus tectorum* or co-dominated by *Bromus tectorum* and a combination of native grass and forb species. *Achnatherum thurberianum* is always present and typically abundant in the understory. *Poa secunda*, *Elymus elymoides*, *Pascopyrum smithii*, and *Pseudoroegneria spicata* are also common to well-represented graminoids. Commonly associated perennial forbs include *Phlox longifolia*, *Phlox hoodii*, *Lomatium* spp., *Allium* spp., *Astragalus* spp., and *Agoseris glauca*.

The association occurs on gentle slopes with convex or straight microtopography in mid- and upper-slope positions. Soils are typically silt loams.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 28, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.19, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.6, *Ericameria nauseosa* (rubber rabbitbrush) V.4, *Artemisia tripartita* (threetip sagebrush) IV.6

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.18, *Bromus tectorum* (cheatgrass) V.17, *Achnatherum thurberianum* (Thurber's needlegrass) V.9, *Elymus elymoides* (bottlebrush squirreltail) V.7, *Pascopyrum smithii* (western wheatgrass) IV.7, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.2, *Leymus cinereus* (basin wildrye) III.2

Forb

Phlox longifolia (longleaf phlox) V.5, *Phlox hoodii* (spiny phlox) IV.4, *Lomatium* spp. (desertparsley) IV.4, *Agoseris glauca* (pale agoseris) III.2, *Allium* spp. (onion) III.2, *Astragalus* spp. (milkvetch) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association occurs from approximately Laidlaw Park to the south in the larger kipukas and around volcanic flows.

Enter CRMO-specific information

Global

This shrubland association may be found anywhere *Bromus tectorum* has invaded the understory of its predominately native counterpart, which occurs in the Owyhee Uplands ecoregional section in southwestern Idaho, southeastern Oregon, and northern Nevada but also occurs in northeastern California and southern Idaho.

COMMENTS

This assocaiton is similar to the Wyoming Big Sagebrush / Thurber's Needlegrass shrubland. The notable difference is that a substantial portion of cover in the understory of this association is from *Bromus tectorum*. The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

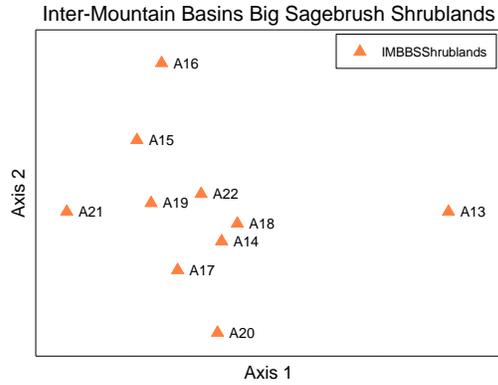
MAP UNITS

Enter CRMO-specific information

A16

Wyoming Big Sagebrush / Crested Wheatgrass Semi-natural Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Agropyron cristatum* Semi-natural Shrubland



Description

Artemisia tridentata ssp. *wyomingensis* forms an open, medium-tall shrub canopy that generally does not exceed 1 m in height and 25% cover. *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, and *Artemisia tripartita* are also often present in the shrub layer. The herbaceous layer is dominated by graminoids with *Bromus tectorum*, *Agropyron cristatum*, and *Poa secunda* occurring as the most abundant and constant species. The combined cover of these three species may be substantial, up to 30% or more. *Achnatherum thurberianum*, *Agropyron fragile*, *Elymus elymoides*, *Elymus lanceolatus*, and *Hesperostipa comata* are all also common in the herbaceous stratum. Associated perennial forbs include *Phlox longifolia*, *Lomatium* spp., *Allium* spp., and *Astragalus* spp.

This shrubland association often occupies the lowest, driest sites within the shrub-steppe mosaic in which it occurs. Slopes range from level to moderate, and many stands are on derived substrates such as loess deposits or alluvial fans and terraces, often modified by a veneer of alluvial cobble or gravel. Soils are generally calcareous, excessively well-drained, fine-textured silts, clays or fine sands; often deep to bedrock but sometimes with a shallow duripan that limits water infiltration.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.14, *Ericameria nauseosa* (rubber rabbitbrush) IV.6, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.3

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.10, *Bromus tectorum* (cheatgrass) V.10, *Agropyron cristatum* (crested wheatgrass) V.9, *Agropyron fragile* (Siberian wheatgrass) IV.17, *Elymus elymoides* (bottlebrush squirreltail) IV.3, *Elymus lanceolatus* (thickspike wheatgrass) IV.3, *Hesperostipa comata* (needle and thread) III.7, *Achnatherum thurberianum* (Thurber's needlegrass) III.4

Forb

Phlox longifolia (longleaf phlox) IV.6, *Lomatium* spp. (desertparsley) IV.4

RANGE

Craters of the Moon National Monument and Preserve

This association can be found from approximately Laidlaw Park to the south, usually in locations with better soil development such as kipukas and adjacent to volcanic flows, generally where communities were reseeded subsequent to a fire or other disturbance.

Global

This shrubland association occurs as patches in a matrix of other shrubland or shrub-steppe types in the Columbia Basin of Washington, Oregon and Idaho, extending south into northern Nevada and east to southeastern Idaho, with outliers in northwestern Colorado.

COMMENTS

Agropyron cristatum has been planted into pastures and rangelands to improve forage production and is well suited to the cold, semi-arid conditions of the Great Basin, northwestern Great Plains and higher elevation rangelands in more southern latitudes, facilitating its persistence and occasional spread. Stands can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, revegetation projects, etc. The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. These species tend to codominate on or adjacent to sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

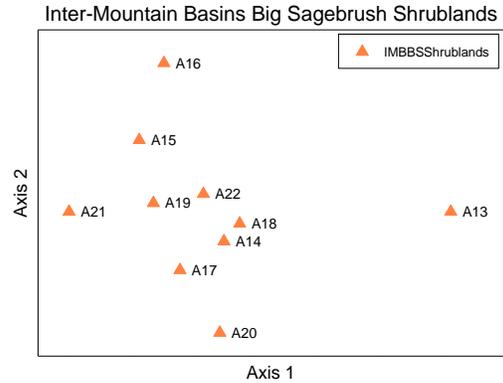
MAP UNITS

Enter CRMO-specific information

A17

Wyoming Big Sagebrush / Cheatgrass Semi-natural Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Bromus tectorum* Semi-natural Shrubland



Description

Artemisia tridentata ssp. *wyomingensis* forms an open, medium-tall shrub canopy that generally does not exceed 1 m in height and 25% cover. *Chrysothamnus viscidiflorus*, *Ericameria nauseosus*, and other *Artemisia* spp. are also often present in the shrub layer. The herbaceous layer is dominated by graminoids with the cover of *Bromus tectorum* often equaling or exceeding that of the shrub layer. *Agropyron cristatum* and *Poa secunda* may also be common graminoids in this plant community. Forb cover and species composition can be quite variable from one site to another. Forbs are likely more characteristic of the association that was present prior to the invasion of cheatgrass than the current vegetation type.

This shrubland association often occupies the most disturbed sites within the shrub-steppe mosaic in which it occurs. Slopes range from level to moderate, and many stands are on derived substrates such as loess deposits or alluvial fans and terraces, often modified by a veneer of alluvial cobble or gravel. Soils are generally calcareous, excessively well-drained, fine-textured silts, clays or fine sands; often deep to bedrock but sometimes with a shallow duripan that limits water infiltration.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 70, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.10, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.2

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.10, *Poa secunda* (Sandberg bluegrass) V.2

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association can be found throughout Craters of the Moon from approximately Laidlaw Park to the south. It may occur on and adjacent to volcanic flows, as well as in kipukas.

Global

This association may occur from northeastern California, eastern Oregon and southeastern Washington, across the northern Great Basin and dry habitats of the Rocky Mountains to the northern Great Plains of Montana, Wyoming and North and South Dakota. Stands are also reported from the intermountain Parks of Colorado, and from Alberta, Canada.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

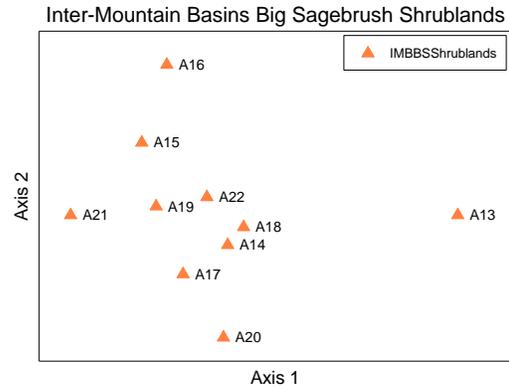
MAP UNITS

Enter CRMO-specific information

A18

Wyoming Big Sagebrush / Idaho Fescue Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Festuca idahoensis* Shrubland



Description

Throughout the geographic range of this vegetation type, *Artemisia tridentata* ssp. *wyomingensis* dominates the shrub layer and has at least 10% canopy cover. Total vegetation cover ranges between 20% and more than 75%, roughly evenly divided between the shrub and herbaceous strata. *Festuca idahoensis* co-dominates this association and usually has a cover of 5-10%. Other shrub species present may include *Artemisia tripartita*, *Chrysothamnus viscidiflorus*, *Purshia tridentata*, and other *Artemisia tridentata* ssp. The herbaceous layer is diverse and variable, providing low to moderate cover. In addition to *Festuca idahoensis*, associated graminoids generally include but are not limited to *Elymus elymoides*, *Poa secunda*, and the introduced grass *Bromus tectorum*. *Bromus tectorum* typically occurs at relatively low cover. Forbs are variable, provide sparse cover, and may include *Allium* spp., *Crepis acuminata*, *Delphinium andersonii*, *Leptodactylon pungens*, *Phlox hoodii*, and *Senecio integerrimus*.

This shrubland association occurs on slopes and terraces above drainages and ridges. Sites are gentle to steep colluvial slopes and alluvial benches often on warmer southeast to southwest aspects. Substrates are variable but are typically moderately deep, well-drained soils with sandy clay loam, sandy loam and loam textures. The ground surface has high cover of large and small rocks, low to moderate cover of litter, and occasionally high cover of bare ground.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 11, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.15

Dwarf-shrub

None

Graminoid

Festuca idahoensis (Idaho fescue) V.6, *Poa secunda* (Sandberg bluegrass) IV.6

Forb

Phlox hoodii (spiny phlox) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association can be found throughout Craters of the Moon from approximately Laidlaw Park to the south. It is more abundant on deeper soils such as those found in kipukas.

Global

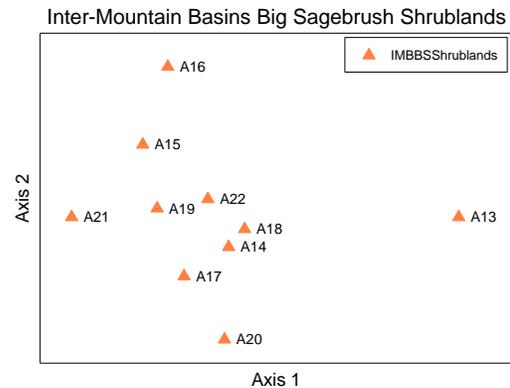
This is a wide-ranging association, known throughout the northwestern U.S. It occurs in eastern Oregon, Nevada, Utah, Colorado, Wyoming, Montana, Idaho, and possibly further north into Alberta and British Columbia. It may also occur in eastern California.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A19**Wyoming Big Sagebrush / Needle and Thread Shrubland***Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland**Description**

This association is dominated by *Artemisia tridentata* ssp. *wyomingensis*, with *Chrysothamnus viscidiflorus* commonly present in the shrub stratum. Other shrubs may include *Artemisia tripartita* and *Ericameria nauseosa*. Average cover is usually between 10 and 50% and the shrub layer is typically less than 1 m in height. The herbaceous layer is diverse and variable, providing low to moderate cover and is dominated by the perennial bunchgrass, *Hesperostipa comata*. Other component graminoids include *Bromus tectorum*, *Poa secunda*, and *Elymus elymoides*. Forbs are variable, provide low to moderate cover, and may include a variety of different species with *Leptodactylon pungens*, and *Phlox longifolia* being some of the most constant. A cryptogamic crust may be present on undisturbed stands of this association.

This association is restricted to sandy loam or uniformly, highly calcareous silt loam soils. B horizons are weakly to moderately developed, and probably overlie C horizons with carbonate hardpans. Sites where this association occurs are susceptible to wind erosion when plant cover is reduced, due to the low precipitation, warm temperatures and sandy soils.

CONSERVATION RANK G2**DATABASE CODE** CEGL001051**CHARACTERISTIC SPECIES** (n = 33, AA)**Tree**

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.14, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.4

Dwarf-shrub

None

Graminoid

Hesperostipa comata (needle and thread) V.5, *Bromus tectorum* (cheatgrass) V.10, *Poa secunda* (Sandberg bluegrass) V.9, *Elymus elymoides* (bottlebrush squirreltail) IV.2

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association can be found from approximately Laidlaw Park to the south, usually in locations with better soil development such as kipukas, but can also occur on well-vegetated basalt with some soil accumulation.

Global

This association occurs within the Columbia River Basin of Oregon and Washington (Columbia Basin and western portion of the Okanogan Highlands ecoregional sections) and the Snake River Plain (Owyhee Uplands and Snake River Basalts ecoregional sections) in Idaho.

COMMENTS

This association is considered to be imperiled. The number, condition, and size of stands of this relatively wide-ranging plant association have declined significantly due to land conversion to cultivation, intensive range management, introduction of exotic species, and alteration of fire disturbance regimes. Few high-quality occurrences are known. Protected occurrences are typically not in good condition and/or are small in size.

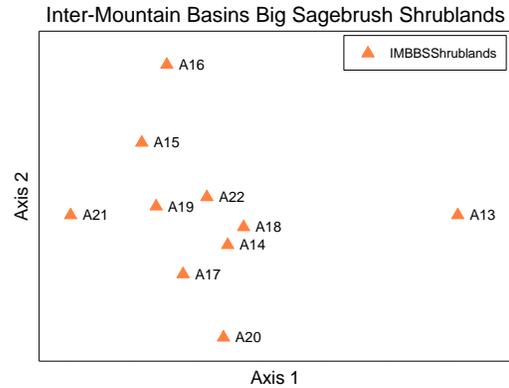
MAP UNITS

Enter CRMO-specific information.

A20

Wyoming Big Sagebrush / Sandberg Bluegrass Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Poa secunda* Shrubland



Description

Species richness may be very low in many stands of this association. *Artemisia tridentata* ssp. *wyomingensis* dominates the open shrub canopy and generally does not exceed 1 m in height and 25% cover. *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, and *Purshia tridentata* may also occur sporadically in the shrub canopy. In addition to *Poa secunda*, *Bromus tectorum* and *Elymus elymoides* are typically common in the graminoid functional group. Other grass species also often occur in the herbaceous layer but are variable in terms of cover and composition. Forbs provide sparse to moderate cover and species composition tends to vary greatly from one stand to another.

This sparse shrubland association occurs as patches in a matrix of other shrubland or shrub-steppe types. Slopes range from level to moderate, and many stands are on derived substrates such as loess deposits or alluvial fans and terraces, often modified by a veneer of alluvial cobble or gravel. Soils are generally calcareous, excessively well-drained, fine-textured silts, clays or fine sands, often deep to bedrock but sometimes with a shallow duripan that limits water infiltration.

CONSERVATION RANK G4

DATABASE CODE CEGL001049

CHARACTERISTIC SPECIES (n = 76, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.11

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.5, *Bromus tectorum* (cheatgrass) V.3

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association can be found throughout Craters of the Moon from approximately Laidlaw Park to the south. It can be found on all types of basalt that have some soil accumulation and significant vegetation cover.

Global

This association has been documented from northwestern Colorado, northeastern Nevada, southern Idaho, and the Columbia Basin of eastern Washington, and Oregon. It is likely to occur in Wyoming and possibly also in northeastern California and southern Montana.

COMMENTS

Dominance of shallow-rooted grasses such as *Poa secunda* indicates that the sites are too dry for deeper-rooted perennials to persist. The distribution of patches of this association may be controlled by microhabitat factors, such as snow depth, that are difficult to predict or model.

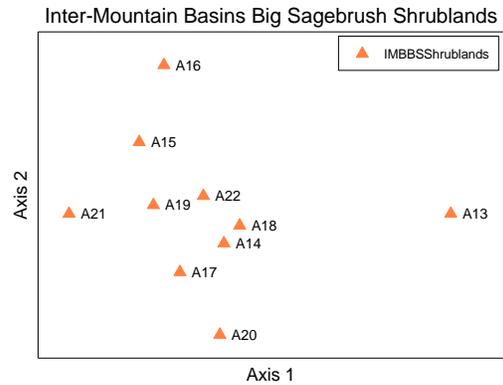
MAP UNITS

Enter CRMO-specific information.

A21

Wyoming Big Sagebrush / Sandberg Bluegrass - Cheatgrass Semi-natural Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland



Description

Artemisia tridentata ssp. *wyomingensis* forms an open, medium-tall shrub canopy that generally does not exceed 1 m in height and 25% cover. *Chrysothamnus viscidiflorus*, *Ericameria nauseosus*, and other *Artemisia* spp. also occur regularly in the shrub stratum. Cover of the herbaceous layer often equals or exceeds that of the shrub layer. The herbaceous layer is dominated by graminoids and *Bromus tectorum* and *Poa secunda* are typically the most abundant grass species. Other common graminoids include *Achnatherum thurberianum*, *Elymus elymoides*, *Pascopyrum smithii*, and *Pseudoroegneria spicata*. Forbs can be diverse in the understory of this vegetation type and forb cover and species composition are often quite variable among stands.

This shrubland association often occupies disturbed sites within the shrub-steppe mosaic in which it occurs. Slopes range from level to moderate, and many stands are on derived substrates such as loess deposits or alluvial fans and terraces, often modified by a veneer of alluvial cobble or gravel. Soils are generally calcareous, excessively well-drained, fine-textured silts, clays or fine sands, often deep to bedrock but sometimes with a shallow duripan that limits water infiltration.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 76, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.11, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.4

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.13, *Poa secunda* (Sandberg bluegrass) V.10, *Elymus elymoides* (bottlebrush squirreltail) III.5

Forb

Phlox longifolia (longleaf phlox) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association can be found throughout Craters of the Moon from approximately Laidlaw Park to the south. It can be found on all types of basalt that have significant vegetation cover and generally at least some soil accumulation.

Global

This association may be located from northeastern California, eastern Oregon and southeastern Washington, across the northern Great Basin and dry habitats of the Rocky Mountains to the northern Great Plains of Montana, Wyoming and North and South Dakota.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to codominate primarily on or adjacent to sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

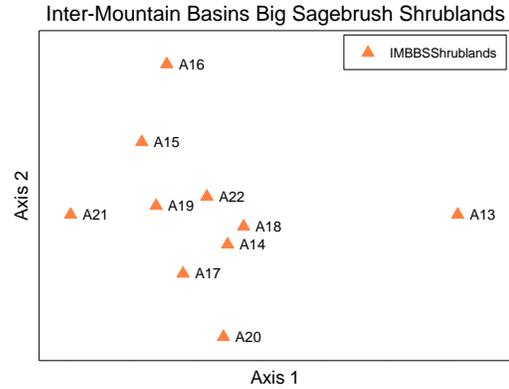
MAP UNITS

Enter CRMO-specific information

A22

Wyoming Big Sagebrush / Bluebunch Wheatgrass Shrubland

Artemisia tridentata ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrubland



Description

Throughout the geographic range of this vegetation type, *Artemisia tridentata* ssp. *wyomingensis* dominates a shrub layer that has at least 10% canopy cover. *Chrysothamnus viscidiflorus* is often present in the shrub canopy as well. Total vegetation cover of this plant community ranges between 20% and more than 100%, roughly evenly divided between the shrub and herbaceous strata. The herbaceous understory is generally a diverse mix of grasses and forbs. *Pseudoroegneria spicata* typically contributes more cover to the diverse herbaceous layer than any other native species. *Achnatherum thurberianum*, *Festuca idahoensis*, *Hesperostipa comata*, *Poa secunda*, *Koeleria macrantha*, and *Elymus elymoides* are also common grasses in the understory of this association. Forbs are variable and diverse across the range of this type, but common species include *Eriogonum* spp., *Crepis acuminata*, *Balsamorhiza sagittata*, *Lomatium* spp., *Lupinus* spp., *Phlox hoodii*, and *Phlox longifolia*.

Slopes may be gentle to steep, and aspect is not important in determining the distribution of this association. Stands generally occupy moderately deep to deep loamy soils (often with coarse fragments), sometimes with a cemented clay layer limiting water and root penetration. Stands may also occur on basalt with shallow soils. Parent materials are variable.

CONSERVATION RANK G5

DATABASE CODE CEGL001009

CHARACTERISTIC SPECIES (n = 15, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.16, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.3

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.8, *Poa secunda* (Sandberg bluegrass) IV.4, *Bromus tectorum* (cheatgrass) III.3

Forb

Phlox longifolia (longleaf phlox) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout Craters of the Moon from approximately Laidlaw Park to the south. It is found on kipukas and areas with unconsolidated materials such as “cinder soils.”

Global

This association is common and widespread throughout the sagebrush zone of the western Great Plains through southern British Columbia, south into the Great Basin and northern Colorado Plateau.

COMMENTS

None.

MAP UNITS

Enter CRMO-specific information.

A23**Basin Big Sagebrush / Idaho Fescue Shrubland***Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Shrubland**Description**

Artemisia tridentata ssp. *tridentata* dominates the shrub layer of the plant communities in this association. Total vegetation cover is low to moderate and tends to be higher in the shrub stratum than in the herbaceous stratum. *Festuca idahoensis* is abundant in the understory and may occasionally co-dominate this association. Other shrub species are occasionally present and may include *Chrysothamnus viscidiflorus*, *Purshia tridentata* and other *Artemisia tridentata* subspecies. The herbaceous layer is diverse and variable, providing low to moderate cover. In addition to *Festuca idahoensis*, associated graminoids generally include, but are not limited to, *Pseudoroegneria spicata*, *Poa secunda*, and the introduced grass, *Bromus tectorum*. *Bromus tectorum* typically occurs at relatively low cover. Forbs are variable, provide sparse cover, and may include *Allium* spp., *Crepis acuminata*, *Delphinium* spp., and *Phlox* spp.

Sites supporting the *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance may include sloping fans, footslopes, rolling hills, and deep, well-drained alluvial bottomlands. Soils are deep, fine- to medium-textured alluvial soils with some source of subirrigation during the summer season, but moderately deep upland soils with ample moisture storage also support these shrublands. The range of the *Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Shrubland Association is likely further constrained by the environmental requirements of *Festuca idahoensis*.

CONSERVATION RANK G4**DATABASE CODE** C EGL001014**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub*Artemisia tridentata* ssp. *tridentata* (basin big sagebrush)**Dwarf-shrub**

N/A

Graminoid*Festuca idahoensis* (Idaho fescue)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association can be found in more mesic areas at the base of slopes in deeper soils.

Global

This association potentially occurs in Nevada, Montana, Idaho, and Oregon.

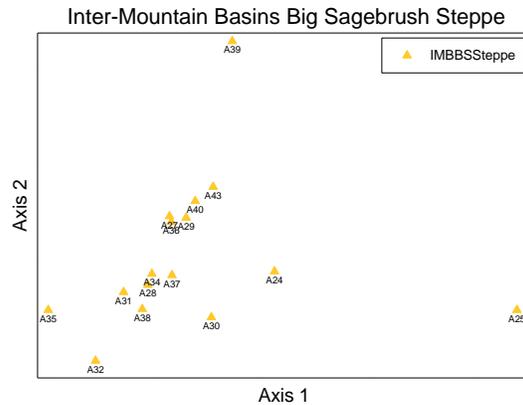
COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

MAP UNITS

Enter CRMO-specific information.

Artemisia tridentata ssp. *tridentata* / *Leymus cinereus* Shrubland



Description

Stands of this association are characterized by a shrub layer dominated by *Artemisia tridentata* ssp. *tridentata*, standing 1-3 m tall, and an herbaceous layer dominated by *Leymus cinereus* at 0.5-1.5 m tall. Some stands may take the form of a *Leymus cinereus* grassland with *Artemisia tridentata* ssp. *tridentata* on the margins, but more often stands are shrublands with grass growing in openings between shrub canopies. *Chrysothamnus viscidiflorus* may be present with some regularity in the shrub stratum. *Leymus cinereus* dominates the understory, but the herbaceous layer typically has lower cover than the shrub layer. Various other graminoids may be present including *Poa secunda* and the introduced annual grass, *Bromus tectorum*. *Bromus tectorum* occurs with relatively high constancy but low abundance. Forbs species vary among sites and range from somewhat mesic to semi-arid in nature.

This sagebrush shrubland is a transitional community found on floodplain terraces of perennial streams, along the edges of seasonally flooded washes and gullies of the high desert steppe, or associated relatively mesic upland sites such as swales on ridge slopes or a landslide/slump below seeps on steeper slopes that have high water tables. Slopes are level to gentle on terraces to moderately steep on mesic hill slopes. Substrates are variable and include alluvium, colluvium or loess. Soils generally have silty or clay loam textures and are moderately well-drained.

CONSERVATION RANK G2

DATABASE CODE C EGL001016

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *tridentata* (basin big sagebrush) V.12, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.3

Dwarf-shrub

None

Graminoid

Leymus cinereus (basin wildrye) V.7, *Bromus tectorum* (cheatgrass) IV.7, *Poa secunda* (Sandberg bluegrass) IV.5

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association can be found scattered throughout Craters of the Moon, usually in locations with better soil development such as kipukas, but it may also occur on well-vegetated basalt.

Global

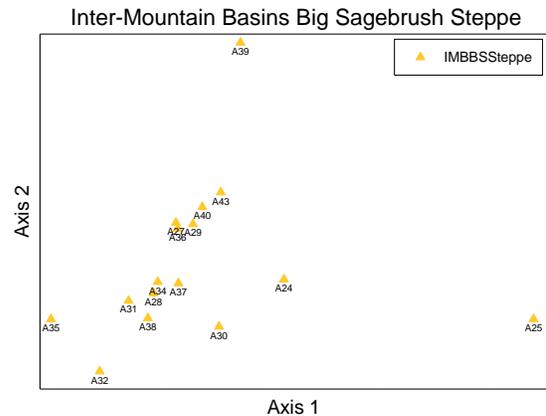
This was formerly a widespread association in the western United States. Today it is known from California to Washington and east to Montana and Colorado.

COMMENTS

The conservation status of this plant association is ranked as imperiled. It was formerly widespread in the western United States but is now rare due to habitat loss and degradation of stands. High-quality examples are of rare occurrence, and most stands are small and fragmented. Excessive livestock use has reduced the quality of stands and continues to threaten remaining occurrences. Agricultural conversion has also eliminated habitat previously occupied by the association. Exotic species, including *Poa pratensis* or *Bromus tectorum*, may become locally dominant, nearly replacing the diagnostic graminoid. Incision of smaller streams and intermittent drainages throughout the West also has affected this association by dropping the water table and causing stands to dry out to the point that they will no longer support *Leymus cinereus*.

MAP UNITS

Enter CRMO-specific information.

A25**Basin Big Sagebrush / Sandberg Bluegrass Shrubland***Artemisia tridentata* ssp. *tridentata* / *Poa secunda* Shrubland**Description**

This association is characterized by open to moderate cover of the tall shrub *Artemisia tridentata* ssp. *tridentata* and sparse to moderate cover of the perennial bunchgrass *Poa secunda*. The shrub layer often includes other shrubs species with sparse to low cover, the most constant being *Ericameria nauseosa* and *Purshia tridentata*. The herbaceous stratum may range from low to high diversity. Additional grasses may include but are not restricted to, low cover of *Elymus elymoides* and moderate cover of the non-native annual grass, *Bromus tectorum*. In many stands *Bromus tectorum* may be more abundant than the native grasses. Forbs typically have very low cover but may have high species diversity and are often variable in species composition from one stand to the next. *Crepis acuminata* and *Delphinium andersonii* are among the most frequently occurring forbs in this plant community.

Stands occur on valley floors, drainages, and lower leeward slopes of ridges. Sites are flat to moderately sloping and are found on all aspects. The unvegetated surface has high exposure of bare soil, low cover of litter, and sparse cover of small rocks and downed wood. Soils are moderately well-drained to rapidly drained and vary texturally from sandy and silty loams to silty clay loam and clay.

CONSERVATION RANK G4**DATABASE CODE** C EGL001008**CHARACTERISTIC SPECIES** (n = 6, AA)**Tree**

None

Shrub

Artemisia tridentata ssp. *tridentata* (basin big sagebrush) V.13, *Purshia tridentata* (antelope bitterbrush) IV.7, *Ericameria nauseosa* (rubber rabbitbrush) IV.1

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.7, *Poa secunda* (Sandberg bluegrass) V.1, *Elymus elymoides* (bottlebrush squirreltail) V.<1

Forb

Crepis acuminata (tapertip hawksbeard) V.<1, *Delphinium andersonii* (Anderson's larkspur) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association can be found scattered throughout Craters of the Moon, usually in locations with better soil development such as kipukas; it can also occur on well-vegetated basalt.

Global

This basin big sagebrush shrubland is reported from the Great Basin, southern Columbia Plateau, Colorado Plateau, and Wyoming Basins of Nevada, Utah and Wyoming.

COMMENTS

None.

MAP UNITS

Enter CRMO-specific information.

A26

Basin Big Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation

Artemisia tridentata ssp. *tridentata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation



Description

Artemisia tridentata ssp. *tridentata* forms a shrub layer up to 1.5-2 m tall, with a relatively open canopy. Other shrub species are often present, but at a comparatively lower abundance. *Pseudoroegneria spicata* contributes substantial cover to the understory and often dominates or codominates the plant community. Other grass species may be present but contribute less cover. A number of forbs may also occur in the understory. Forb species tend to be quite variable in both species composition and abundance.

Stands of this type grow in deep, generally alluvial soils of fans, swales, and draws in intermountain basins and in the foothills of the surrounding mountains.

CONSERVATION RANK G1

DATABASE CODE C EGL001018

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

Artemisia tridentata ssp. *tridentata* (basin big sagebrush)

Dwarf-shrub

N/A

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is not common within Craters of the Moon. It is found in kipukas and other areas of substantial soil development.

Global

This is a tall-shrub type from deep soils in basins and foothills of the Idaho, Montana and Wyoming Rocky Mountains west to eastern Washington, eastern Oregon, and northeastern California.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

This plant community is considered critically imperiled. The number of viable occurrences and area of occupancy of the association have declined severely since the time of European settlement. Remaining occurrences are mostly in relatively poor condition due to the combined and cumulative effects of excessive livestock grazing, exotic species introductions, and altered fire disturbance regimes.

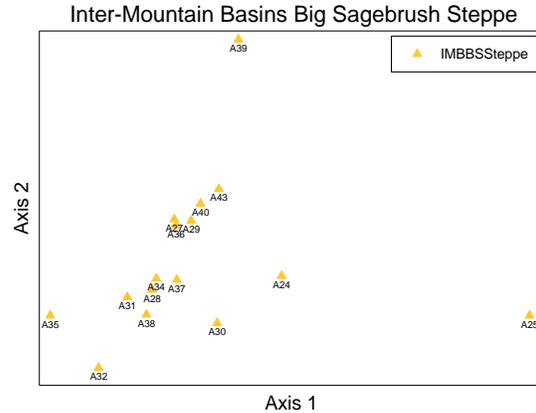
MAP UNITS

Enter CRMO-specific information.

A27

Wyoming Big Sagebrush / Western Wheatgrass Shrub Herbaceous Vegetation

Artemisia tridentata ssp. *wyomingensis* / *Pascopyrum smithii* Shrub Herbaceous Vegetation



Description

This vegetation type contains an open shrub layer, approximately 0.5 m tall, dominated by *Artemisia tridentata* ssp. *wyomingensis*, and a moderate to dense herbaceous layer dominated by medium-tall graminoids. Shrub cover typically averages less than 25%. In addition to *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus* often occurs in the shrub stratum. Other shrub species may be present as well, but occur sporadically and contribute very little cover. The herbaceous layer is usually dominated by *Pascopyrum smithii*; however *Poa secunda* may be locally abundant and occasionally dominate the understory. The introduced annual grass, *Bromus tectorum*, occurs with relatively high constancy and low cover. Forbs generally contribute low cover and are typically of low constancy.

Stands occur on gently rolling uplands, swales or upper parts of stream terraces and drainageways. Drier examples may be found on more exposed slope positions or steeper slopes. Soils are moderately deep to deep clay, clay loam, silt loam or sandy loam. Soil moisture conditions are relatively mesic.

CONSERVATION RANK G4

DATABASE CODE CEGL001047

CHARACTERISTIC SPECIES (n = 9, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.8, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.2

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.5, *Pascopyrum smithii* (western wheatgrass) V.4, *Bromus tectorum* (cheatgrass) V.4

Forb

Gayophytum spp. (groundsmoke) IV.3

RANGE

Craters of the Moon National Monument and Preserve

This association can be found from approximately Laidlaw Park to the south, in locations with better soil development such as kipukas or adjacent to volcanic flows.

Global

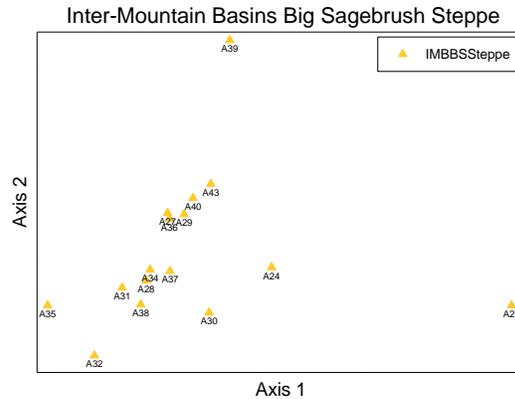
This Wyoming big sagebrush type is found throughout the northern Great Plains and adjacent basins, Black Hills, and Rocky Mountains of the United States, particularly in Colorado, Wyoming, and southern Idaho.

COMMENTS

None.

MAP UNITS

Enter CRMO-specific information.



Description

Shrubs are usually dominant in this vegetation type, but herbaceous species cover is often substantial. *Artemisia tripartita* ssp. *tripartita* typically forms a canopy ranging from open to crowns nearly touching. *Artemisia tridentata* ssp. *wyomingensis*, *Purshia tridentata*, and *Tetradymia canescens* occur occasionally but with only a fraction of the cover of *Artemisia tripartita* ssp. *tripartita*. *Chrysothamnus viscidiflorus* is present with high constancy and variable cover. The herbaceous stratum is dominated by graminoids with moderate cover. *Achnatherum thurberianum* is usually the most abundant graminoid, but *Elymus elymoides*, *Pascopyrum smithii*, *Poa secunda* and *Pseudoroegneria spicata* occur with some regularity and often with moderate cover. The introduced annual grass, *Bromus tectorum*, occurs at low to moderate cover in the herbaceous stratum. Forbs form an important and highly variable component of this vegetation type. The most constant forb species include *Lomatium* spp. and *Phlox longifolia*.

This association 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.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 30, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.22, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.5, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) III.6

Dwarf-shrub

None

Graminoid

Achnatherum thurberianum (Thurber's needlegrass) V.11, *Poa secunda* (Sandberg bluegrass) V.9, *Bromus tectorum* (cheatgrass) V.8, *Elymus elymoides* (bottlebrush squirreltail) IV.6, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.5, *Pascopyrum smithii* (western wheatgrass) IV.3

Forb

Phlox longifolia (longleaf phlox) III.4, *Lomatium* spp. (desertparsley) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development such as Laidlaw Park, other kipukas, or adjacent to volcanic flows.

Global

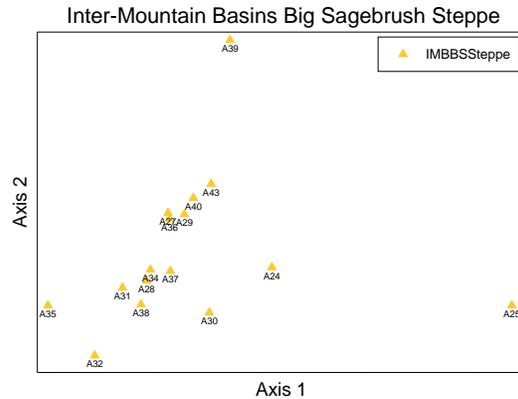
The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance occurs from eastern Washington and British Columbia, across the upper Columbia Basin to dry habitats of the Rocky Mountains of Montana, Wyoming, and Colorado. The *Artemisia tripartita* ssp. *tripartita* / *Achnatherum thurberianum* Shrubland Association is likely found wherever environmental conditions are appropriate throughout the entire range of the greater alliance.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A29**Threetip Sagebrush / Cheatgrass Semi-natural Shrubland***Artemisia tripartita* ssp. *tripartita* / *Bromus tectorum* Semi-natural Shrubland**Description**

Shrubs, primarily *Artemisia tripartita* ssp. *tripartita*, dominate the relatively open canopy of this vegetation type. The herbaceous understory ranges from sparse to moderate in terms of cover and is strongly dominated by *Bromus tectorum*. Total plant cover of this community is generally less than 25%. *Artemisia tridentata* ssp. *wyomingensis* and *Chrysothamnus viscidiflorus* occur occasionally as scattered individuals in the shrub layer. The herbaceous stratum typically has low cover compared to the shrub overstory. Native grasses are sparse and variable; only *Poa secunda* occurs with regularity, albeit at low cover values. Species richness of the forb component of this plant community is generally low. Forbs have highly variable species composition that may include both native and non-native species, and the forbs that are present usually have very sparse cover.

This association has the potential to occur anywhere the environmental conditions are appropriate for *Artemisia tripartita* ssp. *tripartita* to dominate a plant community. These communities may occur 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.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 40, AA)**Tree**

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.10, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.3, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) III.2

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.7, *Poa secunda* (Sandberg bluegrass) IV.2

Forb

Gayophytum spp. (groundsmoke) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development such as Laidlaw Park, other kipukas, and adjacent to volcanic flows.

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Bromus tectorum* Shrubland Association is likely found wherever *Bromus tectorum* has invaded the understory throughout the entire range of the greater alliance.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

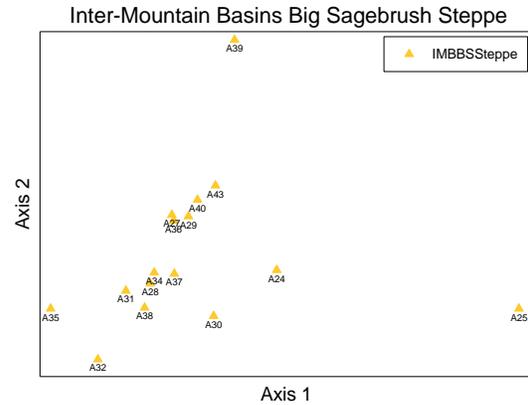
MAP UNITS

Enter CRMO-specific information.

A30

Threetip Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation

Artemisia tripartita ssp. *tripartita* / *Festuca idahoensis* Shrub Herbaceous Vegetation



Description

Throughout the range of this vegetation type, *Artemisia tripartita* ssp. *tripartita* dominates the shrub layer and has at least 10% canopy cover. Total vegetation cover can range between 25% and 75%, and is roughly evenly divided between the shrub and herbaceous strata. *Festuca idahoensis* co-dominates this association and has a cover of at least 5%. Other shrub species may occasionally be present, but *Chrysothamnus viscidiflorus* is the only associated shrub species with high constancy. The herbaceous layer is diverse and variable, providing substantial cover. In addition to *Festuca idahoensis*, associated graminoids generally include, but are not limited to, *Poa secunda*, *Pascopyrum smithii*, *Pseudoroegneria spicata*, and the introduced grass *Bromus tectorum*. *Bromus tectorum* is not consistently present but may occur at moderate cover levels where it exists. Forbs are variable and provide sparse cover. *Phlox hoodii* is the only forb species that is present with high frequency in this association.

Sites are gentle to moderately steep colluvial slopes and alluvial benches. Substrates are variable but are typically moderately deep, well-drained soils with sandy clay loam, sandy loam and loam textures. The ground surface has high cover of large and small rocks, low to moderate cover of litter, and occasionally high cover of bare ground.

CONSERVATION RANK G3

DATABASE CODE C EGL001536

CHARACTERISTIC SPECIES (n = 14, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.25, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.2

Dwarf-shrub

None

Graminoid

Festuca idahoensis (Idaho fescue) V.15, *Poa secunda* (Sandberg bluegrass) IV.10, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.2, *Bromus tectorum* (cheatgrass) III.8, *Pascopyrum smithii* (western wheatgrass) III.3

Forb

Phlox hoodii (spiny phlox) V.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

This association has been documented in Washington, Oregon, Colorado, Montana, and Idaho.

COMMENTS

None.

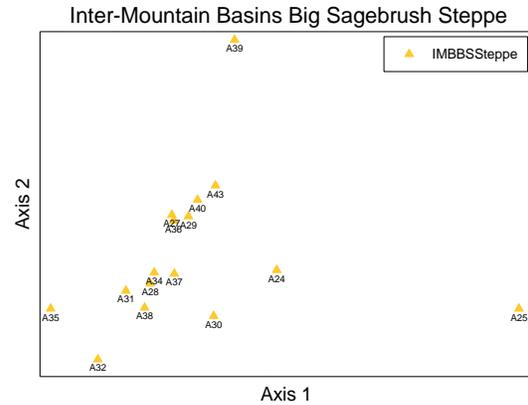
MAP UNITS

Enter CRMO-specific information.

A31

Threetip Sagebrush / Needle and Thread Shrub Herbaceous Vegetation

Artemisia tripartita ssp. *tripartita* / *Hesperostipa comata* Shrub Herbaceous Vegetation



Description

This is a bunchgrass-dominated association, with *Hesperostipa comata* comprising a taller grass layer up to 0.5 m in height, with low to moderate cover. The half-meter-tall shrub layer is discontinuous, with scattered clumps of *Artemisia tripartita* ssp. *tripartita*, averaging 5-25% cover. Scattered *Chrysothamnus viscidiflorus* individuals are often present in the shrub stratum as well. *Poa secunda*, *Pseudoroegneria spicata* and the introduced annual, *Bromus tectorum*, are often present but sparse in the herbaceous layer. Additional shrub and grass species often occur sporadically and are often variable and sparse. Forbs are infrequent and their total cover is typically less than 3%. *Phlox hoodii* is the only forb with high constancy in this vegetation type.

This association occurs at moderate elevations, on sites that are more mesic or at slightly higher elevations than those dominated by *Artemisia tridentata*. It occurs on deep gravel or sandy infertile soils. 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.

CONSERVATION RANK G1

DATABASE CODE C EGL001539

CHARACTERISTIC SPECIES (n = 8, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.13, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.2

Dwarf-shrub

None

Graminoid

Hesperostipa comata (needle and thread) V.4, *Poa secunda* (Sandberg bluegrass) IV.4, *Bromus tectorum* (cheatgrass) IV.2, *Pseudoroegneria spicata* (bluebunch wheatgrass), IV.1

Forb

Phlox hoodii (spiny phlox) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

This vegetation 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.

COMMENTS

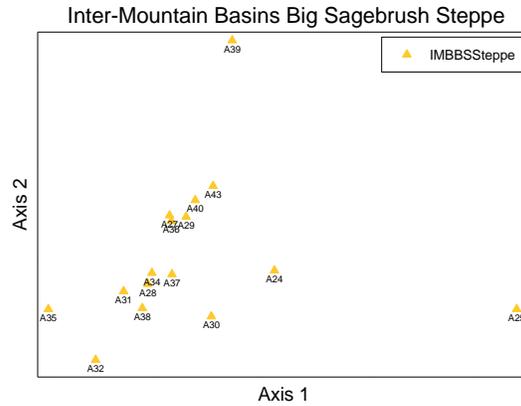
This association is considered to be critically imperiled. The distribution of this plant community is limited. A variety of exotic species is changing the composition of this native community. Most occurrences of this type have been fragmented into isolated tracts and are altered or threatened by the introduction of exotic plants. This is a naturally unusual association that has been reduced further through land conversion to agriculture and exotic plant invasion.

MAP UNITS

Enter CRMO-specific information.

Threetip Sagebrush / Prairie Junegrass Shrubland

Artemisia tripartita ssp. *tripartita* / *Koeleria macrantha* Shrubland



Description

Artemisia tripartita ssp. *tripartita* is the dominant shrub in moderate to dense stands. *Koeleria macrantha* is the most abundant grass species the herbaceous understory. Total vascular cover of this plant community is typically moderate to high. *Chrysothamnus viscidiflorus* occurs with relatively high constancy but low cover. Other shrub species are occasionally present but with low constancy and sparse cover. The herbaceous layer is diverse and variable, providing substantial cover; however, herbaceous cover rarely exceeds that of the shrub overstory. *Poa secunda*, *Pseudoroegneria spicata*, and *Pascopyrum smithii* are usually conspicuous in this association. Several additional graminoid species may occur at low frequencies and moderate cover. *Bromus tectorum*, an invasive annual grass, tends to occur with high constancy and relatively low cover. Forbs are diverse and variable but generally provide sparse cover. *Phlox hoodii*, *Phlox longifolia*, *Lomatium* spp., and *Allium* spp. are present with moderate to high frequencies in this association.

This association generally occurs on flat to 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 may be highly variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 21, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.29, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.4

Dwarf-shrub

None

Graminoid

Koeleria macrantha (prairie Junegrass) V.13, *Bromus tectorum* (cheatgrass) V.5, (Sandberg bluegrass) V.3, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.3, *Pascopyrum smithii* (western wheatgrass) III.7

Forb

Phlox hoodii (spiny phlox) IV.5, *Lomatium* spp. (desertparsley) IV.2, *Allium* spp. (onion) III.4, *Phlox longifolia* (longleaf phlox) III.4

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Koeleria macrantha* Shrubland Association is likely found wherever environmental conditions are appropriate for both species to achieve moderate abundance throughout the entire range of the greater alliance.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A33

Threetip Sagebrush / Basin Wildrye Shrub Herbaceous Vegetation

Artemisia tripartita ssp. *tripartita* / *Leymus cinereus* Shrub Herbaceous Vegetation



Description

Shrubs may be conspicuous in this plant community, but herbaceous species have equal or greater coverage. *Artemisia tripartita* ssp. *tripartita* is the dominant shrub species; other shrub species may be present to relatively common as well. The herbaceous stratum is typically dominated by graminoids of moderate to moderately high cover. *Leymus cinereus* is the most abundant herbaceous species in terms of cover and visual dominance. Other graminoids may also be present at lower cover values. Forbs form a major and highly variable component of this vegetation type.

Stands occur on flat to sloping upland sites. Soil texture is loam, sandy loam, or clay loam, but is highly variable.

CONSERVATION RANK GU

DATABASE CODE C EGL002994

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush)

Dwarf-shrub

N/A

Graminoid

Leymus cinereus (basin wildrye)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development such as kipukas or adjacent to volcanic flows.

Global

Vegetation in the *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance is sporadically distributed around the north and western rims of the Columbia Basin, throughout the Blue Mountains, to the northern Rocky Mountains, through the upper Snake River Plain. However, this association, which is characterized by an abundance of *Leymus cinereus* in the herbaceous layer, has only been documented in Idaho.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

This association is considered unrankable with regard to conservation status.

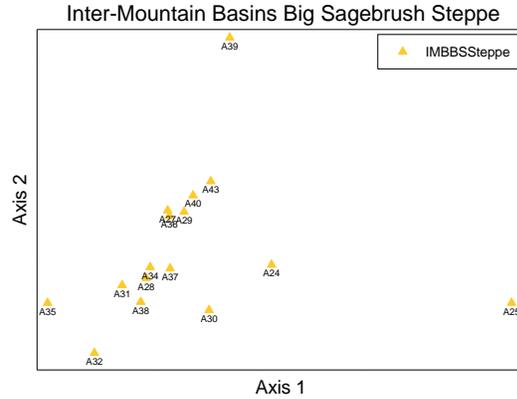
MAP UNITS

Enter CRMO-specific information.

A34

**Threetip Sagebrush / Western Wheatgrass - Cheatgrass
Semi-natural Shrubland**

Artemisia tripartita ssp. *tripartita* / *Pascopyrum smithii* - *Bromus tectorum* Semi-natural Shrubland



Description

Shrubs, primarily *Artemisia tripartita* ssp. *tripartita*, dominate the relatively open canopy of this vegetation type. The herbaceous understory is sparse and total plant cover of this community is generally less than 25%. The native perennial grass, *Pascopyrum smithii*, and the introduced annual grass, *Bromus tectorum*, codominate the depauperate understory in this vegetation type. *Chrysothamnus viscidiflorus* commonly occurs in the shrub layer. Native grasses are sparse and variable. *Achnatherum thurberianum*, *Poa* spp., and *Pseudoroegneria spicata* occur with some constancy, but at low cover values. Diversity of the forb component of this plant community is generally very low. Forbs have highly variable species composition that may include both native and non-native species, and the forbs that are present usually have very sparse cover.

These communities may occur 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.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 11, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.11, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.5

Dwarf-shrub

None

Graminoid

Pascopyrum smithii (western wheatgrass) V.3, *Bromus tectorum* (cheatgrass) V.3, *Achnatherum thurberianum* (Thurber’s needlegrass) V.3, *Poa* spp. (bluegrass) IV.3, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.2

Forb

Gayophytum spp. (groundsmoke) III.2, *Orthocarpus* spp. (owl’s-clover) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Pascopyrum smithii* - *Bromus tectorum* Shrubland Association is likely found sporadically wherever environmental conditions are appropriate throughout the entire range of the greater alliance, and where *Bromus tectorum* has had the opportunity to begin invading the understory.

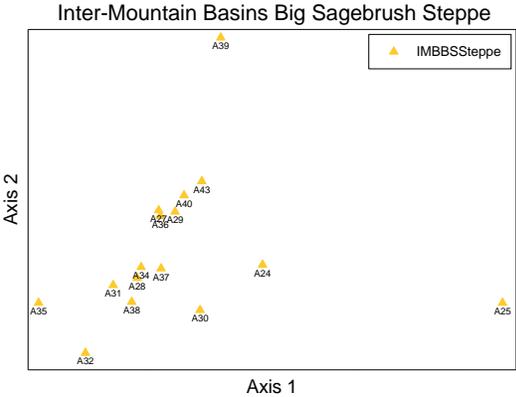
COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.



Description

Artemisia tripartita ssp. *tripartita* dominates the relatively open canopy of this vegetation type. The herbaceous understory is sparse to moderate in terms of cover and is dominated by *Pascopyrum smithii*. *Chrysothamnus viscidiflorus* commonly occurs in the shrub stratum. Additional native grass species are often present in the understory but cover is typically sparse and species composition is variable. *Achnatherum thurberianum*, *Poa secunda*, and *Pseudoroegneria spicata* occur with some constancy, but at low cover values. Forbs have highly variable species composition and cover ranges from sparse to moderate.

Stands occur on gently rolling uplands, swales or upper parts of stream terraces and drainageways. Drier examples may be found on more exposed slope positions or steeper slopes. Soils are moderately deep to deep clay, clay loam, silt loam or sandy loam. Soil moisture conditions are relatively mesic.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 19, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.14, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.4

Dwarf-shrub

None

Graminoid

Pascopyrum smithii (western wheatgrass) V.8, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.3, *Poa secunda* (Sandberg bluegrass) IV.2, *Achnatherum thurberianum* (Thurber’s needlegrass) III.3

Forb

Gayophytum spp. (groundsmoke) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Pascopyrum smithii* Shrubland Association is likely found sporadically wherever soil texture and moisture conditions are appropriate for *Pascopyrum smithii* throughout the entire range of the greater alliance.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

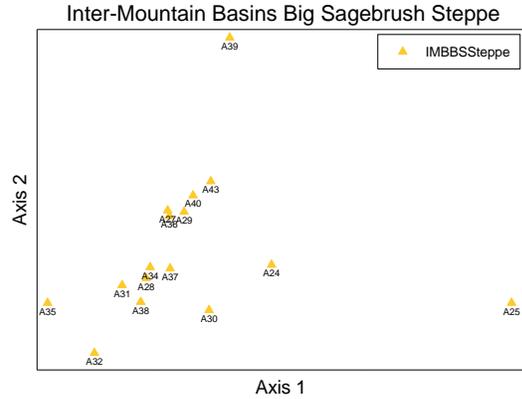
MAP UNITS

Enter CRMO-specific information.

A36

Threetip Sagebrush / Sandberg Bluegrass - Cheatgrass Semi-natural Shrubland

Artemisia tripartita ssp. *tripartita* / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland



Description

Shrubs, primarily *Artemisia tripartita* ssp. *tripartita*, dominate the relatively open canopy of this vegetation type. The native perennial grass, *Poa secunda*, and the introduced annual grass, *Bromus tectorum*, codominate the sparse to moderate understory. Cover of the herbaceous layer may occasionally approach that of the shrub strata. *Chrysothamnus viscidiflorus* commonly occurs in the shrub layer. Additional native grasses are also often present but variable. *Achnatherum thurberianum*, *Poa secunda*, and *Pascopyrum smithii* occur with some constancy. Forbs have highly variable species composition and the forbs that are present usually have very sparse cover.

These communities may occur on flat to sloping upland sites. Soils tend to be shallow and gravelly. Soil texture is loam, sandy loam, or clay loam, but is highly variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 59, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.17, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.4

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.10, *Bromus tectorum* (cheatgrass) V.9, *Pascopyrum smithii* (western wheatgrass) III.5, *Achnatherum thurberianum* (Thurber’s needlegrass) III.4

Forb

Phlox hoodii (spiny phlox) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Poa secunda* - *Bromus tectorum* Shrubland Association is likely found sporadically wherever environmental conditions are appropriate throughout the entire range of the greater alliance, and where *Bromus tectorum* has had the opportunity to begin invading the understory.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

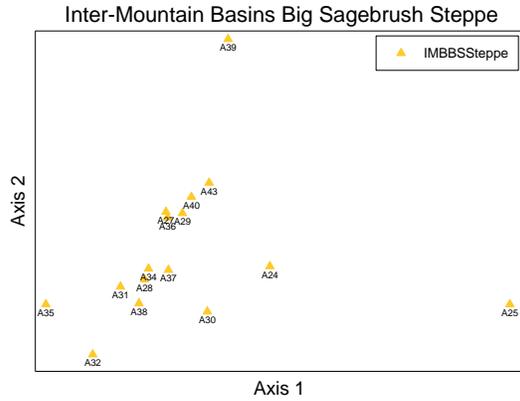
MAP UNITS

Enter CRMO-specific information.

A37

Threetip Sagebrush / Sandberg Bluegrass Shrubland

Artemisia tripartita ssp. *tripartita* / *Poa secunda* Shrubland



Description

Artemisia tripartita ssp. *tripartita* dominates the open to nearly closed canopy of this vegetation type. The understory is often diverse, but is generally dominated by *Poa secunda*. Cover of the herbaceous layer ranges from sparse to moderate and occasionally approaches that of the shrub stratum. Total vegetation cover in this association regularly exceeds 25%. Several additional shrub species may be present in the overstory, but *Chrysothamnus viscidiflorus* is the most constant. Several native grasses may occur in the herbaceous stratum but can be quite variable in terms of composition and cover. *Achnatherum thurberianum*, *Pascopyrum smithii*, and *Bromus tectorum* occur with the highest constancy. The cover of the introduced annual grass, *Bromus tectorum*, is generally sparse in this plant community. Forbs are common but have highly variable species composition and are usually present at relatively low cover.

These communities may occur on flat to sloping upland sites. Soils tend to be shallow and gravelly. Soil texture is loam, sandy loam, or clay loam, but is highly variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 17, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.19, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.2

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.14, *Bromus tectorum* (cheatgrass) IV.4, *Achnatherum thurberianum* (Thurber’s needlegrass) III.3, *Pseudoroegneria spicata* (bluebunch wheatgrass) III.2

Forb

Phlox hoodii (spiny phlox) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows. It is typically not found on exposed basalt

Global

The *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous 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. The *Artemisia tripartita* ssp. *tripartita* / *Poa secunda* Shrubland Association is likely found sporadically wherever environmental conditions are appropriate throughout the entire range of the greater alliance.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

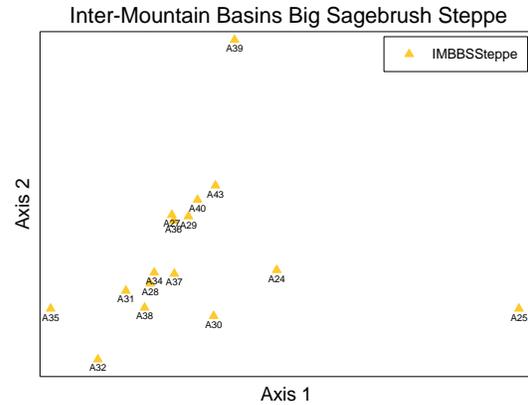
MAP UNITS

Enter CRMO-specific information.

A38

Threetip Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation

Artemisia tripartita ssp. *tripartita* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation



Description

Artemisia tripartita ssp. *tripartita* is the dominant shrub in relatively open stands and *Pseudoroegneria spicata* is abundant in the understory. The cover of the shrub and herbaceous strata are roughly equal. *Chrysothamnus viscidiflorus* is the only additional shrub species with moderate constancy. Other shrub species are occasionally present but with low constancy and sparse cover. The herbaceous layer is diverse and variable, providing substantial cover. *Festuca idahoensis*, *Leymus cinereus*, and *Poa secunda* are usually conspicuous. Several additional graminoid species may occur at low frequency and moderate cover. Forbs are variable and generally provide sparse cover. *Phlox hoodii* is the only forb species that is present with high frequency in this association.

The physical environmental parameters of this vegetation type are not well defined. This association has the potential to occur anywhere the environmental conditions are appropriate for *Artemisia tripartita* ssp. *tripartita* to dominate a plant community and soils are moderately well drained.

CONSERVATION RANK G2

DATABASE CODE C EGL001538

CHARACTERISTIC SPECIES (n = 21, AA)

Tree

None

Shrub

Artemisia tripartita ssp. *tripartita* (threetip sagebrush) V.17, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.4

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.13, *Poa secunda* (Sandberg bluegrass) V.5, *Festuca idahoensis* (Idaho fescue) III.4, *Leymus cinereus* (basin wildrye) III.2

Forb

Phlox hoodii (spiny phlox) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

This association occurs in the Okanogan Highlands, Columbia Basin, Snake River Basalts, Northwest Basin and Range, Beaverhead Mountains, and Overthrust Mountains ecoregional sections.

COMMENTS

The conservation status of this association is ranked as imperiled. This is a somewhat widespread plant association occurring with relatively few, small stands in a sporadic, discontinuous distribution. Approximately 50 percent of the occurrences are considered to be in poor condition.

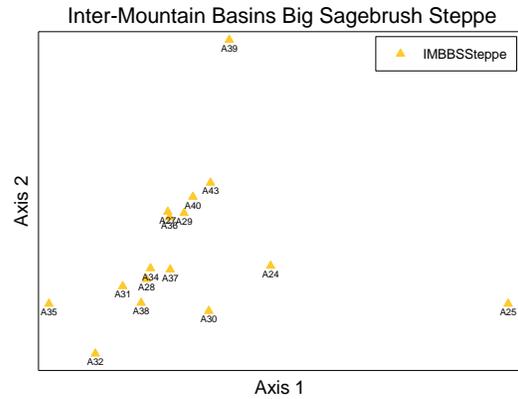
MAP UNITS

Enter CRMO-specific information.

A39

Yellow Rabbitbrush / Crested Wheatgrass Shrubland

Chrysothamnus viscidiflorus / *Agropyron cristatum* Shrubland



Description

Total vegetation cover of this plant community is generally low to moderate and is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus*. Other shrubs, including *Artemisia tridentata* ssp. *wyomingensis* and *Ericameria nauseosa*, may provide sparse cover in the overstory. Herbaceous cover is typically low and the introduced bunchgrass, *Agropyron cristatum* is highly characteristic of this association but is not always the most abundant herbaceous species. *Bromus tectorum* and *Poa secunda* are nearly always present and may dominate or codominate the herbaceous stratum in some stands. Additional graminoids in this community are often diverse in terms of species composition but sparse in terms of cover. Forbs may also be diverse but contribute very little total cover.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Other types of disturbances may also ameliorate conditions and influence the spatial distribution of non-native species, such as *Agropyron cristatum*, resulting in this plant community. Slopes range from gentle to moderately steep. Soils are variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 8, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) V.10, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) IV.1, *Ericameria nauseosa* (rubber rabbitbrush) III.2

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.10, *Bromus tectorum* (cheatgrass) V.8, *Agropyron cristatum* (crested wheatgrass) V.6

Forb

Phlox longifolia (longleaf phlox) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to volcanic flows.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Alliance has been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It probably also occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus* / *Agropyron cristatum* Shrubland Association may be found sporadically through the range of the greater alliance where *Agropyron cristatum* has been planted or has had the opportunity to invade the understory.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

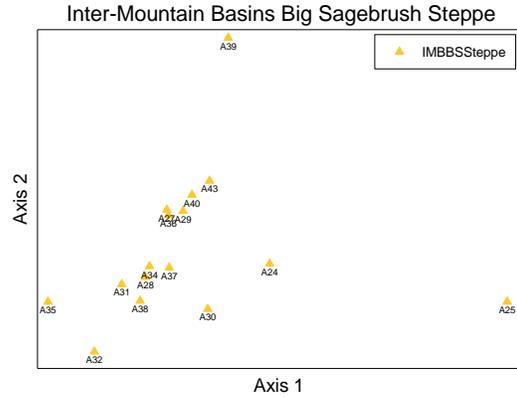
MAP UNITS

Enter CRMO-specific information.

A40

Yellow Rabbitbrush / Cheatgrass Shrubland

Chrysothamnus viscidiflorus / *Bromus tectorum* Shrubland



Description

Total vegetation cover of this plant community is generally low to moderate and the association is characterized by an open shrub canopy dominated by *Chrysothamnus viscidiflorus*. Other shrubs may occur sporadically in the overstory. However, *Artemisia tridentata* ssp. *wyomingensis* is the only species other than *Chrysothamnus viscidiflorus* that occurs with relatively high constancy, albeit at low cover values. Cover of the herbaceous layer is low to moderate and occasionally approaches levels equal to those of the shrub stratum. The introduced annual grass, *Bromus tectorum* generally dominates the understory and *Poa secunda* is nearly always present but at low cover values. Additional graminoids in this community are often diverse in terms of species composition but sparse in terms of cover. Forbs may also be diverse but contribute very little total cover.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Other types of disturbances may also ameliorate conditions and influence the spatial distribution of non-native species, resulting in this semi-natural plant community. Slopes range from gentle to moderately steep. Soils are variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 39, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) V.8, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) IV.2

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.12, *Poa secunda* (Sandberg bluegrass) V.4

Forb

Gayopytum spp. (groundsmoke) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Alliance has been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It likely occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus* / *Bromus tectorum* Shrubland Association likely occurs sporadically through the range of the greater alliance where *Bromus tectorum* has had the opportunity to invade the understory, particularly on or around disturbed sites.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to codominate on sites that have been disturbed.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A41**Yellow Rabbitbrush / Needle and Thread Shrubland***Chrysothamnus viscidiflorus* / *Hesperostipa comata* Shrubland**Description**

Total vegetation cover is generally low to moderate in this vegetation type, and it is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus*. Other short shrubs may provide sparse cover. The native bunchgrass *Hesperostipa comata* dominates the understory but cover values are typically low. The graminoid component of this community is often diverse in terms of species composition but sparse in terms of cover. Forbs are also diverse but contribute very little cover. Introduced species like *Bromus tectorum* may occur occasionally within this vegetation type.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Slopes range from gentle to moderately steep. Soils have textures ranging from silt loam to sandy loam to loamy sand, and bare soil covers most of the unvegetated ground surface.

CONSERVATION RANK GNR**DATABASE CODE** CEGL002799**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub*Chrysothamnus viscidiflorus* (yellow rabbitbrush)**Dwarf-shrub**

N/A

Graminoid*Hesperstipa comata* (needle and thread)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or adjacent to basalt outcrops.

Global

This association has been documented from western Colorado, Utah and the Snake River Plain of southern Idaho. It is likely to occur throughout the interior West in sandy, disturbed areas that normally support sagebrush shrublands.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

This community has not yet been ranked with regard to conservation status.

MAP UNITS

Enter CRMO-specific information.

Description

Total vegetation cover of this plant community is generally low to moderate and is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus*. Other short shrubs that may be present and provide sparse cover include *Artemisia tridentata* and *Artemisia tripartita*. Cover of the herbaceous layer is typically lower than that of the shrub layer. The graminoid component of this community is dominated by *Pascopyrum smithii*. Additional graminoids that may be common or even codominant in the understory include *Achnatherum nelsonii* and *Poa secunda*. *Bromus tectorum* may also occasionally be present at low cover values. Forbs are variable and are normally sparse in terms of cover. Component forb species that occur with some regularity include *Gayophytum* spp. and *Orthocarpus* spp.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Slopes may range from gentle to moderately steep. Soils have textures ranging from silt loam to sandy loam to loamy sand, and bare soil covers most of the unvegetated ground surface.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub*Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.10**Dwarf-shrub**

None

Graminoid*Pascopyrum smithii* (western wheatgrass) V.4, *Achnatherum nelsonii* (Columbia needlegrass) V.3, *Poa secunda* (Sandberg bluegrass) V.2, *Bromus tectorum* (cheatgrass) IV.1**Forb***Gayophytum* spp. (groundsmoke) V.3, *Orthocarpus* spp. (owl's-clover) V.1

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Alliance been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It likely occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus* / *Pascopyrum smithii* Shrubland Association has not been previously documented in the National Vegetation Classification (NVC) so the global range of the specific association is unknown, but is likely restricted to environmental conditions necessary for *Pascopyrum smithii* dominance in the herbaceous layer.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

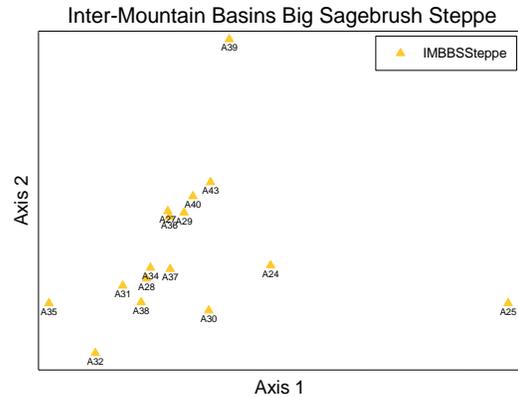
MAP UNITS

Enter CRMO-specific information.

A43

Yellow Rabbitbrush / Sandberg Bluegrass – Cheatgrass Semi-natural Shrubland

Chrysothamnus viscidiflorus / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland



Description

Total vegetation cover of this plant community is generally low to moderate and the association is characterized by an open shrub canopy dominated by *Chrysothamnus viscidiflorus*. Other shrubs may occur sporadically in the overstory, although species composition is variable and cover is sparse. Cover of the herbaceous layer is low to moderate and occasionally approaches cover levels equal to those of the shrub stratum. *Poa secunda* generally dominates the understory and *Bromus tectorum* is always present and occasionally co-dominates the herbaceous layer at low to moderate cover values. Additional graminoids in this community are often diverse in terms of species composition but sparse in terms of cover. Forbs tend to be sparse and variable and often include introduced and native species.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Other types of disturbances may also ameliorate conditions and influence the spatial distribution of non-native species, resulting in this semi-natural plant community. Slopes range from gentle to moderately steep. Soils are variable but tend to be shallow and gravelly.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) V.9

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.7, *Bromus tectorum* (cheatgrass) V.3, *Achnatherum thurberianum* (Thurber's needlegrass) IV.2

Forb

Sisymbrium altissimum (tall tumbled mustard) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Alliance has been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It likely occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus* / *Poa secunda* - *Bromus tectorum* Shrubland Association likely occurs sporadically through the range of the greater alliance where *Bromus tectorum* has had the opportunity to invade the understory, particularly on or around disturbed sites.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to codominate on sites that have been disturbed.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A44**Yellow Rabbitbrush / Bluebunch Wheatgrass Shrubland***Chrysothamnus viscidiflorus* / *Pseudoroegneria spicata* Shrubland**Description**

Total vegetation cover in this association is generally low to moderate and is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus*. Other short shrubs may provide sparse cover. The native bunchgrass *Pseudoroegneria spicata* dominates the understory, but cover values are typically low. Graminoids in this community are often diverse in terms of species composition but sparse in terms of cover. Forbs are also very diverse but contribute very little total cover. Introduced species like *Bromus tectorum* may occur occasionally at low cover values within this vegetation type.

This association generally occurs in areas that have experienced disturbance. *Chrysothamnus viscidiflorus*-dominated communities often result from wildland fires in sagebrush steppe ecosystems. Slopes range from gentle to moderately steep. Soils are variable.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub*Chrysothamnus viscidiflorus* (yellow rabbitbrush)**Dwarf-shrub**

N/A

Graminoid*Pseudoroegneria spicata* (bluebunch wheatgrass)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or vegetated areas adjacent to basalt.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Alliance has been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It likely occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus* / *Pseudoroegneria spicata* Shrubland Association has not been previously documented in the National Vegetation Classification (NVC) so the global range of the specific association is unknown, but is likely constrained by the distribution of *Pseudoroegneria spicata*.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

Description

Purshia tridentata forms an open, medium-tall shrub canopy in this shrubland association. Other shrub species are common and often include *Artemisia tridentata* and *Chrysothamnus viscidiflorus*. *Achnatherum thurberianum* is characteristic of the plant community and is usually abundant in the understory. *Elymus elymoides* and *Poa secunda* are also common to well-represented, occasionally becoming more locally abundant than *Achnatherum thurberianum*. *Bromus tectorum* is often present and typically occurs at low to moderate cover. *Gayophytum* spp. regularly occurs as an associated forb species in this vegetation type.

These shrublands may occur over a broad range of landforms and microhabitats. Soils are variable and range from silt loams to poorly-developed, rocky soils.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub

Purshia tridentata (antelope bitterbrush) V.13, *Artemisia tridentata* (big sagebrush) IV.4, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) IV.3

Dwarf-shrub

None

Graminoid

Achnatherum thurberianum (Thurber's needlegrass) V.3, *Poa secunda* (Sandberg bluegrass) V.2, *Bromus tectorum* (cheatgrass) IV.4, *Elymus elymoides* (bottlebrush squirreltail) IV.3

Forb

Gayophytum spp. (groundsmoke) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

The core range of the *Purshia tridentata* Shrubland Alliance is the Columbia Basin and Plateau, Owyhee Uplands, Snake River Plains, and the Colorado Rockies. The *Purshia tridentata* / *Achnatherum thurberianum* Shrubland Association has not been previously documented in the National Vegetation Classification (NVC) so the global range of this specific association is unknown, but likely occurs sporadically within the range of the greater alliance.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A46

Antelope Bitterbrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation

Purshia tridentata / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation



Description

Relatively open stands of *Purshia tridentata* occur with *Pseudoroegneria spicata* conspicuous in the understory of this shrub herbaceous vegetation type. *Pseudoroegneria spicata* is generally abundant to nearly codominant. Additional shrub species may be present but sparse. Component graminoid and forb species may also be diverse and variable.

The association generally occurs on steep, south-facing, mid to upper slopes. Soils are typically dry, shallow, and rocky. A high exposure of rock and surface soil is common.

CONSERVATION RANK G3

DATABASE CODE CEGL001495

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

Purshia tridentata (antelope bitterbrush)

Dwarf-shrub

N/A

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association is uncommon at Craters of the Moon. It is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

This relatively widespread plant association occurs on sites in the Eastern Cascades, Blue Mountains, and Bitterroot Valley ecoregional sections. Stands are also reported from the southwestern portion of the Idaho Batholith section and the Upper Snake River Plain and Great Rift regions of southeast and south-central Idaho. Stands are clustered in discrete centers of occurrence.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

The conservation status of this plant community is considered to be vulnerable because very few, high-quality, representative stands are known. Nearly all of the known stands are reported to be in poor condition. The condition of occurrences is declining due to the cumulative effects of the establishment and increased abundance of exotic annual grass species, the decline in perennial bunch grass abundance, and the subsequent loss of resilience of stands to fire disturbance events.

MAP UNITS

Enter CRMO-specific information.

A47**Low Sagebrush / Cheatgrass Semi-natural Shrubland***Artemisia arbuscula* ssp. *arbuscula* / *Bromus tectorum* Semi-natural Shrubland**Description**

Artemisia arbuscula ssp. *arbuscula* dominates this association and the low-stature stands tend to occur with relatively open canopies. *Artemisia tridentata* ssp. *wyomingensis* or *Artemisia tridentata* ssp. *vaseyana* often occur and may codominate some stands. The herbaceous layer is generally sparse to moderate in terms of cover and is generally dominated by the introduced annual grass, *Bromus tectorum*. In some stands, *Bromus arvensis* may replace *Bromus tectorum* as the most abundant graminoid species, and both annual grass species may occasionally codominate the sparse herbaceous layer. Various native, perennial graminoids may be present, but with very low cover. Forb cover is often variable and sparse.

Stands typically occur on poorly drained soils on a variety of landforms; from flats and depressions to slopes and ridges. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Climate is typified by a large proportion of precipitation falling as winter snow. Poor drainage often leads to elevated water tables in the spring, which may control the distribution of the vegetation in this association.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub*Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) IV.1**Dwarf-shrub***Artemisia arbuscula* ssp. *arbuscula* (low sagebrush) V.15**Graminoid***Bromus tectorum* (cheatgrass) IV.7, *Bromus arvensis* (field brome) IV.1**Forb**

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found on rocky slopes mainly to the north-northwest of State Highway 20/26/93. It is generally found on a southwest or southeast exposure.

Global

Vegetation in the *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance is described from southern Idaho and California but likely occurs elsewhere in the western U.S. within the distributional range of *Artemisia arbuscula* ssp. *arbuscula*. The *Artemisia arbuscula* ssp. *arbuscula* / *Bromus tectorum* Semi-natural Shrubland Association occurs sporadically within the range of the greater alliance where *Bromus tectorum* has had the opportunity to invade the understory.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A48**Low Sagebrush / Needle and Thread Shrubland***Artemisia arbuscula* ssp. *arbuscula* / *Hesperostipa comata* Shrubland**Description**

Artemisia arbuscula ssp. *arbuscula* dominates this association. Stands are low in stature and tend to occur with relatively open shrub canopies. *Purshia tridentata* may also occur as a very minor component of the shrub layer. Additional shrub species are variable in composition and contribute very little cover to the community. The herbaceous layer is sparse to moderate in terms of cover and *Hesperostipa comata* is typically the most abundant graminoid. Additional native and non-native grass species are present at low cover values and may include *Bromus arvensis*, *Elymus elymoides*, and *Poa pratensis*. The forb functional group of the plant community is often diverse, but cover is usually sparse and component species are variable.

Stands typically occur on poorly drained soils on a variety of landforms; from flats and depressions to slopes and ridges. Soils are usually shallow, rocky clays, often with an impenetrable layer at less than 60 cm depth. Climate is typified by a large proportion of precipitation falling as winter snow. Poor drainage often leads to elevated water tables in the spring, which may control the distribution of the vegetation in this association.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub*Purshia tridentata* (antelope bitterbrush) IV.1**Dwarf-shrub***Artemisia arbuscula* ssp. *arbuscula* (low sagebrush) V.17**Graminoid***Hesperostipa comata* (needle and thread) V.2, *Poa pratensis* (Kentucky bluegrass) IV.1, *Elymus elymoides* (bottlebrush squirreltail) IV.1**Forb**

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found on rocky slopes mainly to the north-northwest of State Highway 20/26/93. It is generally found on a southwest or southeast exposure.

Global

Vegetation in the *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance is described from southern Idaho and California but likely occurs elsewhere in the western U.S. within the distribution range of *Artemisia arbuscula* ssp. *arbuscula*. The *Artemisia arbuscula* ssp. *arbuscula* / *Hesperostipa comata* Shrubland Association likely occurs sporadically within the range of the greater alliance.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

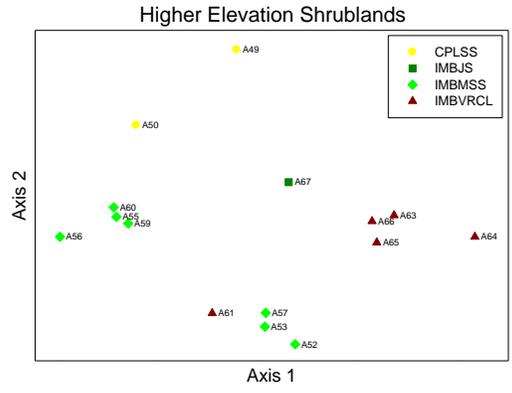
MAP UNITS

Enter CRMO-specific information.

A49

Low Sagebrush / Sandberg Bluegrass Shrub Herbaceous Vegetation

Artemisia arbuscula ssp. *arbuscula* / *Poa secunda* Shrub Herbaceous Vegetation



Description

Artemisia arbuscula ssp. *arbuscula* is the characteristic and predominant low shrub species in this vegetation type, although it can be obscured by tall grass cover. Cover of *Artemisia arbuscula* ssp. *arbuscula* is scattered and the canopy is generally open. *Poa secunda* is the dominant understory grass. *Pseudoroegneria spicata* is usually, but not always, present at low to moderate cover values. *Elymus elymoides* and *Bromus* spp. also typically co-occur in the graminoid functional group. *Phlox hoodii* is the most common forb, but forb cover is generally low and species composition is highly variable.

This *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance occurs on dry, exposed moderate slopes, on undulating to rolling topography, lower mountain toeslopes, inaccessible ridges, and on very steep canyon talus slopes. Slope can range from low to moderate. 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.

CONSERVATION RANK G5

DATABASE CODE C EGL001411

CHARACTERISTIC SPECIES (n = 8, AA)

Tree

None

Shrub

None

Dwarf-shrub

Artemisia arbuscula ssp. *arbuscula* (low sagebrush) V.12

Graminoid

Poa secunda (Sandberg bluegrass) V.4, *Bromus tectorum* (cheatgrass) III.3

Forb

Phlox hoodii (spiny phlox) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on rocky slopes mainly to the north-northwest of State Highway 20/26/93. It is generally found on a southwest or southeast exposure.

Global

This association is common and widespread in the western United States and is documented in Idaho, Oregon, Nevada and California.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

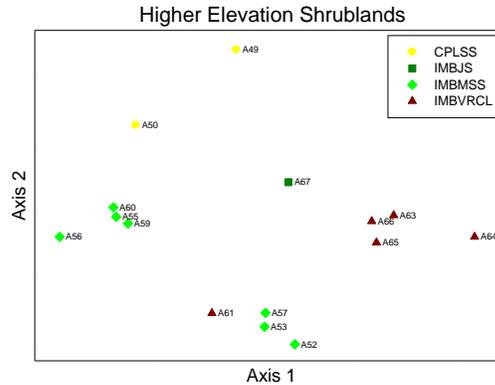
MAP UNITS

Enter CRMO-specific information.

A50

Low Sagebrush / Bluebunch Wheatgrass Shrub Herbaceous Vegetation

Artemisia arbuscula ssp. *arbuscula* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation



Description

This is a montane dwarf-shrub steppe association dominated by *Artemisia arbuscula* ssp. *arbuscula*. Other *Artemisia* spp., *Chrysothamnus viscidiflorus*, or *Purshia tridentata* may also be present in the shrub layer. The shrub canopy is generally open, and herbaceous cover often equals or exceeds shrub cover. *Pseudoroegneria spicata* is the dominant grass in the herbaceous layer. *Poa secunda* and *Bromus tectorum* are also commonly present. *Poa secunda* can even replace *Pseudoroegneria spicata* as the most abundant grass species in some sites. Forbs tend to be less abundant than grasses but may include *Phlox longifolia*, *Phlox hoodii*, *Balsamorhiza sagittata*, *Eriogonum* spp., and *Arenaria aculeata*.

This dwarf-shrubland occurs on foothills and open steep slopes. Sites are generally drier and warmer than sites occupied by other dwarf sagebrush associations, often on southern and western aspects. Soils are quite stony and often have a calcareous cemented layer that inhibits drainage. The soil surface is generally gravelly with up to 50% open bare gravelly soils.

CONSERVATION RANK G5

DATABASE CODE C EGL001412

CHARACTERISTIC SPECIES (n = 7, AA)

Tree

None

Shrub

None

Dwarf-shrub

Artemisia arbuscula ssp. *arbuscula* (low sagebrush) V.8

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.3, *Poa secunda* (Sandberg bluegrass) IV.2, *Bromus tectorum* (cheatgrass) III.3

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found on rocky slopes mainly to the north-northwest of State Highway 20/26/93. It is generally found on a southwest or southeast exposure.

Global

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.

COMMENTS

This association is showing an increase in the presence of the invasive, annual species, *Bromus tectorum*. The invasion of *Bromus tectorum* may be due in part, to the proximity and succetbibility of these plant communities to disturbances.

MAP UNITS

Enter CRMO-specific information.

A51**Early Low Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation***Artemisia arbuscula* ssp. *longiloba* / *Festuca idahoensis* Shrub Herbaceous Vegetation**Description**

Artemisia arbuscula ssp. *longiloba* forms an open low-shrub canopy and *Eriogonum microthecum* is often present but sparse in the dwarf-shrub layer. *Festuca idahoensis* and *Poa secunda* are well-represented to abundant graminoids. *Elymus elymoides* also frequently occurs at low cover values. Forbs are typically diverse in this plant community and commonly associated forbs include *Mertensia oblongifolia*, *Antennaria dimorpha*, *Phlox hoodii*, and *Ranunculus andersonii*. Additional forb species often occur in the understory, but species composition and cover are variable from one stand to another.

The association occurs on gentle, lower-slope and basin positions. It is restricted to rocky, claypan soils.

CONSERVATION RANK G2**DATABASE CODE** C EGL001522**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub

None

Dwarf-shrub

Artemisia arbuscula ssp. *longiloba* (early low sagebrush) V.11, *Eriogonum microthecum* (slender buckwheat) IV.1

Graminoid

Poa secunda (Sandberg bluegrass) V.7, *Festuca idahoensis* (Idaho fescue) V.6, *Elymus elymoides* (bottlebrush squirreltail) V.<1

Forb

Phlox hoodii (spiny phlox) V.1, *Ranunculus andersonii* (Anderson's buttercup) V.1, *Antennaria dimorpha* (low pussytoes) V.<1, *Mertensia oblongifolia* (oblongleaf bluebells) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in kipukas and on north-facing slopes. It occupies somewhat more mesic sites than *Artemisia arbuscula* ssp. *arbuscula* associations.

Global

This plant association occurs in scattered locations from southeastern Oregon to Montana, northern Nevada, southern Idaho, and probably Wyoming.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this association at Craters of the Moon is also limited.

This association is considered imperiled because although its distribution is widespread, it occurs with relatively few, widely distributed, small stands. Stands of the association are naturally protected to a limited degree at some sites due to the placement and abundance of cobbles and stones or their location on inaccessible mesa tops. The abundance of *Festuca idahoensis* and close proximity to seasonal water make these sites attractive to livestock. Though a proportion of the inventoried stands are in a high quality, representative condition, the number, size, and condition of occurrences rangewide are declining.

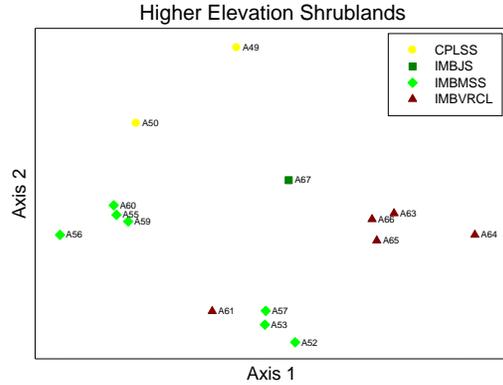
MAP UNITS

Enter CRMO-specific information.

A52

Mountain Big Sagebrush – Antelope Bitterbrush / Sandberg Bluegrass Shrubland

Artemisia tridentata ssp. *vaseyana* – *Purshia tridentata* / *Poa secunda* Shrubland



Description

Artemisia tridentata ssp. *vaseyana* dominates the shrub stratum of this vegetation type with *Purshia tridentata* often occurring as a co-dominant. Other shrubs, such as *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Eriogonum microthecum*, *Leptodactylon pungens*, and *Symphoricarpos oreophilus*, are also common. *Poa secunda* dominates the relatively sparse herbaceous understory. Other perennial grasses, such as *Elymus lanceolatus*, *Hesperostipa comata*, and *Pseudoroegneria spicata* are occasionally found in a patchy distribution throughout the plant community as well. Common forbs include *Eriogonum umbellatum*, *Eriogonum ovalifolium*, *Leptodactylon pungens*, and *Penstemon deustus*.

This plant association is generally found on xeric sites with shallow soil, usually on, but not limited to, volcanic flows and cinder buttes. Soils may also include silt loams and sandy loams.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.20, *Purshia tridentata* (antelope bitterbrush) V.8

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.3

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon, specifically, north of Laidlaw Park. This association is found on basalt, especially pahoehoe, and on shallow soils around the volcanic flows.

Global

This plant association is known from Craters of the Moon National Monument and Preserve in Idaho, south-central and southeastern Oregon, Dinosaur National Monument in northwestern Colorado and possibly north and central Nevada. The distribution of this association is discontinuous, partly due to the restriction of *Artemisia tridentata* ssp. *vaseyana* to cooler and more mesic higher elevations. However, within the range of *Artemisia tridentata* ssp. *vaseyana*, the discontinuous distribution probably also reflects the lack of sites unsuitable for the growth of perennial grasses other than *Poa secunda*.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon National Monument and Preserve and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

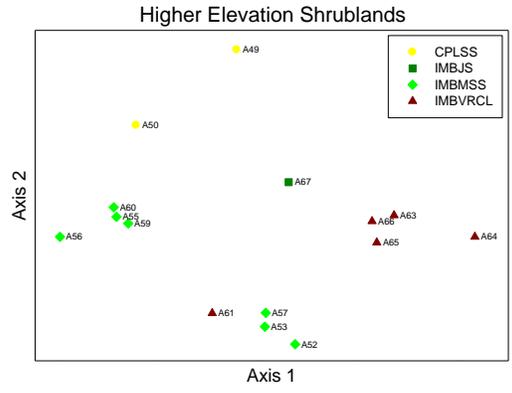
MAP UNITS

Enter CRMO-specific information.

A53

Mountain Big Sagebrush – Antelope Bitterbrush / Bluebunch Wheatgrass Shrubland

Artemisia tridentata ssp. *vaseyana* – *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland



Description

A combination of *Artemisia tridentata* ssp. *vaseyana* and *Purshia tridentata* dominate the canopy of this shrubland association. Other shrubs, such as *Ericameria nauseosa* and *Eriogonum microthecum* may also occur regularly. Shrub cover can range from 25 to 75%, and cover of the shrub stratum is greater than that of the herbaceous stratum. *Pseudoroegneria spicata* is typically the most abundant grass in the relatively sparse, herbaceous understory. Other perennial grasses, such as *Poa secunda*, *Elymus lanceolatus*, *Hesperostipa comata*, and *Bromus tectorum* are often present as well. Forbs occur at very low cover values and often include *Eriogonum heracleoides*, *Crepis acuminata*, *Phacelia hastata*, and *Penstemon deustus*.

Soils that support this plant association can range from xeric sites with shallow soils to sites where soils are deep and well-developed. Soil texture ranges from silt loams to sandy loams.

CONSERVATION RANK G5

DATABASE CODE C EGL001032

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.18, *Purshia tridentata* (antelope bitterbrush) V.12

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.2, *Poa secunda* (Sandberg bluegrass) III.2

Forb

Eriogonum heracleoides (parsnipflower buckwheat) IV.1

RANGE

Craters of the Moon National Monument and Preserve

Enter CRMO-specific information.

Global

This association likely occurs in the lower-montane regions of Nevada, Idaho, and Wyoming.

COMMENTS

This association is documented by NatureServe (2008) as part of the National Vegetation Classification (NVC); however, the vegetation and environmental setting descriptions are limited. Consequently, the plant community description in this document is based on data from Craters of the Moon National Monument and Preserve and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a vegetation description in the NVC.

MAP UNITS

Enter CRMO-specific information.



Mountain Big Sagebrush – Mountain Snowberry / Bluebunch Wheatgrass Shrubland

Artemisia tridentata ssp. *vaseyana* – *Symphoricarpos oreophilus* / *Pseudoroegneria spicata* Shrubland

Description

This shrubland association is dominated by a combination of *Artemisia tridentata* ssp. *vaseyana* and *Symphoricarpos oreophilus*; sometimes one is more dominant than the other, but both are always present. Other shrubs that may occur include; *Chrysothamnus viscidiflorus*, *Ribes* spp., and *Purshia tridentata*. The understory ranges from sparse to relatively high herbaceous cover. *Pseudoroegneria spicata* is always present and usually the most abundant grass.

This sagebrush community generally occurs on southern exposures. Soils are deep and tend to have fine loam texture with gravel fragment up to 30%.

CONSERVATION RANK G5

DATABASE CODE C EGL001038

CHARACTERISTIC SPECIES (n = 0, AA)

Tree

N/A

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush), *Symphoricarpos oreophilus* (mountain snowberry)

Dwarf-shrub

N/A

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association can be found in the northern part of Craters of the Moon, specifically north of Laidlaw Park. It occurs in foothills at the edge of woodlands.

Global

This association is known from northern Nevada, Idaho, and Wyoming and may also occur in Utah.

COMMENTS

This plant community is believed to occur at Craters of the Moon National Monument and Preserve and was retained in the list of plant communities for the site although none of the sampled plots were specifically assigned to this association. Consequently a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

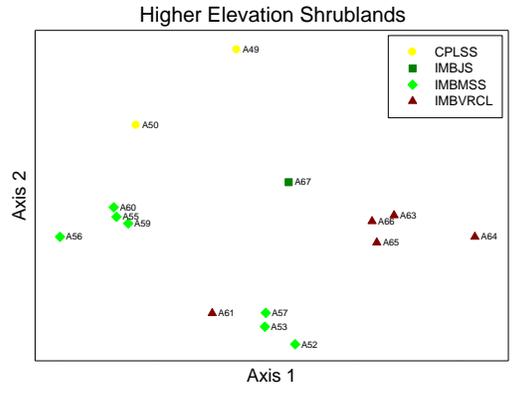
MAP UNITS

Enter CRMO-specific information.

A55

Mountain Big Sagebrush / Cheatgrass Semi-natural Shrubland

Artemisia tridentata ssp. *vaseyana* / *Bromus tectorum* Shrubland



Description

Artemisia tridentata ssp. *vaseyana* dominates the canopy of this shrubland association. Other shrubs, such as *Purshia tridentata*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, and *Artemisia arbuscula* are also common in the shrub stratum. Total plant cover of this community is generally less than 25%. The herbaceous understory ranges from sparse to moderate in terms of cover and is strongly dominated by the introduced annual grass, *Bromus tectorum*. Native grasses are sparse and variable; only *Poa secunda* occurs with regularity, albeit at low cover values. Species richness of the forb component of this plant community is generally low. Forbs have highly variable species composition that may include both native and non-native species and those that are present usually have very sparse cover.

Artemisia tridentata ssp. *vaseyana*-dominated shrublands occupy the most cool and moist climate zones of the *Artemisia tridentata* shrubland and shrub herbaceous alliances. The climate regime is cool, and semi-arid to subhumid. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. Soils generally are moderately deep to deep, well-drained, and comprised of loam, sandy loam, clay loam, or gravelly loam textural classes; they often have a substantial volume of coarse fragments.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 24, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.12, *Purshia tridentata* (antelope bitterbrush) III.3

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.8, *Poa secunda* (Sandberg bluegrass) III.2

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon, specifically north of Laidlaw Park. This association may be found on basalt, especially pahoehoe, and on shallow soils around the basalt.

Global

This shrubland association has the potential to occur 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 or in any montane location where conditions allow *Artemisia tridentata* ssp. *vaseyana* to dominate the plant community.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, it may often be a characteristic species on or around sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

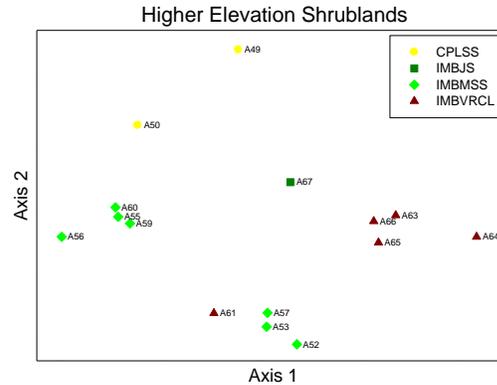
MAP UNITS

Enter CRMO-specific information.

A56

Mountain Big Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation

Artemisia tridentata ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation



Description

This herbaceous shrubland is characterized by an open shrub layer of *Artemisia tridentata* ssp. *vaseyana* and moderate cover of perennial graminoids in the understory. In addition to *Artemisia tridentata* ssp. *vaseyana*, associated shrubs may include *Purshia tridentata*, *Symphoricarpos oreophilus*, *Chrysothamnus viscidiflorus*, and other *Artemisia* spp. The herbaceous layer is typically dominated by perennial graminoids. The most common species is the bunchgrass, *Festuca idahoensis*. Other locally important species may include *Pseudoroegneria spicata*, *Bromus carinatus*, *Elymus elymoides*, and *Poa secunda*. Forb cover and species composition are variable; species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, *Collinsia*, *Collomia* and *Eriogonum* may be common.

This *Artemisia tridentata* ssp. *vaseyana*-dominated shrub herbaceous association occupies the coolest and most mesic climate zone of the *Artemisia tridentata* shrubland and shrub herbaceous complex. The climate regime is cool, semi-arid to subhumid. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. The elevation range for this type is wide and 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. 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.

CONSERVATION RANK G5

DATABASE CODE CEGL001533

CHARACTERISTIC SPECIES (n = 9, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.12

Dwarf-shrub

None

Graminoid

Festuca idahoensis (Idaho fescue) V.2, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.2, *Poa secunda* (Sandberg bluegrass) III.2

Forb

Lupinus ssp. (Lupine ssp.) IV.5

RANGE

Craters of the Moon National Monument and Preserve

This association is not common at Craters of the Moon, but may be found north of Laidlaw Park. This association is found in locations with better soil development, such as kipukas or on hill slopes.

Global

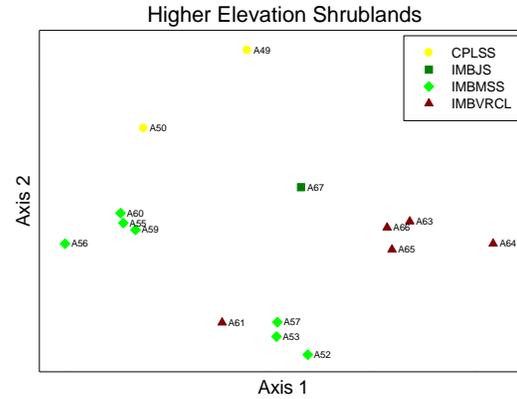
This is a wide-ranging association, known throughout the northwestern U.S. It occurs in eastern Oregon, Nevada, Utah, Colorado, Wyoming, Montana, Idaho, possibly occurring further north into Alberta and British Columbia. It may also occur in eastern California.

COMMENTS

At Craters of the Moon National Monument and Preserve, *Penstemon deustus* is an occasional understory forb in this association.

MAP UNITS

Enter CRMO-specific information.

A57**Mountain Big Sagebrush / Needle and Thread Shrubland***Artemisia tridentata* ssp. *vaseyana* / *Hesperostipa comata* Shrubland**Description**

Total vegetation cover usually exceeds 60% in these moderately to densely vegetated communities. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub with up to 40% cover. *Purshia tridentata*, *Ericameria* spp., *Eriogonum microthecum*, *Chamaebatiaria millefolium*, and *Ribes aureum* may also be present in the shrub layer. *Hesperostipa comata* is the principal herbaceous, understory species. *Poa secunda* may also be abundant in the understory. *Bromus tectorum* and *Elymus elymoides* may be present but sparse. Component forb species may include *Cirsium* spp., *Leptodactylon pungens*, *Penstemon deustus*, and *Eriogonum ovalifolium*.

This association occurs on gentle to moderate slopes, ridges, depressions and plateaus. Soils are derived from alluvium, eolian sands or loess, are often deep and range in texture from clay loam to sandy loams. At Craters of the Moon, this association may also occur in shallow loess soils on basalt.

CONSERVATION RANK GNR**DATABASE CODE** CEGL002931**CHARACTERISTIC SPECIES** (n = 4, AA)**Tree**

None

Shrub*Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) V.14, *Purshia tridentata* (antelope bitterbrush) V.1**Dwarf-shrub**

None

Graminoid*Poa secunda* (Sandberg bluegrass) V.2, *Hesperostipa comata* (needle and thread) V.1, *Bromus tectorum* (cheatgrass) V.<1**Forb***Leptodactylon pungens* (granite prickly phlox) IV.1, *Cirsium* ssp. (thistle) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon, specifically north of Laidlaw Park. This association is often found on various types of basalt.

Global

This association is known from southern Utah to southern Idaho and western Wyoming. It is likely to occur in northern Nevada as well.

COMMENTS

This shrubland association is susceptible to change as a result of fire, drought, or encroaching pinyon-juniper woodlands. The cover of *Hesperostipa comata* may vary considerably from year to year, depending on the quantity and timing of precipitation.

This association has not yet been ranked with regard to conservation status.

MAP UNITS

Enter CRMO-specific information.

A58**Mountain Big Sagebrush / Basin Wildrye Shrubland***Artemisia tridentata* ssp. *vaseyana* / *Leymus cinereus* Shrubland**Description**

Artemisia tridentata ssp. *vaseyana* dominates the shrub layer of this plant community. However, shrub cover is often lower in this association than in most mountain sagebrush types. Other shrub species may also be present with low cover values. *Leymus cinereus* is the dominant grass, with moderate cover; although cover may be lower in stands that have been heavily grazed. Forbs are sparse and species composition is variable among sites.

This association occupies shallow upland drainages associated with springs or seepage areas as well as riparian terraces. Sites are located on gentle to moderate lee slopes that collect windblown snow and may be oriented to any aspect. Soils are deep, well-developed, moderately well-drained and variable in texture.

CONSERVATION RANK G4**DATABASE CODE** CEGL001027**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub*Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush)**Dwarf-shrub**

N/A

Graminoid*Leymus cinereus* (basin wildrye)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This uncommon association is found in the northern part of Craters of the Moon, specifically north of Laidlaw Park. This association may be found on shallow soils and “cinder soils.”

Global

This association is widely distributed as small, isolated stands in northwestern Colorado (Dinosaur National Monument) and southwestern Wyoming (Fossil Butte National Monument). It has been reported from northern and central Nevada, northeastern Utah, southwestern Montana, southern Idaho and possibly occurs in northeastern California.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is based on data from other stands within the geographic range as summarized in NatureServe (2008).

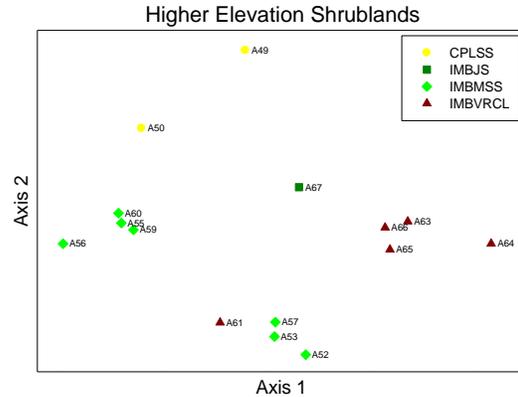
MAP UNITS

Enter CRMO-specific information.

A59

Mountain Big Sagebrush / Sandberg Bluegrass Shrubland

Artemisia tridentata ssp. *vaseyana* / *Poa secunda* Shrubland



Description

Artemisia tridentata ssp. *vaseyana* dominates the shrub stratum of this vegetation class; although other shrubs, such as *Ericameria* spp., *Chrysothamnus* spp., *Eriogonum microthecum*, *Leptodactylon pungens*, and *Purshia tridentata* are also common. *Poa secunda* is generally the most abundant species in the relatively sparse herbaceous understory. Other perennial grasses, including *Achnatherum hymenoides*, *Hesperostipa comata*, *Elymus elymoides*, and *Pseudoroegneria spicata*, are occasionally found as patches in the understory. *Bromus tectorum* may be increasing in frequency and abundance depending on the nature and proximity of disturbance to a given stand. Forbs are highly variable and diverse.

This plant association is found on xeric sites with shallow soil, usually on, but not limited to, lava flows and cinder buttes. It may also occur on soils that are deeper and better-developed. Soil texture may include silt loams and sandy loams.

CONSERVATION RANK G3

DATABASE CODE CEGL001029

CHARACTERISTIC SPECIES (n = 15, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.13, *Purshia tridentata* (antelope bitterbrush) III.2

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.4

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon. This association is found on basalt, especially pahoehoe and on shallow soils around the volcanic flows.

Global

This plant association is known from Craters of the Moon National Monument and Preserve in Idaho, south-central and southeastern Oregon, Dinosaur National Monument in northwestern Colorado and possibly north and central Nevada. The distribution of this association is discontinuous, partly due to the restriction of *Artemisia tridentata* ssp. *vaseyana* to cooler and more mesic higher elevations. However, within the range of *Artemisia tridentata* ssp. *vaseyana*, the discontinuous distribution also probably reflects the lack of sites unsuitable for the growth of perennial grasses other than *Poa secunda*.

COMMENTS

Rangewide, this association is not abundant and it is discontinuously distributed. There are less than 100 occurrences of this type known, though some occurrences cover large areas. The association is probably limited to the least productive soils within the range of *Artemisia tridentata* ssp. *vaseyana*. At lower elevations, these poorly developed and exposed soils are susceptible to surface disturbance and subsequent *Bromus tectorum* invasion.

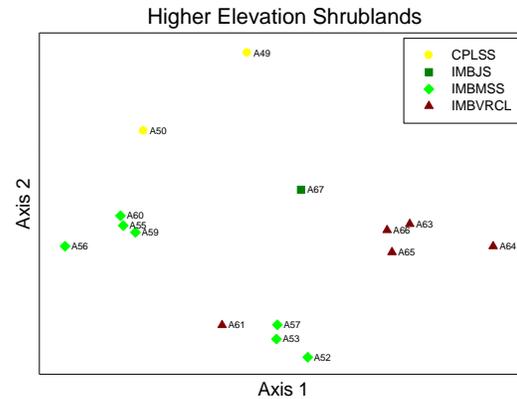
MAP UNITS

Enter CRMO-specific information.

A60

Mountain Big Sagebrush / Bluebunch Wheatgrass Shrubland

Artemisia tridentata ssp. *vaseyana* / *Pseudoroegneria spicata* Shrubland



Description

This association is dominated by *Artemisia tridentata* ssp. *vaseyana*. Other shrubs are usually present, but no one species consistently so, and all generally with low cover. Additional shrub species may include *Chrysothamnus* spp., *Tetradymia canescens*, *Purshia tridentata*, *Symphiocarpus oreophilus*, and *Ericameria nauseosa*. The herbaceous undergrowth is dominated by grasses; *Pseudoroegneria spicata* usually contributes the highest cover to the herbaceous stratum. In or around disturbed stands, *Bromus tectorum* can be abundant. Other component grass species may include *Poa secunda*, *Elymus lanceolatus*, *Koeleria macrantha*, *Hesperostipa comata*, and *Elymus elymoides*. *Festuca idahoensis* is typically absent, but if it occurs, it is present at very low cover. Common forbs include *Eriogonum umbellatum*, *Lupinus* spp., *Balsamorhiza sagittata*, *Lithospermum ruderales*, and *Phlox hoodii*.

This plant community can occur across a range of slopes and aspects, usually on the upper part of the slope, and on ridgetops, with northeast- to south-facing aspects. Soils are generally deep, with texture ranging from loams to gravely clays.

CONSERVATION RANK G5

DATABASE CODE C EGL001030

CHARACTERISTIC SPECIES (n = 32, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.11

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.6

Forb

Lupinus spp. (Lupine spp.) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon. This association is generally found on shallow soils and cinder surfaces but can occur on basalt.

Global

This is a common, abundant and widespread sagebrush community in the western U.S. It is known from Nevada, Oregon, Idaho, Montana, Wyoming, Colorado and possibly Utah.

COMMENTS

None.

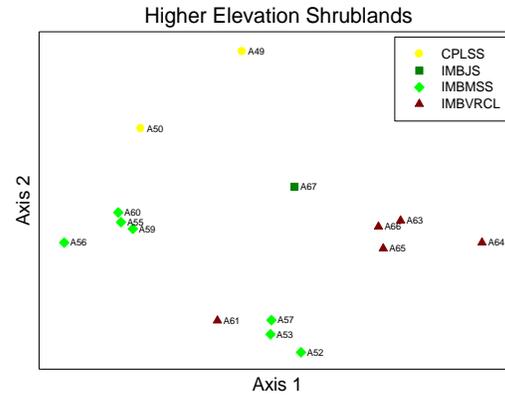
MAP UNITS

Enter CRMO-specific information.

A61**Mountain Big Sagebrush - Fernbush / Scabland Penstemon Shrubland***Artemisia tridentata* ssp. *vaseyana* - *Chamaebatiara millefolium* / *Penstemon deustus* Shrubland**Description**

The vegetation of this association is characterized by low to moderate shrub cover. *Artemisia tridentata* ssp. *vaseyana* is dominant, but *Chamaebatiaria millefolium* and *Purshia tridentata* are always present. *Ericameria nana* may also be common but with very low cover. The sparse herbaceous layer has very few graminoids, those that are most common include *Poa secunda* and *Elymus elymoides*. Forbs are extremely sparse but *Penstemon deustus* is a characteristic species of this association. *Potentilla glandulosa* and *Pteryxia terebinthina* may also be present.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

**CONSERVATION RANK** N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 5, AA)**Tree**

None

Shrub

Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush) V.10, *Chamaebatiara millefolium* (fernbrush) V.5, *Purshia tridentata* (antelope bitterbrush) V.1

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.1

Forb

Penstemon deustus (scabland penstemon) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout the northern part of Craters of the Moon, specifically north of Laidlaw Park. This association is found on various basalt surfaces.

Global

This association occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Penstemon deustus*, is always present and is a characteristic species of the association. However, its cover is typically low, less than 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon National Monument and Preserve and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A62

Curl-leaf Mountain Mahogany - Antelope Bitterbrush / Sandberg Bluegrass Shrubland

Cercocarpus ledifolius - *Purshia tridentata* / *Poa secunda* Shrubland



Description

The vegetation of this association is characterized by low to moderate shrub cover. The shrub layer is dominated by *Cercocarpus ledifolius*. *Purshia tridentata* is also important in the shrub stratum of this community, but it often occurs at low cover values. Other shrub species may also be present on occasion. *Juniperus osteosperma* may occur sporadically, but not with enough regularity or abundance to form a tree canopy. The sparse herbaceous layer has few graminoids, but *Poa secunda* is always present and *Elymus elymoides* commonly occurs. The introduced annual grass *Bromus tectorum* also occurs with some regularity. Forbs cover is very low but *Lactuca serriola*, *Phacelia hastata*, *Stephanomeria minor* are all commonly found in the understory of this plant community.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 2, AA)

Tree

None

Shrub

Cercocarpus ledifolius (curl-leaf mountain mahogany) V.15, *Purshia tridentata* (antelope bitterbrush) V.2, *Ribes aureum* (golden currant) V.<1

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.6, *Poa secunda* (Sandberg bluegrass) V.<1, *Elymus elymoides* (bottlebrush squirreltail) V.<1

Forb

Lactuca serriola (prickly lettuce) V.<1, *Phacelia hastata* (silverleaf phacelia) V.<1, *Stephanomeria minor* (narrowleaf wirelettuce) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on the Wapi Flow on pahoehoe basalt.

Global

The Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

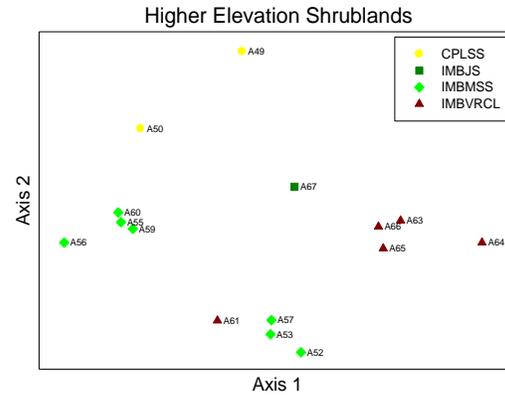
COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A63**Dwarf Goldenbush - Rockspirea / Scabland Penstemon Shrubland***Ericameria nana* - *Holodiscus dumosus* / *Penstemon deustus* Shrubland**Description**

This plant community is characterized by a shrub stratum with low to moderate cover. *Erimcameria nana* and *Holodiscus dumosus* and are the dominant shrub species. The sparse herbaceous layer has very few graminoids, but those that persist include *Poa secunda* and *Elymus elymoides*. Forbs are extremely sparse but the presence of *Penstemon deustus* is a defining characteristic of this association. *Potentilla glandulosa* and *Leptodactylon pungens* may also be present.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 11, AA)**Tree**

None

Shrub*Holodiscus dumosus* (rockspirea) V.2**Dwarf-shrub***Ericameria nana* (dwarf goldenbush) V.8**Graminoid***Poa secunda* (Sandberg bluegrass) V.1, *Elymus elymoides* (bottlebrush squirreltail) V.<1**Forb***Leptodactylon pungens* (granite prickly phlox) V.1, *Penstemon deustus* (scabland penstemon) V.1, *Potentilla glandulosa* (sticky cinquefoil) V.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found mainly on the Wapi Flow on pahoehoe basalt, though it can be found on other volcanic flows less frequently.

Global

This association occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

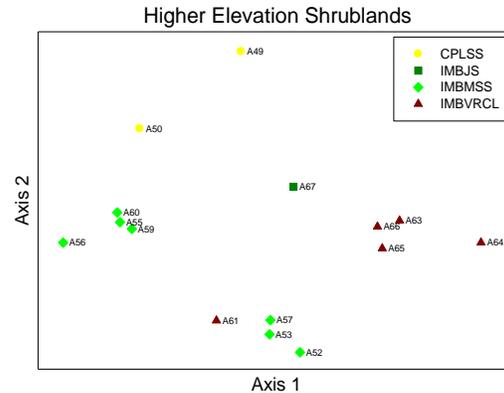
COMMENTS

The forb, *Penstemon deustus*, is always present and is a characteristic species of the association. However, its cover is low, generally under 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A64**Antelope Bitterbrush - Dwarf Goldenbush / Scabland
Penstemon Shrubland***Purshia tridentata* - *Ericameria nana* / *Penstemon deustus* Shrubland**Description**

Purshia tridentata is the dominant species in this shrubland vegetation type and *Ericameria nana* is always present. *Eriogonum microthecum* also occurs frequently but with very low cover. Other shrubs such as *Artemisia tridentata* ssp. *wyomingensis* and *Ericameria nauseosa* may occur sporadically in the shrub canopy of this association. The sparse herbaceous layer may include various graminoid species and those that occur frequently include *Poa secunda*, *Bromus tectorum*, and *Elymus elymoides*. Forbs are extremely sparse but *Penstemon deustus* is a characteristic species of this association. *Leptodactylon pungens* and *Phacelia hastata* are also common.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 15, AA)**Tree**

None

Shrub*Purshia tridentata* (antelope bitterbrush) V.5**Dwarf-shrub***Ericameria nana* (dwarf goldenbush) V.1, *Eriogonum microthecum* (slender buckwheat) IV.1**Graminoid***Bromus tectorum* (cheat grass) V.1, *Poa secunda* (Sandberg bluegrass) V.1**Forb***Leptodactylon pungens* (granite prickly phlox) V.1, *Penstemon deustus* (scabland penstemon) V.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found mostly on the Wapi Flow and less frequently on other volcanic flows. It is found mainly on pahoehoe basalt, and to a much lesser extent on aa basalt.

Global

This association occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Penstemon deustus*, is always present and is a characteristic species of the association. However, its cover is low, generally under 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based primarily on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A65

Antelope Bitterbrush - Lewis' Mock Orange / Sandberg Bluegrass Shrubland

Purshia tridentata - *Philadelphus lewisii* / *Poa secunda* Shrubland



Description

This association has an open shrub canopy and may occasionally have a sparse tree canopy resulting from scattered *Pinus flexilis* individuals. The shrub stratum is dominated by *Purshia tridentata* and *Philadelphus lewisii*, but *Chamaebatiaria millefolium* is common as well. Other shrubs such as *Ericameria nauseosa*, *Ribes aureum*, *Ericameria nana*, and *Eriogonum microthecum* may also be present. The sparse herbaceous layer has few graminoids, but *Poa secunda* is always present and *Elymus elymoides* is common. Forb cover is sparse in this plant community, but *Penstemon deustus*, *Potentilla glandulosa*, *Pteryxia terebinthina*, and *Packera cana* all occur with high constancy.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 4, AA)

Tree

Pinus flexilis (limber pine) III.2

Shrub

Philadelphus lewisii (Lewis' mock orange) V.5, *Purshia tridentata* (antelope bitterbrush) V.1, *Chamaebatiaria millefolium* (fern-bush) IV.2

Dwarf-shrub

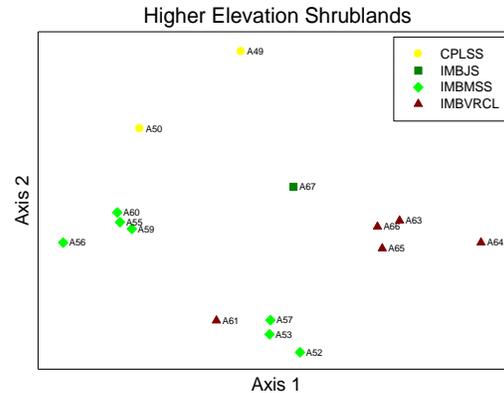
None

Graminoid

Poa secunda (Sandberg bluegrass) V.1

Forb

Penstemon deustus (scabland penstemon) V.<1, *Potentilla glandulosa* (sticky cinquefoil) V.<1, *Pteryxia terebinthina* var. *foeniculacea* (turpentine wavewing) IV.1



RANGE

Craters of the Moon National Monument and Preserve

This association is found primarily on pahoehoe basalt. It is not common but occurs throughout Craters of the Moon.

Global

This association occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

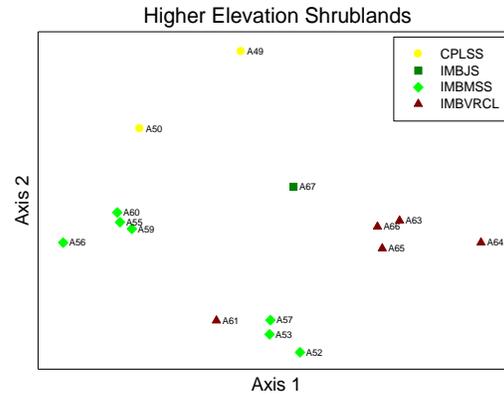
COMMENTS

Lewis' mock orange is a unique shrub species in that it is tolerant of a wide range of precipitation levels but intolerant of both fire and shade. It thrives on the exposed basaltic fissures that are common in the Snake River Plain of Eastern Idaho.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A66**Antelope Bitterbrush / Basin Wildrye Shrub Herbaceous Vegetation***Purshia tridentata* / *Leymus cinereus* Shrub Herbaceous Vegetation**Description**

Purshia tridentata forms a low and relatively open shrub canopy in this shrub herbaceous vegetation type. Several other shrub species are commonly present as scattered individuals; the most frequent of which is *Artemisia tridentata* ssp. *vaseyana*. Herbaceous cover generally equals or exceeds that of the shrub stratum. The perennial bunchgrass *Leymus cinereus* dominates the herbaceous layer, with a growth form of large clumps up to 1 m across. Other grasses are often present and include *Bromus tectorum* and *Poa secunda*. Common forbs include *Collinsia parviflora*, *Crepis acuminata*, *Delphinium andersonii*, *Eriogonum umbellatum*, *Lomatium dissectum*, and *Phacelia hastata*.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 4, AA)**Tree**

None

Shrub*Purshia tridentata* (antelope bitterbrush) V.9**Dwarf-shrub**

None

Graminoid*Leymus cinereus* (basin wildrye) V.3, *Bromus tectorum* (cheat grass) III.2**Forb**

None

RANGE

Craters of the Moon National Monument and Preserve

This uncommon association is found on cinder-derived soils, mainly in the northern section of Craters of the Moon.

Global

The plant association is known only to occur on medium-aged and older cinder cones of the Great Rift System, within the Snake River Basalts ecoregional section.

COMMENTS

This narrowly endemic plant association occurs on medium-aged and older cinder cones of the Great Rift System, on northern Snake River Plain, Idaho. Several of the known stands of the plant association occur within Craters of the Moon National Monument and Preserve. Most stands are believed to be in a stable, high-quality condition.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

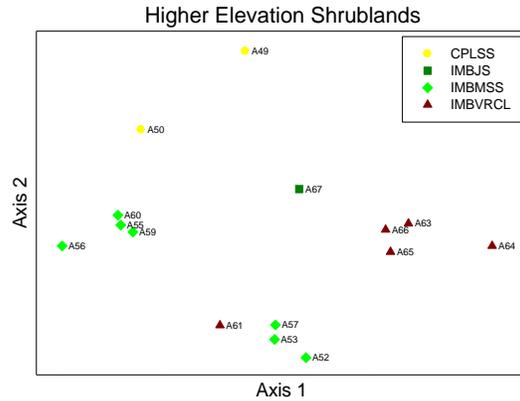
MAP UNITS

Enter CRMO-specific information.

A67

Utah Juniper / Wyoming Big Sagebrush / Needle and Thread Wooded Shrubland

Juniperus osteosperma / *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Wooded Shrubland



Description

The vegetation of this association is characterized by an open tree canopy dominated by *Juniperus osteosperma* with *Artemisia tridentata* ssp. *wyomingensis* dominating the sparse to moderately dense short-shrub layer. Tree canopy cover values are typically over 5%, but less than 20%, and the height of the tree canopy is 2-10 m. Other shrubs, such as *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, and *Ericameria nana* may be present in the shrub stratum, but generally with low cover. The herbaceous layer tends to have sparse to low cover but can range to moderately dense in some stands. The herbaceous layer is dominated by *Hesperostipa comata*, a perennial bunchgrass that typically occurs on rocky or sandy soils. Other graminoids such as *Achnatherum hymenoides*, *Elymus elymoides*, *Poa secunda*, *Pseudoroegneria spicata*, and introduced annual *Bromus tectorum* are common with cover values ranging from very low to moderate. Associated forbs are variable and include a combination of native and non-native species. The most common forbs include *Allium acuminatum*, *Descurainia pinnata*, *Gutierrezia sarothrae*, *Lactuca serriola*, *Lomatium dissectum*, *Opuntia polyacantha*, *Penstemon deustus*, *Potentilla glandulosa*, *Sisymbrium altissimum* and *Tragopogon dubius*.

This community occurs on a variety of slopes and aspects, often at the break between foothill and basin; it also occurs regularly on exposed basalt at Craters of the Moon. Soils are poorly developed, thin and somewhat sandy. Evidence of erosion such as gullies and rills is not uncommon. Rock cover is variable.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 6, AA)

Tree

Juniperus osteosperma (Utah juniper) V.7

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) V.6, *Ericameria nauseosa* (rubber rabbitbrush) V.2, *Purshia tridentata* (antelope bitterbrush) V.1, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) III.10

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheat grass) V.22, *Poa secunda* (Sandberg bluegrass) V.1, *Hesperostipa comata* (needle and

thread) IV.2

Forb

Lactuca serriola (prickly lettuce) V.<1, *Opuntia polyacantha* (plains pricklypear) IV.1, *Penstemon deustus* (scabland penstemon) III.2, *Lomatium dissectum* (fernleaf biscuitroot) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found on the Wapi Flow on pahoehoe basalt. It may be found less frequently on other volcanic flows.

Global

This plant association has been described for the southwestern region of the Bitterroot Mountains ecoregional section, within east-central Idaho. However, the combination of *Juniperus osteosperma* and *Artemisia tridentata* ssp. *wyomingensis* occurs throughout much of the western Rocky Mountains, Colorado Plateau, and Great Basin region and extends east to the Bighorn Mountains and hills of central Wyoming.

COMMENTS

Fires in this association are thought to be infrequent because smaller *Juniperus osteosperma* and *Artemisia tridentata* are easily killed by burns and do not resprout. In addition, many stands have an open canopy with insufficient understory to carry fire.

This community may have high variability in annual forb cover. Disturbance, precipitation and other factors are likely to influence the presence and abundance of native and introduced annual species.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based primarily on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A68**Chokecherry / Basin Wildrye Shrubland***Prunus virginiana* / *Leymus cinereus* Shrubland**Description**

The tall-shrub canopy of this vegetation type can range from open to closed, with higher cover values occurring on sites located in drainage bottoms and lower cover values occurring on sites located higher up on hillsides. *Prunus virginiana* is the dominant shrub species in this association. *Symphoricarpos oreophilus* is often present, but typically with sparse to low cover. Other shrubs may include *Artemisia tridentata*, *Rosa woodsii*, and *Alnus incana*. Herbaceous cover is usually sparse, less than 10%, and *Leymus cinereus* is characteristic of the understory. Other component herbaceous species may include *Bromus tectorum*, *Poa pratensis*, *Angelica pinnata*, *Galium bifolium*, *Heracleum maximum*, and *Urtica dioica*.

This vegetation type occurs in the foothills and lower slopes of mountains, along higher creeks, and in draws and ravines of plateaus. It favors the interface between larger riparian areas and the adjacent upland. 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. Slope varies from flat to moderately steep, with variable aspects. Soil texture ranges from sandy loam to clay loam.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 8, AA)**Tree**

None

Shrub*Prunus virginiana* (chokecherry) V.56, *Symphoricarpos oreophilus* (mountain snowberry) IV.3**Dwarf-shrub**

None

Graminoid*Leymus cinereus* (basin wildrye) V.3**Forb***Angelica pinnata* (small-leaf angelica) IV.2, *Galium bifolium* (twinleaf bedstraw) IV.1, *Urtica dioica* (stinging nettle) III.3

RANGE

Craters of the Moon National Monument and Preserve

This association is restricted to mesic sites north-northwest of State Highway 20/26/93 in the foothills and drainages of the mountains. It can also be found at other mesic sites such as Pratt Butte where favorable conditions exist.

Global

This is a widespread shrubland that tends to occur in small patches. It is known from the Columbia Plateau of eastern Washington, eastern Oregon, southeastern Idaho, throughout Wyoming, Montana, Colorado, and California.

COMMENTS

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter-CRMO specific information.



Description

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 are sometimes present. A somewhat sparse low-shrub layer is often present and may include species of *Ribes*, *Rosa*, and *Salix*. Undisturbed stands have abundant forbs and native grasses. The undergrowth is characterized by a mixed forb cover that may include; *Angelica pinnata*, *Heracleum maximum*, *Osmorhiza berteroi*, *Galium bifolium*, *Maianthemum stellatum*, *Hydrophyllum capitatum*, *Solidago canadensis*, and *Urtica dioica*. Graminoids species may include *Leymus cinereus* and *Poa pratensis*.

Stands of this vegetation type 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.

CONSERVATION RANK G3

DATABASE CODE C EGL001147

CHARACTERISTIC SPECIES (n = 4, AA)

Tree

Populus tremuloides (quaking aspen) V.2

Shrub

Alnus incana (gray alder) V.28, *Prunus virginiana* (chokecherry) IV.1, *Salix boothii* (Booth's willow) IV.1

Dwarf-shrub

None

Graminoid

Poa pratensis (Kentucky bluegrass) V.<1, *Leymus cinereus* (basin wildrye) IV.2

Forb

Heracleum maximum (common cowparsnip) V.13, *Urtica dioica* (stinging nettle) V.6, *Galium bifolium* (twinleaf bedstraw) V.1, *Angelica pinnata* (small-leaf angelica) V.<1, *Hydrophyllum capitatum* (ballhead waterleaf) V.<1, *Maianthemum racemosum* (feathery false lily of the valley) V.<1, *Solidago canadensis* (Canada goldenrod) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is restricted to mesic sites north-northwest of State Highway 20/26/93 in the foothills and drainages of the mountains.

Global

The plant association is found in Montana, Idaho, Nevada, Utah, Wyoming and Colorado.

COMMENTS

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 located within watersheds that are subject to numerous threats including livestock grazing, logging, recreational activities, hydrologic modifications, and road building.

MAP UNITS

Enter CRMO-specific information.

A70

Columbia Needlegrass / Silvery Lupine Herbaceous Vegetation

Achnatherum nelsonii / *Lupinus argenteus* Herbaceous Vegetation

Description

These northern lower montane and valley grasslands are typified by cool-season perennial bunch grasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer. *Achnatherum nelsonii* is the dominant graminoid species in this association. *Elymus trachycaulus* may also be common. *Lupinus argenteus* is characteristic of the plant community and is usually the most abundant forb species. It may be a codominant at a local scale. Additional forb species are variable in both cover and species composition.

This plant community can occur under a broad range of environmental conditions, on flat to somewhat steep slopes from the basin floor to high slopes at various aspects. It is often found within a matrix of *Artemisia tridentata*-dominated shrublands. Soil texture ranges from moderately well-drained to rapidly drained silt loam or clay. These are generally moderately to well-developed, medium- to coarse-textured soils. Litter and small rock often dominate the non-vegetated ground surface.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminoid

Achnatherum nelsonii (Columbia needlegrass)

Forb

Lupinus argenteus (silvery lupine)

RANGE

Craters of the Moon National Monument and Preserve

Enter CRMO-specific information.

Global

The Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland Ecological System occurs in the mountains and large valleys of northwestern Wyoming and western Montana, east to the central Montana Rocky Mountain Front and isolated mountain ranges west through Idaho into the Blue Mountains of Oregon. The range of the Columbia Needlegrass / Silvery Lupine Herbaceous Vegetation Association is more restricted than that of the ecological system and is constrained by the range of occurrence of *Achnatherum nelsonii*.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A71**Streambank Wheatgrass / Silvery Lupine Herbaceous Vegetation***Elymus lanceolatus* / *Lupinus argenteus* Herbaceous Vegetation**Description**

These sparse grasslands are dominated by *Elymus lanceolatus*, which is a cool-season, rhizomatous perennial grass. Total cover rarely exceeds 20%. Additional grass species that occur with high constancy but low cover include *Leymus cinereus*, *Pseudoroegneria spicata* and the introduced annual grass *Bromus tectorum*. Very scattered patches of 1- to 2-m tall shrubs are occasionally present and include *Artemisia tridentata* and *Chrysothamnus viscidiflorus*. *Lupinus argenteus* is characteristic of this plant community although it often occurs with very low cover. Several other forb species also tend to be constant but sparse in this vegetation type. They include *Allium acuminatum*, *Crepis acuminata*, *Lomatium triternatum*, and *Phlox longifolia*.

Sites are flat to gentle slopes with dry, deep loess or sandy soils. This association is often found in a patchwork with sand dunes and dune shrublands. Summers are typically hot and dry, with most precipitation falling during October through May.

CONSERVATION RANK N/A**DATABASE CODE** N/A**CHARACTERISTIC SPECIES** (n = 4, AA)**Tree**

None

Shrub*Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.1**Dwarf-shrub**

None

Graminoid

Elymus lanceolatus (streambank wheatgrass) V.8, *Bromus tectorum* (cheatgrass) IV.3, *Leymus cinereus* (basin wildrye) IV.1, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.1

Forb

Lupinus argenteus (silvery lupine) V.<1, *Allium acuminatum* (tapertip onion) V.<1, *Crepis acuminata* (tapertip hawksbeard) V.<1, *Lomatium triternatum* (nineleaf biscuitroot) V.<1, *Phlox longifolia* (longleaf phlox) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association was only recorded in the valley to the east of the Craters of the Moon boundary, and could be found in similar grasslands with adequate soil depths.

Global

Stands of this grassland community may occur in sandy areas that are scattered in the Columbia Basin in northeastern Oregon and in southeastern Washington mostly along the Columbia River. It also occurs in southwestern Montana, Utah, Colorado, and Idaho.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this association at Craters of the Moon is also limited.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.



Idaho Fescue – Bluebunch Wheatgrass Herbaceous Vegetation

Festuca idahoensis – *Pseudoroegneria spicata* Herbaceous Vegetation

Description

This grassland is characterized by the dominance of *Festuca idahoensis* and *Pseudoroegneria spicata*. Cover may occur within a wide range of variability for each species, but their combined cover is usually much greater than any shrub or forb component. Shrubs are often present sporadically and are widely scattered within this plant community. Additional graminoid species may also occur but are typically sparse and variable. Forb species composition varies, depending on aspect and geographic distribution. Invasive, non-native species are also likely to be present and even abundant in heavily disturbed stands.

This grassland is found mostly on flat to gently rolling topography, but can be found on relatively steep slopes as well. It tends to occur more on northerly exposures at the lower elevations and on southerly exposures at the higher elevations. Soils are primarily Mollisols, deep and dark-colored, with varying degrees of calcium carbonate buildup. pH runs from slightly acidic (6.0) to neutral or alkaline.

CONSERVATION RANK G4

DATABASE CODE CEGL001624

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminoid

Festuca idahoensis (Idaho fescue), *Pseudoroegneria spicata* (bluebunch wheatgrass)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

This association was only recorded in the valley to the east of the Craters of the Moon boundary. This association may also be found on the foothills and drainages to the north-northwest of State Highway 20/26/93.

Global

This grassland is known from eastern Washington, southern Idaho, western Montana, Wyoming, and southern Alberta. It is also likely to occur in northeastern California on the Modoc Plateau.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled and the plant community description is primarily based on data from other stands within the geographic range as summarized in NatureServe (2008).

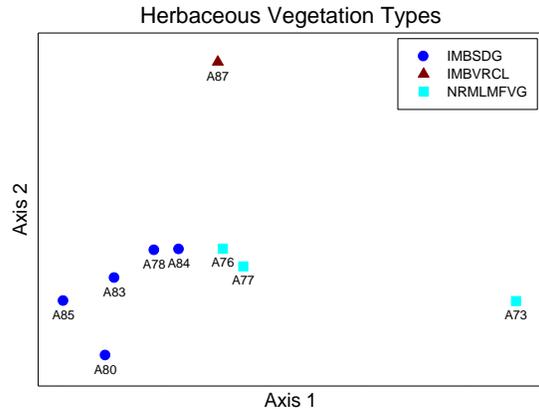
MAP UNITS

Enter CRMO-specific information.

A73

Basin Wildrye Herbaceous Vegetation

Leymus cinereus Herbaceous Vegetation



Description

This association is a characteristically tall, moderately dense grassland dominated *Leymus cinereus*. Other plant species are found primarily between clumps of *Leymus cinereus* or on the edges of dense stands. Scattered shrubs may be present, including *Artemisia tridentata*, *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, *Purshia tridentata*, and *Symphoricarpos oreophilus*. Associated graminoid species occurring with low cover values may include *Poa secunda*, *Poa bulbosa*, and introduced annual species, *Bromus tectorum*. Forbs are variable with low diversity and low cover and species composition varies across the range of the association.

This association is found along lower elevation riparian corridors and some moderately alkaline valley bottomlands. Stands tend to be patchy and grow on mesic sites with more soil moisture than is available to the surrounding vegetation. Sites are flat to steep and occur on all aspects. Soils are rapidly drained, often with a shallow water table. Soil texture is variable and ranges from silty clays to deep loamy sands.

CONSERVATION RANK G2

DATABASE CODE CEGL001479

CHARACTERISTIC SPECIES (n = 4, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Leymus cinereus (basin wildrye) V.28

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is limited to areas of increased moisture availability, such as the foothills and drainages north-northwest of State Highway 20/26/93. It is also found around cinder cones and valley floors on the eastern side of Craters of the Moon.

Global

This vegetation type is found mainly in the Great Basin and the Intermountain Region, and just reaches the western part of the Northern Great Plains. Although it occupies only a relatively small total area, it has a fairly large range.

COMMENTS

The conservation status of this association has been ranked as imperiled because few high-quality sites remain. This is a very widespread community type, and is found in many western states, but it is degraded throughout most of its range. This association was formerly very abundant in interior valleys, but most of these sites have been converted to agriculture. More knowledge of its distribution is needed, but it should remain a priority for conservation since most remaining sites are threatened by livestock grazing, agriculture, altered stream hydrology, and altered fire regime.

MAP UNITS

Enter CRMO-specific information.

A74

Bluebunch Wheatgrass – Oniongrass Herbaceous Vegetation

Pseudoroegneria spicata - *Melica bulbosa* Herbaceous Vegetation

Description

Stands of this association have a sparse to dense cover of graminoids (<1 m tall) and is dominated or codominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata*. *Melica bulbosa* is also characteristic of this grassland and cover may range from sparse to codominant. There is typically sparse to moderate cover of perennial forbs and widely scattered shrubs and dwarf-shrubs. Annual grasses and forbs may be seasonally present. Litter, moss and lichen are important groundcover in some stands.

Stands may be found on valley bottoms, stream terraces, rolling uplands, canyon benches and slopes, hills, ridges, plateaus and buttes, and foothills. Sites may be xeric or mesic, on nearly level to steep slopes. The *Pseudoroegneria spicata* Herbaceous Alliance may occur 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.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 1, AA)

Tree

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass), *Melica bulbosa* (oniongrass)

Forb

N/A

RANGE

Craters of the Moon National Monument and Preserve

Enter CRMO-specific information.

Global

Grasslands included in the *Pseudoroegneria spicata* Herbaceous 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. The *Pseudoroegneria spicata* - *Melica bulbosa* Herbaceous Vegetation Association occurs in scattered stands throughout the range of the greater alliance.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A75**Bluebunch Wheatgrass – Sandberg Bluegrass / Arrowleaf
Balsamroot Herbaceous Vegetation***Pseudoroegneria spicata* – *Poa secunda* / *Balsamorhiza sagittata* Herbaceous Vegetation

Description

This plant association is characterized by a relatively open, tall bunchgrass layer dominated by *Pseudoroegneria spicata*. *Poa secunda* is consistently present but cover may range from low to moderate. *Balsamorhiza sagittata* is conspicuous in this plant community and cover often approaches moderate levels. Scattered shrubs are occasionally present but component species are variable. Additional grass species may also occur but are sparse and variable. Annual *Bromus* spp. are occasionally present and may occur with abundance in degraded stands. Associated forbs are variable but common in this plant community.

Stands typically occur on steep, southeast- to southwest-facing slopes on mid- to upper-slope positions of major ridge systems in highly dissected terrain. Soils are often gravelly with abundant cobbles and stones.

CONSERVATION RANK G2**DATABASE CODE** CEG001662**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminoid*Pseudoroegneria spicata* (bluebunch wheatgrass), *Poa secunda* (Sandberg bluegrass)**Forb***Balsamorhiza sagittata* (arrowleaf balsamroot)

RANGE

Craters of the Moon National Monument and Preserve

Enter CRMO-specific information.

Global

The association appears 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.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

The conservation status of this association rangewide is considered to be imperiled. This regional endemic plant association is relatively common and widespread on suitable habitats within its range. However, occurrences of this plant association are prone to invasion by exotic annual grass species. While the number and range of occurrences and rangewide acreage of the plant association appear relatively stable, nearly all of the stands inventoried are degraded by the presence of exotic annual grass species. Pristine stands are extremely rare.

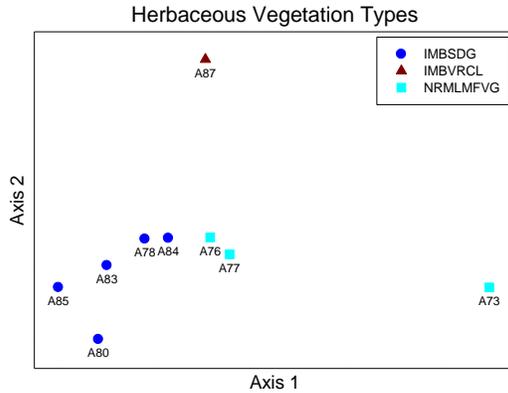
MAP UNITS

Enter CRMO-specific information.

A76

Bluebunch Wheatgrass – Sandberg Bluegrass Herbaceous Vegetation

Pseudoroegneria spicata – *Poa secunda* Herbaceous Vegetation



Description

This association is a bunchgrass grassland with minor cover of forbs and often sparse cover of shrubs. *Pseudoroegneria spicata* dominates or codominates the plant community; *Poa secunda* is usually present with substantial cover, and *Festuca idahoensis* may be either absent or only present with very sparse cover. *Hesperostipa comata* often occurs with moderate cover and may occasionally codominate the graminoid layer. The commonly occurring shrubs in this plant community include *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, and *Artemisia tridentata*. *Bromus tectorum*, *Tragopogon* spp., and *Alyssum* spp. are introduced annual species that are also common to this vegetation type, due at least in part, to susceptibility and proximity to disturbance.

Sites where this plant community occurs include ridges and slopes, occasionally 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 part of the geographic range. This association grows over a very broad elevational range. Stands grow on well-drained, often shallow, and frequently gravelly or rocky soils generally of loam, clay loam, silt loam, or sandy loam textural classes.

CONSERVATION RANK G4

DATABASE CODE C EGL001677

CHARACTERISTIC SPECIES (n = 11, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) III.2

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.13, *Poa secunda* (Sandberg bluegrass) V.2

Forb

Crepis acuminata (tapertip hawksbeard) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around the basalt. Much of the surface is “cinder soils.”

Global

This grassland association occurs in the Intermountain northwestern U.S. and adjacent Canada, and extends east into the Rocky Mountains from northern Colorado to northern Montana and east on to the northwestern Great Plains.

COMMENTS

This association was at one time common throughout its wide geographic range, but much of it 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* and shrubs have increased. Exotics, especially *Bromus tectorum*, *Tragopogon* spp., and *Alyssum* spp., have become increasingly common members of the plant community.

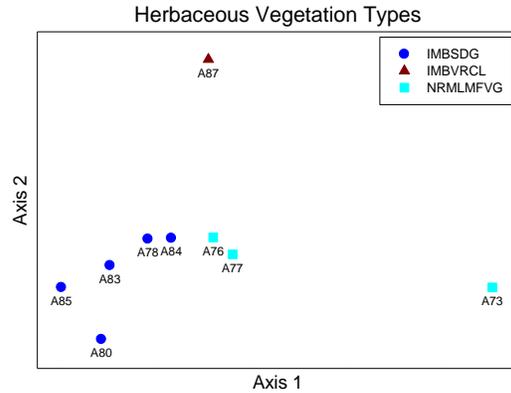
MAP UNITS

Enter CRMO-specific information.

A77

Bluebunch Wheatgrass / Tapertip Hawksbeard Herbaceous Vegetation

Pseudoroegneria spicata / *Crepis acuminata* Herbaceous Vegetation



Description

Pseudoroegneria spicata dominates or codominates the plant community in this herbaceous association; *Poa secunda* is usually present with low to moderate cover, and *Crepis acuminata* is a characteristic forb, but it usually occurs with low cover. *Festuca idahoensis* may be absent or present with very low cover. *Chrysothamnus viscidiflorus* and *Artemisia tridentata* are the only shrub species that occur with regularity but tend to occur sporadically and contribute very little cover to the plant community.

Sites suitable for this vegetation type may include ridges and slopes, 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 part of the geographic range. This association can occur over a very broad elevational range. Stands grow on well-drained, often shallow, and frequently gravelly or rocky soils generally of loam, clay loam, silt loam, or sandy loam textural classes.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 6, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Pseudoroegneria spicata (bluebunch wheatgrass) V.10, *Poa secunda* (Sandberg bluegrass) V.1

Forb

Crepis acuminata (tapertip hawksbeard) V.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around the basalt. Much of the surface is “cinder soils.”

Global

This grassland association likely occurs in the intermountain northwestern U.S. and adjacent Canada, and extends east into the Rocky Mountains from northern Colorado to northern Montana and east on to the northwestern Great Plains.

COMMENTS

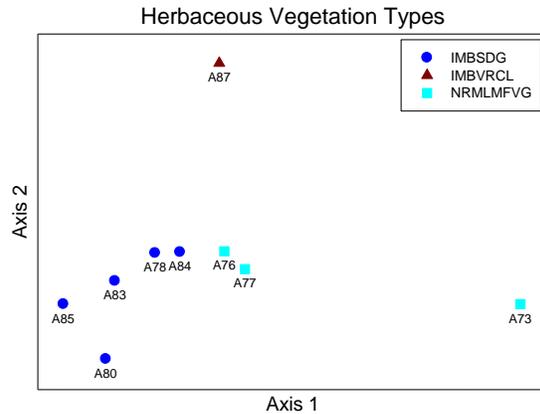
This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

Thurber’s Needlegrass – Cheatgrass Semi-natural Herbaceous Vegetation

Achnatherum thurberianum – *Bromus tectorum* Semi-natural Herbaceous Vegetation



Description

This herbaceous vegetation association is dominated by *Achnatherum thurberianum*, a native perennial bunchgrass. *Bromus tectorum*, an introduced annual grass is always present and may codominate this grassland vegetation type. Total vegetation cover ranges from 10 to 70%. Shrubs may occur sporadically with low densities. *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, and *Purshia tridentata* are the most constant native shrubs in this association. In addition to *Achnatherum thurberianum*, *Pseudoroegneria spicata* and *Pascopyrum smithii* are the most frequently occurring and abundant native grasses in this community type. Several native perennial and annual forb species may also occur with sparse cover and variable species composition across stands of this vegetation type. Non-native forb species are often common, but again, species composition is variable.

This association 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, and may be highly variable from one stand to another. This association often occurs on or near sites that have been disturbed.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 9, AA)

Tree

None

Shrub

Artemisia tridentata ssp. *wyomingensis* (Wyoming big sagebrush) III.3

Dwarf-shrub

None

Graminoid

Achnatherum thurberianum (Thurber’s needlegrass) V.10, *Bromus tectorum* (cheatgrass) V.7, *Pseudoroegneria spicata* (bluebunch wheatgrass) IV.3, *Pascopyrum smithii* (western wheatgrass) IV.2

Forb

Collinsia parviflora (maiden blue eyed Mary) IV.3

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

This distribution of this association is restricted to sites within the range of *Achnatherum thurberianum*, primarily in the Owyhee Uplands ecoregional section in southwestern Idaho, southeastern Oregon, and northern Nevada. The range of this vegetation type also coincides with the invasion of *Bromus tectorum*, often on or in close proximity to sites that have been disturbed.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to codominate primarily on sites that have been disturbed.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided here may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A79

Crested Wheatgrass – Cheatgrass Semi-natural Herbaceous Vegetation

Agropyron cristatum – *Bromus tectorum* Semi-natural Herbaceous Vegetation



Description

This herbaceous plant community is characterized by an abundance of introduced grass species. The vegetation in this association is dominated by *Agropyron cristatum*, a perennial bunchgrass, *Bromus tectorum*, an annual grass, or a combination of both species. *Bromus tectorum* may occasionally be replaced by another introduced annual *Bromus* species. This association often occurs on or near sites that have been disturbed. Total vegetation cover ranges from 10 to 70%, generally with less than half from native species. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced grasses. Native shrubs may occur sporadically with low densities. *Chrysothamnus viscidiflorus* is the most constant native shrub in this association while *Poa secunda* is the most frequently occurring and abundant native grass. Several native perennial and annual forb species may also be sparse and variable across stands of this type. Non-native forb species are common, but again, species composition is variable.

This association can occur across a wide range of environmental conditions in semi-arid ecosystems and is not tightly constrained by slope, aspect, soil texture, or soil depth.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 16, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) IV.3

Dwarf-shrub

None

Graminoid

Agropyron cristatum (crested wheatgrass) V.7, *Bromus tectorum* (cheatgrass) V.6, *Poa secunda* (Sandberg bluegrass) IV.6

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or adjacent to basalt. It is more likely to occur subsequent to fire or other disturbance.

Global

This distribution of this association coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Alliance, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S.

COMMENTS

Agropyron cristatum has been planted into pastures and rangelands to improve forage production and is well suited to the cold, semi-arid conditions of the Great Basin, northwestern Great Plains and higher elevation rangeland in more southern latitudes, facilitating its persistence and occasional spread. Stands can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, revegetation projects, etc. The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, these species tend to co-dominate primarily on sites that have been severely impacted.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

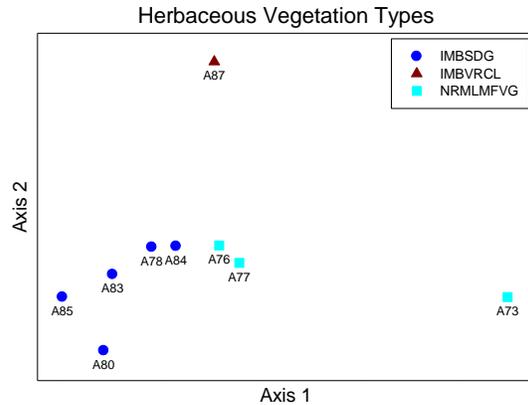
MAP UNITS

Enter CRMO-specific information.

A80

Cheatgrass Semi-natural Herbaceous Vegetation

Bromus tectorum Semi-natural Herbaceous Vegetation



Description

The vegetation in this association is dominated by *Bromus tectorum*, an introduced annual grass species. Total vegetation cover may be highly variable, generally with less than half from native species. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced grasses. Native shrubs may occur sporadically with low densities. *Chrysothamnus viscidiflorus* is the most constant native shrub in this association and *Poa secunda* is the most frequently occurring and abundant native grass. Several native perennial and annual forb species may also be sparse and variable across stands of this type. Non-native forb species are common, but again, species composition is variable.

This association can occur across a wide range of environmental conditions in semi-arid ecosystems and is not tightly constrained by slope, aspect, soil texture, or soil depth. This association often occurs on or near sites that have been disturbed.

CONSERVATION RANK N/A

DATABASE CODE CEGL003019

CHARACTERISTIC SPECIES (n = 52, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.18, *Poa secunda* (Sandberg bluegrass) IV.2

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found most often in locations with better soil development, such as kipukas or vegetated areas around the basalt. It does occur on various basalt types, although infrequently.

Global

The distribution of this association coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Alliance, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to dominate or codominate primarily on sites that have been severely impacted.

This vegetation type was not formally recognized in the National Vegetation Classification (NVC) at the association level and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A81**Needle and Thread – Sandberg Bluegrass Herbaceous Vegetation***Hesperostipa comata* – *Poa secunda* Herbaceous Vegetation**Description**

This is a moderate to dense herbaceous vegetation type with most of its total cover from bunchgrasses. *Hesperostipa comata* dominates the herbaceous layer and *Poa secunda* is well-represented. Shrubs are common at low cover values and *Chrysothamnus viscidiflorus* occurs frequently in this plant community. Additional shrubs are variable and sparse. Several grass species may also occur as minor components of this association, but no one species occurs with regularity. Some grass species, like *Elymus lanceolatus*, may occasionally be locally abundant where they occur. *Phlox longifolia* occurs with some constancy at moderate cover values. Otherwise, forbs typically contribute little cover to the plant community, but component forb species may be diverse and variable. The annual grass, *Bromus tectorum* may be present at low to moderate cover.

Sandy to gravelly soils or certain low fertility soils (old weathered volcanic ash) are associated with this vegetation type.

CONSERVATION RANK G1**DATABASE CODE** CEGL001704**CHARACTERISTIC SPECIES** (n = 3, AA)**Tree**

None

Shrub*Chrysothamnus viscidiflorus* (yellow rabbitbrush) V.1**Dwarf-shrub**

None

Graminoid*Hesperostipa comata* (needle and thread) V.29, *Poa secunda* (Sandberg bluegrass) V.5, *Bromus tectorum* (cheatgrass) V.4, *Elymus lanceolatus* (streambank wheatgrass) IV.8**Forb***Phlox longifolia* (longleaf phlox) IV.7

RANGE

Craters of the Moon National Monument and Preserve

This uncommon association is found in locations with better soil development, such as kipukas or vegetated areas around the basalt.

Global

Historically, this association was thought to be endemic to the Palouse Prairie region of Oregon and Washington. It has since been documented to occur on the Hanford Monument in Washington and the Boardman RNA in Oregon, as well as in Montana and Idaho.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this association at Craters of the Moon is also limited.

This association, as described by NatureServe (2008), typically occurs in more mesic areas than sites of *Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* Shrubland Association, a related plant community, which is common at Craters of the Moon National Monument and Preserve. Therefore, stands in the *Hesperostipa comata* – *Poa secunda* Herbaceous Vegetation Association at Craters of the Moon are likely a result of disturbance and are dissimilar in terms of environment, species composition, and dynamic processes to those described in the National Vegetation Classification (NVC). The description reported herein reflects local vegetation abundance and composition.

The conservation status of this association is considered to be critically imperiled. Its status is based on the limited distribution and poor quality of existing stands based on the range of the association as it is described in NatureServe (2008).

MAP UNITS

Enter CRMO-specific information.



Description

This association is characterized by an open to moderated herbaceous layer that grows 0.5-1 m tall and is strongly dominated by *Pascopyrum smithii*. Herbaceous cover may be significantly less on drier sites or after scarce cool-season precipitation. Other graminoids may co-occur in this community type. *Carex douglasii* occurs at relatively high frequency and low cover values. Additional graminoid species vary from one stand to another. Shrubs and dwarf-shrubs are rare in this community, but occasional woody species that are common to sagebrush steppe plant communities may be present. Forbs are common but are variable in species composition and sparse in terms of vegetation cover. A mix of native and introduced forbs are typically represented and species may include *Descurainia pinnata*, *Lepidium densiflorum*, *Viola nuttallii*, *Taraxacum officinale*, and *Tragopogon dubius*. Additional non-native, weedy species may be locally abundant, especially in stands that have been disturbed.

Stands occur on level to gently sloping terrain. They may be found on alluvial fans, swales, floodplains, valley bottoms and basins. The soils are typically deep (40-100 cm), slightly alkaline and well-developed with clay, clay loam, and silt loam textures, but also coarser textures such as sand and loamy sand. Some stands occur on perched water tables. Parent materials include Quaternary landslide deposits, volcanic rocks, sandstones and shale that have eroded and deposited as secondary stream alluvium.

CONSERVATION RANK G4

DATABASE CODE C EGL001577

CHARACTERISTIC SPECIES (n = 2, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Pascopyrum smithii (western wheatgrass) V.30, *Carex douglasii* (Douglas' sedge) V.2

Forb

Lepidium densiflorum (common pepperweed) V.1, *Descurainia pinnata* (western tansymustard) V.<1, *Taraxacum officinale* (common dandelion) V.<1, *Tragopogon dubius* (yellow salsify) V.<1, *Viola nuttallii* (Nuttall's violet)

V.<1

RANGE

Craters of the Moon National Monument and Preserve

This uncommon association is found on rangeland or roadside shoulders, especially in low areas where water may pool seasonally.

Global

This grassland vegetation type is found in the northern and western Great Plains, Rocky Mountains, intermountain western United States and Canada, ranging from North Dakota and Saskatchewan, south to Nebraska and Colorado, and west to northern Arizona, Utah and Idaho.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Consequently, the characteristic species list for this plant community at Craters of the Moon is also limited.

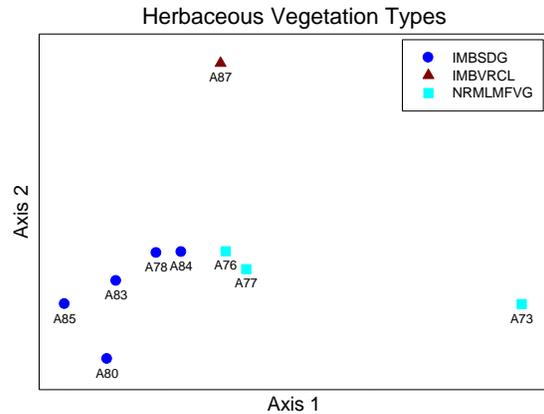
MAP UNITS

Enter CRMO-specific information.

A83

Sandberg Bluegrass – Cheatgrass Semi-natural Herbaceous Vegetation

Poa secunda – *Bromus tectorum* Semi-natural Herbaceous Vegetation



Description

This herbaceous vegetation association is dominated by *Poa secunda*, *Bromus tectorum*, or a combination of both species. *Poa secunda* is a native, perennial grass, and *Bromus tectorum* is an introduced, annual grass. Shrubs may occur sporadically with low densities. *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, and *Artemisia tripartita* are the most constant native shrubs in this association. In addition to *Poa secunda*, other native grasses are often present, but no one species occurs with high constancy. Several native perennial and annual forb species may also occur with sparse cover and variable species composition across stands of this type. Non-native forb species are common as well, but species composition is variable.

This association occurs on flat to steeply sloping upland sites. Stands occur in swales, gentle slopes and drainage bottoms and valley floors, often with easterly facing aspects. Substrates are deep, well-drained loam, clay loam and silty clay soils. Litter cover is variable but often relatively high. This plant community is often associated with disturbance.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 99, AA)

Tree

None

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) IV.2, *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) III.3

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.11, *Poa secunda* (Sandberg bluegrass) V.6

Forb

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around, and occasionally on basalt. It is most common from Laidlaw Park and continuing south.

Global

The distribution of this association coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Alliance, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S. It is further constrained to sites within that region where environmental conditions are appropriate for *Poa secunda* to dominate a plant community.

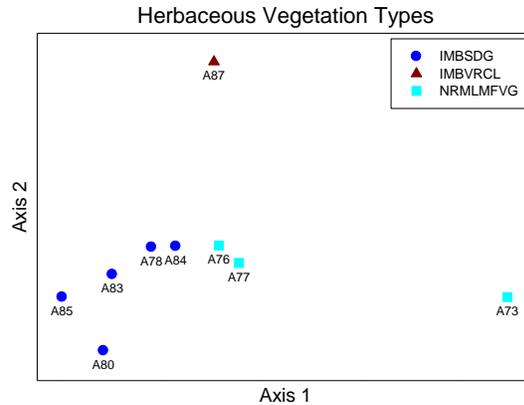
COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. Consequently, this species tends to codominate on or in close proximity to sites that have been impacted by disturbance.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A84**Sandberg Bluegrass Herbaceous Vegetation***Poa secunda* Herbaceous Vegetation**Description**

This herbaceous vegetation association forms a somewhat open to dense graminoid layer strongly dominated by the short bunchgrass *Poa secunda* (up to 50% cover). The shrubs *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, *Artemisia tripartita*, and *Purshia tridentata* may be present sporadically and with sparse cover. The herbaceous layer may be diverse, with additional graminoids such as *Elymus elymoides*, *Pascopyrum smithii*, *Pseudoroegneria spicata*, *Achnatherum thurberianum*, and *Bromus tectorum* providing low to moderate cover. Forbs contribute sparse to moderate cover and may include a wide variety of native and non-native species.

This widespread grassland association occurs across a large range of elevations. Stands occur on uplands in swales, gentle slopes and drainage bottoms and valley floors, often with easterly facing aspects. Substrates are deep, well-drained loam, clay loam and silty clay soils. Litter cover is variable but often relatively high.

CONSERVATION RANK G4**DATABASE CODE** C EGL001657**CHARACTERISTIC SPECIES** (n = 8, AA)**Tree**

None

Shrub*Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) IV.4**Dwarf-shrub**

None

Graminoid*Poa secunda* (Sandberg bluegrass) V.11, *Pseudoroegneria spicata* (bluebunch wheatgrass) III.2, *Bromus tectorum* (cheatgrass) III.2**Forb**

None

RANGE

Craters of the Moon National Monument and Preserve

This association is found in locations with better soil development, such as kipukas or vegetated areas around and occasionally on basalt.

Global

This grassland association occurs across the intermountain western U.S. from western Colorado to California, north to Idaho and Oregon.

COMMENTS

None.

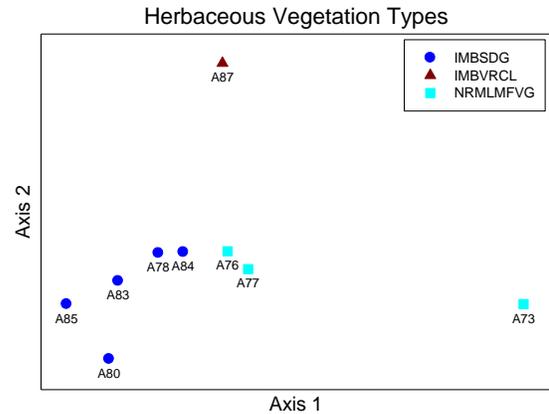
MAP UNITS

Enter CRMO-specific information.

A85

Tall Tumblemustard / Cheatgrass Semi-natural Herbaceous Vegetation

Sisymbrium altissimum / *Bromus tectorum* Semi-natural Herbaceous Vegetation



Description

This herbaceous plant community is characterized by an abundance of introduced species. The vegetation in this association is dominated by *Sisymbrium altissimum*, an annual forb, *Bromus tectorum*, an annual grass, or a combination of both species. This association often occurs on or near sites that have been disturbed. Total vegetation cover ranges from 10 to 70%, generally with less than half from native species. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced species. Native shrubs may occur sporadically with low densities. *Poa secunda* is the most frequently occurring and abundant native grass. Several native forb species may also be sparse and variable across stands of this vegetation type.

This association can occur across a wide range of environmental conditions in semi-arid ecosystems but is likely to be found in low-lying areas that have fine soil-textures and experience occasional seasonal flooding.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 24, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Bromus tectorum (cheatgrass) V.18, *Poa secunda* (Sandberg bluegrass) IV.6

Forb

Sisymbrium altissimum (tall tumblemustard) V.14, *Tragopogon dubius* (yellow salsify) IV.2, *Lactuca serriola* (prickly lettuce) III.2

RANGE

Craters of the Moon National Monument and Preserve

This association is found on kipukas and areas between the basalt and agricultural fields. It is most common from Laidlaw Park to the south, especially around the Wapi Flow.

Global

This global distribution of this association coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Alliance, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S.

COMMENTS

The unique life history characteristics of *Bromus tectorum* and the altered ecological process associated with this species have promoted the spread of it and other exotic annual bromes at the expense of sagebrush shrublands in large parts of the western U.S. *Sisymbrium altissimum* is also characteristic of disturbed areas. Consequently, these species tend to codominate on or around sites that have been severely impacted.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on limited data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

**Description**

This broadly defined association is characterized by a low (<50 cm), open to moderate graminoid layer dominated by the rhizomatous perennial, *Juncus balticus*. *Carex* species are often present at low cover. Other graminoids are common and species composition is variable and highly dependent on annual/seasonal precipitation. Forb cover is generally low but may include *Achillea millefolium*, *Artemisia ludoviciana*, *Cirsium* spp., *Iris missouriensis*, and *Solidago canadensis*. Shrubs and dwarf-shrubs are not common, but occasional. *Artemisia tridentata*, *Ericameria nauseosa*, *Populus* spp., *Rosa woodsii*, or *Salix* spp. shrubs may occur. Additional introduced species may occur in disturbed stands.

This wet meadow plant community occurs as small to extensive, open to typically dense patches on flat stream benches, along overflow channels, and near springs. Habitats are often alkaline meadows and may have long-term grazing disturbance. Soils are variable and range from poorly to well-drained, sandy clay loam to fine sand-textured and are usually mottled or gleyed.

CONSERVATION RANK G5**DATABASE CODE** C EGL001838**CHARACTERISTIC SPECIES** (n = 1, AA)**Tree**

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminoid*Juncus balticus* (Baltic rush)**Forb**

N/A

RANGE

Craters of the Moon National Monument and Preserve

This uncommon association is restricted to wet or saturated ground, such as perennial ponds, springs, and lake edges.

Global

This Baltic rush wet meadow community is found widely throughout the western United States, ranging from South Dakota and Nebraska west to Washington, south to California, and east to New Mexico. It also occurs in western Canada.

COMMENTS

This association is uncommon at Craters of the Moon National Monument and Preserve. Due to the limited spatial extent of occurrence and associated low sample size, the classification of this plant community is considered provisional. Only one plot was sampled at Craters of the Moon; therefore a thorough characteristic species list could not be compiled.

Juncus balticus is still recognized as such in the Nation Vegetation Classification (NVC); however, the taxonomy of the species and its subspecies has changed (see the PLANTS National Database) and the species occurring at Craters of the Moon is currently identified as *Juncus arcticus*.

This association is often considered to be a grazing-induced community since it increases with disturbance.

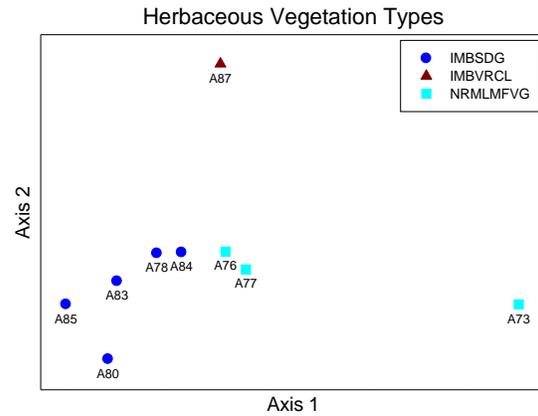
MAP UNITS

Enter CRMO-specific information.

A87

Juniper (Rocky Mountain, Utah) / Dwarf Goldenbush Wooded Herbaceous Vegetation

Juniperus (scopulorum, osteosperma) / Ericameria nana Wooded Herbaceous Vegetation



Description

The vegetation of this community is characterized by an open tree canopy. The canopy is dominated *Juniperus osteosperma*, *Juniperus scopulorum*, or a combination of both. Total tree cover is usually less than 10% and canopy height is usually 2-10m. The dwarf-shrub *Ericameria nana* is characteristic of this association. *Ericameria nauseosa* and *Purshia tridentata* often occur in the sparse shrub stratum, and other shrub species, such as *Holodiscus dumosus* may occasionally be present but not very constant across stands of this type. The moderate herbaceous layer is dominated equally by graminoids such as *Poa secunda*, *Achnatherum hymenoides*, *Elymus elymoides*, and *Bromus tectorum*, and forbs such as *Leptodactylon pungens*, *Penstemon deustus*, *Potentilla glandulosa*, and *Stephanomeria minor*.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 14, AA)

Tree

Juniperus osteosperma (Utah juniper) V.4, *Juniperus scopulorum* (Rocky Mountain juniper) V.3

Shrub

Ericameria nauseosa (rubber rabbitbrush) IV.1, *Purshia tridentata* (antelope bitterbrush) III.2

Dwarf-shrub

Ericameria nana (dwarf goldenbush) V.5

Graminoid

Poa secunda (Sandberg bluegrass) V.3, *Bromus tectorum* (cheat grass) III.3

Forb

Penstemon deustus (scabland penstemon) V.3, *Leptodactylon pungens* (granite prickly phlox) V.2, *Potentilla glandulosa* (sticky cinquefoil) V.1, *Stephanomeria minor* (narrowleaf wirelettuce) IV.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on basalt, primarily pahoehoe. It is most common on the Wapi Flow.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

This community may show immense variability in annual forb cover. Grazing, precipitation and other factors are likely to influence the presence and abundance of native and introduced annuals.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

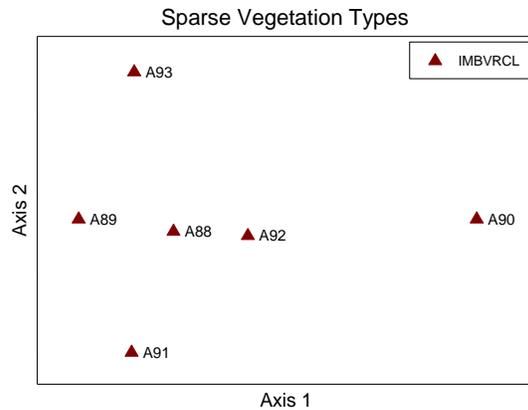
MAP UNITS

Enter CRMO-specific information.

A88

Fernbush / Scabland Penstemon Sparse Vegetation

Chamaebatiaria millefolium / *Penstemon deustus* Sparse Vegetation



Description

The vegetation of this association is characterized by very sparse total cover (less than 5%). Shrub cover is primarily from *Chamaebatiaria millefolium*. Other component shrubs may include various subspecies of *Artemisia tridentata*. The minimal herbaceous layer has very few graminoids, but species that may occur include *Poa secunda*, and *Hesperostipa comata*. Forbs cover is also low but *Penstemon deustus* is a characteristic species of this association.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 5, AA)

Tree

None

Shrub

Chamaebatiaria millefolium (fernbrush) V.1

Dwarf-shrub

None

Graminoid

None

Forb

Penstemon deustus (scabland penstemon)

RANGE

Craters of the Moon National Monument and Preserve

This association is found throughout Craters of the Moon on either aa or pahoehoe basalt.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Penstemon deustus*, occurs with high constancy and is a characteristic species of the association. However, its cover is typically low, less than 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously documented. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

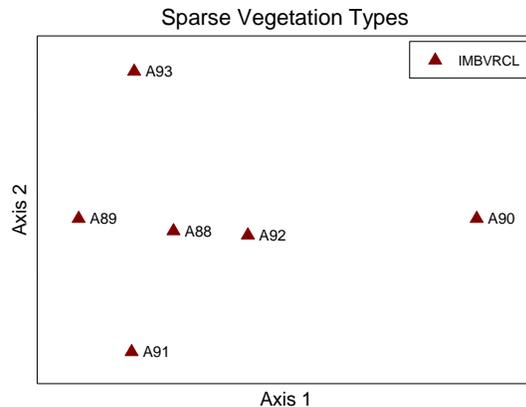
MAP UNITS

Enter CRMO-specific information.

A89

Dwarf Goldenbush / Sandberg Bluegrass / Scabland Penstemon Sparse Vegetation

Ericameria nana / *Poa Secunda* / *Penstemon deustus* Sparse Vegetation



Description

This association is characterized by a dwarf-shrub stratum with low to moderate cover. *Ericameria nana* and *Eriogonum microthecum* dominate the dwarf-shrub canopy. Taller shrubs are occasionally present and *Holodiscus dumosus* and/or *Purshia tridentata* often occur as scattered individuals throughout the plant community. The sparse herbaceous layer typically has higher graminoid cover and diversity than other cinder land communities. Commonly occurring graminoid species include *Poa secunda*, *Elymus elymoides*, and *Hesperostipa comata*. *Penstemon deustus* is a characteristic forb species of this association. Other common forbs include *Potentilla glandulosa*, *Leptodactylon pungens*, *Stephanomeria minor*, and *Phacelia hastata*.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns. Soil is more available for vegetation establishment in this plant community than on other cinder land plant communities, as evidenced by higher average graminoid cover.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 11, AA)

Tree

None

Shrub

Purshia tridentata (antelope bitterbrush) IV.1

Dwarf-shrub

Ericameria nana (dwarf goldenbush) V.2, *Eriogonum microthecum* (slender buckwheat) IV.1

Graminoid

Hesperostipa comata ssp. *comata* (needle and thread grass) V.1, *Poa secunda* (Sandberg bluegrass) V.1, *Elymus elymoides* (bottlebrush squirreltail) V.>1

Forb

Leptodactylon pungens (granite prickly phlox) V.1, *Potentilla glandulosa* (sticky cinquefoil) V.1, *Penstemon deustus* (scabland penstemon) V.<1, *Phacelia hastata* (silverleaf Phacelia) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on pahoehoe and block basalt throughout Craters of the Moon.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Penstemon deustus*, is always present and is a characteristic species of the association. However, its cover is typically low, less than 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

**Description**

This is a very sparsely vegetated, forb-dominated association. Total cover of this plant community is very low, generally less than 5%. The most important species is *Eriogonum ovalifolium* var. *depressum*, a caespitose, evergreen perennial, forming mats 3-4 dm across. Annual forbs may be common in the spring, depending on moisture conditions, and several perennial forbs are common into July, including *Phacelia hastata*, *Chaenactis douglasii*, and *Lewisia rediviva*. All constant species in this association are found within the inner canopy of *Eriogonum ovalifolium* var. *depressum*. This spatial pattern is most likely due to higher accumulations of seeds and fine materials captured by the *Eriogonum* mats, and to relatively high moisture, total nitrogen and available phosphorus occurring under the canopy.

This association has only been described on relatively fresh lava flows with cinder fields. Interstitial material is sand-sized. The cinders are light weight, porous and soft; yet there is little mass movement of the deposits. The cinders are extremely porous; water filters down through them very quickly, often to depths beyond the reach of plant roots.

CONSERVATION RANK G1**DATABASE CODE** CEGL001401**CHARACTERISTIC SPECIES** (n = 4, AA)**Tree**

None

Shrub

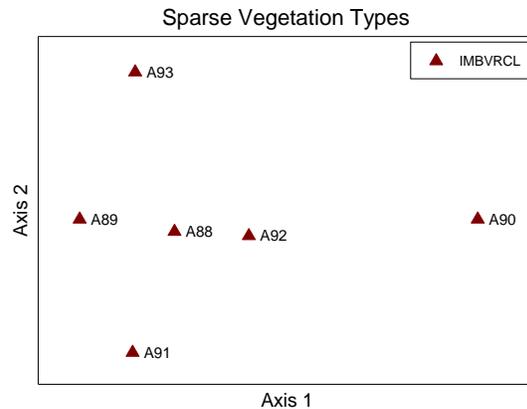
None

Dwarf-shrub

None

Graminoid

None

Forb*Eriogonum ovalifolium* var. *depressum* (cushion buckwheat) V.1, *Phacelia hastata* (silverleaf Phacelia) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found around cinder cones near the Monument headquarters. This association may also occur on other similar cinder cones elsewhere at Craters of the Moon.

Global

This association has only been described from the Craters of the Moon National Monument and Preserve on the northern edge of the Snake River Plain of southern Idaho. It may also occur in the same region of southern Idaho on cinder cones on the Idaho National Laboratory.

COMMENTS

The forb, *Eriogonum ovalifolium* var. *depressum*, is a characteristic species of the association. However, its cover is typically low, averaging about 1%. This species rapidly develops a deep root system (up to 1.2 m deep), allowing it to colonize the light, porous cinders. With its restricted range of occurrence on an unusual substrate (volcanic cinders), this association diminishes in extent over time as the cinders weather and increase in organic matter, due to plant matter deposition. Unless more cinders are deposited by renewed volcanic activity, this association will continue to decrease in extent.

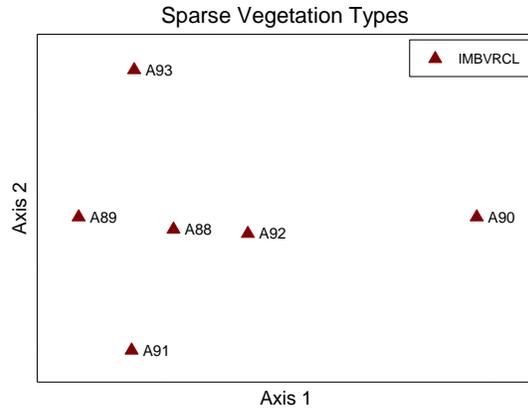
MAP UNITS

Enter CRMO-specific information.

A91

Lewis' Mock Orange/ Scabland Penstemon Sparse Vegetation

Philadelphus lewisii / *Penstemon deustus* Sparse Vegetation



Description

An open shrub canopy is characteristic of this association. The shrub layer is dominated by *Philadelphus lewisii*, though individuals tend to be widely spaced and total shrub cover is sparse. *Chamaebatiaria millefolium* may also occur occasionally in the shrub stratum. The minimal herbaceous layer has very few graminoids, but *Elymus elymoides* occurs with some regularity. Forbs cover is also very low but *Penstemon deustus* is always present and is a characteristic species in this association. Other common forbs include; *Gilia leptomeria*, *Potentilla glandulosa*, and *Pteryxia terebinthina*.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 8, AA)

Tree

None

Shrub

Philadelphus lewisii (Lewis' mock orange) V.1

Dwarf-shrub

None

Graminoid

None

Forb

Potentilla glandulosa (sticky cinquefoil) V.1, *Penstemon deustus* (scabland penstemon) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on pahoehoe and aa basalt throughout Craters of the Moon.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

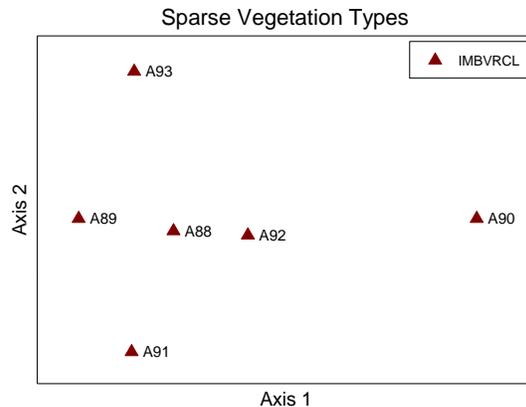
COMMENTS

The forb, *Penstemon deustus*, and the shrub, *Philadelphus lewisii* are always present and are characteristics of this association. However, cover of each species is typically low, around 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

A92**Limber pine / Fernbush / Sandberg Bluegrass Sparse Vegetation***Pinus flexilis* / *Chamaebatiaria millefolium* / *Poa secunda* Sparse Vegetation**Description**

The vegetation of this association is characterized by sparse total cover, less than 10%. *Pinus flexilis* individuals are scattered throughout this vegetation type, but do not occur with high enough abundance to form a tree canopy. The shrub stratum is dominated by *Artemisia tridentata* ssp. *vaseyana*, *Chamaebatiaria millefolium* and *Philadelphus lewisii*. *Chamaebatiaria millefolium* occurs with sparse cover, but is a characteristic species of this association. Other, less frequently occurring shrubs may include *Holodiscus dumosus* and *Purshia tridentata*. The minimal herbaceous layer includes the graminoids *Poa secunda* and *Pseudoroegneria spicata*. Forbs cover is also low but highly variable in terms of species composition, and may include species such as *Crepis acuminata*, *Dryopteris filix-mas*, *Gilia leptomeria*, *Leptodactylon pungens*, *Lithophragma tenellum*, *Pteryxia terebinthina*, and *Viola nuttallii*.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns. Soil is more available for vegetation establishment in this plant community than on other cinder land plant communities, as evidenced by higher average graminoid cover.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 4, AA)**Tree***Pinus flexilis* (limber pine) V.2**Shrub***Philadelphus lewisii* (Lewis' mock orange) V.2 *Chamaebatiaria millefolium* (fernbrush) V.1, *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) IV.1**Dwarf-shrub**

None

Graminoid*Pseudoroegneria spicata* (bluebunch wheatgrass) IV.2, *Poa secunda* (Sandberg bluegrass) V.<1**Forb**

Inter-Mountain Basins Volcanic Rock and Cinder Land

Gilia leptomeria (sand gilia) V.<1, *Lithophragma tenellum* (slender woodland-star) V.<1

RANGE

Craters of the Moon National Monument and Preserve

This association is found on pahoehoe and aa basalt in the northern portion of Craters of the Moon.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The shrub, *Chamaebatiaria millefolium*, a characteristic species of the association. However, its cover is typically low, less than 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

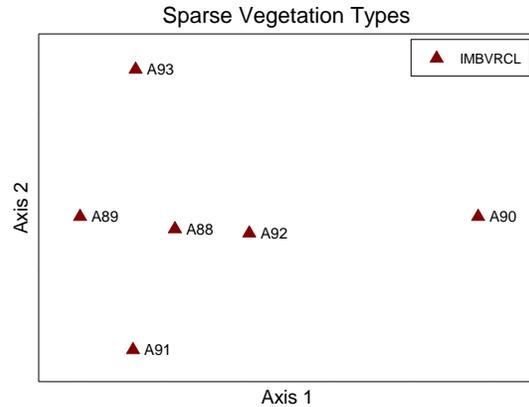
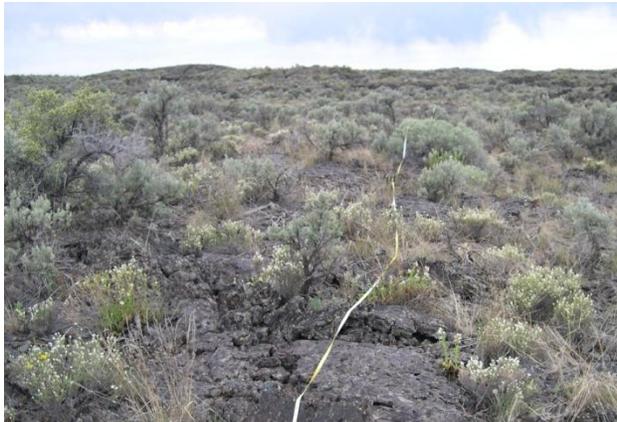
MAP UNITS

Enter CRMO-specific information.

A93

Sandberg Bluegrass / Granite Prickly Phlox Sparse Vegetation

Poa secunda / *Leptodactylon pungens* Sparse Vegetation



Description

Shrub and grass cover are equally abundant in this plant community. The shrub layer is diverse with numerous species contributing to the canopy. *Ericameria nauseosa* is usually the most abundant shrub species. The herbaceous layer has more graminoid species and higher grass abundance than many other cinder land associations. Species such as *Poa secunda*, *Elymus elymoides*, and *Bromus tectorum* are relatively constant graminoid components. *Poa secunda* is typically the most abundant and constant grass species in this vegetation type. Common forbs include *Leptodactylon pungens* and *Penstemon deustus*. The succulent species, *Opuntia polyacantha* may also occur occasionally.

This association, like all associations in the Inter-Mountain Basins Volcanic Rock and Cinder Land Ecological System, is limited to barren and sparsely vegetated volcanic substrates of basalt and basaltic andesite origin including tuffs, cinder cones, spatter cones, pressure plateaus, or cinder fields. It may occur in large-patch, small-patch or linear spatial patterns. There is a greater accumulation of soil on the volcanic substrate supporting this association, as evidenced by higher graminoid cover.

CONSERVATION RANK N/A

DATABASE CODE N/A

CHARACTERISTIC SPECIES (n = 11, AA)

Tree

None

Shrub

None

Dwarf-shrub

None

Graminoid

Poa secunda (Sandberg bluegrass) V.5, *Elymus elymoides* (bottlebrush squirreltail) IV.1

Forb

Leptodactylon pungens (granite prickly phlox) V.1

RANGE

Craters of the Moon National Monument and Preserve

This association is found in a variety of habitats including aa, pahoehoe, and block basalt, as well as on kipukas throughout Craters of the Moon.

Global

This association occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.

COMMENTS

The forb, *Leptodactylon pungens*, is a characteristic species of the association. However, its cover is typically low, less than 1%.

This association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2008) at the time this document was produced. Therefore, the plant community description is based on data from Craters of the Moon and on related plant communities that have been previously described. The descriptions provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

MAP UNITS

Enter CRMO-specific information.

Appendix E – Species List

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|---------------|---|----------|------------------|-----------|------------|
| Aceraceae | <i>Acer glabrum</i> var. <i>glabrum</i> | 28743 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Achillea millefolium</i> ssp. <i>lanulosa</i> var. <i>lanulosa</i> | -501892 | Present in Park | Common | Unknown |
| Asteraceae | <i>Acroptilon repens</i> | 36459 | Present in Park | Rare | Non-Native |
| Ranunculaceae | <i>Actaea rubra</i> | 18723 | Present in Park | Uncommon | Native |
| Lamiaceae | <i>Agastache urticifolia</i> | 32450 | Present in Park | Common | Native |
| Asteraceae | <i>Agoseris aurantiaca</i> var. <i>aurantiaca</i> | 182405 | Present in Park | Common | Native |
| Asteraceae | <i>Agoseris glauca</i> var. <i>dasycephala</i> | 182409 | Present in Park | Common | Native |
| Asteraceae | <i>Agoseris glauca</i> var. <i>laciniata</i> | 182410 | Present in Park | Common | Native |
| Asteraceae | <i>Agoseris heterophylla</i> var. <i>heterophylla</i> | 182412 | Present in Park | Rare | Native |
| Poaceae | <i>Agropyron cristatum</i> , sensu amplo | -9752845 | Present in Park | Common | Non-Native |
| Poaceae | <i>Agrostis exarata</i> | 40412 | Present in Park | Uncommon | Native |
| Poaceae | <i>Agrostis scabra</i> | 40424 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Allium acuminatum</i> | 42707 | Present in Park | Common | Native |
| Liliaceae | <i>Allium brandegeei</i> | 42716 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Allium geyeri</i> var. <i>geyeri</i> | 182610 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Allium nevadense</i> var. <i>nevadense</i> | 182626 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Allium textile</i> | 42670 | Present in Park | Uncommon | Native |
| Betulaceae | <i>Alnus incana</i> ssp. <i>rugosa</i> var. <i>occidentalis</i> | -501918 | Present in Park | Common | Native |
| Poaceae | <i>Alopecurus aequalis</i> | 40436 | Present in Park | Rare | Native |
| Brassicaceae | <i>Alyssum desertorum</i> | 23032 | Present in Park | Common | Non-Native |
| Amaranthaceae | <i>Amaranthus albus</i> | 20719 | Present in Park | Uncommon | Native |
| Amaranthaceae | <i>Amaranthus californicus</i> | 20725 | Present in Park | Uncommon | Native |
| Amaranthaceae | <i>Amaranthus retroflexus</i> | 20745 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Ambrosia acanthicarpa</i> | 36497 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Amelanchier alnifolia</i> | 25109 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Amelanchier utahensis</i> var. <i>utahensis</i> | 182042 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Amsinckia menziesii</i> | 31711 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Amsinckia retrorsa</i> | 31712 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Amsinckia tessellata</i> | 31706 | Present in Park | Common | Native |
| Asteraceae | <i>Anaphalis margaritacea</i> | 36529 | Present in Park | Rare | Native |
| Asteraceae | <i>Ancistrocarphus filagineus</i> | 182440 | Probably Present | NA | Native |
| Apiaceae | <i>Angelica pinnata</i> | 29448 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Antennaria corymbosa</i> | 36726 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Antennaria dimorpha</i> | 36727 | Present in Park | Common | Native |
| Asteraceae | <i>Antennaria microphylla</i> | 185162 | Present in Park | Common | Native |
| Asteraceae | <i>Antennaria rosea</i> | 36754 | Present in Park | Common | Native |
| Asteraceae | <i>Anthemis cotula</i> | 36330 | Present in Park | Rare | Non-Native |
| Apocynaceae | <i>Apocynum androsaemifolium</i> | 30156 | Present in Park | Uncommon | Native |
| Apocynaceae | <i>Apocynum cannabinum</i> | 30157 | Present in Park | Uncommon | Native |
| Apocynaceae | <i>Apocynum medium</i> | 184794 | Present in Park | Uncommon | Native |
| Ranunculaceae | <i>Aquilegia formosa</i> | 18738 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis cobrensis</i> | 22680 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis divaricarpa</i> | -501943 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis glabra</i> | 22695 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis holboellii</i> | 22702 | Present in Park | Common | Native |
| Brassicaceae | <i>Arabis holboellii</i> var. <i>pendulocarpa</i> | 184358 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis holboellii</i> var. <i>pinetorum</i> | 184360 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis holboellii</i> var. <i>retrofracta</i> | 184362 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|-----------------|--|----------|-----------------|-----------|------------|
| Brassicaceae | <i>Arabis holboellii</i> var. <i>secunda</i> | 184362 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis lemmonii</i> var. <i>lemmonii</i> | 184382 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis lignifera</i> | 22708 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis microphylla</i> | 22711 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis perennans</i> | 22720 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis sparsiflora</i> var. <i>sparsiflora</i> | 184443 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis sparsiflora</i> var. <i>subvillosa</i> | 184454 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Arabis suffrutescens</i> | 22737 | Present in Park | Uncommon | Native |
| Viscaceae | <i>Arceuthobium cyanocarpum</i> | 184678 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Arctium minus</i> | 36546 | Present in Park | Uncommon | Non-Native |
| Caryophyllaceae | <i>Arenaria aculeata</i> | 20238 | Present in Park | Uncommon | Native |
| Caryophyllaceae | <i>Arenaria congesta</i> var. <i>congesta</i> | 184218 | Present in Park | Uncommon | Native |
| Caryophyllaceae | <i>Arenaria fendleri</i> var. <i>aculeata</i> | 532220 | Present in Park | Uncommon | Native |
| Caryophyllaceae | <i>Arenaria franklinii</i> var. <i>franklinii</i> | 184233 | Present in Park | Uncommon | Native |
| Caryophyllaceae | <i>Arenaria kingii</i> var. <i>glabrescens</i> | 532228 | Present in Park | Uncommon | Native |
| Poaceae | <i>Aristida purpurea</i> | 41429 | Present in Park | Rare | Native |
| Asteraceae | <i>Arnica chamissonis</i> | 36560 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Arnica cordifolia</i> | 36561 | Present in Park | Common | Native |
| Asteraceae | <i>Arnica longifolia</i> | 36569 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Arnica mollis</i> | 36571 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Arnica sororia</i> | 36576 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Artemisia arbuscula</i> | 35449 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia cana</i> | 35454 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Artemisia dracunculus</i> | 35462 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia ludoviciana</i> ssp. <i>ludoviciana</i> var. <i>incompta</i> | -9752840 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia ludoviciana</i> ssp. <i>ludoviciana</i> var. <i>latiloba</i> | -501968 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia ludoviciana</i> ssp. <i>ludoviciana</i> var. <i>ludoviciana</i> | -501969 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia tridentata</i> | 35498 | Present in Park | Abundant | Native |
| Asteraceae | <i>Artemisia tridentata</i> var. <i>tridentata</i> | -9752861 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Artemisia tridentata</i> var. <i>vaseyana</i> | 532368 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia tridentata</i> var. <i>wyomingensis</i> | 532369 | Present in Park | Common | Native |
| Asteraceae | <i>Artemisia tripartita</i> | 35502 | Present in Park | Common | Native |
| Asclepiadaceae | <i>Asclepias fascicularis</i> | 30267 | Present in Park | Rare | Native |
| Asclepiadaceae | <i>Asclepias speciosa</i> | 30304 | Present in Park | Uncommon | Native |
| Asclepiadaceae | <i>Asclepias subverticillata</i> | 30308 | Present in Park | Rare | Native |
| Boraginaceae | <i>Asperugo procumbens</i> | 31723 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Aster chilensis</i> ssp. <i>adscendens</i> | 193306 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Aster eatonii</i> | 565552 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Aster perelegans</i> | 513251 | Present in Park | Common | Native |
| Asteraceae | <i>Aster scopulorum</i> | 507020 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus agrestis</i> | 25405 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus calycosus</i> var. <i>calycosus</i> | 192389 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus canadensis</i> var. <i>brevidens</i> | 192393 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus cibarius</i> | 25463 | Present in Park | Common | Native |
| Fabaceae | <i>Astragalus convallarius</i> var. <i>convallarius</i> | 192422 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus curvicarpus</i> | 25485 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus filipes</i> | 25515 | Present in Park | Common | Native |
| Fabaceae | <i>Astragalus geyeri</i> var. <i>geyeri</i> | 192508 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus iodanthus</i> | 25547 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus lentiginosus</i> var. <i>lentiginosus</i> | 192574 | Present in Park | Common | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|----------------|--|----------|------------------|-----------|------------|
| Fabaceae | <i>Astragalus lentiginosus</i> var. <i>salinus</i> | 192584 | Present in Park | Common | Native |
| Fabaceae | <i>Astragalus malacus</i> | 25574 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus miser</i> var. <i>tenuifolius</i> | 192629 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus obscurus</i> | 25612 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus oniciformis</i> | 25613 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Astragalus purshii</i> var. <i>glareosus</i> | 192713 | Present in Park | Common | Native |
| Fabaceae | <i>Astragalus purshii</i> var. <i>purshii</i> | 192724 | Present in Park | Common | Native |
| Fabaceae | <i>Astragalus terminalis</i> | 25700 | Present in Park | Rare | Native |
| Fabaceae | <i>Astragalus whitneyi</i> var. <i>confusus</i> | 192799 | Present in Park | Rare | Native |
| Chenopodiaceae | <i>Atriplex canescens</i> var. <i>canescens</i> | 192226 | Present in Park | Rare | Native |
| Poaceae | <i>Avena fatua</i> | 41458 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Avena sativa</i> | 41459 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Balsamorhiza sagittata</i> | 36818 | Present in Park | Common | Native |
| Brassicaceae | <i>Barbarea orthoceras</i> | 22740 | Present in Park | Rare | Native |
| Betulaceae | <i>Betula occidentalis</i> | 19488 | Present in Park | Rare | Native |
| Asteraceae | <i>Brickellia grandiflora</i> | 36878 | Present in Park | Rare | Native |
| Poaceae | <i>Bromus inermis</i> | 40502 | Present in Park | Uncommon | Non-Native |
| Poaceae | <i>Bromus japonicus</i> | 40479 | Present in Park | Uncommon | Non-Native |
| Poaceae | <i>Bromus marginatus</i> | 501074 | Present in Park | Common | Native |
| Poaceae | <i>Bromus riparius</i> | -9752854 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Bromus secalinus</i> | 40519 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Bromus squarrosus</i> | 40489 | Present in Park | Common | Non-Native |
| Poaceae | <i>Bromus tectorum</i> | 40524 | Present in Park | Abundant | Non-Native |
| Poaceae | <i>Calamagrostis rubescens</i> | 40540 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Calochortus bruneaunus</i> | 42837 | Present in Park | Common | Native |
| Liliaceae | <i>Calochortus eurycarpus</i> | 42846 | Present in Park | Common | Native |
| Liliaceae | <i>Calochortus macrocarpus</i> | 42858 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Calochortus nuttallii</i> | 42863 | Present in Park | Uncommon | Native |
| Portulacaceae | <i>Calyptidium roseum</i> | 501566 | Present in Park | Rare | Native |
| Brassicaceae | <i>Camelina microcarpa</i> | 22599 | Present in Park | Uncommon | Non-Native |
| Onagraceae | <i>Camissonia andina</i> | 27463 | Present in Park | Common | Native |
| Onagraceae | <i>Camissonia breviflora</i> | 27474 | Present in Park | Rare | Native |
| Onagraceae | <i>Camissonia minor</i> | 27526 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Camissonia parvula</i> | 27536 | Present in Park | Rare | Native |
| Onagraceae | <i>Camissonia tanacetifolia</i> | 27556 | Present in Park | Uncommon | Native |
| Campanulaceae | <i>Campanula rotundifolia</i> | 34497 | Present in Park | Rare | Non-Native |
| Cannabaceae | <i>Cannabis sativa</i> | 19109 | Probably Present | NA | Non-Native |
| Brassicaceae | <i>Capsella bursa-pastoris</i> | 22766 | Present in Park | Uncommon | Non-Native |
| Fabaceae | <i>Caragana arborescens</i> | 26529 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Carduus nutans</i> | 35787 | Present in Park | Rare | Non-Native |
| Cyperaceae | <i>Carex aquatilis</i> | 39374 | Present in Park | Common | Native |
| Cyperaceae | <i>Carex aurea</i> | 39445 | Present in Park | Rare | Native |
| Cyperaceae | <i>Carex douglasii</i> | 39578 | Present in Park | Common | Native |
| Cyperaceae | <i>Carex filifolia</i> | 39600 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex hoodii</i> | 39642 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex lanuginosa</i> | 507767 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex microptera</i> | 39699 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex pachystachya</i> | 39735 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex petasata</i> | 39751 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex praegracilis</i> | 39767 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|------------------|--|---------|-----------------|-----------|------------|
| Cyperaceae | <i>Carex praticola</i> | 39770 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Carex vallicola</i> | 39860 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Castilleja angustifolia</i> var. <i>angustifolia</i> | 527192 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Castilleja chromosa</i> | 33102 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Castilleja cusickii</i> | 33109 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Castilleja exilis</i> | 33113 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Castilleja flava</i> | 33115 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Castilleja miniata</i> | 33069 | Present in Park | Common | Native |
| Scrophulariaceae | <i>Castilleja pallescens</i> var. <i>inverta</i> | 527203 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Castilleja rhexiifolia</i> | 33164 | Present in Park | Rare | Native |
| Poaceae | <i>Catabrosa aquatica</i> | 41541 | Present in Park | Rare | Native |
| Rhamnaceae | <i>Ceanothus velutinus</i> | 28517 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Centaurea diffusa</i> | 36958 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Centaurea maculosa</i> | 501347 | Present in Park | Uncommon | Non-Native |
| Caryophyllaceae | <i>Cerastium nutans</i> | 19958 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Chaenactis douglasii</i> | 36987 | Present in Park | Common | Native |
| Rosaceae | <i>Chamaebatiaria millefolium</i> | 25142 | Present in Park | Common | Native |
| Euphorbiaceae | <i>Chamaesyce glyptosperma</i> | 501422 | Present in Park | Rare | Native |
| Euphorbiaceae | <i>Chamaesyce ocellata</i> var. <i>arenicola</i> | 566435 | Present in Park | Rare | Native |
| Chenopodiaceae | <i>Chenopodium album</i> | 20592 | Present in Park | Uncommon | Non-Native |
| Chenopodiaceae | <i>Chenopodium chenopodioides</i> | 20602 | Present in Park | Uncommon | Native |
| Chenopodiaceae | <i>Chenopodium fremontii</i> var. <i>fremontii</i> | 527321 | Present in Park | Uncommon | Native |
| Chenopodiaceae | <i>Chenopodium humile</i> | 565063 | Present in Park | Rare | Non-Native |
| Chenopodiaceae | <i>Chenopodium leptophyllum</i> var. <i>leptophyllum</i> | -502142 | Present in Park | Common | Native |
| Chenopodiaceae | <i>Chenopodium leptophyllum</i> var. <i>subglabrum</i> | 533472 | Present in Park | Common | Native |
| Asteraceae | <i>Chondrilla juncea</i> | 37029 | Present in Park | Rare | Non-Native |
| Brassicaceae | <i>Chorispota tenella</i> | 23099 | Present in Park | Uncommon | Non-Native |
| Polygonaceae | <i>Chorizanthe brevicornu</i> | 21007 | Present in Park | Rare | Native |
| Polygonaceae | <i>Chorizanthe watsonii</i> | 21034 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysopsis villosa</i> var. <i>hispida</i> | 531216 | Present in Park | Rare | Native |
| Asteraceae | <i>Chrysothamnus nauseosus</i> var. <i>oreophilus</i> | 566635 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysothamnus nauseosus</i> var. <i>speciosus</i> | 566648 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysothamnus viscidiflorus</i> | 37090 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysothamnus viscidiflorus</i> var. <i>lanceolatus</i> | 533581 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysothamnus viscidiflorus</i> var. <i>puberulus</i> | 533586 | Present in Park | Common | Native |
| Asteraceae | <i>Chrysothamnus viscidiflorus</i> var. <i>viscidiflorus</i> | 566625 | Present in Park | Common | Native |
| Asteraceae | <i>Cichorium intybus</i> | 36763 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Cinna latifolia</i> | 40584 | Present in Park | Rare | Native |
| Onagraceae | <i>Circaea alpina</i> | 27563 | Present in Park | Rare | Native |
| Asteraceae | <i>Cirsium arvense</i> | 36335 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Cirsium canovirens</i> | 36351 | Present in Park | Common | Native |
| Asteraceae | <i>Cirsium subniveum</i> | 36416 | Present in Park | Common | Native |
| Asteraceae | <i>Cirsium utahense</i> | 36424 | Present in Park | Common | Native |
| Asteraceae | <i>Cirsium vulgare</i> | 36428 | Present in Park | Rare | Non-Native |
| Onagraceae | <i>Clarkia rhomboidea</i> | 27621 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Collinsia parviflora</i> | 33534 | Present in Park | Common | Native |
| Polemoniaceae | <i>Collomia linearis</i> | 31041 | Present in Park | Common | Native |
| Polemoniaceae | <i>Collomia tenella</i> | 31038 | Present in Park | Common | Native |
| Polemoniaceae | <i>Collomia tinctoria</i> | 31045 | Present in Park | Common | Native |
| Convolvulaceae | <i>Convolvulus arvensis</i> | 30705 | Present in Park | Uncommon | Non-Native |
| Orchidaceae | <i>Corallorrhiza maculata</i> | 43523 | Present in Park | Rare | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|------------------|---|----------|-----------------|-----------|------------|
| Orchidaceae | <i>Corallorrhiza striata</i> | 43526 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Cordylanthus capitatus</i> | 33539 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Cordylanthus ramosus</i> | 33574 | Present in Park | Uncommon | Native |
| Cornaceae | <i>Cornus sericea</i> var. <i>sericea</i> | -502184 | Present in Park | Rare | Native |
| Asteraceae | <i>Crepis acuminata</i> | 37169 | Present in Park | Common | Native |
| Asteraceae | <i>Crepis atribarba</i> | 37172 | Present in Park | Common | Native |
| Asteraceae | <i>Crepis modocensis</i> | 37186 | Present in Park | Common | Native |
| Asteraceae | <i>Crepis occidentalis</i> | 37196 | Present in Park | Rare | Native |
| Boraginaceae | <i>Cryptantha affinis</i> | 31766 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha celosioides</i> | 31792 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha circumscissa</i> | 31793 | Present in Park | Common | Native |
| Boraginaceae | <i>Cryptantha fendleri</i> | 31807 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha gracilis</i> | 31813 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha humilis</i> | 31820 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha interrupta</i> | 31825 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha rostellata</i> | 31808 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Cryptantha spiculifera</i> | 31875 | Present in Park | Common | Native |
| Boraginaceae | <i>Cryptantha torreyana</i> | 31880 | Present in Park | Common | Native |
| Apiaceae | <i>Cymopterus acaulis</i> var. <i>acaulis</i> | 527613 | Present in Park | Uncommon | Native |
| Apiaceae | <i>Cymopterus glaucus</i> | 29639 | Present in Park | Uncommon | Native |
| Apiaceae | <i>Cymopterus longipes</i> | 29643 | Present in Park | Uncommon | Native |
| Apiaceae | <i>Cymopterus petraeus</i> | 29843 | Present in Park | Unknown | Native |
| Apiaceae | <i>Cymopterus terebinthinus</i> var. <i>foeniculaceus</i> | 529926 | Present in Park | Common | Native |
| Dryopteridaceae | <i>Cystopteris fragilis</i> | 17482 | Present in Park | Uncommon | Native |
| Poaceae | <i>Dactylis glomerata</i> | 193446 | Present in Park | Rare | Non-Native |
| Ranunculaceae | <i>Delphinium andersoni</i> | 18532 | Present in Park | Uncommon | Native |
| Ranunculaceae | <i>Delphinium andersonii</i> var. <i>andersonii</i> | -9752851 | Present in Park | Common | Native |
| Ranunculaceae | <i>Delphinium andersonii</i> var. <i>scaposum</i> | 534315 | Present in Park | Uncommon | Native |
| Ranunculaceae | <i>Delphinium nuttallianum</i> var. <i>nuttallianum</i> | 527664 | Present in Park | Common | Native |
| Ranunculaceae | <i>Delphinium occidentale</i> | -502224 | Present in Park | Uncommon | Native |
| Poaceae | <i>Deschampsia danthonioides</i> | 40593 | Present in Park | Uncommon | Native |
| Poaceae | <i>Deschampsia elongata</i> | 40594 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia californica</i> | 22821 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia pinnata</i> var. <i>filipes</i> | 534389 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia pinnata</i> var. <i>nelsonii</i> | 534393 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia richardsonii</i> var. <i>sonnei</i> | 534402 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia richardsonii</i> var. <i>viscosa</i> | 534403 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Descurainia sophia</i> | 22843 | Present in Park | Uncommon | Non-Native |
| Fumariaceae | <i>Dicentra uniflora</i> | 18953 | Present in Park | Rare | Native |
| Campanulaceae | <i>Downingia bacigalupii</i> | 34552 | Present in Park | Rare | Native |
| Brassicaceae | <i>Draba densifolia</i> | 22875 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Draba douglasii</i> | 501856 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Draba paysonii</i> var. <i>treleaseii</i> | 527782 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Draba verna</i> | 22923 | Present in Park | Common | Non-Native |
| Dryopteridaceae | <i>Dryopteris filix-mas</i> | 17535 | Present in Park | Uncommon | Native |
| Elaeagnaceae | <i>Elaeagnus angustifolia</i> | 27770 | Present in Park | Rare | Non-Native |
| Cyperaceae | <i>Eleocharis palustris</i> | 40019 | Present in Park | Uncommon | Native |
| Cyperaceae | <i>Eleocharis rostellata</i> | 40022 | Present in Park | Rare | Native |
| Poaceae | <i>Elymus brevisfolius</i> | -9752853 | Present in Park | Rare | Native |
| Poaceae | <i>Elymus cinereus</i> | 503433 | Present in Park | Common | Native |
| Poaceae | <i>Elymus elongatus</i> ssp. <i>ponticus</i> | -9752836 | Present in Park | Rare | Non-Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|---------------|---|----------|-----------------|-----------|------------|
| Poaceae | <i>Elymus elymoides</i> | 502264 | Present in Park | Common | Native |
| Poaceae | <i>Elymus flavescens</i> | 503435 | Present in Park | Rare | Native |
| Poaceae | <i>Elymus glaucus</i> | 40684 | Present in Park | Uncommon | Native |
| Poaceae | <i>Elymus hispidus</i> | 522540 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Elymus junceus</i> | 504629 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Elymus lanceolatus</i> | 502267 | Present in Park | Common | Native |
| Poaceae | <i>Elymus repens</i> | 512839 | Present in Park | Uncommon | Non-Native |
| Poaceae | <i>Elymus smithii</i> | 504124 | Present in Park | Uncommon | Native |
| Poaceae | <i>Elymus spicatus</i> | 512845 | Present in Park | Common | Native |
| Poaceae | <i>Elymus subsecundus</i> | 506657 | Present in Park | Common | Native |
| Poaceae | <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> | 524041 | Present in Park | Uncommon | Native |
| Poaceae | <i>Elymus wawawaiensis</i> | -9752855 | Present in Park | Rare | Non-Native |
| Poaceae | <i>Elymus</i> X <i>hanseni</i> | 502265 | Present in Park | Rare | Native |
| Poaceae | <i>Elymus</i> X <i>saundersii</i> | 502276 | Present in Park | Rare | Native |
| Onagraceae | <i>Epilobium brachycarpum</i> | 27288 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Epilobium ciliatum</i> var. <i>ciliatum</i> | -502303 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Epilobium ciliatum</i> var. <i>glandulosum</i> | 534938 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Epilobium densiflorum</i> | 507916 | Present in Park | Rare | Native |
| Onagraceae | <i>Epilobium halleanum</i> | 27304 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Epilobium pygmaeum</i> | 507920 | Present in Park | Rare | Native |
| Equisetaceae | <i>Equisetum hyemale</i> ssp. <i>affine</i> | 525635 | Present in Park | Rare | Native |
| Equisetaceae | <i>Equisetum laevigatum</i> | 17156 | Present in Park | Rare | Native |
| Equisetaceae | <i>Equisetum variegatum</i> | 17149 | Present in Park | Rare | Native |
| Poaceae | <i>Eremopyrum triticeum</i> | 41717 | Present in Park | Rare | Non-Native |
| Polemoniaceae | <i>Eriastrum sparsiflorum</i> var. <i>wilcoxii</i> | 535005 | Present in Park | Common | Native |
| Asteraceae | <i>Erigeron aphanactis</i> var. <i>aphanactis</i> | 527915 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron bloomeri</i> | 35829 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron chrysopsidis</i> var. <i>austinae</i> | 35840 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron compositus</i> var. <i>glabratus</i> | 535024 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron corymbosus</i> | 35844 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron divergens</i> var. <i>divergens</i> | -502323 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron glabellus</i> | 35873 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron lonchophyllus</i> | 35897 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron pumilus</i> | 35934 | Present in Park | Common | Native |
| Asteraceae | <i>Erigeron pumilus</i> ssp. <i>concinoides</i> | 35936 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Erigeron pumilus</i> ssp. <i>concinoides</i> var. <i>concinus</i> | -9752859 | Present in Park | Common | Native |
| Asteraceae | <i>Erigeron pumilus</i> ssp. <i>intermedius</i> var. <i>gracilior</i> | 566656 | Present in Park | Common | Native |
| Asteraceae | <i>Erigeron speciosus</i> var. <i>macranthus</i> | 527963 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum baileyi</i> var. <i>baileyi</i> | 195424 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum caespitosum</i> | 21086 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum capistratum</i> var. <i>grimesii</i> | -9752856 | Present in Park | Rare | Native |
| Polygonaceae | <i>Eriogonum cernuum</i> | 21090 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum chrysops</i> | 21091 | Present in Park | Unknown | Native |
| Polygonaceae | <i>Eriogonum elatum</i> | 21122 | Present in Park | Rare | Native |
| Polygonaceae | <i>Eriogonum heracleoides</i> | 21150 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum heracleoides</i> var. <i>heracleoides</i> | 195489 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum heracleoides</i> var. <i>minus</i> | 195489 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum microthecum</i> | 21192 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum microthecum</i> var. <i>foliosum</i> | 195533 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum microthecum</i> var. <i>laxiflorum</i> | 528009 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum nidularium</i> | 21202 | Present in Park | Unknown | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|----------------|--|----------|-----------------|-----------|------------|
| Polygonaceae | <i>Eriogonum ovalifolium</i> | 21212 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum ovalifolium</i> var. <i>depressum</i> | 195555 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum ovalifolium</i> var. <i>orthocaulon</i> | 195560 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum ovalifolium</i> var. <i>ovalifolium</i> | 195553 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum ovalifolium</i> var. <i>purpureum</i> | 195560 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum sphaerocephalum</i> var. <i>sphaerocephalum</i> | 195580 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> | 21266 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> var. <i>deserticum</i> | 195603 | Present in Park | Rare | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> var. <i>dichrocephalum</i> | 195605 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> var. <i>majus</i> | 528020 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> var. <i>subalpinum</i> | 528020 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum umbellatum</i> var. <i>umbellatum</i> | 195595 | Present in Park | Common | Native |
| Polygonaceae | <i>Eriogonum verrucosum</i> | 21268 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Eriogonum vimineum</i> var. <i>vimineum</i> | -502336 | Present in Park | Common | Native |
| Asteraceae | <i>Eriophyllum lanatum</i> var. <i>integrifolium</i> | 528052 | Present in Park | Common | Native |
| Geraniaceae | <i>Erodium cicutarium</i> | 29147 | Present in Park | Uncommon | Non-Native |
| Brassicaceae | <i>Erysimum asperum</i> | 22931 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Erysimum cheiranthoides</i> | 22933 | Present in Park | Rare | Non-Native |
| Brassicaceae | <i>Erysimum occidentale</i> | 22945 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Eupatorium occidentale</i> | 36473 | Present in Park | Rare | Native |
| Euphorbiaceae | <i>Euphorbia albomarginata</i> | 501400 | Present in Park | Rare | Native |
| Euphorbiaceae | <i>Euphorbia esula</i> | 28064 | Present in Park | Rare | Non-Native |
| Chenopodiaceae | <i>Eurotia lanata</i> | 503290 | Present in Park | Rare | Native |
| Poaceae | <i>Festuca idahoensis</i> | 40816 | Present in Park | Common | Native |
| Poaceae | <i>Festuca octoflora</i> | 513551 | Present in Park | Rare | Native |
| Poaceae | <i>Festuca pacifica</i> | 513552 | Present in Park | Common | Native |
| Poaceae | <i>Festuca trachyphylla</i> | 502613 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Filago californica</i> | 37372 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Fritillaria atropurpurea</i> | 502669 | Present in Park | Common | Native |
| Liliaceae | <i>Fritillaria pudica</i> | 42936 | Present in Park | Common | Native |
| Asteraceae | <i>Gaillardia aristata</i> | 37398 | Present in Park | Rare | Unknown |
| Rubiaceae | <i>Galium aparine</i> var. <i>echinospermum</i> | 535587 | Present in Park | Uncommon | Native |
| Rubiaceae | <i>Galium bifolium</i> | 34826 | Present in Park | Uncommon | Native |
| Rubiaceae | <i>Galium multiflorum</i> | 34892 | Present in Park | Uncommon | Native |
| Rubiaceae | <i>Galium multiflorum</i> var. <i>multiflorum</i> | -9752850 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Gayophytum decipiens</i> | 27670 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Gayophytum diffusum</i> var. <i>strictipes</i> | 535690 | Present in Park | Common | Native |
| Onagraceae | <i>Gayophytum humile</i> | 27676 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Gayophytum lasiospermum</i> | 513859 | Present in Park | Common | Native |
| Onagraceae | <i>Gayophytum racemosum</i> | 27678 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Gayophytum ramosissimum</i> | 27679 | Present in Park | Common | Native |
| Gentianaceae | <i>Gentiana affinis</i> | 29964 | Present in Park | Rare | Native |
| Geraniaceae | <i>Geranium viscosissimum</i> var. <i>incisum</i> | 566245 | Present in Park | Common | Native |
| Rosaceae | <i>Geum macrophyllum</i> var. <i>perincisum</i> | 528245 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Geum triflorum</i> | 24662 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gilia aggregata</i> var. <i>aggregata</i> | -502395 | Present in Park | Common | Native |
| Polemoniaceae | <i>Gilia congesta</i> var. <i>congesta</i> | -9752847 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gilia inconspicua</i> | 31127 | Present in Park | Common | Native |
| Polemoniaceae | <i>Gilia inconspicua</i> var. <i>inconspicua</i> | -9752860 | Present in Park | Common | Native |
| Polemoniaceae | <i>Gilia inconspicua</i> var. <i>sinuata</i> | 535797 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gilia inconspicua</i> var. <i>tweedyi</i> | 535798 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|-----------------|--|----------|-----------------|-----------|------------|
| Polemoniaceae | <i>Gilia leptomeria</i> | 31150 | Present in Park | Common | Native |
| Polemoniaceae | <i>Gilia leptomeria</i> var. <i>leptomeria</i> | -9752858 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gilia leptomeria</i> var. <i>micromeria</i> | 535800 | Present in Park | Common | Native |
| Polemoniaceae | <i>Gilia tenerrima</i> | 31181 | Present in Park | Uncommon | Native |
| Poaceae | <i>Glyceria striata</i> | 40833 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Glycyrrhiza lepidota</i> | 26719 | Present in Park | Rare | Native |
| Asteraceae | <i>Gnaphalium palustre</i> | 36709 | Present in Park | Uncommon | Native |
| Chenopodiaceae | <i>Grayia spinosa</i> | 20690 | Present in Park | Rare | Native |
| Asteraceae | <i>Grindelia squarrosa</i> var. <i>quasiperennis</i> | 528287 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Grindelia squarrosa</i> var. <i>serrulata</i> | 528288 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Grindelia squarrosa</i> var. <i>squarrosa</i> | 528289 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Gutierrezia sarothrae</i> | 37483 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gymnosteris nudicaulis</i> | 31189 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Gymnosteris parvula</i> | 31190 | Present in Park | Rare | Native |
| Orchidaceae | <i>Habenaria dilatata</i> var. <i>dilatata</i> | -502411 | Present in Park | Rare | Native |
| Orchidaceae | <i>Habenaria hyperborea</i> | 514368 | Present in Park | Rare | Native |
| Boraginaceae | <i>Hackelia floribunda</i> | 31927 | Present in Park | Common | Native |
| Boraginaceae | <i>Hackelia micrantha</i> | 31931 | Present in Park | Common | Native |
| Boraginaceae | <i>Hackelia patens</i> | 31916 | Present in Park | Common | Native |
| Chenopodiaceae | <i>Halogeton glomeratus</i> | 20692 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Haplopappus acaulis</i> | 37499 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Haplopappus nanus</i> | 502366 | Present in Park | Common | Native |
| Asteraceae | <i>Haplopappus stenophyllus</i> | 505373 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Helianthella uniflora</i> | 37598 | Present in Park | Common | Native |
| Asteraceae | <i>Helianthus annuus</i> | 36616 | Present in Park | Common | Native |
| Asteraceae | <i>Helianthus petiolaris</i> | 36671 | Present in Park | Common | Native |
| Apiaceae | <i>Heracleum lanatum</i> | 502953 | Present in Park | Uncommon | Native |
| Hydrophyllaceae | <i>Hesperochiron pumilus</i> | 31381 | Present in Park | Uncommon | Native |
| Saxifragaceae | <i>Heuchera cylindrica</i> | 24347 | Present in Park | Uncommon | Native |
| Saxifragaceae | <i>Heuchera parvifolia</i> | 24366 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Hieracium cynoglossoides</i> | 37704 | Present in Park | Common | Native |
| Asteraceae | <i>Hieracium gracile</i> | 37709 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Hieracium scouleri</i> var. <i>griseum</i> | 536208 | Present in Park | Common | Native |
| Rosaceae | <i>Holodiscus dumosus</i> | 25178 | Present in Park | Rare | Native |
| Rosaceae | <i>Holodiscus dumosus</i> var. <i>dumosus</i> | -9752862 | Present in Park | Common | Native |
| Rosaceae | <i>Holodiscus dumosus</i> var. <i>glabrescens</i> | 536224 | Present in Park | Uncommon | Native |
| Poaceae | <i>Hordeum brachyantherum</i> | 40875 | Present in Park | Uncommon | Native |
| Poaceae | <i>Hordeum jubatum</i> | 40871 | Present in Park | Uncommon | Native |
| Poaceae | <i>Hordeum vulgare</i> | 40874 | Present in Park | Rare | Non-Native |
| Hydrophyllaceae | <i>Hydrophyllum capitatum</i> var. <i>capitatum</i> | 528508 | Present in Park | Common | Native |
| Solanaceae | <i>Hyoxyamus niger</i> | 30523 | Present in Park | Rare | Non-Native |
| Clusiaceae | <i>Hypericum formosum</i> | 21439 | Present in Park | Rare | Native |
| Malvaceae | <i>Iliamna rivularis</i> | 21812 | Present in Park | Rare | Native |
| Iridaceae | <i>Iris missouriensis</i> | 43221 | Present in Park | Rare | Native |
| Asteraceae | <i>Iva axillaris</i> | 36033 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Iva xanthifolia</i> | 36041 | Present in Park | Rare | Native |
| Juncaceae | <i>Juncus arcticus</i> | 39222 | Present in Park | Uncommon | Native |
| Juncaceae | <i>Juncus bufonius</i> | 39227 | Present in Park | Uncommon | Native |
| Juncaceae | <i>Juncus ensifolius</i> | 39269 | Present in Park | Uncommon | Native |
| Juncaceae | <i>Juncus tenuis</i> | 39243 | Present in Park | Uncommon | Native |
| Juncaceae | <i>Juncus triglumis</i> | 39239 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|----------------|---|----------|-----------------|-----------|------------|
| Cupressaceae | <i>Juniperus osteosperma</i> | 194859 | Present in Park | Uncommon | Native |
| Cupressaceae | <i>Juniperus scopulorum</i> | 194872 | Present in Park | Common | Native |
| Chenopodiaceae | <i>Kochia prostrata</i> | 503283 | Present in Park | Uncommon | Non-Native |
| Chenopodiaceae | <i>Kochia scoparia</i> | 20696 | Present in Park | Common | Non-Native |
| Poaceae | <i>Koeleria macrantha</i> | 503284 | Present in Park | Common | Native |
| Asteraceae | <i>Lactuca serriola</i> | 36608 | Present in Park | Common | Non-Native |
| Polemoniaceae | <i>Langloisia setosissima</i> | 31228 | Present in Park | Rare | Native |
| Boraginaceae | <i>Lappula occidentalis</i> var. <i>occidentalis</i> | 528678 | Present in Park | Common | Unknown |
| Asteraceae | <i>Layia glandulosa</i> var. <i>glandulosa</i> | -9752838 | Present in Park | Uncommon | Native |
| Lemnaceae | <i>Lemna minor</i> | 42590 | Present in Park | Rare | Native |
| Lemnaceae | <i>Lemna minuta</i> | 503361 | Present in Park | Rare | Native |
| Brassicaceae | <i>Lepidium densiflorum</i> | 22960 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Lepidium lasiocarpum</i> | 22967 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Lepidium perfoliatum</i> | 22974 | Present in Park | Common | Non-Native |
| Brassicaceae | <i>Lepidium virginicum</i> | 22955 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Leptodactylon pungens</i> var. <i>pungens</i> | 31234 | Present in Park | Common | Native |
| Polemoniaceae | <i>Leptodactylon watsonii</i> | 503390 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Lesquerella occidentalis</i> | 23212 | Present in Park | Common | Native |
| Brassicaceae | <i>Lesquerella occidentalis</i> var. <i>diversifolia</i> | 536724 | Present in Park | Rare | Native |
| Brassicaceae | <i>Lesquerella occidentalis</i> var. <i>occidentalis</i> | -9752857 | Present in Park | Uncommon | Native |
| Poaceae | <i>Leucopoa kingii</i> | 41832 | Present in Park | Rare | Native |
| Portulacaceae | <i>Lewisia rediviva</i> | 20490 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Linanthus harknessii</i> | 31254 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Linanthus septentrionalis</i> | 31277 | Present in Park | Uncommon | Native |
| Linaceae | <i>Linum perenne</i> ssp. <i>lewisii</i> | 526067 | Present in Park | Uncommon | Non-Native |
| Saxifragaceae | <i>Lithophragma glabrum</i> | 24395 | Present in Park | Common | Native |
| Saxifragaceae | <i>Lithophragma parviflorum</i> | 24398 | Present in Park | Uncommon | Native |
| Saxifragaceae | <i>Lithophragma tenellum</i> | 24400 | Present in Park | Common | Native |
| Boraginaceae | <i>Lithospermum arvense</i> | 501090 | Present in Park | Rare | Non-Native |
| Boraginaceae | <i>Lithospermum ruderales</i> | 31953 | Present in Park | Uncommon | Native |
| Apiaceae | <i>Lomatium dissectum</i> | 503534 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium dissectum</i> var. <i>eatonii</i> | 528870 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium dissectum</i> var. <i>multifidum</i> | 528870 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium foeniculaceum</i> var. <i>macdougallii</i> | 536921 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium triternatum</i> | 29754 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium triternatum</i> ssp. <i>platycarpum</i> | 526072 | Present in Park | Common | Native |
| Apiaceae | <i>Lomatium triternatum</i> ssp. <i>triternatum</i> var. <i>triternatum</i> | -9752848 | Present in Park | Common | Native |
| Fabaceae | <i>Lotus tenuis</i> | 26407 | Present in Park | Rare | Non-Native |
| Fabaceae | <i>Lupinus arbustus</i> | 25941 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus argenteus</i> | 503575 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus argenteus</i> var. <i>argenteus</i> | 566682 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus argenteus</i> var. <i>heteranthus</i> | 566452 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus argenteus</i> var. <i>holosericeus</i> | 537009 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus argenteus</i> var. <i>parviflorus</i> | 537015 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus argenteus</i> var. <i>utahensis</i> | 566453 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus caudatus</i> | 25981 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus leucophyllus</i> | 26049 | Present in Park | Common | Native |
| Fabaceae | <i>Lupinus polyphyllus</i> | 25921 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus polyphyllus</i> var. <i>burkei</i> | 537157 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus polyphyllus</i> var. <i>humicola</i> | 537158 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Lupinus polyphyllus</i> var. <i>prunophilus</i> | 537159 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|------------------|--|----------|-----------------|-----------|------------|
| Fabaceae | <i>Lupinus sericeus</i> | 26112 | Present in Park | Common | Native |
| Caryophyllaceae | <i>Lychnis alba</i> | 516470 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Lygodesmia spinosa</i> | 38454 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Machaeranthera canescens</i> var. <i>sessiliflora</i> | 566724 | Present in Park | Common | Native |
| Asteraceae | <i>Madia glomerata</i> | 38029 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Madia gracilis</i> | 38030 | Present in Park | Uncommon | Native |
| Malvaceae | <i>Malva neglecta</i> | 21836 | Present in Park | Uncommon | Non-Native |
| Lamiaceae | <i>Marrubium vulgare</i> | 32561 | Present in Park | Rare | Non-Native |
| Fabaceae | <i>Medicago falcata</i> | 516848 | Present in Park | Rare | Non-Native |
| Fabaceae | <i>Medicago lupulina</i> | 503721 | Present in Park | Rare | Non-Native |
| Fabaceae | <i>Medicago sativa</i> | 183623 | Present in Park | Uncommon | Non-Native |
| Poaceae | <i>Melica bulbosa</i> | 41851 | Present in Park | Common | Native |
| Fabaceae | <i>Melilotus alba</i> | 26149 | Present in Park | Rare | Non-Native |
| Fabaceae | <i>Melilotus officinalis</i> | 26150 | Present in Park | Uncommon | Non-Native |
| Lamiaceae | <i>Mentha arvensis</i> var. <i>glabrata</i> | 537473 | Present in Park | Rare | Native |
| Loasaceae | <i>Mentzelia albicaulis</i> | 503757 | Present in Park | Common | Native |
| Loasaceae | <i>Mentzelia dispersa</i> | 503769 | Present in Park | Uncommon | Native |
| Loasaceae | <i>Mentzelia laevicaulis</i> | 503779 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Mertensia ciliata</i> | 31668 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Mertensia longiflora</i> | 31671 | Present in Park | Uncommon | Native |
| Boraginaceae | <i>Mertensia oblongifolia</i> | 31683 | Present in Park | Common | Native |
| Asteraceae | <i>Microseris nutans</i> | 38114 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Microsteris gracilis</i> var. <i>humilior</i> | 537538 | Present in Park | Common | Native |
| Scrophulariaceae | <i>Mimulus floribundus</i> | 33311 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Mimulus guttatus</i> | 33236 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Mimulus lewisii</i> | 33260 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Mimulus nanus</i> | 33263 | Present in Park | Common | Native |
| Scrophulariaceae | <i>Mimulus pilosus</i> | 33655 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Mimulus suksdorfii</i> | 33272 | Present in Park | Common | Native |
| Chenopodiaceae | <i>Monolepis nuttalliana</i> | 20700 | Present in Park | Rare | Native |
| Portulacaceae | <i>Montia chamissoi</i> | 20406 | Present in Park | Rare | Native |
| Portulacaceae | <i>Montia dichotoma</i> | 20407 | Present in Park | Rare | Native |
| Portulacaceae | <i>Montia perfoliata</i> | 517308 | Present in Park | Rare | Native |
| Poaceae | <i>Muhlenbergia richardsonis</i> | 41938 | Present in Park | Uncommon | Native |
| Ranunculaceae | <i>Myosurus aristatus</i> | 18783 | Present in Park | Rare | Native |
| Hydrophyllaceae | <i>Nama densum</i> | 31401 | Present in Park | Rare | Native |
| Brassicaceae | <i>Nasturtium officinale</i> | 22993 | Present in Park | Uncommon | Native |
| Polemoniaceae | <i>Navarretia breweri</i> | 31325 | Present in Park | Common | Native |
| Polemoniaceae | <i>Navarretia intertexta</i> | 31316 | Present in Park | Common | Native |
| Hydrophyllaceae | <i>Nemophila breviflora</i> | 31423 | Present in Park | Uncommon | Native |
| Solanaceae | <i>Nicotiana attenuata</i> | 30571 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Oenothera caespitosa</i> | 565328 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Oenothera caespitosa</i> var. <i>caespitosa</i> | -502619 | Present in Park | Uncommon | Native |
| Onagraceae | <i>Oenothera caespitosa</i> var. <i>marginata</i> | 566494 | Present in Park | Common | Native |
| Onagraceae | <i>Oenothera elata</i> | 27395 | Present in Park | Rare | Native |
| Onagraceae | <i>Oenothera pallida</i> ssp. <i>pallida</i> var. <i>pallida</i> | -9752841 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Onobrychis viciifolia</i> | 26810 | Present in Park | Uncommon | Non-Native |
| Asteraceae | <i>Onopordum acanthium</i> | 38140 | Present in Park | Rare | Non-Native |
| Cactaceae | <i>Opuntia polyacantha</i> var. <i>polyacantha</i> | 195296 | Present in Park | Uncommon | Native |
| Orobanchaceae | <i>Orobanche corymbosa</i> | 34287 | Present in Park | Rare | Native |
| Orobanchaceae | <i>Orobanche fasciculata</i> | 34290 | Present in Park | Rare | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|------------------|--|----------|-----------------|-----------|------------|
| Orobanchaceae | Orobanche fasciculata form lutea | -9752852 | Present in Park | Rare | Native |
| Apiaceae | Orogenia linearifolia | 29777 | Present in Park | Uncommon | Native |
| Apiaceae | Osmorhiza chilensis | 507093 | Present in Park | Uncommon | Native |
| Apiaceae | Osmorhiza occidentalis | 29792 | Present in Park | Uncommon | Native |
| Polygonaceae | Oxytheca dendroidea | 21299 | Present in Park | Rare | Native |
| Fabaceae | Oxytropis lagopus var. lagopus | 529334 | Present in Park | Rare | Native |
| Urticaceae | Parietaria pensylvanica | 19169 | Present in Park | Rare | Native |
| Boraginaceae | Pectocarya penicillata | 504160 | Present in Park | Uncommon | Native |
| Boraginaceae | Pectocarya setosa | 31976 | Present in Park | Rare | Native |
| Scrophulariaceae | Penstemon acuminatus var. acuminatus | 529456 | Present in Park | Rare | Native |
| Scrophulariaceae | Penstemon attenuatus var. militaris | 529464 | Present in Park | Uncommon | Native |
| Scrophulariaceae | Penstemon barbatus | 33825 | Present in Park | Rare | Non-Native |
| Scrophulariaceae | Penstemon cusickii | 33863 | Present in Park | Rare | Native |
| Scrophulariaceae | Penstemon cyananthus var. subglaber | 529469 | Present in Park | Rare | Unknown |
| Scrophulariaceae | Penstemon cyaneus | 33684 | Present in Park | Common | Native |
| Scrophulariaceae | Penstemon deustus | 33876 | Present in Park | Common | Native |
| Scrophulariaceae | Penstemon eatonii var. eatonii | -9752863 | Present in Park | Rare | Non-Native |
| Scrophulariaceae | Penstemon humilis var. humilis | -502658 | Present in Park | Common | Native |
| Scrophulariaceae | Penstemon montanus | 33727 | Present in Park | Rare | Native |
| Scrophulariaceae | Penstemon palmeri var. eglandulosus | 529502 | Present in Park | Rare | Non-Native |
| Scrophulariaceae | Penstemon palmeri var. palmeri | 33739 | Present in Park | Rare | Non-Native |
| Scrophulariaceae | Penstemon perpulcher | 33977 | Present in Park | Uncommon | Native |
| Scrophulariaceae | Penstemon pumilus | 33754 | Present in Park | Uncommon | Native |
| Scrophulariaceae | Penstemon radicosus | 33986 | Present in Park | Rare | Native |
| Apiaceae | Perideridia gairdneri | 29804 | Present in Park | Uncommon | Native |
| Rosaceae | Petrophyton caespitosum | 25272 | Present in Park | Rare | Native |
| Hydrophyllaceae | Phacelia glandulifera | 31521 | Present in Park | Uncommon | Native |
| Hydrophyllaceae | Phacelia hastata var. alpina | 31530 | Present in Park | Common | Native |
| Hydrophyllaceae | Phacelia hastata var. hastata | 31530 | Present in Park | Common | Native |
| Hydrophyllaceae | Phacelia heterophylla var. heterophylla | -502676 | Present in Park | Common | Native |
| Hydrophyllaceae | Phacelia inconspicua | 31499 | Present in Park | Rare | Native |
| Poaceae | Phalaris arundinacea | 41335 | Present in Park | Uncommon | Native |
| Hydrangeaceae | Philadelphus lewisii | 24430 | Present in Park | Common | Native |
| Poaceae | Phleum pratense | 41062 | Present in Park | Rare | Non-Native |
| Polemoniaceae | Phlox aculeata | 30904 | Present in Park | Common | Native |
| Polemoniaceae | Phlox hoodii var. canescens | 538685 | Present in Park | Common | Native |
| Polemoniaceae | Phlox longifolia | 30956 | Present in Park | Common | Native |
| Brassicaceae | Phoenicaulis cheiranthoides | 23266 | Present in Park | Rare | Native |
| Pinaceae | Pinus contorta var. latifolia | 529673 | Present in Park | Rare | Unknown |
| Pinaceae | Pinus flexilis | 183343 | Present in Park | Common | Native |
| Boraginaceae | Plagiobothrys scouleri var. penicillatus | 529700 | Present in Park | Common | Native |
| Plantaginaceae | Plantago patagonica | 32907 | Present in Park | Uncommon | Native |
| Poaceae | Poa ampla | 41103 | Present in Park | Common | Native |
| Poaceae | Poa bulbosa | 41116 | Present in Park | Uncommon | Non-Native |
| Poaceae | Poa fendleriana | 504467 | Present in Park | Rare | Native |
| Poaceae | Poa juncifolia | 41103 | Present in Park | Uncommon | Native |
| Poaceae | Poa nemoralis | 41146 | Present in Park | Uncommon | Native |
| Poaceae | Poa nevadensis | 41103 | Present in Park | Uncommon | Native |
| Poaceae | Poa pratensis, sensu amplo | -9752846 | Present in Park | Common | Non-Native |
| Poaceae | Poa secunda, sensu amplo | -9752844 | Present in Park | Uncommon | Native |
| Poaceae | Poa secunda, sensu stricto | -9752843 | Present in Park | Abundant | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|-----------------|--|----------|------------------|-----------|------------|
| Poaceae | <i>Poa wheeleri</i> | 508133 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Polyctenium fremontii</i> var. <i>fremontii</i> | 529742 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Polygonum amphibium</i> | 20865 | Present in Park | Rare | Native |
| Polygonaceae | <i>Polygonum aviculare</i> | 20876 | Present in Park | Uncommon | Non-Native |
| Polygonaceae | <i>Polygonum douglasii</i> | 20891 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Polygonum douglasii</i> var. <i>douglasii</i> | -502745 | Present in Park | Common | Native |
| Polygonaceae | <i>Polygonum kelloggii</i> | 20898 | Present in Park | Uncommon | Native |
| Polygonaceae | <i>Polygonum lapathifolium</i> | 20860 | Present in Park | Rare | Native |
| Poaceae | <i>Polypogon monspeliensis</i> | 41171 | Present in Park | Uncommon | Non-Native |
| Dryopteridaceae | <i>Polystichum scopulinum</i> | 17689 | Present in Park | Rare | Native |
| Salicaceae | <i>Populus acuminata</i> | -502754 | Present in Park | Rare | Unknown |
| Salicaceae | <i>Populus angustifolia</i> | 22452 | Present in Park | Rare | Unknown |
| Salicaceae | <i>Populus tremuloides</i> | 195773 | Present in Park | Uncommon | Native |
| Salicaceae | <i>Populus trichocarpa</i> | 195735 | Present in Park | Rare | Unknown |
| Campanulaceae | <i>Porterella carnosula</i> | 34606 | Present in Park | Rare | Native |
| Portulacaceae | <i>Portulaca oleracea</i> | 20422 | Present in Park | Rare | Native |
| Rosaceae | <i>Potentilla arguta</i> var. <i>convallaria</i> | 539186 | Present in Park | Unknown | Native |
| Rosaceae | <i>Potentilla biennis</i> | 24695 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Potentilla diversifolia</i> var. <i>diversifolia</i> | 529820 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Potentilla glandulosa</i> | 24713 | Present in Park | Common | Native |
| Rosaceae | <i>Potentilla glandulosa</i> var. <i>nevadensis</i> | 539208 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Potentilla glandulosa</i> var. <i>pseudorupestris</i> | 539209 | Present in Park | Common | Native |
| Rosaceae | <i>Potentilla gracilis</i> var. <i>elmeri</i> | 539212 | Present in Park | Unknown | Native |
| Rosaceae | <i>Potentilla gracilis</i> var. <i>flabelliformis</i> | 531522 | Present in Park | Unknown | Native |
| Rosaceae | <i>Potentilla gracilis</i> var. <i>pulcherrima</i> | 539216 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Prunus virginiana</i> var. <i>melanocarpa</i> | 529894 | Present in Park | Common | Native |
| Pinaceae | <i>Pseudotsuga menziesii</i> var. <i>glauca</i> | 183428 | Present in Park | Uncommon | Native |
| Fabaceae | <i>Psoraleidium lanceolatum</i> | 504645 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Purshia tridentata</i> | 25290 | Present in Park | Common | Native |
| Asteraceae | <i>Pyrrocoma carthamoides</i> var. <i>cusickii</i> | 529940 | Probably Present | NA | Native |
| Asteraceae | <i>Pyrrocoma insecticuriis</i> | 504697 | Probably Present | NA | Native |
| Ranunculaceae | <i>Ranunculus andersonii</i> | 18590 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Ranunculus aquatilis</i> | 18581 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Ranunculus cymbalaria</i> | 18600 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Ranunculus glaberrimus</i> | 18606 | Present in Park | Common | Native |
| Ranunculaceae | <i>Ranunculus macounii</i> var. <i>macounii</i> | -502828 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Ranunculus sceleratus</i> var. <i>multifidus</i> | 529980 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Ranunculus testiculatus</i> | 501365 | Present in Park | Common | Non-Native |
| Ranunculaceae | <i>Ranunculus uncinatus</i> var. <i>uncinatus</i> | 194988 | Present in Park | Rare | Native |
| Grossulariaceae | <i>Ribes aureum</i> | 24452 | Present in Park | Uncommon | Native |
| Grossulariaceae | <i>Ribes cereum</i> var. <i>inebrians</i> | 530048 | Present in Park | Common | Native |
| Grossulariaceae | <i>Ribes hudsonianum</i> var. <i>petiolare</i> | 530055 | Present in Park | Rare | Native |
| Brassicaceae | <i>Rorippa curvipes</i> var. <i>curvipes</i> | 530091 | Present in Park | Uncommon | Native |
| Rosaceae | <i>Rosa woodsii</i> var. <i>ultramontana</i> | 530129 | Present in Park | Rare | Native |
| Rosaceae | <i>Rubus parviflorus</i> var. <i>parviflorus</i> | 530144 | Present in Park | Rare | Native |
| Asteraceae | <i>Rudbeckia occidentalis</i> | 36782 | Present in Park | Rare | Native |
| Polygonaceae | <i>Rumex crispus</i> | 20937 | Present in Park | Uncommon | Non-Native |
| Polygonaceae | <i>Rumex paucifolius</i> | 20971 | Present in Park | Rare | Native |
| Polygonaceae | <i>Rumex salicifolius</i> ssp. <i>triangulivalvis</i> var. <i>montigenitus</i> | -9752839 | Present in Park | Rare | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|-----------------|--|----------|-----------------|-----------|------------|
| Polygonaceae | Rumex salicifolius ssp. triangulivalvis var. triangulivalvis | -9752849 | Present in Park | Rare | Native |
| Salicaceae | Salix boothii | 22509 | Present in Park | Rare | Native |
| Salicaceae | Salix exigua | 22529 | Present in Park | Rare | Native |
| Salicaceae | Salix exigua ssp. exigua | -502873 | Present in Park | Rare | Native |
| Salicaceae | Salix lasiandra var. caudata | 540097 | Present in Park | Rare | Native |
| Salicaceae | Salix scouleriana | 504980 | Present in Park | Uncommon | Native |
| Chenopodiaceae | Salsola pestifer | 520950 | Present in Park | Uncommon | Non-Native |
| Caprifoliaceae | Sambucus cerulea | 35320 | Present in Park | Rare | Native |
| Rosaceae | Sanguisorba minor | 25303 | Present in Park | Uncommon | Non-Native |
| Saxifragaceae | Saxifraga occidentalis | 24289 | Present in Park | Rare | Native |
| Saxifragaceae | Saxifraga oregana | 24290 | Present in Park | Rare | Native |
| Brassicaceae | Schoenocrambe linifolia | 23296 | Present in Park | Rare | Native |
| Cyperaceae | Scirpus acutus | 40240 | Present in Park | Rare | Native |
| Cyperaceae | Scirpus americanus | 565758 | Present in Park | Rare | Native |
| Lamiaceae | Scutellaria antirrhinoides | 32784 | Present in Park | Uncommon | Native |
| Poaceae | Secale cereale | 42090 | Present in Park | Rare | Non-Native |
| Crassulaceae | Sedum lanceolatum | 24126 | Present in Park | Uncommon | Native |
| Asteraceae | Senecio canus | 518142 | Present in Park | Common | Native |
| Asteraceae | Senecio integerrimus var. exaltatus | 530318 | Present in Park | Common | Native |
| Asteraceae | Senecio serra var. serra | 530332 | Present in Park | Common | Native |
| Asteraceae | Senecio streptanthifolius | 518158 | Present in Park | Uncommon | Native |
| Malvaceae | Sidalcea oregana var. oregana | 566797 | Present in Park | Uncommon | Native |
| Caryophyllaceae | Silene douglasii | 20065 | Present in Park | Uncommon | Native |
| Caryophyllaceae | Silene menziesii | 20083 | Present in Park | Uncommon | Native |
| Brassicaceae | Sisymbrium altissimum | 23312 | Present in Park | Common | Non-Native |
| Brassicaceae | Sisymbrium loeselii | 23315 | Present in Park | Unknown | Non-Native |
| Iridaceae | Sisyrinchium demissum | 43255 | Present in Park | Rare | Native |
| Iridaceae | Sisyrinchium idahoense | 43266 | Present in Park | Rare | Native |
| Liliaceae | Smilacina racemosa | 43036 | Present in Park | Uncommon | Native |
| Liliaceae | Smilacina stellata | 503656 | Present in Park | Uncommon | Native |
| Solanaceae | Solanum triflorum | 30461 | Present in Park | Rare | Native |
| Asteraceae | Solidago canadensis var. salebrosa | 530447 | Present in Park | Uncommon | Native |
| Asteraceae | Sonchus asper | 38424 | Present in Park | Rare | Non-Native |
| Malvaceae | Sphaeralcea munroana | 21949 | Present in Park | Common | Native |
| Poaceae | Sphenopholis obtusata | 41279 | Present in Park | Rare | Native |
| Poaceae | Sporobolus cryptandrus | 42132 | Present in Park | Uncommon | Native |
| Caryophyllaceae | Stellaria longipes | 20168 | Present in Park | Rare | Native |
| Asteraceae | Stephanomeria tenuifolia var. myrioclada | 566324 | Present in Park | Common | Native |
| Poaceae | Stipa comata | 42172 | Present in Park | Common | Native |
| Poaceae | Stipa comata var. comata | 530571 | Present in Park | Common | Native |
| Poaceae | Stipa comata var. intermedia | 541007 | Present in Park | Unknown | Native |
| Poaceae | Stipa hymenoides | 507943 | Present in Park | Common | Native |
| Poaceae | Stipa nelsonii ssp. dorei | 525105 | Present in Park | Rare | Native |
| Poaceae | Stipa nelsonii ssp. nelsonii var. longiaristata | 531831 | Present in Park | Common | Native |
| Poaceae | Stipa nelsonii ssp. nelsonii var. nelsonii | 531832 | Present in Park | Uncommon | Native |
| Poaceae | Stipa occidentalis | 42186 | Present in Park | Uncommon | Native |
| Poaceae | Stipa occidentalis var. californica | 541016 | Present in Park | Rare | Unknown |
| Poaceae | Stipa occidentalis var. pubescens | 541019 | Present in Park | Common | Native |
| Poaceae | Stipa pinetorum | 507954 | Present in Park | Rare | Native |
| Poaceae | Stipa thurberiana | 507961 | Present in Park | Uncommon | Native |

| Family | Scientific Name | TSN | ParkStatus | Abundance | Nativity |
|------------------|---|----------|-----------------|-----------|------------|
| Poaceae | <i>Stipa webberi</i> | 507962 | Present in Park | Uncommon | Native |
| Poaceae | <i>Stipa X bloomeri</i> | -502971 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Stylocline psilocarphoides</i> | 38474 | Present in Park | Uncommon | Native |
| Caprifoliaceae | <i>Symphoricarpos oreophilus</i> var. <i>utahensis</i> | 530607 | Present in Park | Common | Native |
| Asteraceae | <i>Tanacetum vulgare</i> | 36328 | Present in Park | Rare | Non-Native |
| Asteraceae | <i>Taraxacum officinale</i> | 36213 | Present in Park | Uncommon | Unknown |
| Asteraceae | <i>Tetradymia canescens</i> | 38494 | Present in Park | Uncommon | Native |
| Ranunculaceae | <i>Thalictrum fendleri</i> | 18670 | Present in Park | Rare | Native |
| Ranunculaceae | <i>Thalictrum occidentale</i> | 18676 | Present in Park | Uncommon | Native |
| Brassicaceae | <i>Thlaspi arvense</i> | 23422 | Present in Park | Common | Non-Native |
| Poaceae | <i>Torreyochloa pallida</i> | 505539 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Townsendia florifera</i> | 38544 | Present in Park | Uncommon | Native |
| Asteraceae | <i>Tragopogon dubius</i> | 38564 | Present in Park | Common | Non-Native |
| Fabaceae | <i>Trifolium cyathiferum</i> | 26235 | Present in Park | Rare | Native |
| Fabaceae | <i>Trifolium hybridum</i> | 26261 | Present in Park | Uncommon | Non-Native |
| Fabaceae | <i>Trifolium repens</i> | 26206 | Present in Park | Uncommon | Non-Native |
| Fabaceae | <i>Trifolium variegatum</i> | 26326 | Present in Park | Rare | Native |
| Fabaceae | <i>Trifolium wormskioldii</i> var. <i>wormskioldii</i> | -9752837 | Present in Park | Rare | Native |
| Juncaginaceae | <i>Triglochin maritimum</i> | 505588 | Present in Park | Rare | Native |
| Poaceae | <i>Triticum aestivum</i> | 42237 | Present in Park | Rare | Non-Native |
| Typhaceae | <i>Typha angustifolia</i> | 42325 | Present in Park | Rare | Native |
| Typhaceae | <i>Typha latifolia</i> | 42326 | Present in Park | Rare | Native |
| Ulmaceae | <i>Ulmus pumila</i> | 19057 | Present in Park | Rare | Non-Native |
| Urticaceae | <i>Urtica dioica</i> ssp. <i>gracilis</i> var. <i>procera</i> | -9752842 | Present in Park | Uncommon | Native |
| Valerianaceae | <i>Valeriana acutiloba</i> var. <i>pubicarpa</i> | 530771 | Present in Park | Rare | Native |
| Valerianaceae | <i>Valeriana occidentalis</i> | 35362 | Present in Park | Rare | Native |
| Liliaceae | <i>Veratrum californicum</i> | 42757 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Verbascum blattaria</i> | 33389 | Present in Park | Rare | Non-Native |
| Scrophulariaceae | <i>Verbascum thapsus</i> | 33394 | Present in Park | Uncommon | Non-Native |
| Verbenaceae | <i>Verbena bracteata</i> | 32085 | Present in Park | Rare | Native |
| Scrophulariaceae | <i>Veronica americana</i> | 33399 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Veronica anagallis-aquatica</i> | 565594 | Present in Park | Uncommon | Native |
| Scrophulariaceae | <i>Veronica peregrina</i> | 33421 | Present in Park | Rare | Native |
| Violaceae | <i>Viola beckwithii</i> | 22042 | Present in Park | Uncommon | Native |
| Violaceae | <i>Viola nephrophylla</i> | 22117 | Present in Park | Rare | Native |
| Violaceae | <i>Viola nuttallii</i> | 22120 | Present in Park | Rare | Native |
| Violaceae | <i>Viola nuttallii</i> var. <i>major</i> | 530842 | Present in Park | Uncommon | Native |
| Violaceae | <i>Viola nuttallii</i> var. <i>vallicola</i> | 530843 | Present in Park | Common | Native |
| Violaceae | <i>Viola purpurea</i> var. <i>venosa</i> | 541745 | Present in Park | Uncommon | Native |
| Dryopteridaceae | <i>Woodsia scopulina</i> | 17747 | Present in Park | Rare | Native |
| Poaceae | X <i>Elyhordeum macounii</i> | 502250 | Present in Park | Rare | Native |
| Poaceae | X <i>Elyleymus aristatus</i> | 502252 | Present in Park | Rare | Native |
| Poaceae | X <i>Pseudelymus saxicola</i> | 504631 | Present in Park | Uncommon | Native |
| Liliaceae | <i>Zigadenus elegans</i> | 43158 | Present in Park | Common | Native |
| Liliaceae | <i>Zigadenus paniculatus</i> | 43167 | Present in Park | Common | Native |
| Liliaceae | <i>Zigadenus venenosus</i> | 43168 | Present in Park | Common | Native |

Appendix F – Photo Interpretation Mapping Conventions and Visual Key

Craters of the Moon National Monument and Preserve - Map Units

This appendix describes the map units for the Craters of the Moon National Monument and Preserve Vegetation Classification and Mapping Project. Its purpose is to:

- Describe the vegetation of each map unit;
- Provide a representative ground photograph/image for each map unit;
- Describe the link between each map unit and the U.S. National Vegetation Classification;
- Provide visual examples of each map unit with digital overhead images and delineated overlays.

The map units for CRMO were based on a combination of NVCS plant associations/alliances, local requests (i.e. Park Specials), the limitations of the digital imagery, and land use / land cover classes. The vegetation described in this section reflects the classification designed specifically for this project. Non-vegetated and land-use map units are not described in this key. For more information on the development of the mapping scheme for CRMO please reference the mapping sections of this report and the digital information (i.e. lookup tables, metadata) included on the project DVD.

This key follows the physiognomic grouping of each map unit starting with woodland and forest types. Each map unit is fully described by a variety of characteristics and features. First the NVC crosswalk to associations and the common plant species for each association is presented. Next is a description of the mapping concept and a representative ground photograph. A map of the distribution for each mapping unit across the study area follows along with an example of the 2006 digital basemap ortho-imagery (true-color bands). The imagery snapshot examples also include representative polygon outlines that highlight the map unit signatures. Many of the map unit descriptions rely heavily on the vegetation plot data collected in 2006. The sample ground photographs were taken during the 2006 plot data collection or during the 2008 accuracy assessment by Northwest Management, Incorporated.

*Please note that following the accuracy assessment, Map Units 6, 23, 33 and 34 were combined with other map units. Subsequently these types are not included in the final mapping scheme or in this key; however these data were retained in the comments field for individual polygons.

Forests and Woodlands

Map Code *Pseudotsuga menziesii* Forest Alliance
1 Douglas-fir Forest Alliance

Common Species

Pseudotsuga menziesii, *Pinus flexilis*,
Chrysothamnus viscidiflorus,
Bromus tectorum, *Pseudoroegneria spicata*,
Poa secunda, *Artemisia tridentata* ssp.
vaseyana

NVCS Associations

-*Pseudotsuga menziesii* / *Carex geyeri* Forest
-*Pseudotsuga menziesii* / *Symphoricarpos*
oreophilus Forest

Representative Ground Photo



Description

Douglas-fir was a rare type, primarily located in the northern section of the study area. Stands of Map Unit 1 usually occurred on hillslopes, adjacent to sagebrush flats. Dense stands of this type supported low understory diversity. This map unit was expressed as a bright green, coarse and pebbly photo signature on the imagery. Conversely, open stands supported high understory cover with a resulting photo signature of green, individual trees against a grey (shrub) or tan (herbaceous) background color. Stands of this Douglas-fir may have been confused with the limber pine types (Map Units 2, 3, and 4) as they occurred in similar locations.

Range and Distribution

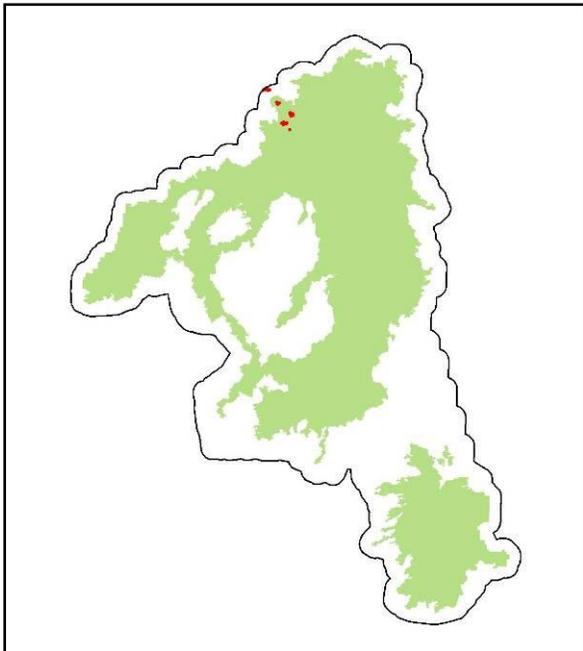


Photo Signature Example



Map Code *Pinus flexilis* / *Chamaebatiaria millefolium* / *Poa secunda* Sparse Vegetation
2 **Limber Pine / Fernbush / Sandberg Bluegrass Sparse Vegetation**

Common Species

Pinus flexilis, *Chamaebatiaria millefolium*,
Poa secunda, *Ericameria nauseosa*,
Chrysothamnus viscidiflorus, *Achnatherum*
hymenoides, *Bromus tectorum*, *Hesperostipa*
comata, *Pseudoroegneria spicata*, *Poa*
secunda, *Artemisia tridentata* ssp. *vaseyana*

NVCS Association

-*Pinus flexilis* / *Chamaebatiaria millefolium* /
Poa secunda Sparse Vegetation

Representative Ground Photo



Description

Map Unit 2 occurred primarily on aa lava and cinder fields common in the northwest section of CRMO. Polygons of Map Unit 2 were mostly sparse and the trees widely spaced. This type was expressed clearly on the imagery as dark colored trees (raised black dots) on the black or brown lava/cinders matrix. The commonly associated shrubs and grasses often appeared as a grey haze. Other conifers, including Douglas-fir and juniper species may have been confused with this type during the mapping.

Range and Distribution

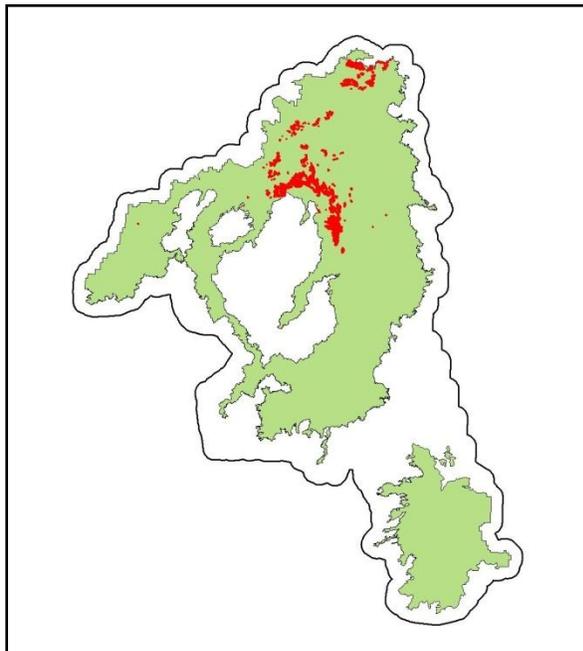
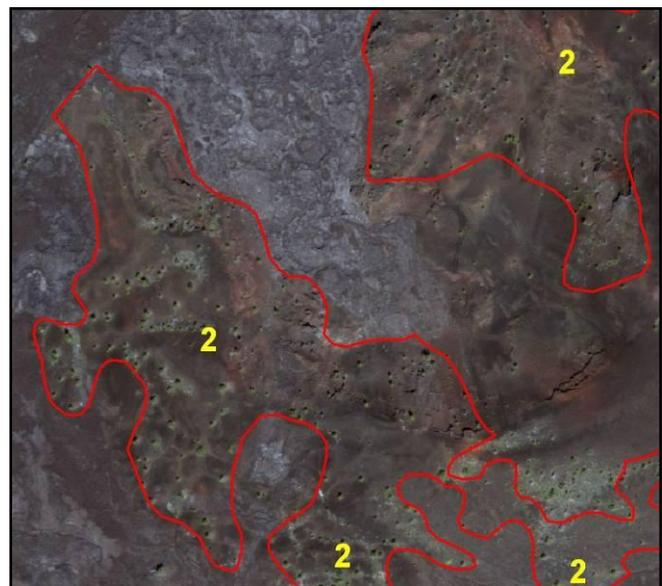


Photo Signature Example



Map Unit 3 *Pinus flexilis* / *Purshia tridentata* Woodland
Limber Pine / Antelope Bitterbrush Woodland

Common Species

Pinus flexilis, *Purshia tridentata*

NVCS Association

-*Pinus flexilis* / *Purshia tridentata* Woodland

Representative Ground Photo



Description

Map Unit 3 occurred primarily on pahoehoe lava in northwest section of CRMO. Polygons of Map Unit 3 were mostly sparse and the trees widely spaced. This mapping unit was used to define large areas that supported limber pine with sparse bitterbrush. The photo signature differed from the other limber pine Map Units (2 and 4) in that the bitterbrush shrubs appeared as small dark splotches intermixed with the larger, raised green spots (i.e. limber pine trees). The closeness of Map Unit 3 to the other limber pine mapping units likely resulted in some confusion between them during map attribution.

Range and Distribution

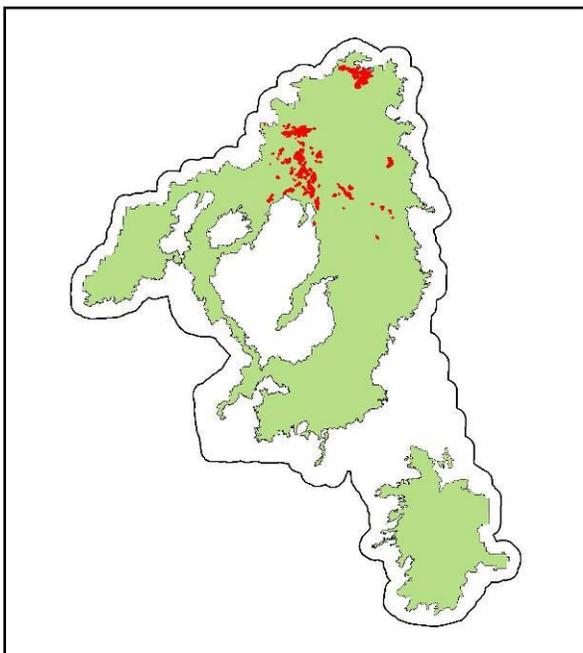
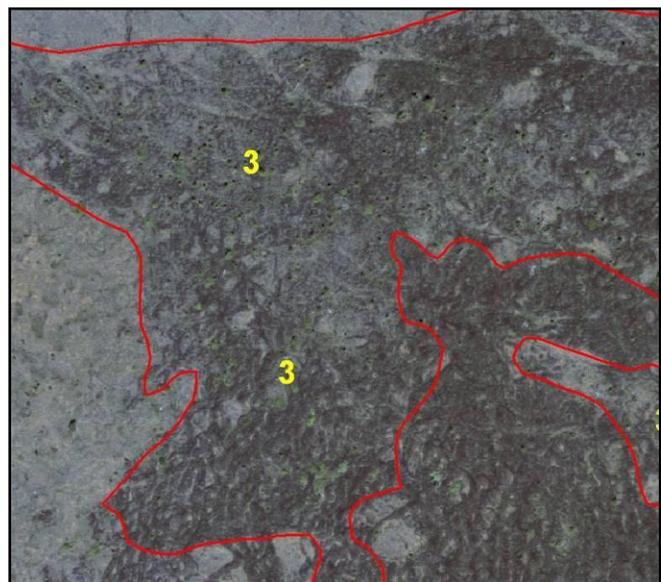


Photo Signature Example



Map Unit 4 *Pinus flexilis* / *Artemisia* spp. Woodland
 Limber pine / Sagebrush Woodland

Common Species

Pinus flexilis, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tripartita*, *Purshia tridentata*

NVCS Alliance

-*Pinus flexilis* Woodland Alliance

Representative Ground Photo



Description

Map Unit 4 occurred primarily on pahoehoe lava in the northwest section of CRMO. Polygons representing this unit were mostly sparse and the trees widely spaced. Map Unit 4 was included to represent limber pine stands that supported high cover of sagebrush in the understory. On the ortho-imagery this signature appeared as raised, dark green spots (limber pine trees) interspersed with large grey splotches and streaks (sagebrush). The other conifer map units may have been confused with this type, especially Map Unit 3.

Range and Distribution

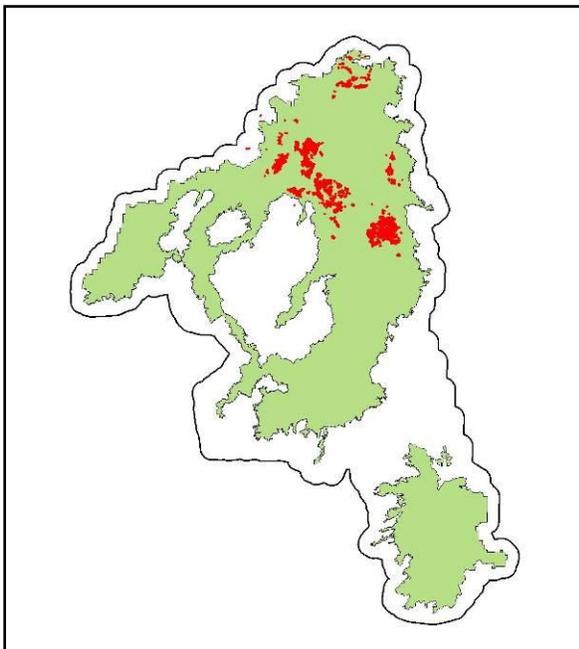
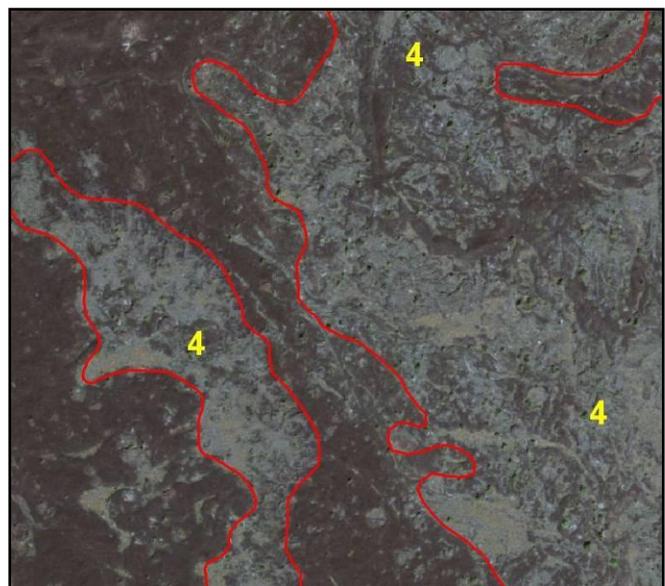


Photo Signature Example



Map Unit 5 ***Juniperus (osteosperma, scopulorum) / Mixed Shrub Complex***
Juniper (Utah, Rocky Mountain) / Mixed Shrub Complex

Common Species

Juniperus scopulorum, *Ericameria nana*,
Juniperus osteosperma, *Artemisia tridentata*
ssp. *wyomingensis*, *Chamaebatiaria*
millefolium, *Hesperostipa comata*,
Artemisia tridentata ssp. *vaseyana*

NVCS Associations

-*Juniperus (scopulorum, osteosperma) /*
Ericameria nana Wooded Herbaceous
Vegetation
-*Juniperus (osteosperma, scopulorum) /*
Artemisia tridentata ssp. *wyomingensis* -
Chamaebatiaria millefolium Woodland
-*Juniperus osteosperma / Artemisia tridentata*
ssp. *wyomingensis / Hesperostipa comata*
Wooded Shrubland

Description

Stands of Utah and Rocky Mountain juniper associated with mixed shrubs were very common in the southern lava flow and the extreme southern portions of the northern lava flows. Juniper trees and tall shrubs were fairly obvious as dark green spots on the ortho-imagery and the associated shrubs were usually apparent as light grey smears and splotches. Map Unit 5 occurred primarily on pahoehoe lava but also occurred to a lesser extent on some small aa exposures. Emphasis was placed on interpreting all of the juniper cover resulting in some polygons that are very sparse, allowing them to be confused with the sparse lava and Map Unit 7. The close similarity of Rocky Mountain juniper to Utah juniper (data retained in the comments field) made separate mapping impractical.

Representative Ground Photo



Range and Distribution

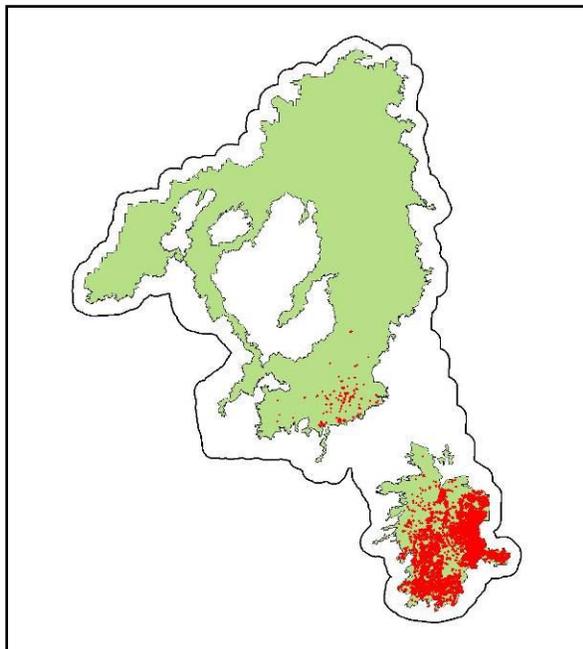
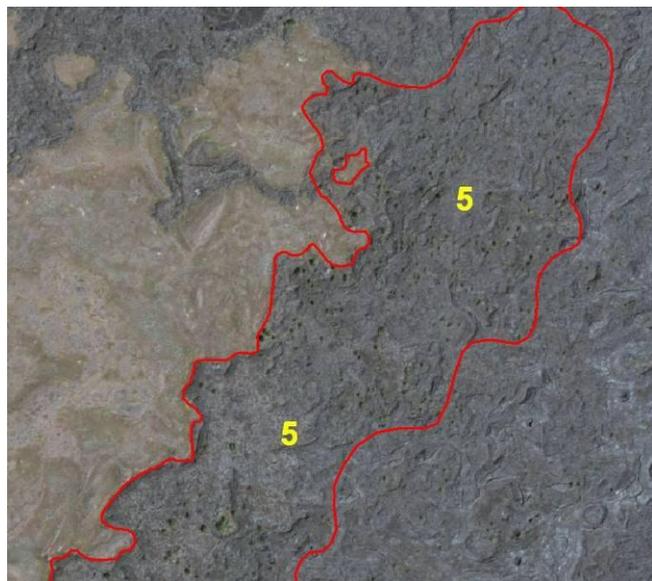


Photo Signature Example



Map Unit 7 *Juniperus scopulorum* / *Poa secunda* / *Penstemon deustus* Woodland
Rocky Mountain Juniper / Sandberg Bluegrass / Scabland Penstemon Woodland

Common Species

Juniperus scopulorum, *Poa secunda*
Penstemon deustus, *Purshia tridentata*,
Ericameria nauseosa, *Bromus tectorum*,
Leymus cinereus, *Achnatherum hymenoides*,
Artemisia tridentata ssp. *wyomingensis*,
Pseudoroegneria spicata

NVCS Association

-*Juniperus scopulorum* / *Poa secunda* /
Penstemon deustus Woodland

Representative Ground Photo



Description

Map Unit 7 represents juniper stands that contained sparse if any shrub cover in the understory. Polygons in this map unit occurred on the southern lava flow and were they occurred mostly on pahoehoe lava. The mapping of this type focused first on the presence of the juniper trees, appearing as raised, dark green spots on the ortho-imagery, and then on the lack of an associated understory. Although shrub signatures were mostly lacking in these polygons some inclusions of the other juniper type (Map Unit 5) may occur. An initial effort was made to separate stands of Rocky Mountain and Utah juniper (data retained in the comments field) but their appearance and signatures were too similar for proper identification, delineation, and mapping.

Range and Distribution

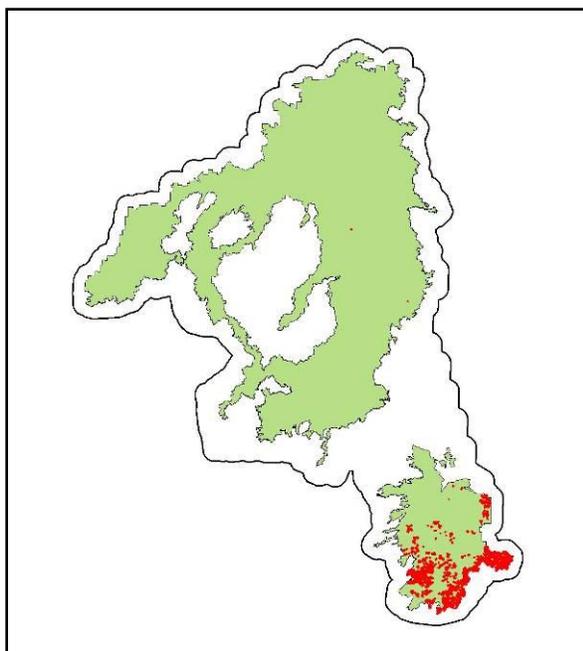
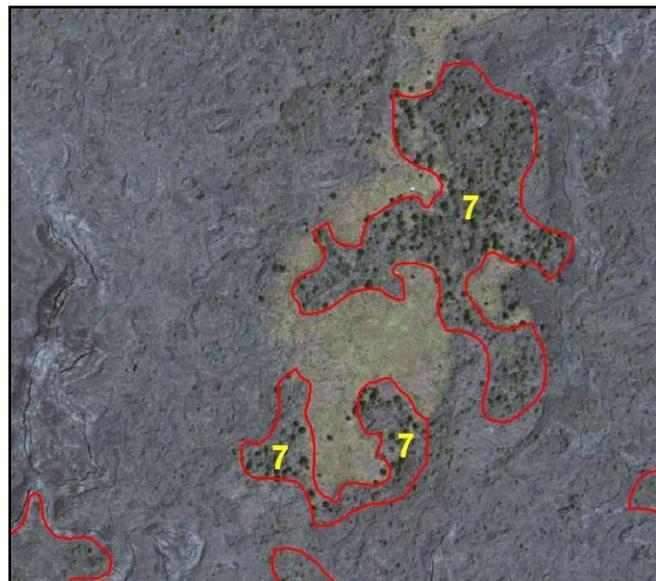


Photo Signature Example



Map Unit 8 *Populus tremuloides* / Mixed Herbaceous Forest Complex
Quaking Aspen / Mixed Herbaceous Forest Complex

Common Species

Populus tremuloides, *Calamagrostis rubescens*, *Prunus virginiana*

NVCS Associations

- Populus tremuloides* / *Calamagrostis rubescens* Forest
- Populus tremuloides* / Tall Forbs Forest

Representative Ground Photo



Description

Quaking aspen stands of Map Unit 8 occurred in the far northern portion of the project area on mesic sites in the foothills. Here this type was fairly common on north-facing slopes and in smaller, intermittent drainages. Quaking aspen forest stands appeared on the ortho-imagery as dark, Kelly green splotches with some white flecks due to white limbs and trunks. In general this map unit was very similar in appearance to Map Unit 10 but the interstitial spaces in the canopy were filled with the smooth green texture of low growing forbs and grasses. This smooth, green texture contrasted with the rough texture of the sagebrush and deciduous shrubs found in the understory of the other quaking aspen map units; however to some extent this type may still have been confused with the other quaking aspen map units during delineation.

Range and Distribution

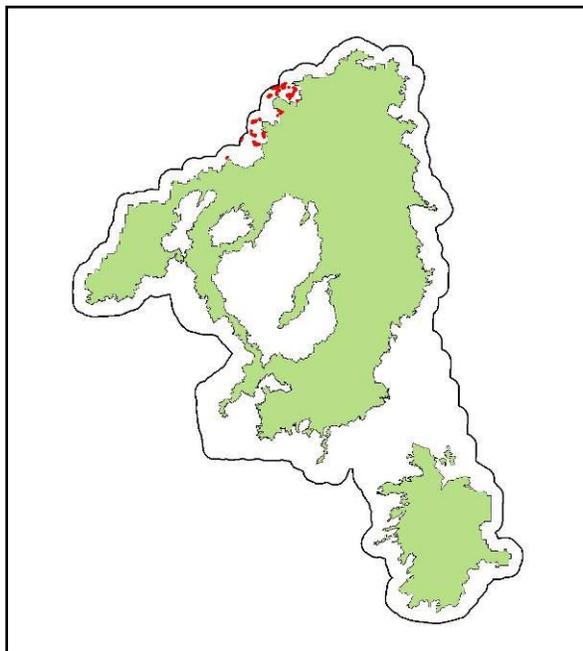
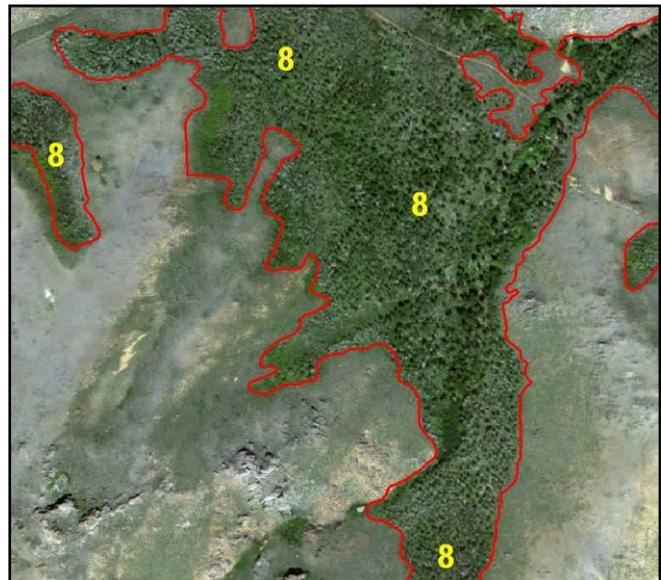


Photo Signature Example



Map Unit 9 *Populus tremuloides* / *Artemisia tridentata* Forest
Quaking Aspen / Basin Big Sagebrush Forest

Common Species

Populus tremuloides, *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, *Prunus virginiana*

NVCS Association

-*Populus tremuloides* / *Artemisia tridentata* Forest

Representative Ground Photo



Description

Map Unit 9 was restricted to the far northern environs and also rarely occurred as small outliers on the northern lava flow. This map unit differed from the other two quaking aspen map units in that sagebrush species were the dominant understory species. Most of the sagebrush cover was contributed by mountain big sagebrush but basin and Wyoming big sagebrush were also present in some stands. Polygons of this map unit tended to occur mid-slope on mesic side hills. Map Unit 9 was interpreted and mapped from the ortho-imagery where it appeared as large trees having a light green signature with grey, roughened spots (sagebrush) in the canopy openings. Quaking aspen with sagebrush did appear somewhat similar to the other quaking aspen map units although landscape location and the lighter green signature usually allowed for accurate separation.

Range and Distribution

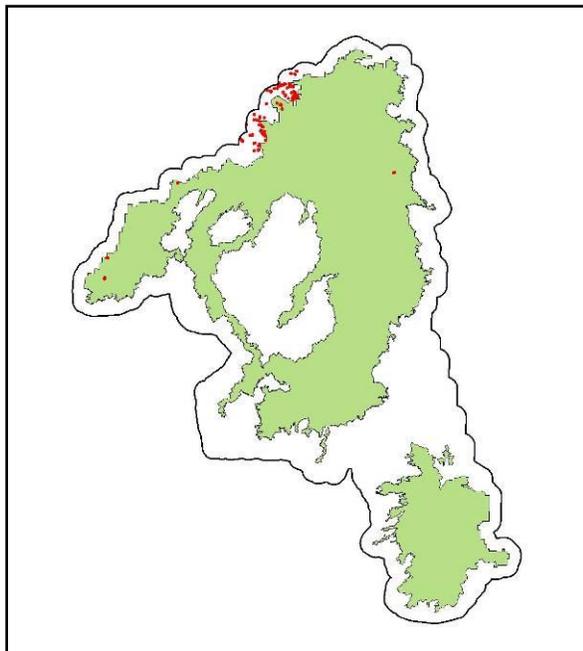
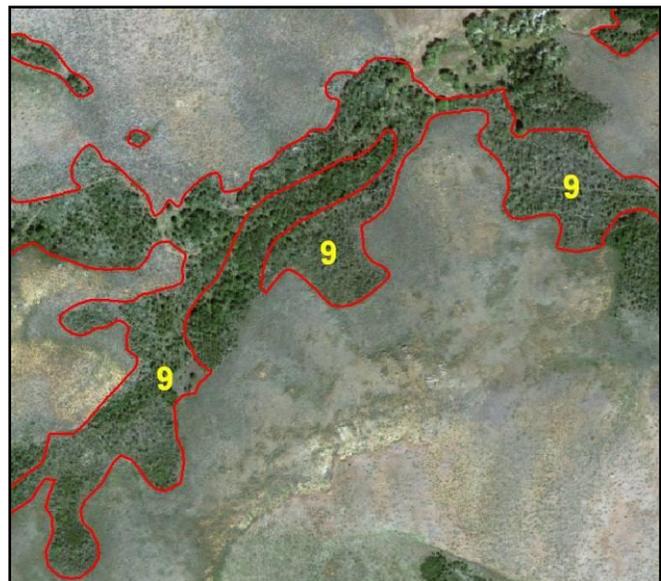


Photo Signature Example



Map Unit 10 ***Populus tremuloides* / Mixed Shrub Forest Complex**
Quaking Aspen / Mixed Shrub Forest Complex

Common Species

Populus tremuloides, *Symphoricarpos oreophilus*, *Calamagrostis rubescens*
Prunus virginiana, *Pinus flexilis*, *Betula occidentalis*, *Elymus cinereus*

NVCS Associations

- Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest
- Populus tremuloides* / *Prunus virginiana* Forest
- Populus tremuloides* - *Pinus flexilis* Forest

Representative Ground Photo



Description

Similar to the other quaking aspen map units, Map Unit 10 occurred exclusively in the very northern portion of the project area occupying mesic slopes, valley bottoms and drainage ways. Polygons representing this map unit exhibited the characteristic dark green color, with white specks (tree limbs and trunks) of quaking aspen in the overstory. The presence of dense deciduous shrubs in the understory filled in the canopy openings with a diagnostic coarse bright green color. The similar texture and color of quaking aspen trees of this map unit to the other quaking aspen map units may have resulted in some misclassification and the larger polygons of this type may have inclusions of tall shrub stands like speckled alder, water birch and chokecherry.

Range and Distribution

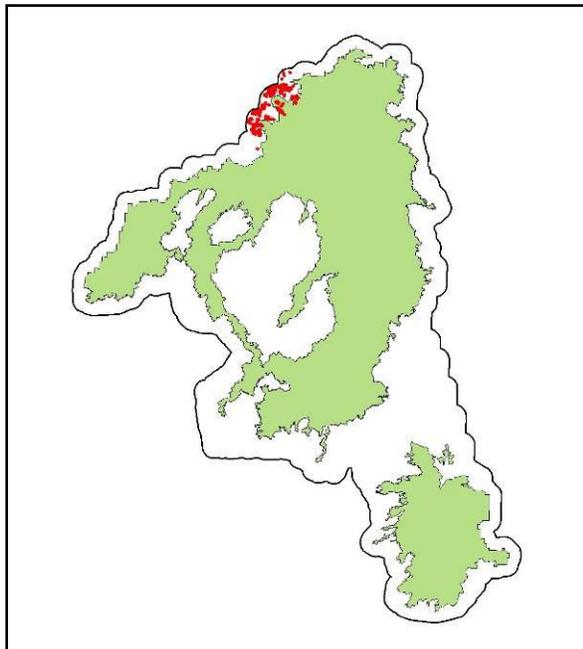
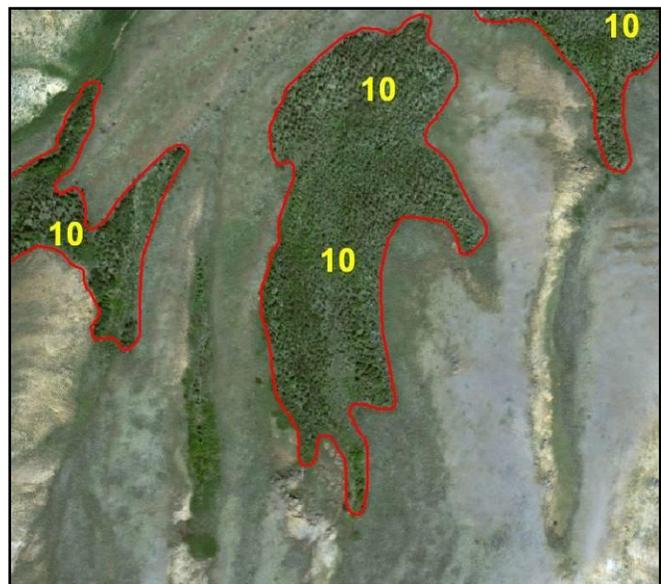


Photo Signature Example



Map Unit *Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Woodland Alliance
11 Black Cottonwood Temporarily Flooded Woodland Alliance

Common Species

Populus balsamifera ssp. *trichocarpa*,
Artemisia tridentata ssp. *tridentata*,
Prunus virginiana, *Leymus cinereus*,
Ericameria nauseosa, *Purshia tridentata*,
Populus tremuloides

NVCS Alliance

-*Populus balsamifera* ssp. *trichocarpa*
Temporarily Flooded Woodland Alliance

Representative Ground Photo



Description

Black cottonwood woodlands (Map Unit 11) were a minor component of the mesic vegetation occurring in the northern environs of the project area. Here the map unit often occurred in close proximity to similar quaking aspen, speckled alder and water birch map units sharing similar understory species. This combination of deciduous trees and shrubs presented itself as a bright green, coarse signature on the ortho-imagery. It is likely that some minor confusion exists in the mapping between Map Unit 11 and the other deciduous forest and woodland map units. This map unit was also used to attribute larger more mature trees located in and around the agricultural lands of the environs west of CRMO. In these areas the individual black cottonwood trees appeared as large green spots and the understory signature was typically lacking. It is likely that in these settings this map unit may have also inadvertently been used to delineate other planted deciduous trees.

Range and Distribution

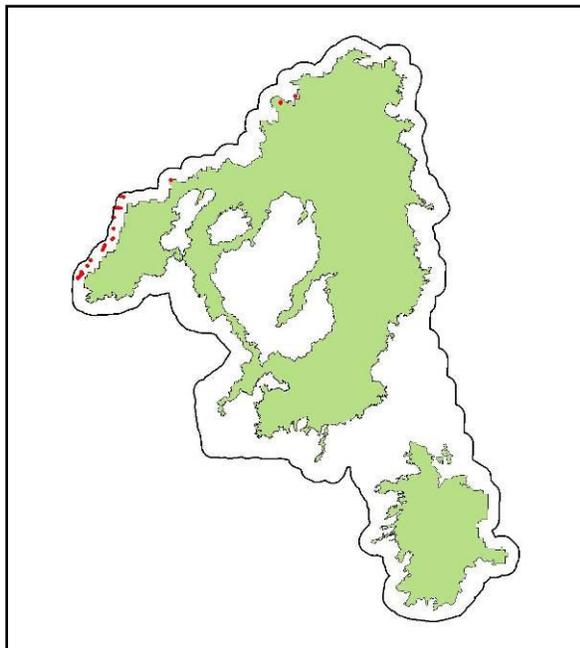


Photo Signature Example



Shrublands

| | |
|-----------------|---|
| Map Unit | <i>Cercocarpus ledifolius</i> - <i>Purshia tridentata</i> / <i>Poa secunda</i> Shrubland |
| 12 | Curl-leaf Mountain-mahogany - Bitterbrush / Sandberg Bluegrass Shrubland |

Common Species

Cercocarpus ledifolius, *Purshia tridentata*,
Poa secunda, *Chrysothamnus viscidiflorus*,
Juniperus spp.

NVCS Association

-*Cercocarpus ledifolius* - *Purshia tridentata* /
Poa secunda Shrubland

Representative Ground Photo



Description

Map Unit 12 was rare occurring only on select pahoehoe lava deposits directly south of Pillar Butte in the southern lava flow. Most interpretation for this map unit was performed using a combination of known classification plot locations and the coarse diagnostic signature of the mountain mahogany shrubs. This unique signature included large gray spots indicating individual curl-leaf mountain mahogany shrubs against the black lava on the true-color ortho-imagery. These pebbled shrub indicators were even more pronounced when the color infrared band was used for interpretation. Curl-leaf mountain mahogany stands had a similar appearance to short juniper trees and shrub and some confusion may exist between the two map units in the interpretation and delineation.

Range and Distribution

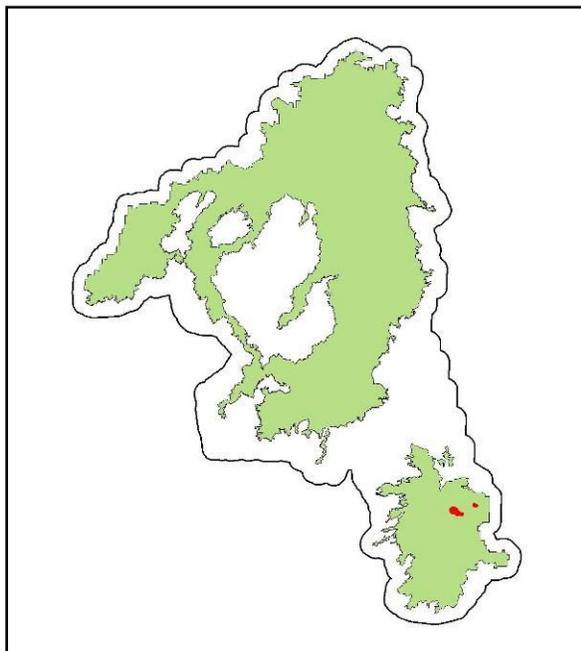


Photo Signature Example



Map Unit 13 ***Artemisia arbuscula* Shrubland Alliance**
Low Sagebrush (Alkali Sagebrush) Shrubland Alliance

Common Species

Artemisia arbuscula ssp. *arbuscula*,,
Artemisia arbuscula ssp. *longiloba*,
Hesperostipa comata, *Pseudoroegneria*
spicata, *Bromus tectorum*, *Festuca idahoensis*

NVCS Associations

- Artemisia arbuscula* ssp. *arbuscula* /
Hesperostipa comata Shrubland
- Artemisia arbuscula* ssp. *arbuscula* / *Poa*
secunda Shrub Herbaceous Vegetation
- Artemisia arbuscula* ssp. *arbuscula* /
Pseudoroegneria spicata Shrub Herbaceous
Vegetation
- Artemisia arbuscula* ssp. *arbuscula* / *Bromus*
tectorum Semi-natural Shrubland
- Artemisia arbuscula* ssp. *longiloba* / *Festuca*
idahoensis Shrub Herbaceous Vegetation

Representative Ground Photo



Description

Map Unit 13 has become established in sparse stands on dry northern hills and slopes supporting stands. Low sagebrush is likely more prevalent and widespread than alkali sagebrush in the project area. This map unit includes areas that have both native grasses and non-native cheatgrass in the understory. An initial attempt was made to separate stands that were dominated in the understory by cheatgrass and this information remains in the comments field for those affected polygons. Overall, Map Unit 13 exhibited a very consistent light grey, barren or smooth-textured signature on the ortho-photography due to the high percentage of bare ground common to this plant community.

Range and Distribution

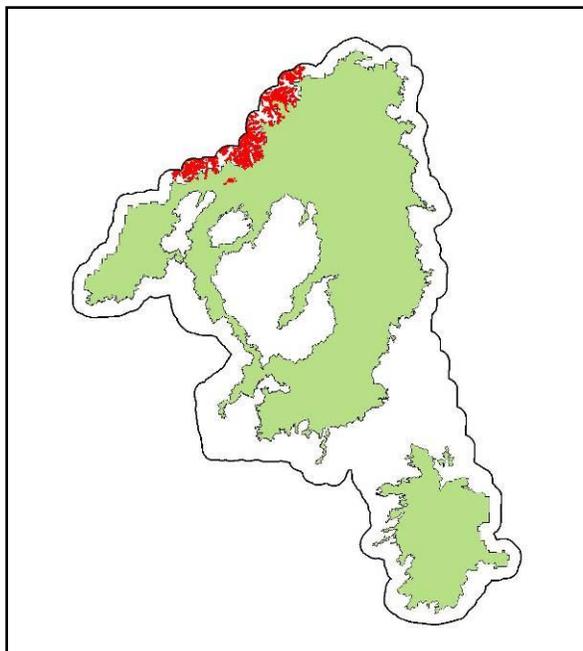
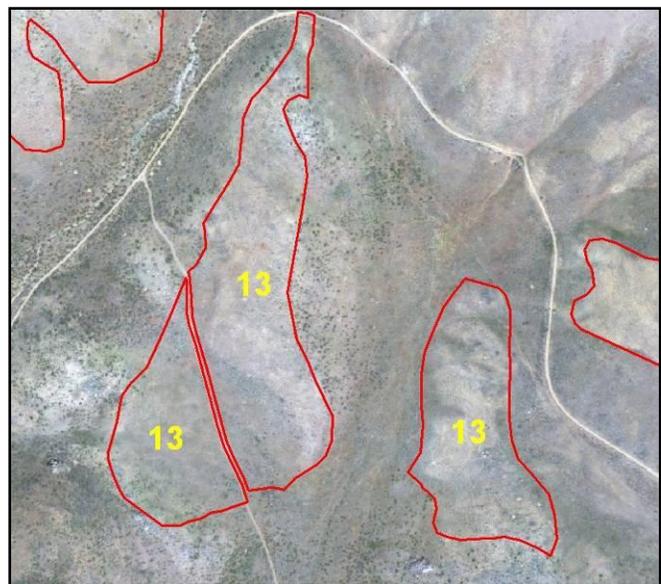


Photo Signature Example



Map Unit *Artemisia tridentata* ssp. *tridentata* Shrubland Alliance
14 Basin Big Sagebrush Shrubland Alliance

Common Species

Artemisia tridentata ssp. *tridentata*,
Pseudoroegneria spicata, *Leymus cinereus*,
Poa secunda, *Festuca idahoensis*

NVCS Associations

- Artemisia tridentata* ssp. *tridentata* / *Festuca idahoensis* Shrubland
- Artemisia tridentata* ssp. *tridentata* / *Leymus cinereus* Shrubland
- Artemisia tridentata* ssp. *tridentata* / *Poa secunda* Shrubland
- Artemisia tridentata* ssp. *tridentata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation

Representative Ground Photo



Description

Basin big sagebrush has a scattered distribution on deep soils with major stands and smaller patches occurring around the southern lava flows and in some kipukas. This map unit also occurred as sparse stands on lava flows where small shrubs grew in cracks and crevices. At CRMO, basin big sagebrush often intermixed with Wyoming big sagebrush and the possible hybridization may have resulted in confusion in interpretation, delineation, and plant identification. However, this map unit appeared to have larger more robust shrubs yielding a very characteristic mottled or broken signature on the ortho-imagery. This signature often included patches of brown representing grass-dominated patches and white specks indicating bare ground or rocks. In some areas the signature for this map unit appeared completely grey likely due to fire or black when it occurred on lava.

Range and Distribution

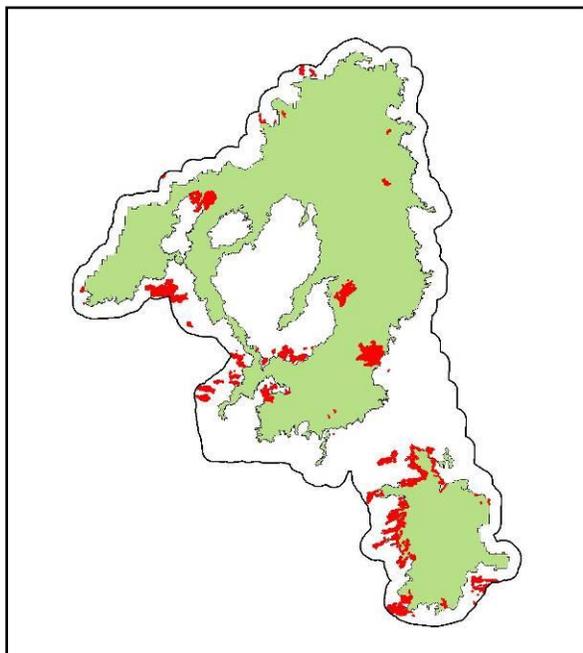
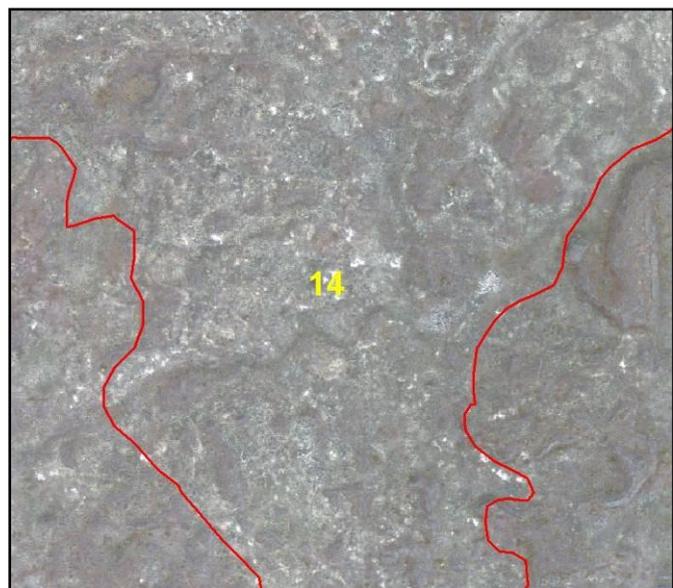


Photo Signature Example



Map Unit 15 *Artemisia tridentata* ssp. *tridentata* / *Bromus tectorum* Semi-natural Shrubland
Basin Big Sagebrush / Cheatgrass Semi-natural Shrubland

Common Species

Artemisia tridentata ssp. *tridentata*,
Bromus tectorum, *Ericameria nauseosa*,
Chrysothamnus viscidiflorus

NVCS Association

-*Artemisia tridentata* ssp. *tridentata* / *Bromus tectorum* Semi-natural Shrubland

Representative Ground Photo



Description

Map Unit 15, basin big sagebrush with a cheatgrass understory, was widely scattered throughout the project area, occurring on lava flows and on deep soils in the upland environs. The high cover of cheatgrass in the understory distinguished it from Map Unit 14 signatures. On some sites, the basin big sagebrush appeared nearly dead due to fire, drought, or insect infestations. On the ortho-imagery this map unit typically supported shrubs that appeared larger than the other common sagebrush species onsite (i.e. bigger grey dots) however the cheatgrass background color was very similar to the other cheatgrass map units (orange-brown). Since this map unit included many of the same understory species as the other sagebrush map units, some confusion likely occurred during interpretation and delineation.

Range and Distribution

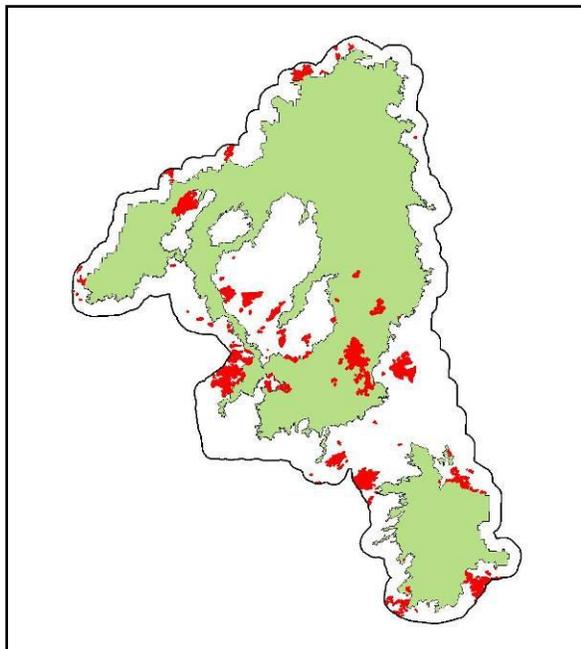
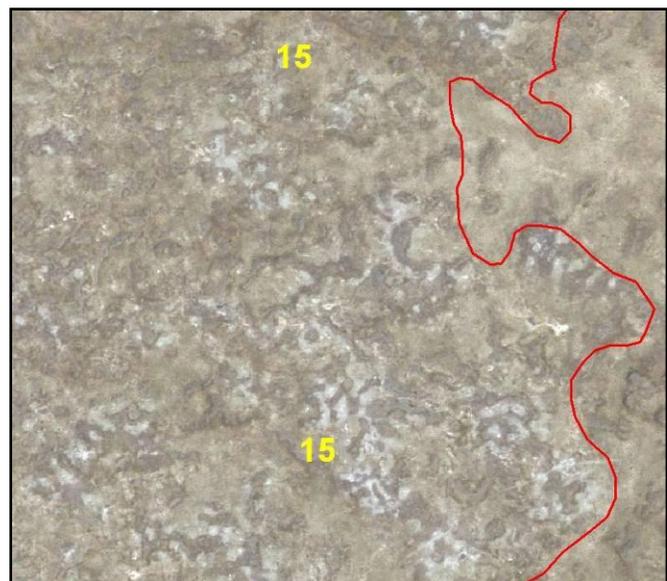


Photo Signature Example



Map Unit 16 *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance
Mountain Big Sagebrush Shrubland Alliance

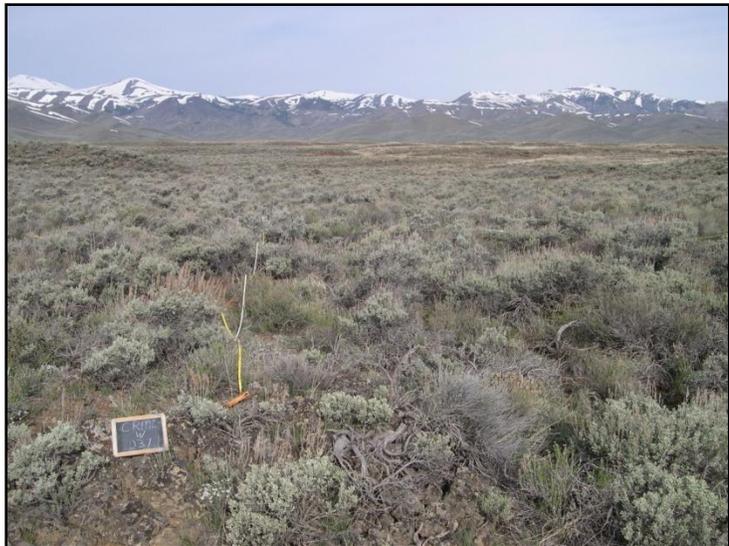
Common Species

Artemisia tridentata ssp. *vaseyana*,
Penstemon deustus, *Poa secunda*,
Pseudoroegneria spicata, *Purshia tridentata*

NVCS Associations

- Artemisia tridentata* ssp. *vaseyana* - *Chamaebatiaria millefolium* / *Penstemon deustus* Shrubland
- Artemisia tridentata* ssp. *vaseyana* - *Purshia tridentata* / *Poa secunda* Shrubland
- Artemisia tridentata* ssp. *vaseyana* - *Purshia tridentata* / *Pseudoroegneria spicata* Shrubland
- Artemisia tridentata* ssp. *vaseyana* - *Symphoricarpos oreophilus* / *Pseudoroegneria spicata* Shrubland
- Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation
- Artemisia tridentata* ssp. *vaseyana* / *Hesperostipa comata* Shrubland
- Artemisia tridentata* ssp. *vaseyana* / *Leymus cinereus* Shrubland
- Artemisia tridentata* ssp. *vaseyana* / *Poa secunda* Shrubland
- Artemisia tridentata* ssp. *vaseyana* / *Pseudoroegneria spicata* Shrubland

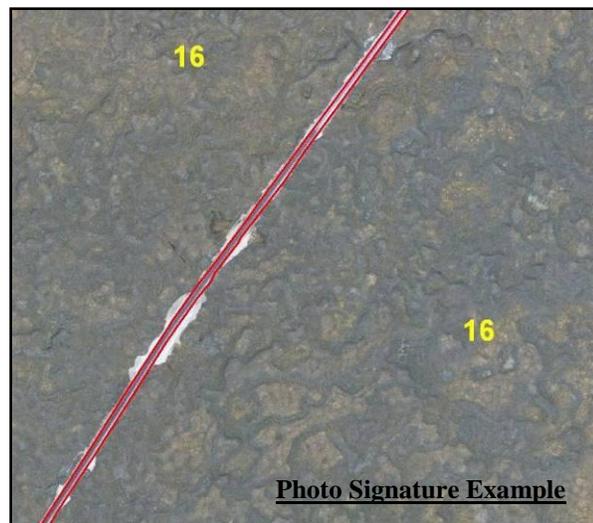
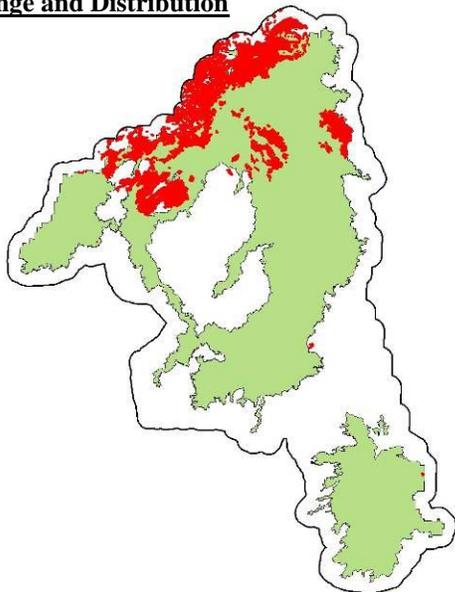
Representative Ground Photo



Description

Map Unit 16 was widespread throughout the northern portions of the project area where mountain big sagebrush replaced Wyoming big sagebrush as the dominant shrub on upland terraces, slopes, and valley floors. Sparse polygons of this map unit occurred across large areas of the lava flows. Map Unit 16 is characterized by high understory cover of native bunchgrasses and other shrubs including bitterbrush and rabbitbrush. On the orthoimagery this map unit had a similar signature as Map Unit 18 (grey dots on black = sparse lava and a grey mottled on brown = dense upland) but it tended to be smoother and patchier (likely due to shorter shrubs, exposed stones, and more bare ground). Since this map unit contained many of the same species as the other sagebrush map units, some confusion likely occurred when trying to delineation

Range and Distribution



Map Unit 17 *Artemisia tridentata* ssp. *vaseyana* / *Bromus tectorum* Semi-natural Shrubland
Mountain Big Sagebrush / Cheatgrass Semi-natural Shrubland

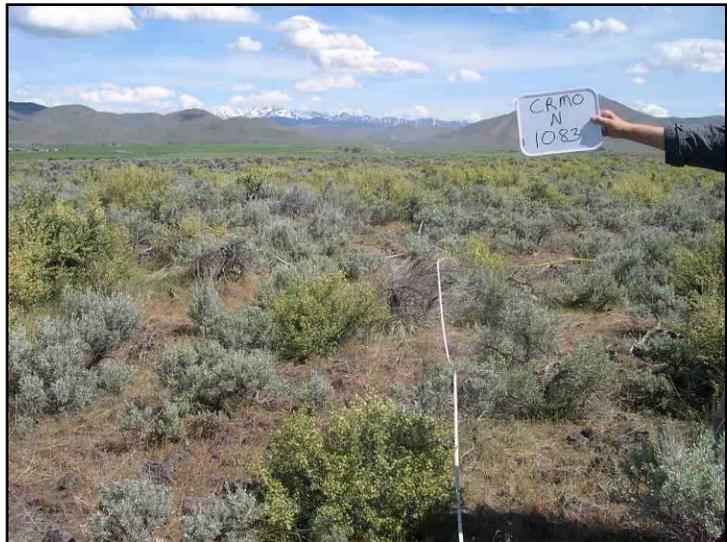
Common Species

Artemisia tridentata ssp. *vaseyana*, *Bromus tectorum*, *Ericameria nauseosa*, *Chrysothamnus viscidiflorus*, *Festuca idahoensis*, *Hesperostipa comata*, *Pascopyrum smithii*, *Pseudoroegneria spicata*

NVCS Association

-*Artemisia tridentata* ssp. *vaseyana* / *Bromus tectorum* Semi-natural Shrubland

Representative Ground Photo



Description

Map Unit 17 was limited to the higher northern portions of the project area where it occurred on deep soils of hills, slopes, and broad valley floors. This map unit also occurred as sparse, small patches on the adjacent lava flows. Map Unit 17 is characterized by the high cover of non-native annual cheatgrass in the understory, often excluding all other vegetation except the mountain big sagebrush. On the ortho-imagery this map unit had a similar signature as the other sagebrush map units but contained a very strong orange-brown background color due to the high cover of cheatgrass. Since this map unit contained many of the same species as the other sagebrush map units, some confusion likely occurred during the interpretation process.

Range and Distribution

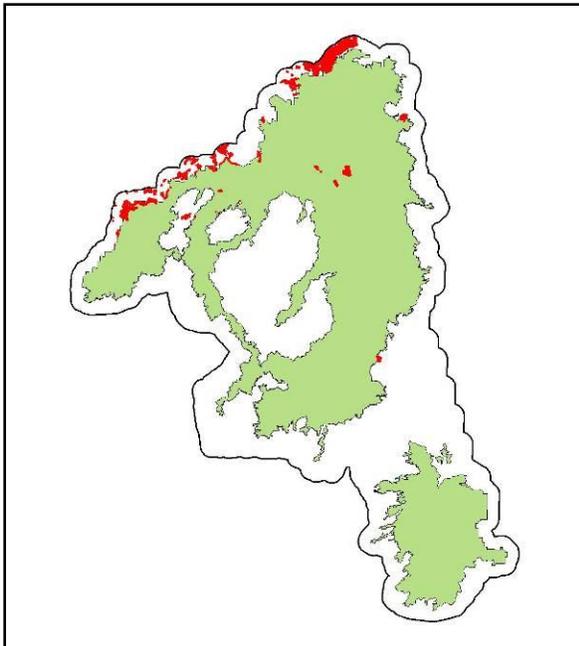
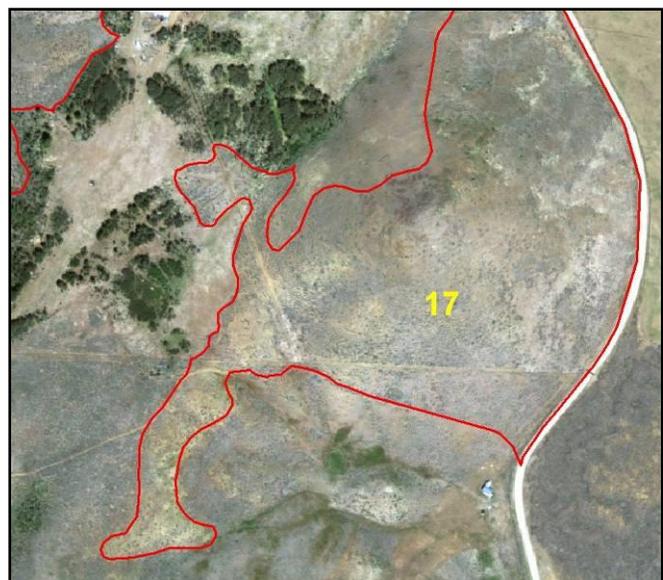


Photo Signature Example



Map Unit 18 *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance
Wyoming Big Sagebrush Shrubland Alliance

Common Species

Artemisia tridentata ssp. *wyomingensis*,
Achnatherum thurberianum, *Achnatherum hymenoides*, *Poa secunda*, *Festuca idahoensis*
Bromus tectorum, *Hesperostipa comata*,
Pascopyrum smithii, *Pseudoroegneria spicata*

NVCS Associations

- Artemisia tridentata* ssp. *wyomingensis* / -
Achnatherum hymenoides Shrubland
- Artemisia tridentata* ssp. *wyomingensis* /
Achnatherum thurberianum Shrubland
- Artemisia tridentata* ssp. *wyomingensis* / *Festuca idahoensis* Shrubland
- Artemisia tridentata* ssp. *wyomingensis* /
Hesperostipa comata Shrubland
- Artemisia tridentata* ssp. *wyomingensis* /
Pascopyrum smithii Shrub Herbaceous Vegetation
- Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* Shrubland
- Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* Shrubland

Representative Ground Photo



Description

Map Unit 18, Wyoming big sagebrush, was very common on deep soils of upland plains, slopes, and terraces and occurred as a sparse type on some vegetated lava flows. Although cheatgrass was often present it did not dominate the understory as with Map Class 19. Native bunch grasses and other shrubs were common in Map Unit 18 varying in composition and density depending on the soil type and moisture availability. On the ortho-imagery this map unit varied in appearance from dispersed medium-sized grey dots against a white or grey background (fire-affected situations), to grey dots on black lava (sparse situations), to a homogenous grey mottled texture on a light tan background (dense stands). Due to its similarity in size, shape, and color to the other species of sagebrush this map unit was likely confused with Map Units 14, 16, and 20 during interpretation.

Range and Distribution

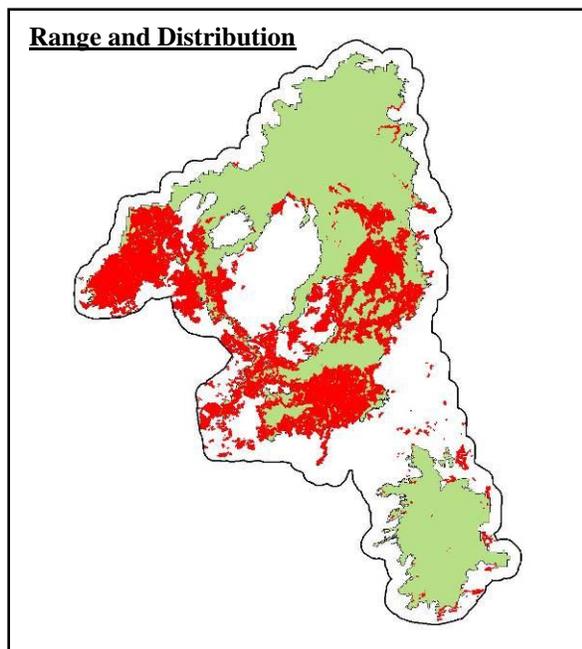
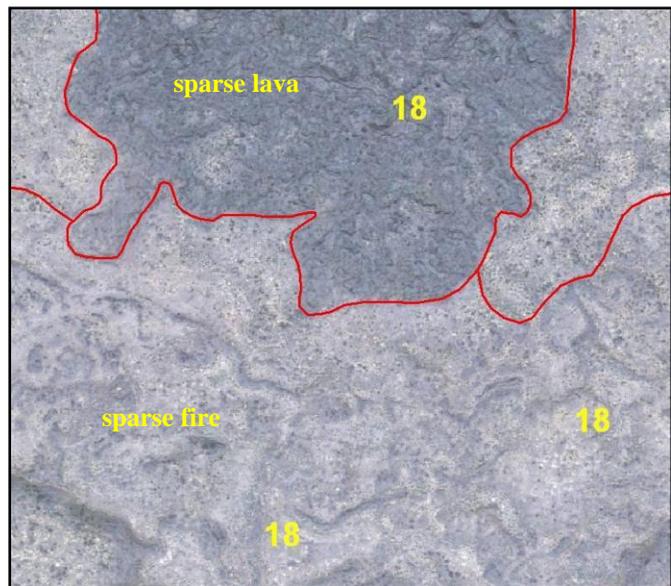


Photo Signature Example



Map Unit 19 *Artemisia tridentata* ssp. *wyomingensis* / *Bromus tectorum* - (*Agropyron cristatum*) Shrubland Complex
Wyoming Big Sagebrush / Cheatgrass – (Crested Wheatgrass) Shrubland Complex

Common Species

Artemisia tridentata ssp. *wyomingensis*,
Bromus tectorum, *Agropyron cristatum*
Poa secunda, *Achnatherum thurberianum*

NVCS Associations

- Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum thurberianum* - *Bromus tectorum* Semi-natural Shrubland
- Artemisia tridentata* ssp. *wyomingensis* / *Agropyron cristatum* Semi-natural Shrubland
- Artemisia tridentata* ssp. *wyomingensis* / *Bromus tectorum* Semi-natural Shrubland
- Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland

Description

Map Unit 19 was widespread throughout the project area occurring on upland terraces, slopes, and on the lava flows as both dense and sparse shrublands. This map unit is characterized by the high cover of non-native annual cheatgrass (and in some cases the non-native perennial crested wheatgrass) in the understory, often excluding all other vegetation except Wyoming big sagebrush. In some areas Wyoming big sagebrush shrubs appeared nearly dead due to fire, drought, or insect infestations. On the ortho-imagery this map unit provided similar signatures as other species of sagebrush with cheatgrass dominant in the understory (Map Units 17, 19, and 21) and contained a very strong orange-brown background color due to the high cover of cheatgrass or crested wheatgrass. Since this map unit is characterized by many of the same species as the other sagebrush map units, some confusion likely occurred during interpretation.

Representative Ground Photo



Range and Distribution

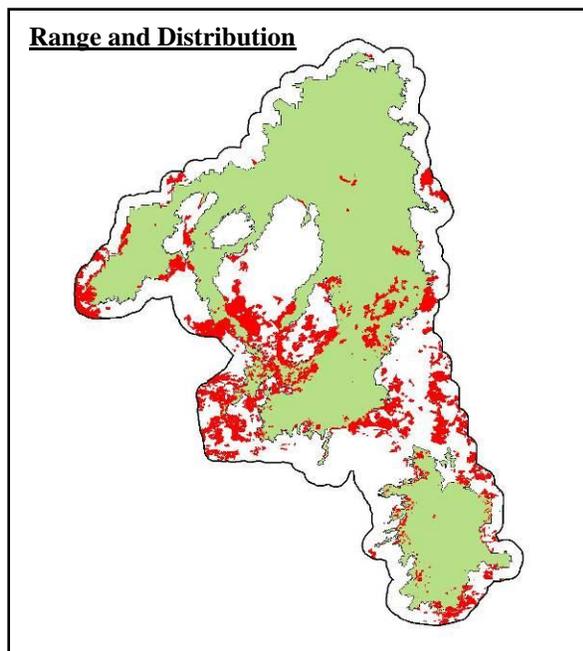
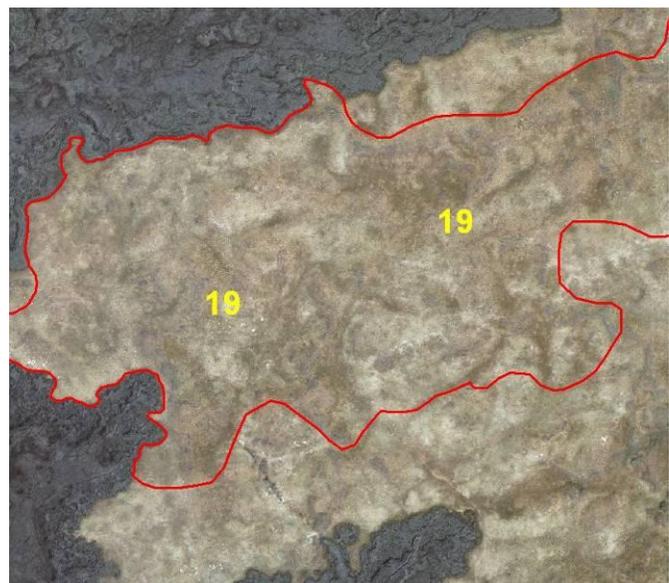


Photo Signature Example



Map Unit 20 *Artemisia tripartita* Shrubland Alliance
 Threetip Sagebrush Shrubland Alliance

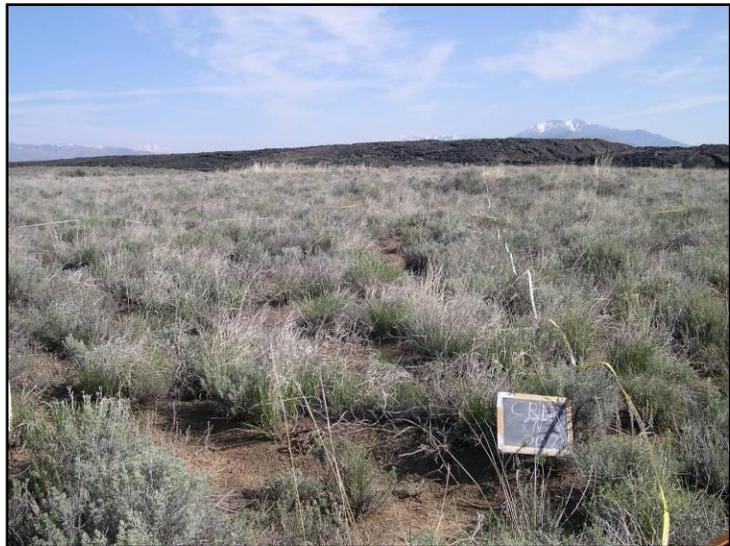
Common Species

Artemisia tripartita ssp. *tripartita*,
Poa secunda, *Festuca idahoensis*,
Pseudoroegneria spicata

NVCS Associations

- Artemisia tripartita* ssp. *tripartita* / *Achnatherum thurberianum* Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Festuca idahoensis* Shrub Herbaceous Vegetation
- Artemisia tripartita* ssp. *tripartita* / *Hesperostipa comata* Shrub Herbaceous Vegetation
- Artemisia tripartita* ssp. *tripartita* / *Koeleria macrantha* Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Leymus cinereus* Shrub Herbaceous Vegetation
- Artemisia tripartita* ssp. *tripartita* / *Pascopyrum smithii* Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Poa secunda* Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation

Representative Ground Photo

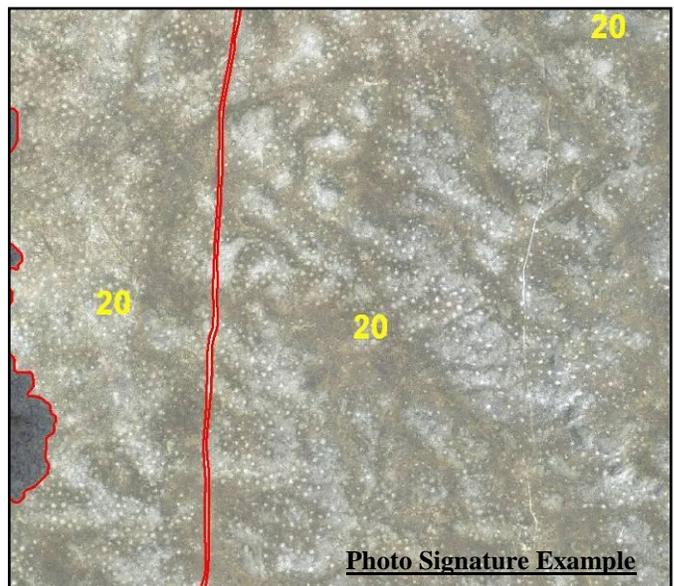
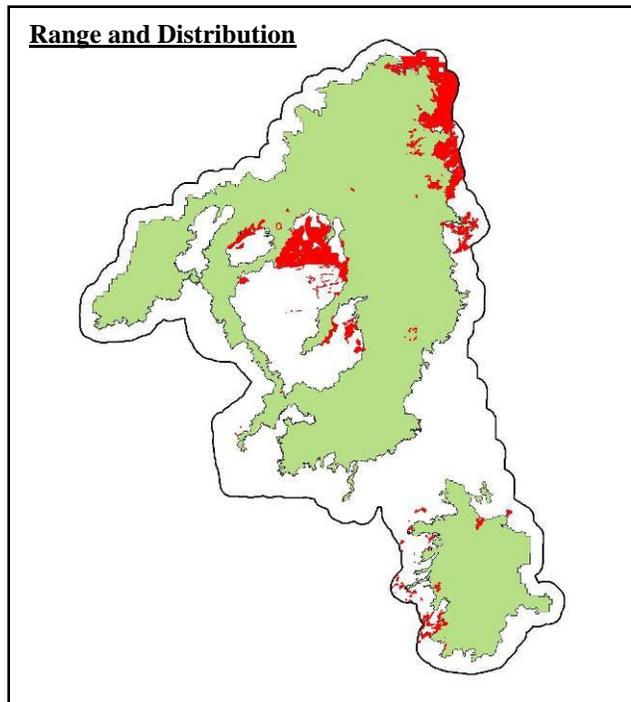


Description

Threetip sagebrush with a native grass understory was a common map unit occurring on upland slopes, benches, and terraces primarily in the northeast corner of the project area and in Laidlaw Park. Map Unit 20 also occurred as sparse pockets on some of the adjacent lava flows. Although cheatgrass was usually present, it did not dominate the understory instead native bunch grasses and dwarf shrubs were common. On the ortho-imagery this type varied in appearance from dispersed small grey dots against a white or tan background (sparse situations) to a more

homogenous grey mottled texture (dense stands). Due to the similarity in color and intermixing with other sagebrush species this type may have been confused with Map Units 14, 16, and 18 during the mapping.

Range and Distribution



Map Unit 21 *Artemisia tripartita* / *Bromus tectorum* Shrubland Complex
 Threetip Sagebrush / Cheatgrass Shrubland Complex

Common Species

Artemisia tripartita ssp. *tripartita*,
Bromus tectorum, *Poa secunda*,
Festuca idahoensis, *Pascopyrum smithii*
Pseudoroegneria spicata, *Leymus cinereus*

NVCS Associations

- Artemisia tripartita* ssp. *tripartita* / *Bromus tectorum* Semi-natural Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Pascopyrum smithii* - *Bromus tectorum* Semi-natural Shrubland
- Artemisia tripartita* ssp. *tripartita* / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland

Description

Threetip sagebrush with a cheatgrass understory was a relatively common map unit occurring on upland slopes, benches, and terraces adjacent to CRMO. This map unit sometimes occurred as a sparse type in lava flows, usually along the edges. Map Unit 21 is characterized by the high cover of cheatgrass in the understory, often excluding all other vegetation except threetip sagebrush. On the ortho-imagery this map unit varied in appearance from dispersed small grey dots against an orange-to-brown background (sparse situations), to grey/brown dots on a black background (lava flows), to a more homogenous grey/brown mottled texture (dense stands). Due to the presence of cheatgrass this map unit exhibited similar characteristics to other species of sagebrush with a cheatgrass understory (Map Units 15, 17, and 19) but the threetip sagebrush shrubs were usually much smaller in stature. Map Unit 21 appeared very similar to Map Unit 20 (the other threetip sagebrush map unit), which may have resulted in some mapping confusion between the two units.

Representative Ground Photo



Range and Distribution

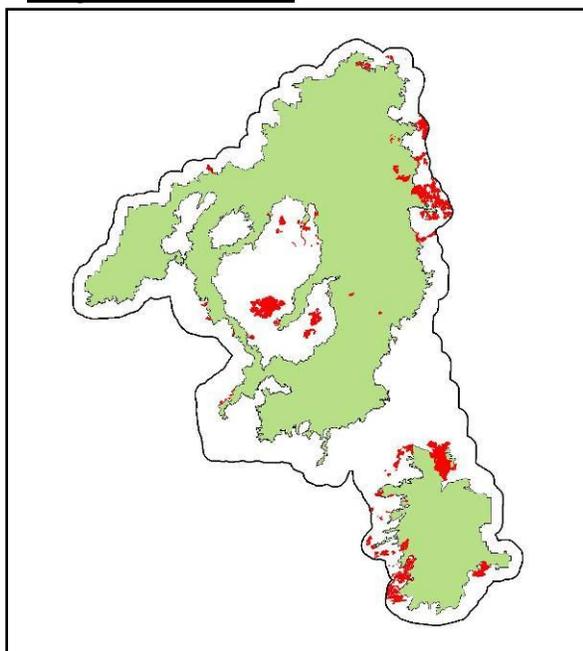
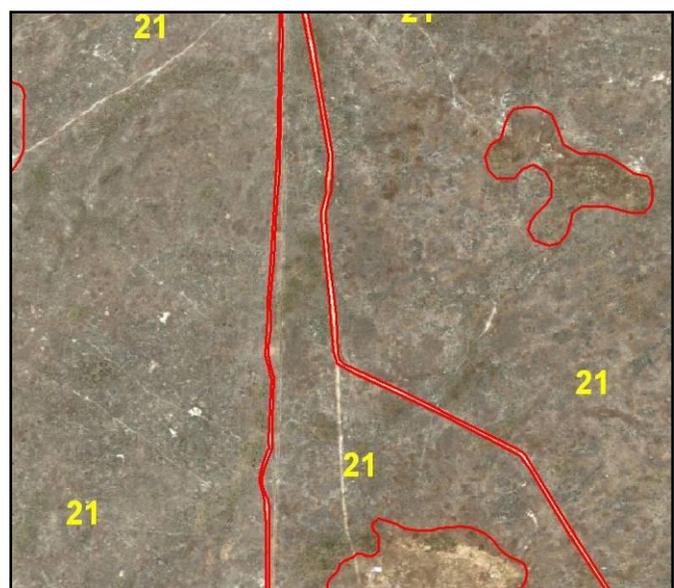


Photo Signature Example



Map Unit 22 *Ericameria (Chrysothamnus) spp. Shrubland Complex*
Rabbitbrush Shrubland Complex

Common Species

Ericameria nauseosa, *Chrysothamnus viscidiflorus*, *Achnatherum hymenoides*, *Bromus tectorum*, *Hesperostipa comata*, *Artemisia tridentata* ssp. *wyomingensis*, *Pseudoroegneria spicata*, *Agropyron cristatum*, *Poa secunda*

NVCS Associations

- Chrysothamnus viscidiflorus* / *Hesperostipa comata* Shrubland
- Chrysothamnus viscidiflorus* / *Pascopyrum smithii* Shrubland
- Chrysothamnus viscidiflorus* / -*Pseudoroegneria spicata* Shrubland
- Ericameria nauseosa* / *Achnatherum hymenoides* Sparse Vegetation
- Chrysothamnus viscidiflorus* / *Agropyron cristatum* Shrubland
- Chrysothamnus viscidiflorus* / *Bromus tectorum* Semi-natural Shrubland
- Chrysothamnus viscidiflorus* / *Poa secunda* - *Bromus tectorum* Semi-natural Shrubland

Representative Ground Photo



Description

Stands of Map Unit 22 were common throughout the project area with rubber rabbitbrush occurring on disturbed, flat uplands and green rabbitbrush occurring on rolling hills and gentle slopes. This map unit often intermixed with the sagebrush map units and often contained similar associated species including cheatgrass (as indicated in the comments field). On the ortho-imagery, Map Unit 22 exhibited a characteristic smooth olive-green signature that varied from a solid green color in dense stands to a light green color with a tan or brown background in sparser sites.

Range and Distribution

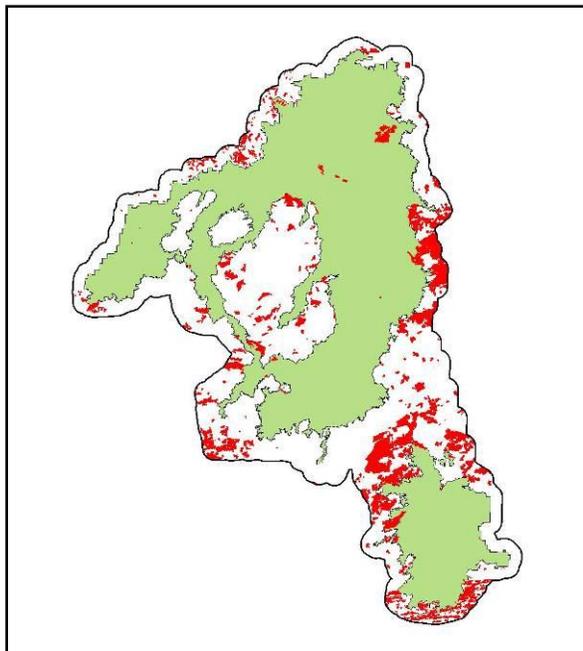
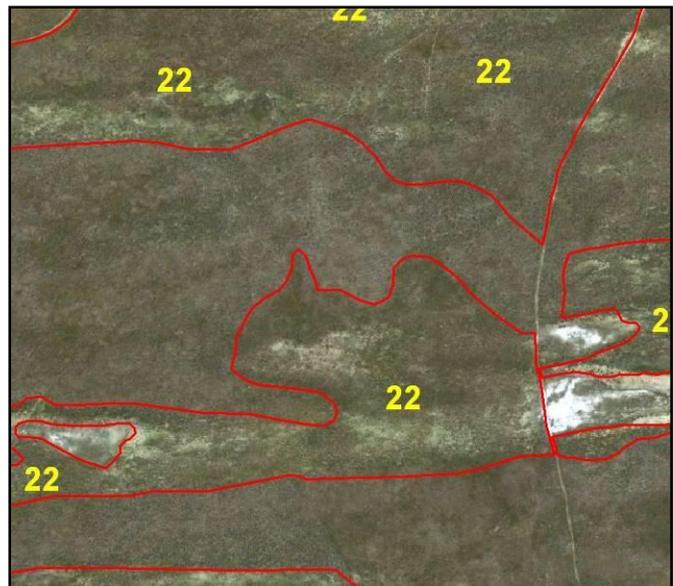


Photo Signature Example



Map Unit *Grayia spinosa* Shrubland Alliance
24 Spiny Hopsage Shrubland Alliance

Common Species

Grayia spinosa,
Bromus tectorum,
Pseudoroegneria spicata

NVCS Alliance

-*Grayia spinosa* Shrubland Alliance

Representative Ground Photo



Description

Map Unit 24 occurred in one stand on the far northeastern portion of CRMO (location is based on the classification plot data). Because spiny hopsage is similar in growth-form to species of sagebrush on the ortho-imagery it is likely that other stands exist and were not mapped. On the ortho-imagery this type exhibited an olive-green mottled signature against a grey background. The shrubs appeared short in stature.

Range and Distribution

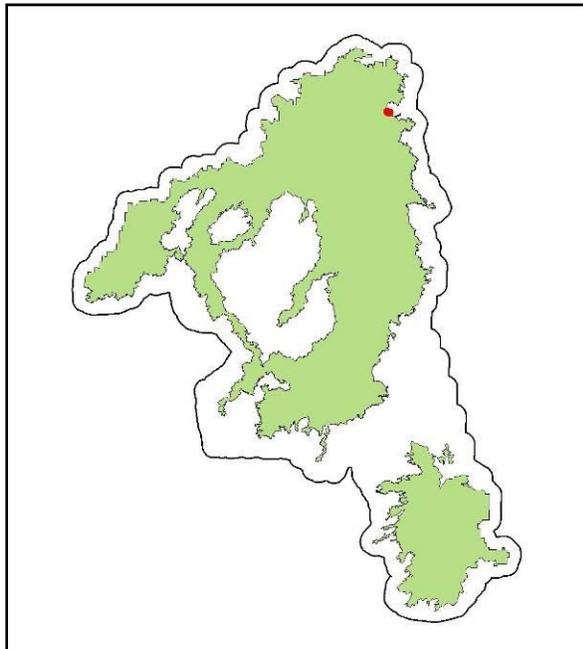


Photo Signature Example



Map Unit 25 ***Betula occidentalis* Intermittently Flooded Shrubland Alliance**
Water Birch Intermittently Flooded Shrubland Alliance

Common Species

Betula occidentalis, *Leymus cinereus*,
Prunus virginiana, *Populus tremuloides*,

NVCS Alliance

-*Betula occidentalis* Intermittently Flooded
Shrubland Alliance

Representative Ground Photos



Description

Four stands of water birch (Map Unit 25) were observed in the mesic drainages and on north-facing slopes in the northern environs of the project area. The four interpreted sites represent the only known locations where water birch shrubs were dominant and not associated with an overstory of quaking aspen. Map Unit 25 was characterized by medium-sized water birch shrubs occurring in thick, dense stands with few associated species. Stands may also have intermingled with speckled alder and chokecherry (Map Units 28 and 26) and some mapping confusion may have occurred between these map units. On the ortho-imagery this map unit appeared as light green, smooth stands in contrast to the coarse, dark green of quaking aspen trees.

Range and Distribution

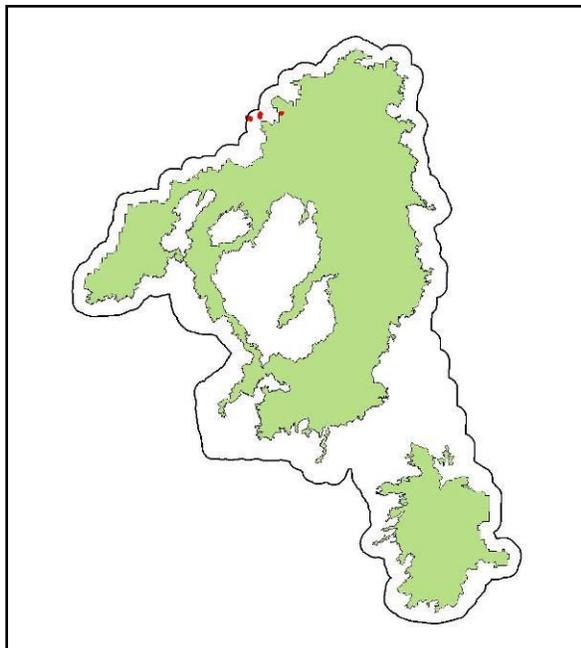
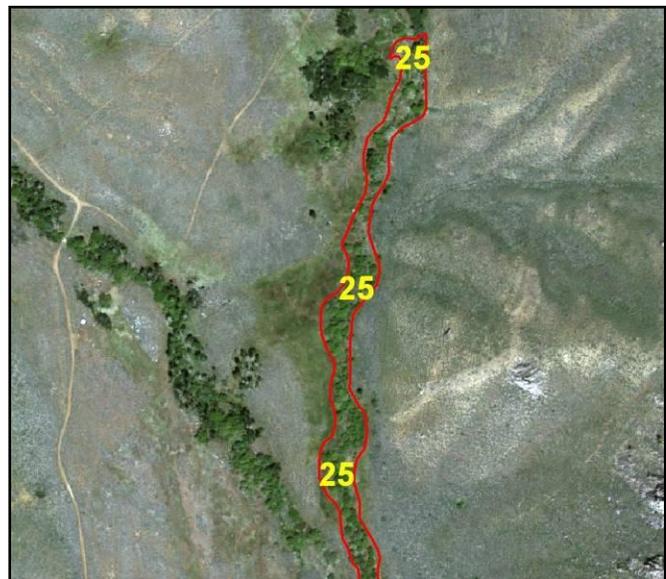


Photo Signature Example



Map Unit 26 *Prunus virginiana* / *Leymus cinereus* Shrubland
Chokecherry / Basin Wildrye Shrubland

Common Species

Prunus virginiana, *Leymus cinereus*,
Ericameria nauseosa, *Purshia tridentata*,
Symphoricarpos oreophilus, *Calamagrostis*
rubescens, *Betula occidentalis*

NVCS Association

-*Prunus virginiana* / *Leymus cinereus*
Shrubland

Representative Ground Photo



Description

Small stands of chokecherry tall shrubs were observed on mesic sites throughout the very northern portions of the project area. Map Unit 26 occurred in drainage bottoms, on shaded slopes, and near seeps and springs. The mesic habitat of this tall shrub often placed it in close proximity or in the understory of the speckled alder and quaking aspen map units (28 and 8, 9, 10) and some mapping confusion between these may have occurred. The chokecherry map unit was characterized by small to medium-sized shrubs occurring in thick, dense stands with few associated species. On the ortho-imagery this map unit appeared as an olive green color with a smooth-texture when small in stature and a coarser olive-green when the shrubs were taller.

Range and Distribution

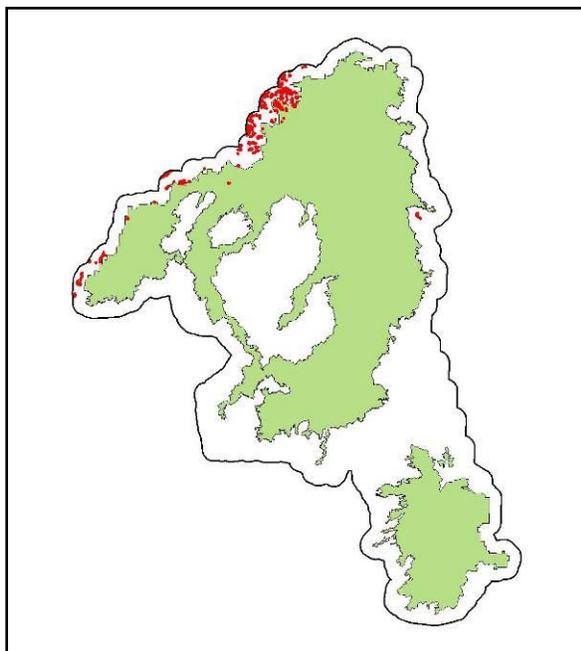
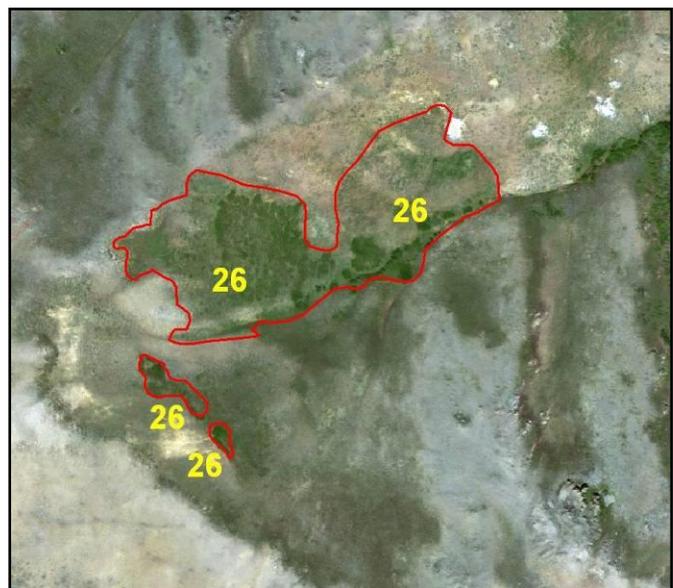


Photo Signature Example



Map Unit *Purshia tridentata* Shrubland Alliance
27 Bitterbrush Shrubland Alliance

Common Species

Purshia tridentata, *Ericameria nauseosa*,
Bromus tectorum, *Leymus cinereus*
Achnatherum hymenoides, *Artemisia*
tridentata ssp. *wyomingensis*,
Pseudoroegneria spicata

NVCS Associations

- Purshia tridentata* / *Achnatherum*
thurberianum Shrubland
- Purshia tridentata* / *Leymus cinereus* Shrub
Herbaceous Vegetation
- Purshia tridentata* / *Pseudoroegneria spicata*
Shrub Herbaceous Vegetation
- Purshia tridentata* / *Bromus tectorum* Semi-
natural Shrubland

Representative Ground Photo



Description

Bitterbrush occurs throughout the project area but only formed dominant stands in the northern half. Bitterbrush shrubs have become established both on newer lava flows (sparse cover) and more established soils (dense cover). When bitterbrush was dominant on lava, Map Unit 27 was used to attribute polygons and when it was part of a mix of shrubs Map Unit 36 was assigned. Adjacent to the lava flows, bitterbrush was often associated with the various sagebrush species and in some cases its close proximity and signature may have led to some mapping confusion. On the ortho-imagery, this map unit was characterized by small to medium-sized shrubs that appeared as light green circles. Where it was dense, the bitterbrush had a mottled to smooth appearance and when it was sparse it had a tan or grey background.

Range and Distribution

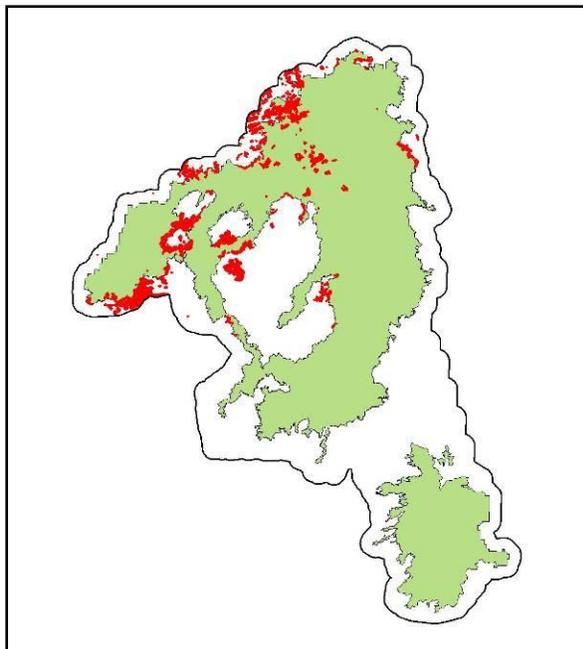
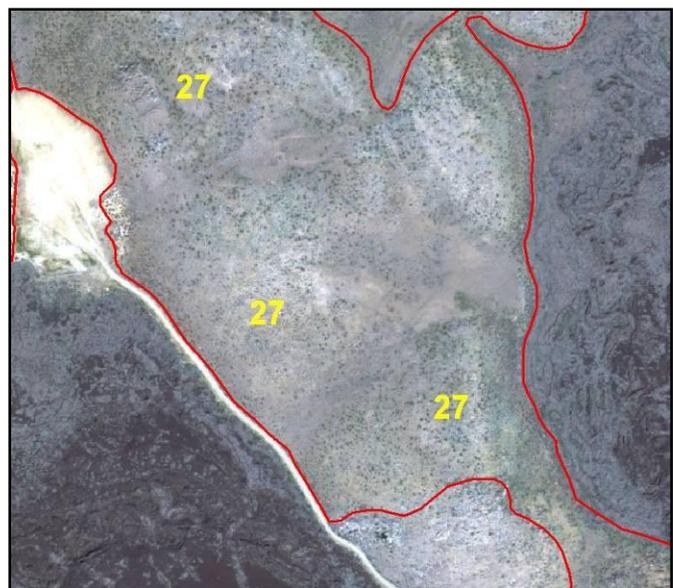


Photo Signature Example



Map Unit *Alnus incana* / Mesic Forbs Shrubland
28 Speckled Alder / Mesic Forbs Shrubland

Common Species

Alnus incana, *Prunus virginiana*,
Leymus cinereus, *Ericameria nauseosa*,
Purshia tridentata, *Populus tremuloides*

NVCS Association

-*Alnus incana* / Mesic Forbs Shrubland

Representative Ground Photos



Description

Small stands of speckled alder (Map Unit 28) occurred in a few riparian and mesic sites in the northern portion of the project area. Speckled alder often intermixed or occurred adjacent to quaking aspen, water birch, and chokecherry map units (8, 9, 10, 25, and 26). This map unit is characterized by small to medium-size shrubs. When small, speckled alder shrubs exhibited a smooth dark green signature changing to a coarser green signature when larger shrubs occurred on the ortho-imagery. Due to the close similarity of signatures and intermixing of common species, this map unit may have been confused with the quaking aspen and/or water birch map units in some locations.

Range and Distribution

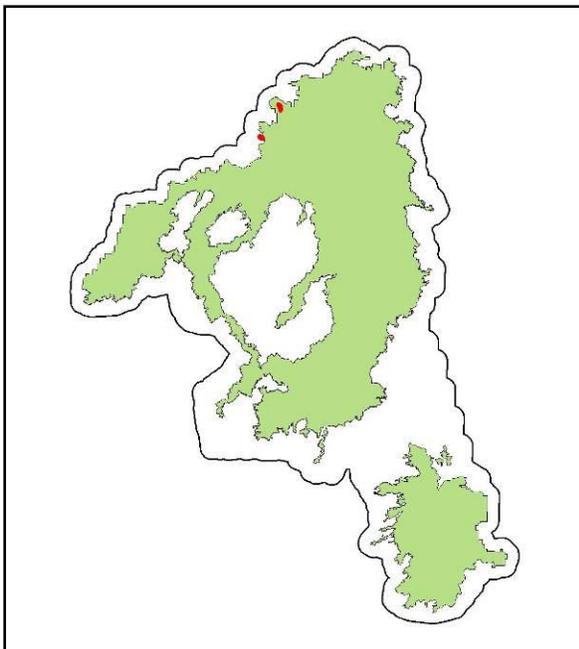


Photo Signature Example



Herbaceous Vegetation

| | |
|------------------------------|--|
| Map Unit
29 | <i>Agropyron cristatum</i> - <i>Bromus tectorum</i> Semi-natural Herbaceous Vegetation
Crested Wheatgrass / Cheatgrass Semi-natural Herbaceous Vegetation |
|------------------------------|--|

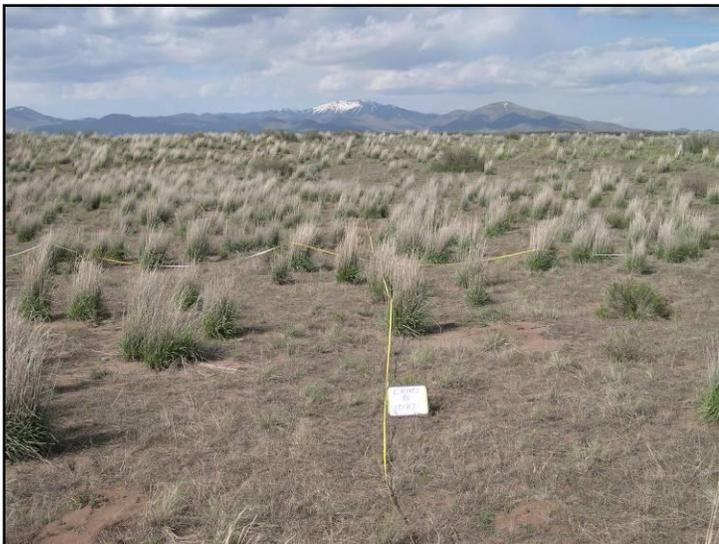
Common Species

Agropyron cristatum,
Bromus tectorum

NVCS Association

-*Agropyron cristatum* - *Bromus tectorum*
Semi-natural Herbaceous Vegetation

Representative Ground Photo



Description

Map Unit 29 represents pasture and previously cultivated lands that were probably seeded at one time with crested wheatgrass, a non-native bunchgrass. Planted stands occurred in the central and southern portions of the study area on large flat fields. On the ortho-imagery, Map Unit 29 usually exhibited dark brown-tan (mocha) color and old agricultural tillage lines were sometimes apparent. Polygons delineating this map unit likely includes areas with high cheatgrass cover and possibly some pockets of native grasses.

Range and Distribution

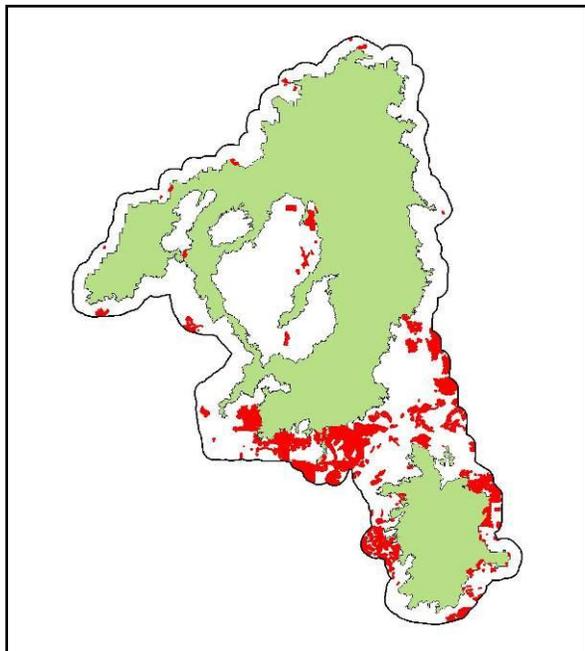


Photo Signature Example



Map Unit 30 *Bromus inermis* Semi-natural Herbaceous Alliance
Smooth Brome Semi-natural Herbaceous Alliance

Common Species

Bromus inermis,
Bromus tectorum

NVCS Association

-*Bromus inermis* Semi-natural Herbaceous Alliance

Representative Ground Photo



Description

Map Unit 30 represents three small areas in the northern section of CRMO known to have very high cover of smooth brome, a non-native rhizomatous grass. These polygons likely represent sites that were once seeded with smooth brome following road building and restoration activities. Other small patches or pockets of smooth brome likely occur in the project area but were either not large or recognizable enough to interpret. On the ortho-imagery this map unit was characterized by a tan or grey signature similar to those of the native grasses. Polygons of smooth brome stands may include small inclusions of other grassland and herbaceous types.

Range and Distribution

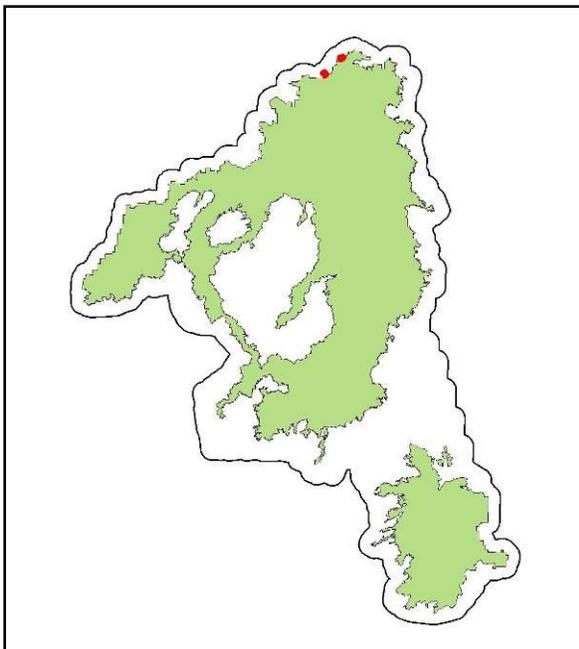
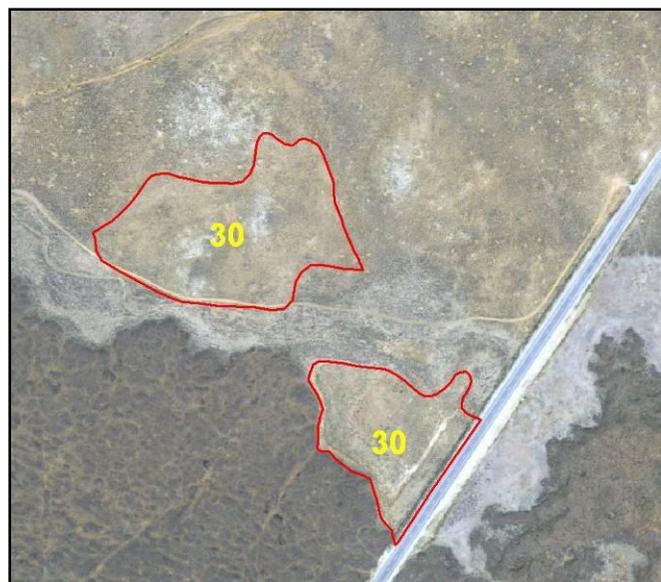


Photo Signature Example



Map Unit 31 Mixed Weedy Herbaceous Vegetation Complex

Common Species

Bromus tectorum, *Sisymbrium altissimum*,
Leymus cinereus, *Elymus lanceolatus*

NVCS Associations

- Achnatherum thurberianum* - *Bromus tectorum* Semi-natural Herbaceous Vegetation
- Bromus tectorum* Semi-natural Herbaceous Vegetation
- Sisymbrium altissimum* / *Bromus tectorum* Semi-natural Herbaceous Vegetation
- Poa secunda* - *Bromus tectorum* Semi-natural Herbaceous Vegetation
- Elymus lanceolatus* / *Lupinus argenteus* Herbaceous Vegetation
- Juncus balticus* Herbaceous Vegetation
- Leymus cinereus* Herbaceous Vegetation

Representative Ground Photo



Description

Map Unit 31 represents a broad grouping of disturbed and mesic herbaceous sites occurring throughout the project area. Originally this map unit was split into three separate units (cheatgrass, mesic meadow, and annual weedy types) later combined as a result of accuracy assessment data analyses. For the most part, the original linework for all three map units was retained and the original map unit name is stored in the comments field. Grouping the three units into a complex is a direct result of the wide distribution and abundance of cheatgrass in and around CRMO. Cheatgrass occurred in nearly monotypic stands across broad plains, intermixed with other non-native grass and forb species in pastures and on moist sites along streams, springs and potholes. On the ortho-imagery stands of cheatgrass with sufficient cover (>20%) exhibited a characteristic smooth, tan-brown color.

Range and Distribution

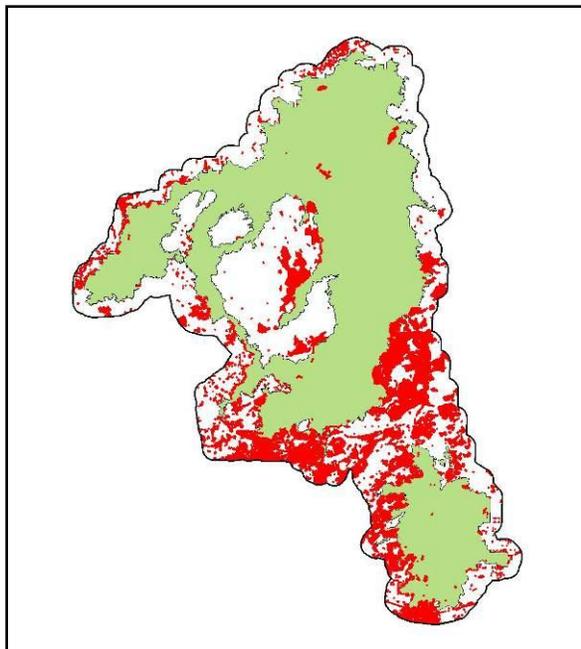
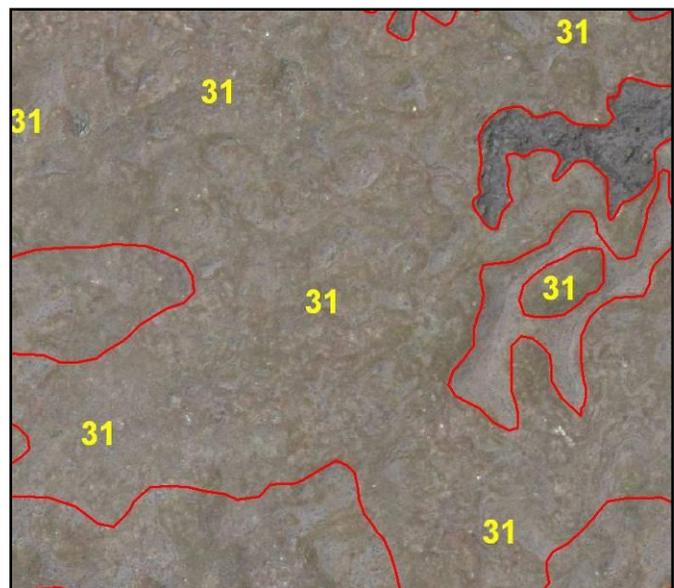


Photo Signature Example



Map Unit Dry Meadow Mixed Herbaceous Vegetation Mosaic
32

Common Species

Pascopyrum smithii, *Achnatherum hymenoides*, *Hesperostipa comata*
Pseudoroegneria spicata

NVCS Association

- Achnatherum nelsonii* / *Lupinus argenteus* Herbaceous Vegetation
- Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation
- Hesperostipa comata* - *Poa secunda* Herbaceous Vegetation
- Pascopyrum smithii* Herbaceous Vegetation
- Poa secunda* Herbaceous Vegetation
- Pseudoroegneria spicata* - *Melica bulbosa* Herbaceous Vegetation
- Pseudoroegneria spicata* - *Poa secunda* / *Balsamorhiza sagittata* Herbaceous Vegetation
- Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation
- Pseudoroegneria spicata* / *Crepis acuminata* Herbaceous Vegetation

Representative Ground Photo



Description

The dry meadow map unit represents grasslands with moderate to high cover of native grasses. Western wheatgrass, Idaho fescue, Sandberg bluegrass, bluebunch wheatgrass, and other native grass species occurred on large flat terraces, kipukas, rolling meadows, and along lava formations. Although non-native cheatgrass and crested wheatgrass were sometimes present they did not form the monotypic stands as occur elsewhere in the mapping area. The density of native grasses varied greatly from sparse communities on sandy soils to denser stands on loams and other established soil types. On the ortho-imagery this map unit appeared as a mottled, smooth signature due to the lack of shrubs and varied in color from grey to light tan to almost white in sandy areas.

Range and Distribution

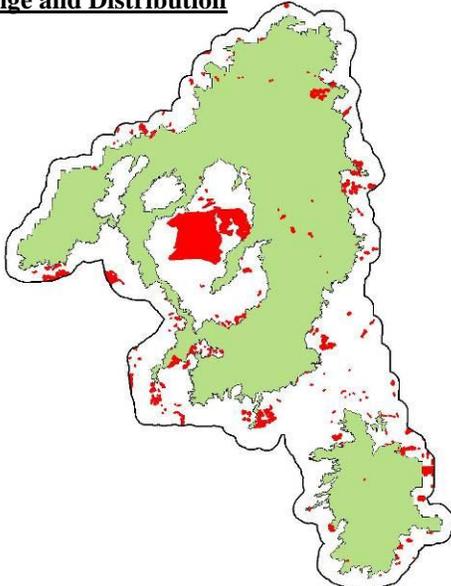
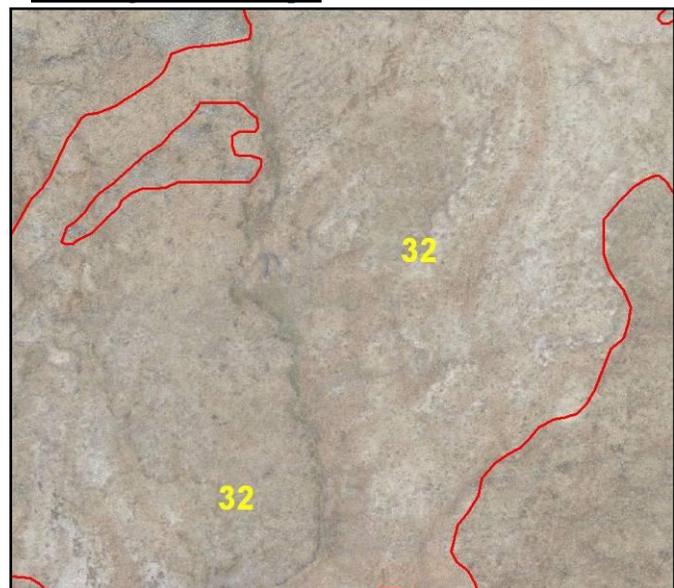


Photo Signature Example



Sparse Vegetation

Map Unit 35 **Pahoehoe Lava Sparsely Vegetated Herbaceous Vegetation Complex**

Common Species

Poa secunda, *Leptodactylon pungens*,
Bromus tectorum

NVCS Associations

-*Poa secunda* / *Leptodactylon pungens* Sparse
Vegetation
-*Poa secunda* - *Bromus tectorum* Semi-natural
Herbaceous Vegetation

Representative Ground Photo



Description

Map Unit 35 represents areas of pahoehoe lava that supported sparse cover of grasses and forbs. Although this unit is probably common throughout CRMO, it rarely occurred in large enough stands or patches to delineate. Also, Map Unit 35 usually occurred in and among stands of shrubs and barren lava further compounding reasonable and accurate delineation. In general this map unit represents areas of pahoehoe lava that had a grey or brown signature and lacked any obvious shrubs or trees. This map unit was likely confused with the other sparse pahoehoe vegetation types (Map Units 36 and 39) and with barren lava flows (Map Unit 40).

Range and Distribution

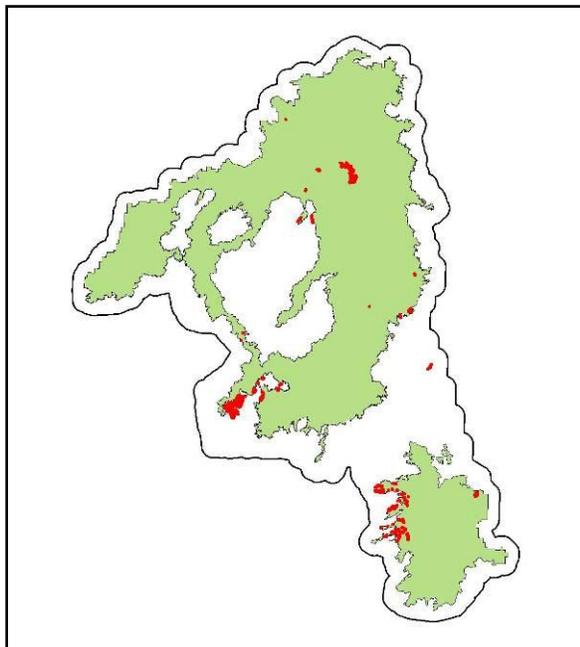
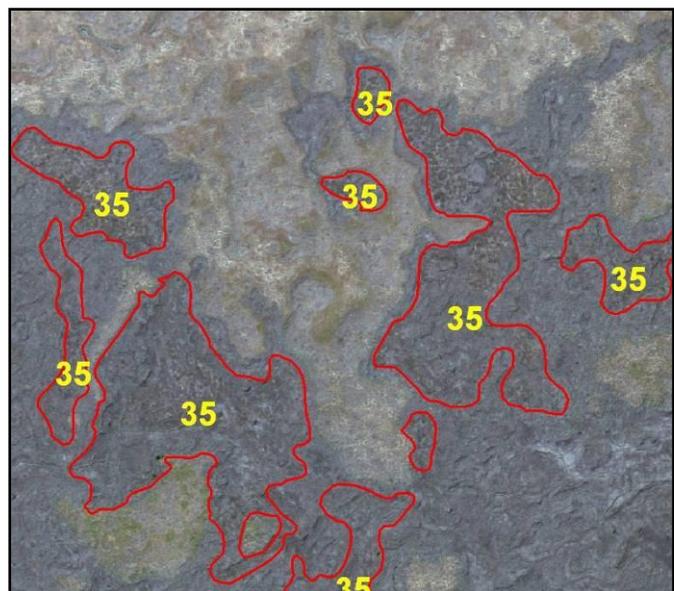


Photo Signature Examples



Map Unit 36 Pahoehoe Lava Sparsely Vegetated Shrubland Complex

Common Species

Chamaebatiaria millefolium, *Penstemon deustus*, *Philadelphus lewisii*, *Holodiscus dumosus*, *Ericameria nana*, *Ericameria nauseosa*, *Purshia tridentata*

NVCS Associations

- Eriogonum ovalifolium* var. *depressum* Dwarf-shrubland Sparse Vegetation
- Chamaebatiaria millefolium* / *Penstemon deustus* Sparse Vegetation
- Philadelphus lewisii* / *Penstemon deustus* Sparse Vegetation
- Ericameria nana* - *Holodiscus dumosus* / *Penstemon deustus* Shrubland
- Ericameria nana* / *Poa secunda* / *Penstemon deustus* Sparse Vegetation
- Purshia tridentata* - *Ericameria nana* / *Penstemon deustus* Shrubland
- Purshia tridentata* - *Philadelphus lewisii* / *Poa secunda* Shrubland

Representative Ground Photo



Description

Map Unit 36 represents pahoehoe lava flows that supported sparse shrub vegetation communities similar to those occurring on aa lava and cinder beds. Due to similar appearance on ortho-imagery and intermixing, individual shrub associations were not reliably separable within this map unit. Map Unit 36 therefore groups all of the sparse shrubs that appeared as small patches in otherwise barren pahoehoe lava flows. On the new ortho-imagery this map unit exhibited a broken dark black/purple signature. Grey specks of vegetation were typically observed in the cracks and valleys. Small areas of barren aa/pahoehoe lava (Map Units 39 and 40) and sparsely vegetated aa lava (Map Unit 38) were likely included in polygons of Map Unit 36.

Range and Distribution

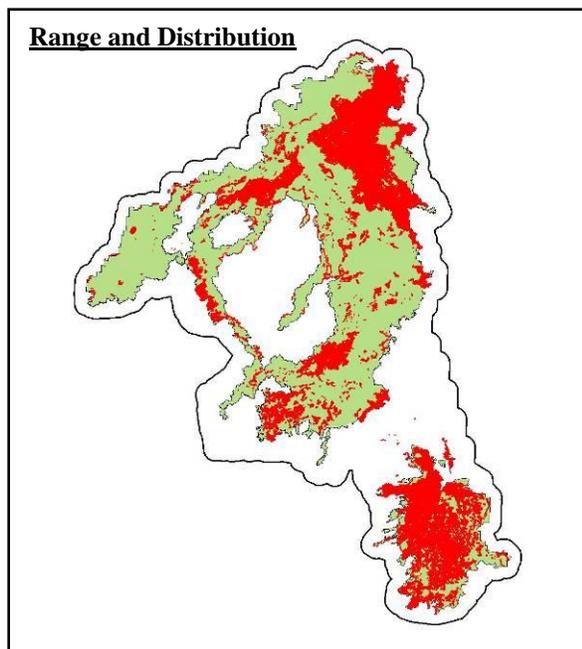
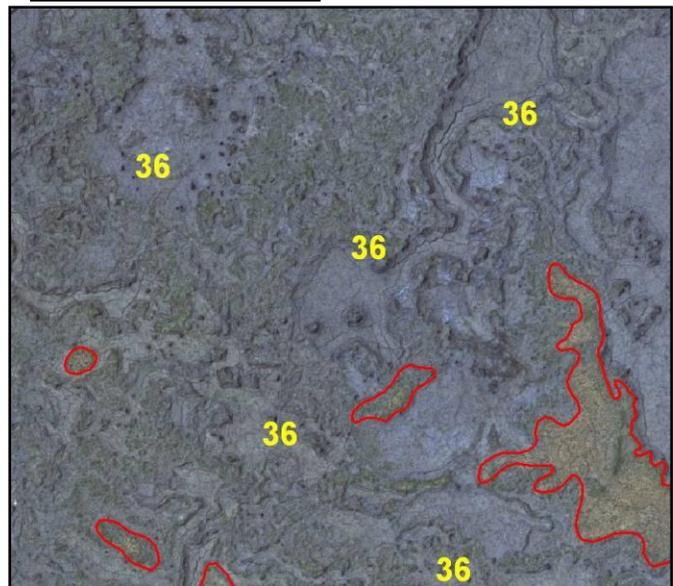


Photo Signature Example



Map Unit 37 **Sparsely Vegetated Cinders**

Common Species

Phacelia hastata, *Eriogonum ovalifolium* var. *depressum*, *Penstemon deustus*

NVCS Association

-*Phacelia hastata* Cinder Garden Sparse Vegetation

Representative Ground Photo



Description

Map Unit 37 represents cinder beds that supported a very sparse vegetation layer. In some cases the vegetation was apparent on the ortho-imagery as grey and white specks and in some cases this type was mapped based on a where known basis. Due to similar color and signature patterns, some barren cinder beds (Map Unit 41) may have been included in this type (Map Unit 37). On the ortho-imagery this map unit varied in color from dark black to brown-orange.

Range and Distribution

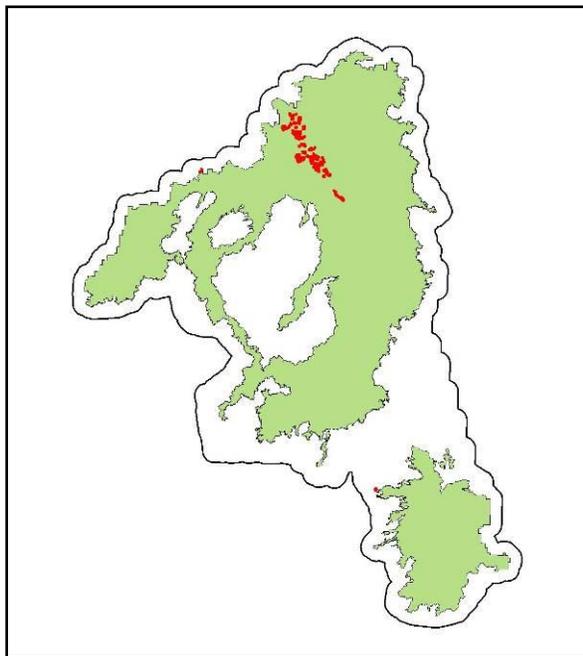
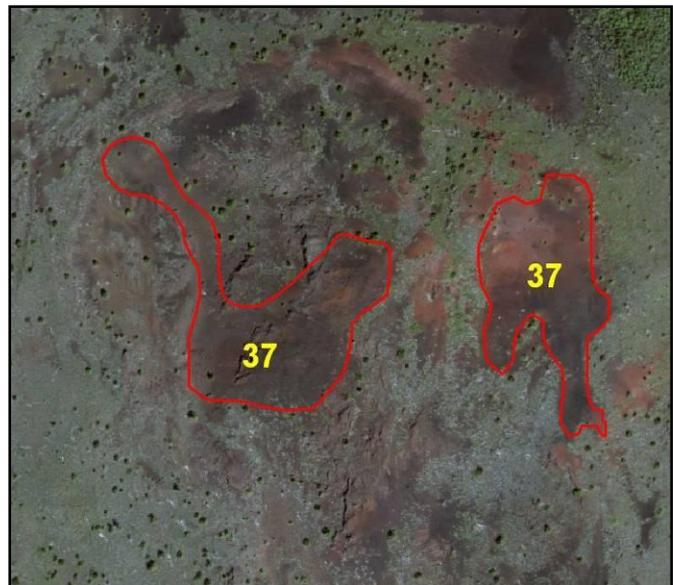


Photo Signature Example



Map Unit 38 Aa Lava Sparsely Vegetated Shrubland Complex

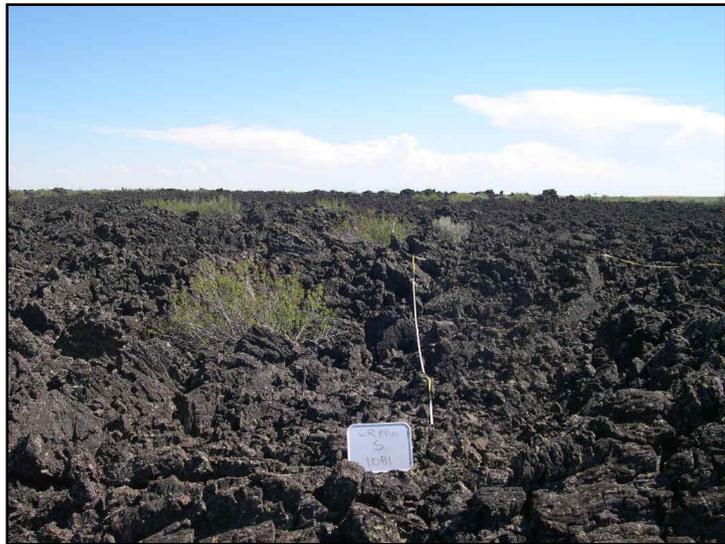
Common Species

Chamaebatiaria millefolium, *Penstemon deustus*, *Philadelphus lewisii*, *Holodiscus dumosus*, *Ericameria nana*, *Ericameria nauseosa*, *Achnatherum hymenoides*, *Purshia tridentata*

NVCS Associations

- Eriogonum ovalifolium* var. *depressum* Dwarf-shrubland Sparse Vegetation
- Chamaebatiaria millefolium* / *Penstemon deustus* Sparse Vegetation
- Philadelphus lewisii* / *Penstemon deustus* Sparse Vegetation
- Ericameria nana* - *Holodiscus dumosus* / *Penstemon deustus* Shrubland
- Ericameria nana* / *Poa secunda* / *Penstemon deustus* Sparse Vegetation
- Purshia tridentata* - *Ericameria nana* / *Penstemon deustus* Shrubland
- Purshia tridentata* - *Philadelphus lewisii* / *Poa secunda* Shrubland

Photo Signature Example



Description

Map Unit 38 represents areas of aa lava that supported sparse vegetation similar to the species established on pahoehoe lava. In fact, other than the obvious substrate difference, the associations within Map Unit 38 were identical to those occurring in Map Unit 36. Due to their similar appearance on ortho-imagery and intermixing, individual plant associations were not able to be separated. Instead, Map Unit 38 was used to group all of the sparse vegetation that appeared as small patches within otherwise barren aa lava flows. On the new ortho-imagery this type exhibited a coarse dark black matrix with small grey and white spots. Small areas (below the minimum mapping unit) of barren aa/pahoehoe lava and sparsely vegetated pahoehoe lava were likely included in polygons of this type.

Range and Distribution

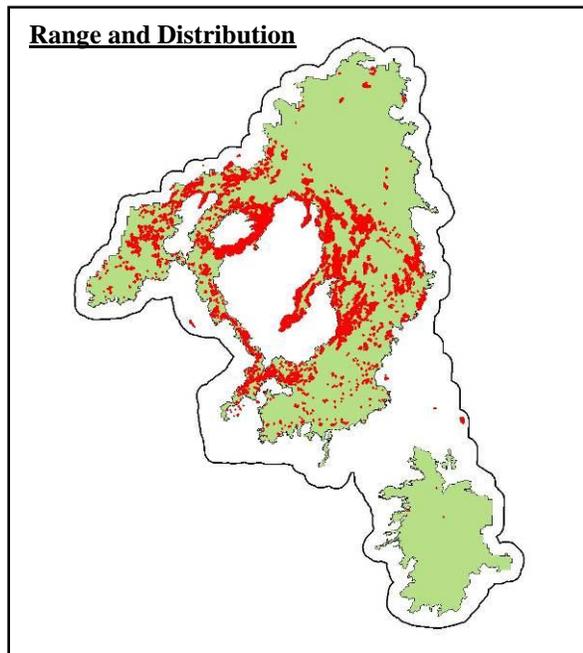
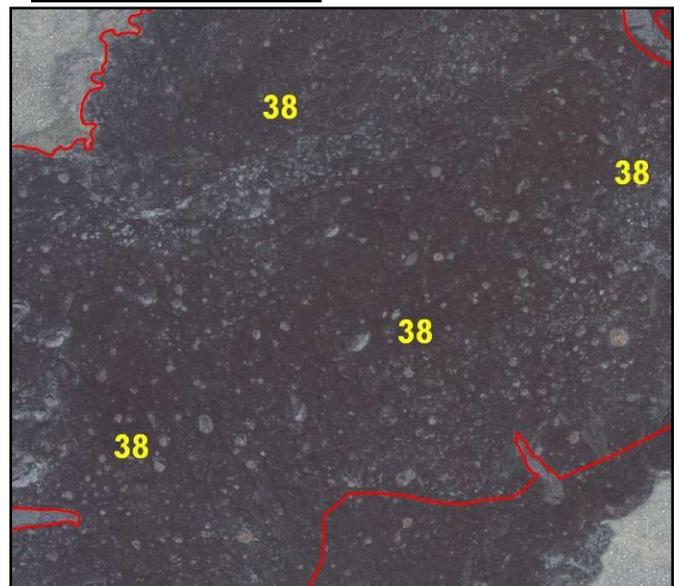


Photo Signature Example



Barren

Map Unit **Pahoehoe Lava (Barren)**
39

Common Species

(Geology type, no vegetation)

NVCS Association

No Vegetation

Photo Signature Example



Description

Map Unit 39 represents non-vegetated pahoehoe lava flows within, and adjacent to CRMO. This type differed from the sparsely vegetated pahoehoe lava types (Map Units 35 and 36) due to the lack of vegetation cover (< 1% on average). This type also included barren areas that had too fine a mix of aa, pahoehoe lava, and cinders to reliably delineate. Areas with very sparse or extremely patchy vegetation were likely inadvertently included in some Map Unit 39 polygons. On the new ortho-imagery this type appeared as a smooth, dark black signature with white and grey streaks.

Range and Distribution

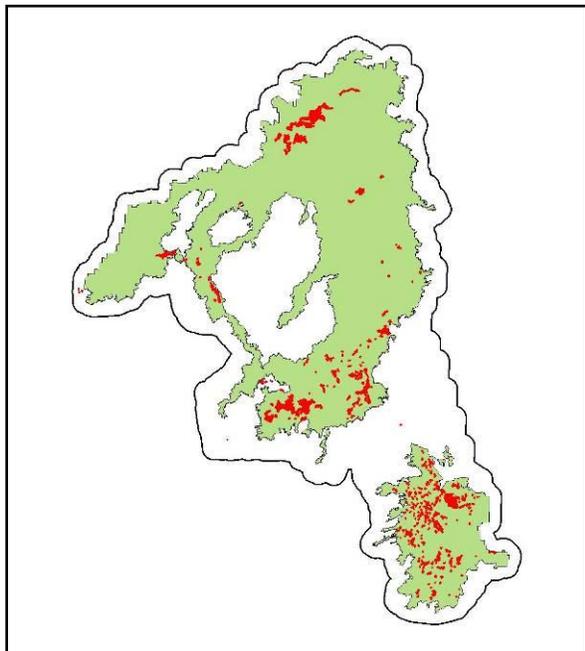
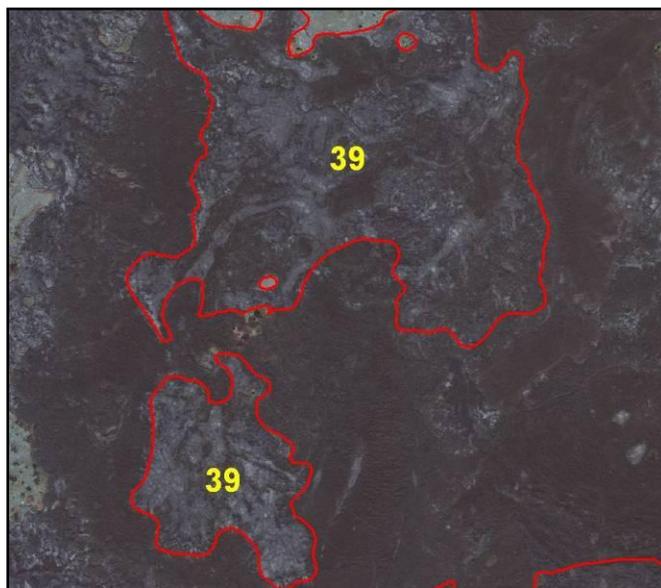


Photo Signature Example



Map Unit 40 Aa Lava (Barren)

Common Species

(Geology type, no vegetation)

NVCS Association

No Vegetation

Photo Signature Example



Description

Map Unit 40 represents non-vegetated aa lava flows within, and adjacent to CRMO. This type differed from the sparsely vegetated aa lava (Map Unit 38) due to the lack of vegetation cover (< 1% on average) and some areas with very sparse vegetation may have been inadvertently included in some of the Map Unit 38 polygons. On the new ortho-imagery this type appeared dark black and looked similar to the signature for barren cinders. Small areas (below the minimum mapping unit) of barren and sparsely vegetated pahoehoe lava occurred and were likely included in polygons of non-vegetated aa lava.

Range and Distribution

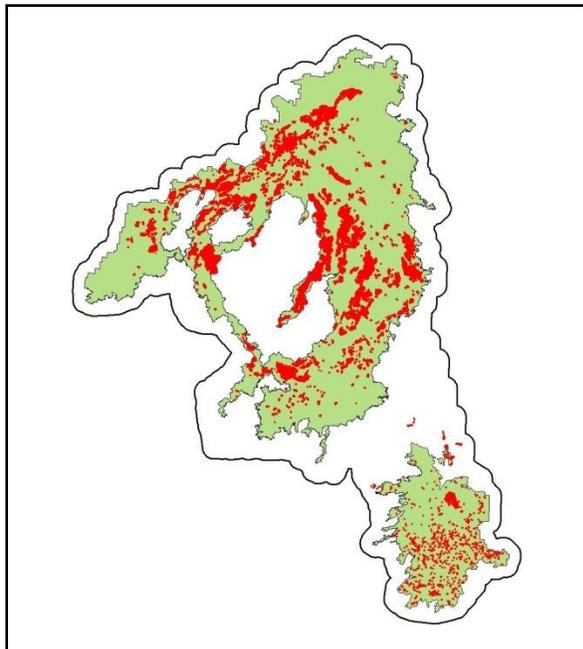
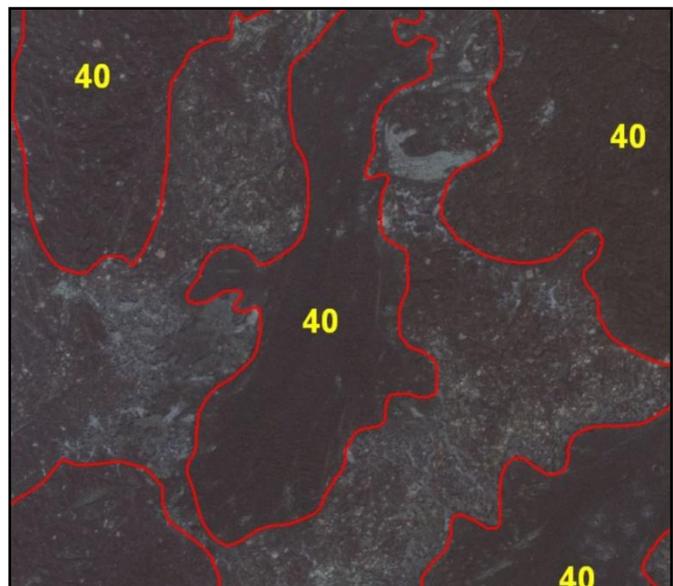


Photo Signature Example



Map Unit Cinder Fields (Barren)
41

Common Species

(Geology type, no vegetation)

NVCS Association

No Vegetation

Photo Signature Example



Description

Map Unit 41 represents non-vegetated cinder beds that supported less than 1% vegetation cover (on average). Polygons of this type occur among the northern lava flows close to the visitor center. Due to a similar color and signature some small, barren cinder beds may have been confused with the barren aa lava type or mapped with the aa or cinders sparse vegetation types (Map Units 37 and 38). On the ortho-imagery some of the cinder beds had a very smooth, dark black signature and others had more of a brownish tint.

Range and Distribution

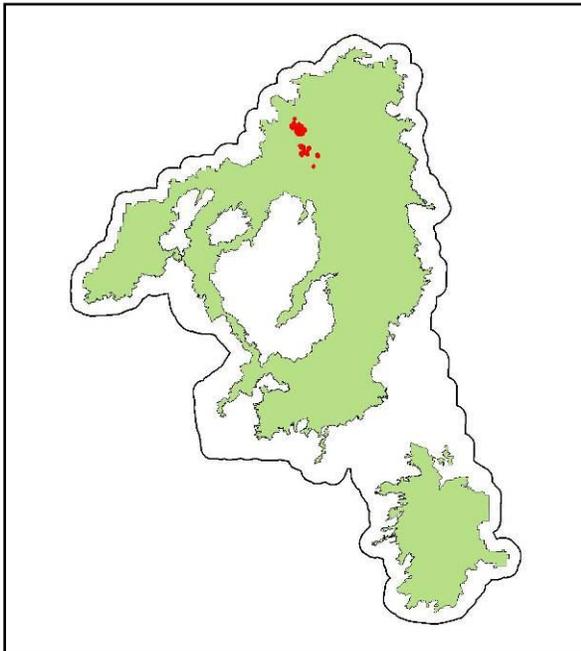
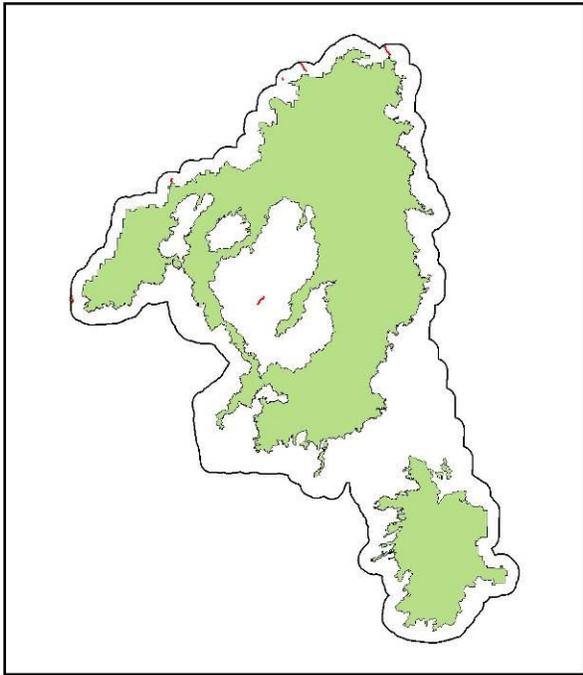


Photo Signature Example

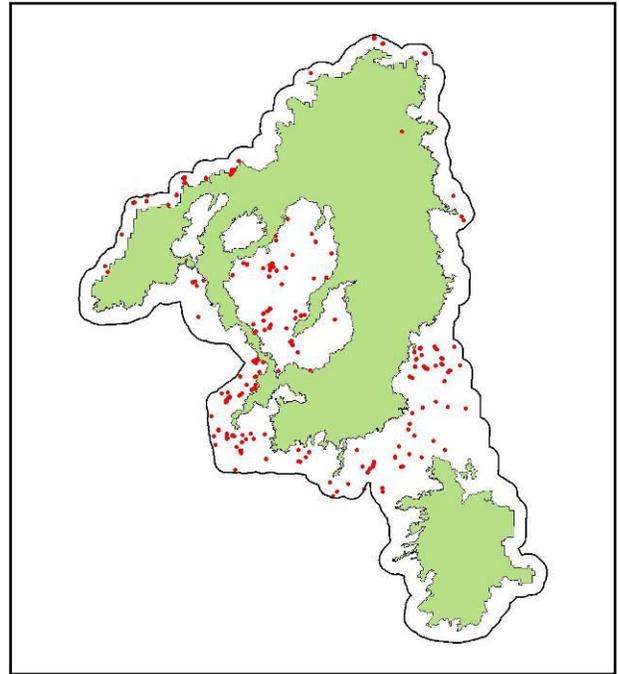


LAND COVER – LAND USE

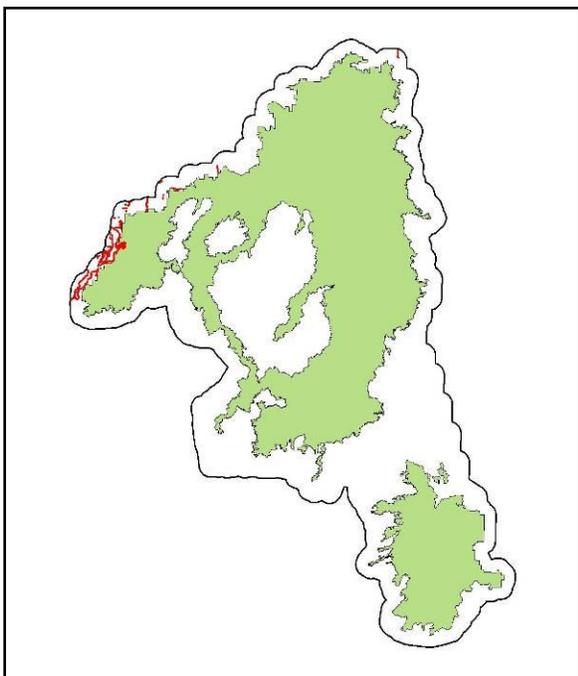
MAP CODE **Stream / River**
42



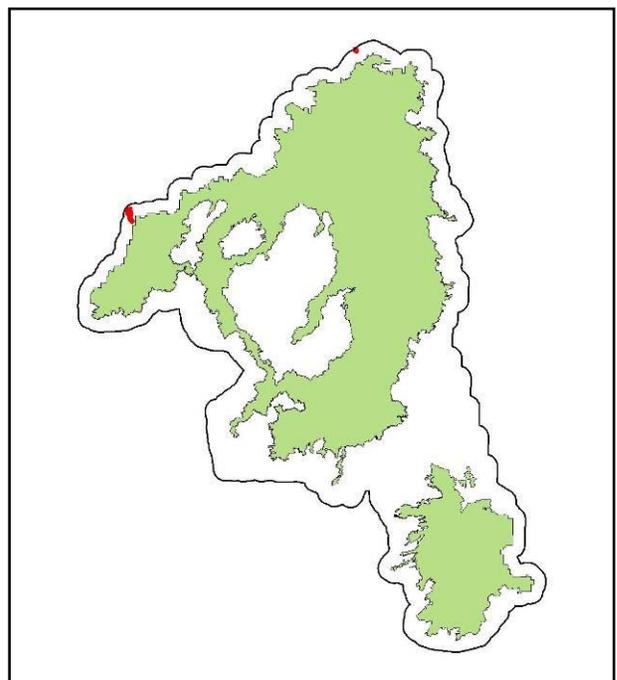
MAP CODE **Lake / Pond**
44



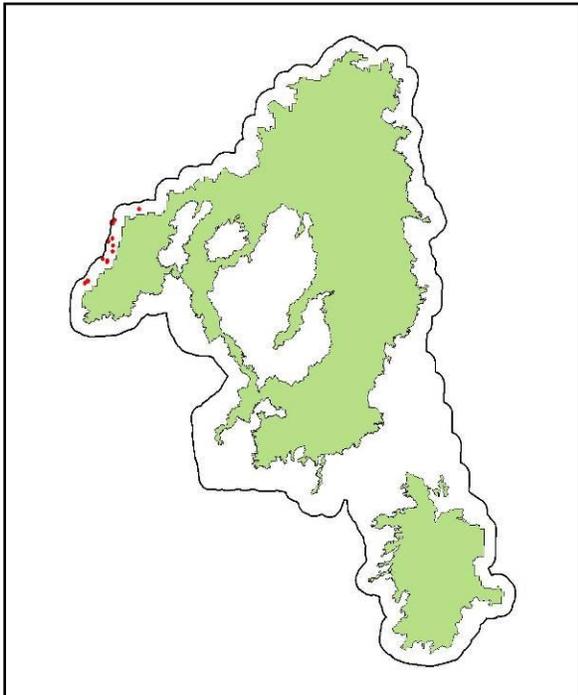
MAP CODE **Canal / Ditch**
43



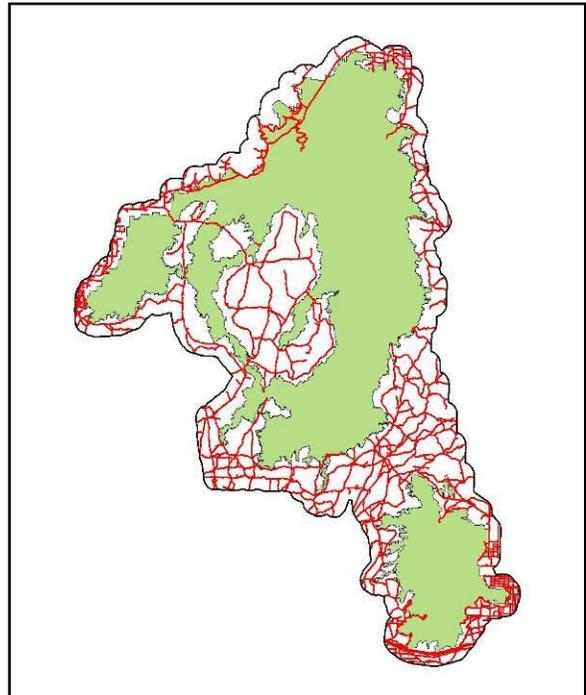
MAP CODE **Reservoir**
45



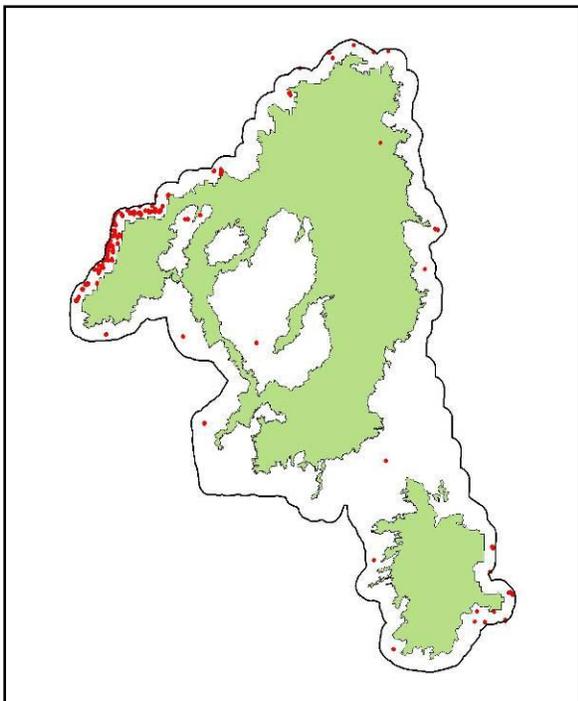
MAP CODE
46 **Residential**



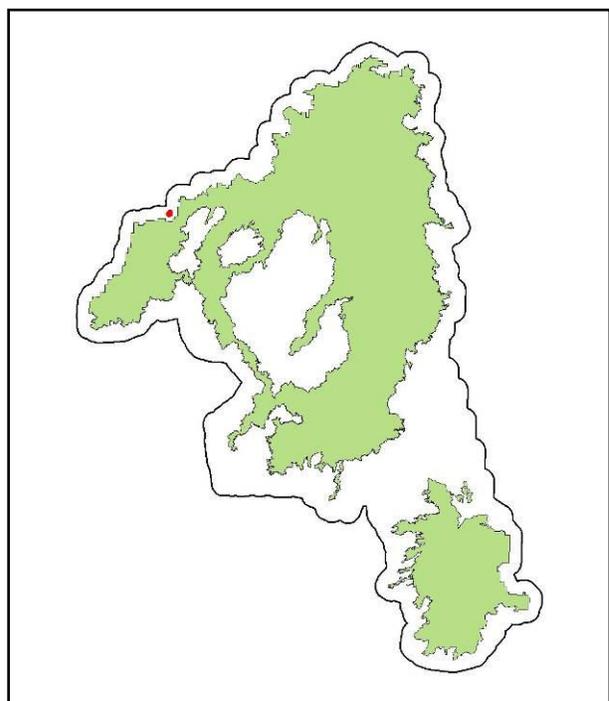
MAP CODE
48 **Transportation**



MAP CODE
47 **Agricultural**
Business

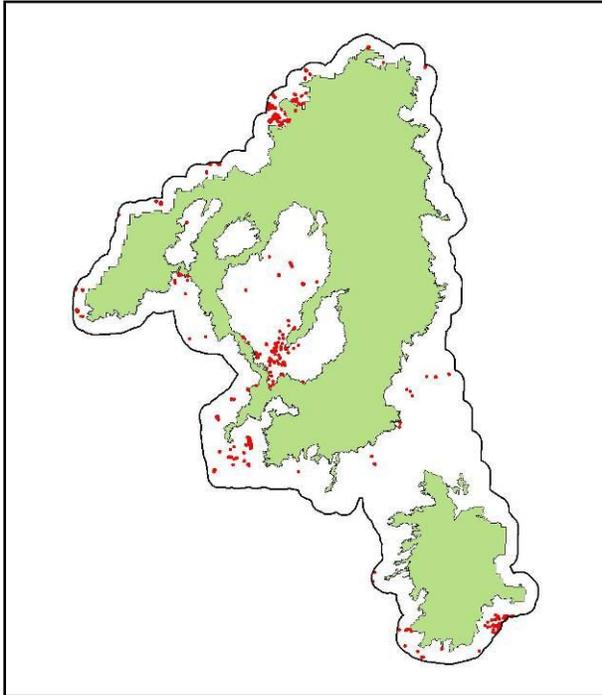


MAP CODE
49 **Quarries / Strip**
Mines / Gravel Pits



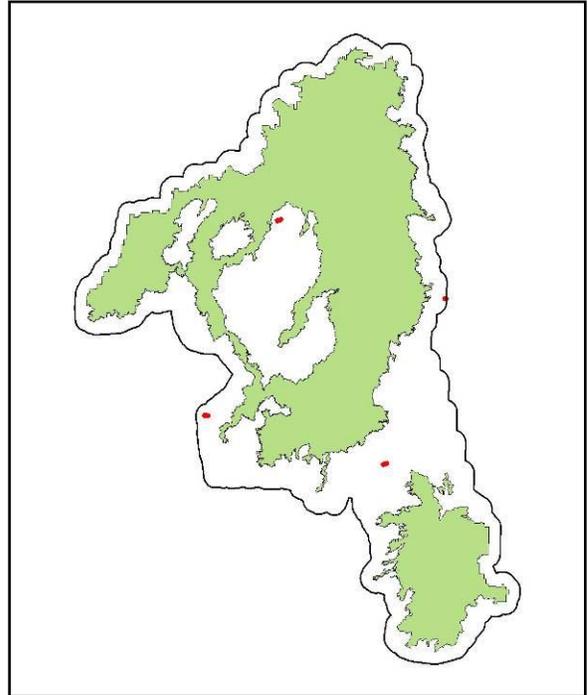
MAP CODE
50

Bare Rock /
Sand



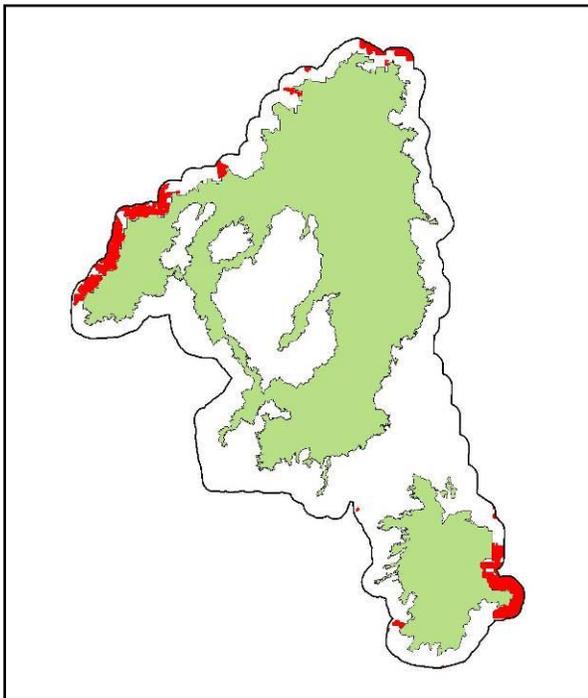
MAP CODE
52

Airstrip



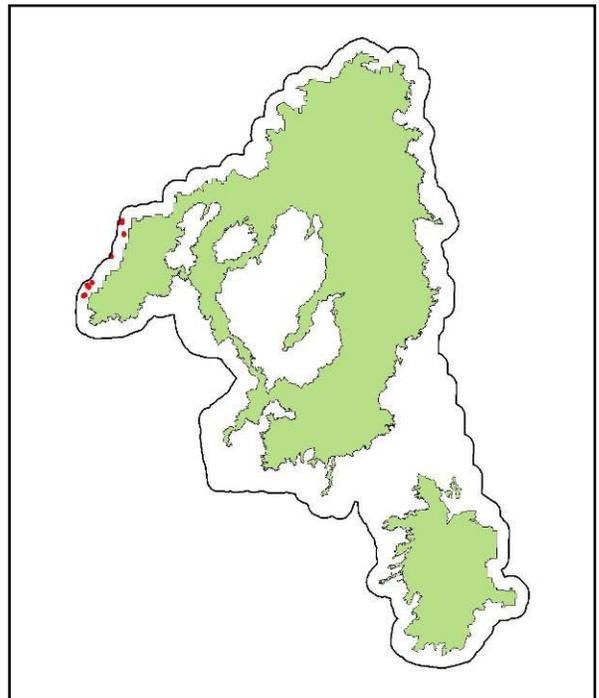
MAP CODE
51

Planted / Cultivated



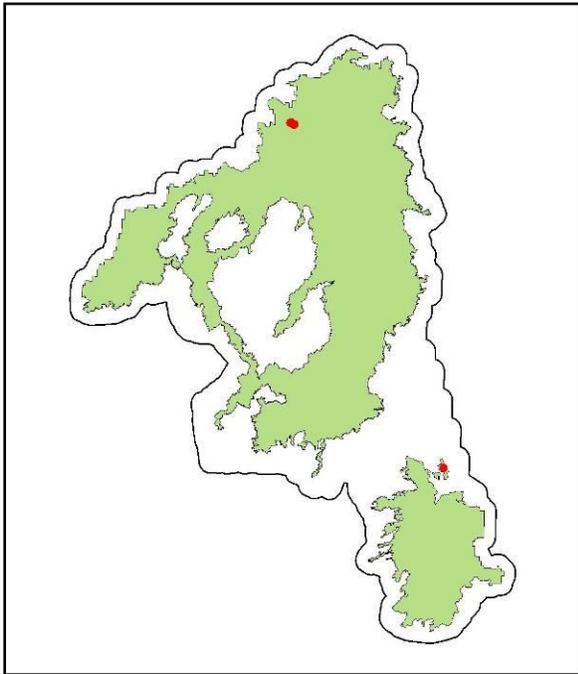
MAP CODE
53

Orchards, Groves,
Vineyards, Nurseries
and Horticultural
Areas



MAP CODE
54

NPS Facilities



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 131/100755, December 2009

National Park Service
U.S. Department of the Interior



Natural Resource Program Center
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA™