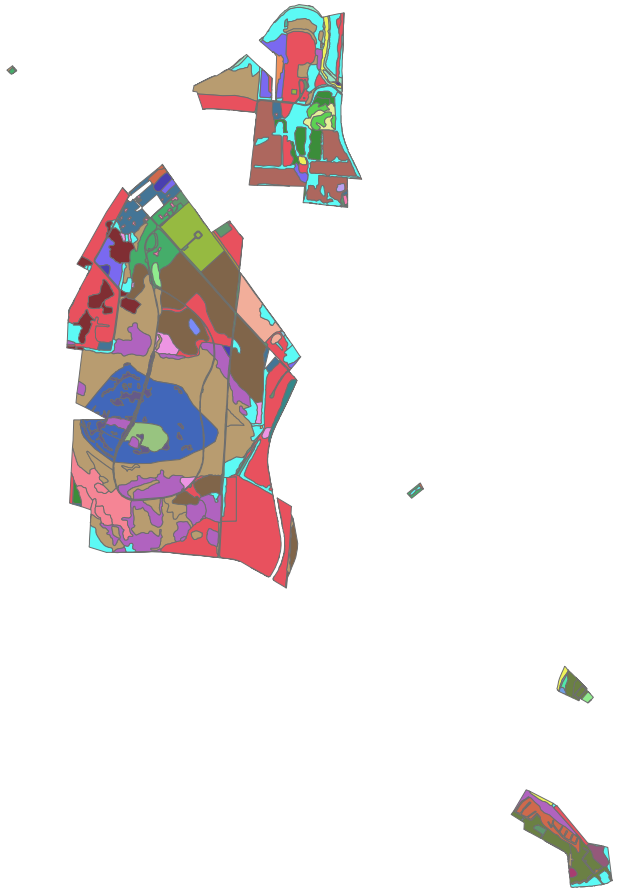
Accuracy Assessment:
Stones River National Battlefield



Prepared for the National Park Service by NatureServe
Durham, NC
December 2008

NatureServe is a non-profit organization providing the scientific knowledge that forms the basis for effective conservation action.

A NatureServe Technical Report
Prepared for the National Park Service under Cooperative Agreement H 5028 01 0435

Citation: Summer, H. and C. Nordman. 2008. *Accuracy Assessment: Stones River National Battlefield*. NatureServe: Durham, North Carolina.

© 2008 NatureServe

NatureServe
6114 Fayetteville Road, Suite 109
Durham, NC 27713
919-484-7857

International Headquarters
1101 Wilson Boulevard, 15th Floor
Arlington, VA 22209
www.natureserve.org

National Park Service
Southeast Regional Office
Atlanta Federal Center
1924 Building
100 Alabama St., S.W.
Atlanta, GA 30303
404-562-3163

The view and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions of policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government.

Electronic files have been provided to the National Park Service in addition to hard copies. Current information on all vegetation communities mentioned in this report can be found on NatureServe Explorer at www.natureserve.org/explorer.

Acknowledgements

This report was prepared in cooperation with the Cumberland Piedmont Inventory and Monitoring Network, National Park Service, Department of the Interior. Network coordinator Teresa Leibfreid quickly responded and provided support whenever issues arose that needed to be addressed, as well as assisted with field data collection. Terri Hogan, ecologist for Stones River National Battlefield, also assisted with field data collection.

Marguerite Madden, Director of the Center for Remote Sensing and Mapping Science (CRMS) at the University of Georgia (UGA), Tommy Jordan, the Associate Director of CRMS, and Phyllis Jackson, a photointerpreter/ecologist at CRMS, were actively involved in the creation of the vegetation map. We're grateful for their help in providing data and answering the questions that arose in the process of conducting the accuracy assessment.

Several other NatureServe Southeast staff assisted with various aspects of this accuracy assessment. We thank Regan Lyons Smyth, Milo Pyne, and Mary Russo for their assistance with assessment point selection, field data collection, data entry, and data analysis.

Table of Contents

Acknowledgements iii
Executive Summary 2
Introduction 4
Methods 4
Results 7
Discussion 8
References 11
Appendix A: Revised Vegetation Classification Key 12
Appendix B: Contingency Matrices and Accuracy Tables 19
Table 2a: Contingency Matrix Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match), plus Combined Map Classes (7808/7699 and 4044/4048/NRU) 20
Table 2b: Accuracy Calculations Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match), plus Combined Map Classes (7808/7699 and 4044/4048/NRU) 21
Table 3a: Contingency Matrix Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match) 22
Table 3b: Accuracy Calculations Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match) 23
Table 4a: Contengency Matrix Using Mapped Dominant Vegetation Only 24
Table 4b: Accuracy Calculations Using Mapped Dominant Vegetation Only 25

Executive Summary

This report presents an accuracy assessment of the digital vegetation map of Stones River National Battlefield (STRI). Vegetation at STRI was mapped by The University of Georgia Center for Remote Sensing and Mapping Science (Jordan and Madden 2008) with ecological consultation assistance from NatureServe. The mapping was conducted as part of the National Park Service Vegetation Mapping Program.

The map accuracy was assessed by comparing the mapped vegetation type to the field verified vegetation type at randomized evaluation points. The evaluation points were chosen prior to field work so as to represent the full range of map classes in the park in a statistically valid manner. Accuracy was calculated for each individual map class, as well as for all map classes combined.

It is very important to understand that the accuracy assessment process is not meant to exclusively judge the performance of the mapper or the ecologists on the project since error can be caused at any point in the process, from remote sensing to ecological classification to the accuracy assessment exercise itself. In addition, even the best mappers cannot tell the difference between certain species of oaks or pines from a remotely sensed image. Sources of error for the mapping project include not just "remote sensing error" but also "ecologist error" caused by poor interpretation of the vegetation community concept, "field worker error" caused by mistakes made by fieldworkers while collecting the data (including misreading of the key), and temporal error when conditions on the ground change between the mapping and assessment processes. It is not possible to tease apart which of these errors is causing accuracy issues without more research. *The accuracy assessment, therefore, should be used more as a tool to discern usability of map classes rather than a way to judge the performance of the mapmakers.*

In an attempt to provide the most useful information possible to NPS, the University of Georgia (UGA) Team has made a strong effort to pull out the highest level of detail possible when mapping vegetation of parks. As a consequence, assessment of the finished project requires a two step approach: assessing the overall accuracy of the finest scale map produced and then combining the most "confused" map classes and determining the accuracy of the coarser scale but higher accuracy map. In this way, we are able to report our best approximation of how accurate each individual map class is but also suggest a way to combine certain map classes to produce a more reliable map at a coarser scale.

Making the accuracy assessment interpretation at STRI more complex is the fact that land management actions between the time of the original mapping project and the accuracy assessment affected a large portion of the parkland. During the period between mapping and the accuracy assessment, many restoration activities have taken place in the park (including mowing, herbicide application, and the planting of many native grasses in areas formerly dominated by fescue). These restoration activities have caused the maps of old fields/cultivated meadows (CEGL004048), Successional Broom-sedge Vegetation (CEGL004044), and other upland native plant restoration sites (NRU) to become less accurate. All of these vegetation associations have essentially been turned into various mixes of native and non-native herbaceous species. As a consequence, these types were all merged to create a map class that is more representative of current conditions on the ground.

For STRI, the overall accuracy of the final map, which includes several grouped map classes, is 83%, with a kappa statistic of 0.79 (79%). This version of the map is the most appropriate for use by the standard user; what it misses in fine-scale detail, it makes up for in the relatively high level of accuracy of map classes. Vegetation associations displayed as grouped map classes on the coarse-scale map include:

a. Cultivated meadows (CEGL004048), Successional Broom-sedge Vegetation (CEGL004044), and other upland native plant restoration sites (NRU)
b. Interior Low Plateau Chinquapin Oak - Mixed Oak Forest (CEGL007699) and Interior Plateau Chinquapin Oak - Shumard Oak Forest (CEGL007808)

The accuracy assessment for this version of the map considered points as a match if the vegetation observed on the ground matched any of the dominant, secondary, or tertiary vegetation types attributed to the map by the mapmaking team.

The strictest analysis of the data (before any combining of map classes or NVC associations occurred and considering a point a match only if the vegetation observed on the ground matched the dominant vegetation type attributed by the mappers) showed an overall accuracy of the map of 52% with a kappa statistic of 0.44 (44%). This lower accuracy reflects the difficulty in differentiating the vegetation associations that were combined in the final analysis and that are similar in their composition on the ground and/or in their appearance on aerial photography.

<u>Key findings:</u>

For users interested in preserving the full detail of the map for the purpose of highly detailed studies or management of the landscape, we recommend use of the fine-scale map as published by UGA. For all other users, we recommend combining map classes as specified above to allow for an overall map accuracy above 80%. These actions will allow for a map that is useful for the widest audience possible while not losing potentially important fine scale detail.

Introduction

In an effort to catalog and map the biodiversity of the United States, in 1994 the National Park Service (NPS) and the U.S. Geological Survey (USGS) embarked on a collaborative Vegetative Mapping project with the goal of mapping 230+ national park units (ESRI et al. 1994). As part of this national mapping initiative, a digital vegetation map of Stones River National Battlefield (STRI) was created in 2004 by the University of Georgia Center for Remote Sensing and Mapping Science (Jordan and Madden 2008), in consultation with NatureServe. The mapping effort included collection of field data, aerial photograph interpretation, and polygon attribution to GIS maps.

Stones River National Battlefield is located on the outskirts of Murfreesboro in Rutherford County, Tennessee. The park's approximately 265 hectares (654 acres) all lie within the watershed of the West Fork Stones River, which is a tributary of the Stones River, which drains into Percy Priest Reservoir and the Cumberland River. The vegetation at Stones River consists of hardwood forests, limestone cedar glades, fields, and riparian areas, and occurs on a diversity of soils derived from Ordovician limestone. This limestone frequently occurs at the surface as outcrops. Vegetation at Stones River was mapped and classified to the association level using the United States National Vegetation Classification (Grossman et al. 1998), following NPS guidelines. The minimum mapping unit (MMU) was 0.5 hectare.

The accuracy assessment assigns a measure of validity to the map product and allows users to understand the reliability with which the mapped vegetation classes capture conditions on the ground. Knowing the accuracy of the map will enable potential users to determine the suitability of the map for any particular application (ESRI et al. 1994). This report describes the methods used in the accuracy assessment and the results for each map class.

Methods

The thematic accuracy of the map was assessed by comparing the vegetation type shown on the map to the vegetation type identified on the ground for a representative sample of evaluation points. When polygons representing vegetation types are mapped and labeled with the correct community types, then the map has high thematic accuracy.

For each map class, both producer's and user's accuracy are evaluated. User's accuracy is a prediction of the percentage of points mapped as a certain type which are confirmed to belong to that mapped vegetation type when visited in the field. In other words, user's accuracy is a measure of the reliability of the map to predict what is found on the ground (i.e. how likely the map user is to encounter correct information while using the map). Producer's accuracy is the percentage of points observed to be of a given vegetation type in the field that are correctly mapped to that type. In other words, producer's accuracy is a measure of the reliability of the aerial photo interpretation to distinguish the vegetation types (i.e. how well the map maker was able to represent the ground features). In addition to the user's and producer's accuracy, measures of the overall map accuracy are calculated, and contingency tables showing the frequency of confusion (i.e. misclassification) between associations are presented.

Point Selection

A point-based approach was used to assess the accuracy of the map classes, with one or more evaluation points representing each map class. The map represents vegetation types using one or more polygons per type. Points were selected from within those polygons using a stratified random sampling design, so that points were distributed across all map classes with a higher number of points placed within map classes with large areas. Because representative points, not entire polygons, were evaluated, the assessment results should be interpreted as a measure of the accuracy of the overall map class, rather than an assessment of whether whole polygons were classified correctly. For the STRI accuracy assessment, 108 points representing 16 vegetation types were evaluated.

In the mapping process, UGA assigned a dominant vegetation association based on the U.S. National Vegetation Classification (NVC) for each polygon. Many polygons were also assigned secondary and/or tertiary associations where ecotones, inclusions smaller than the minimum mapping unit, active succession, or blended vegetation types made assignment to one association unrepresentative of the situation on the ground. For the selection of evaluation points, only the dominant vegetation type was considered. The number of required points for each dominant vegetation type was determined based on differences in predominance and overall size of each vegetation polygon at the park (ESRI et al. 1994, NatureServe 2007). The locations of the evaluation points were then selected using the Generate Random Points tool in the GIS extension "Hawth's Analysis Tools for ArcGIS" (Beyer 2004). Points were excluded from a 12 meter internal buffer around the boundary of each vegetation polygon to ensure that points were within polygons and to avoid misclassification due to GPS error in the field; however, in some instances the size and shape of the vegetation polygons prevented selection of an adequate number of points outside the buffered area. Likewise, points were randomly placed but polygons smaller than 0.045 hectares (452 square meters) were excluded because of the potential that GPS error could lead field crews to record data for an area outside the polygon of the mapped class. A distance of at least 80 meters was maintained between adjacent points to prevent overlap in the area evaluated around each point.

Field Data Collection

Field crews located each evaluation point using a WAAS-enabled Garmin 5 GPS unit. Wide Area Augmentation System (WAAS) is a form of Differential GPS, which provides enhanced positional accuracy. At each point, the field crew recorded new coordinates, GPS positional accuracy, and collected limited vegetation data. When collecting the data for the accuracy points, the vegetation was considered in an area approximately 0.5 hectare, in a 40 meter radius circle around each point. Only the dominant and diagnostic species were recorded for each stratum. The primary association type at that point was determined by the field crew using an existing key to the ecological and human influenced communities at STRI (found in Nordman 2004), and a "fit" value of this type of high, medium, or low was also selected. During the accuracy assessment data collection, it became evident that the vegetation key required some modification, and the modified key is included in this report as Attachment A. At some more confusing points, a secondary or alternate association was also recorded, and notes were taken on

any difficulties keying out the point. A total of 108 data points with field data were used for the assessment of thematic accuracy.

Data Analysis

Data analysis for the accuracy assessment consisted of creation of contingency tables which summarize misclassification rates for each vegetation type, calculation of user's and producer's accuracy for each vegetation type, and evaluation of the overall accuracy of the map using the kappa statistic (Cohen 1960). The data was analyzed for three scenarios. The first scenario was a strict interpretation of map accuracy at the finest scale. An evaluation point was considered correctly classified only if the dominant vegetation type assigned on the map matched the observed value on the ground. The second scenario considered a point a match if the dominant, secondary, or tertiary vegetation type assigned to the mapped polygon matched the observed type. The third scenario was similar to the second in that it used dominant, secondary, or tertiary vegetation, but in addition, this scenario combined several map classes into broader groups where evaluation of the first scenario results indicated they were difficult to differentiate. If questions arose with regard to the proper assignment of a point to a map class, the supplemental notes recorded by the field crew were also considered. In addition, any points that fell within the 12 meter polygon edge buffer that were observed to have the same type as that of an adjacent mapped polygon were regarded as correct in the third analysis.

A contingency matrix was constructed for each scenario. This table lists sample data (i.e. mapped values) as rows and reference data (i.e. the type observed in the field) as columns. An example of a contingency matrix is presented below (Table 1). Cell values equal the number of points mapped or field-verified as belonging to that type, with numbers along the diagonal representing correctly classified points and all others cells representing misclassifications. In this example, four of the five evaluation points mapped as belonging to Class B were mapped correctly, while the fifth point was found to belong to Class D in the field. In addition, the field crew identified two evaluation points that were mapped as Class C but were shown to belong in Class B in the field. Examining the contingency table in this manner allows the users to discern patterns in misclassifications between classes.

Table 1. A sample contingency matrix with shaded cells representing correctly classified points.

		Observed as:				Row Totals
		A	B	C	D	
Mapped as:	A	5	0	0	0	5
	B	0	4	0	1	5
	C	0	2	8	0	10
	D	0	0	3	2	5
Column Totals		5	6	11	3	25

User's and producer's accuracy were derived from the values in the contingency table. Producer's accuracy, or (1 - errors of omission), is calculated by dividing the number of correctly classified points for a map class by the total number of points determined to belong to that class in the field (i.e. the column total). In our example, the producer's accuracy for Class B is 4 divided by 6, or 67%. User's accuracy (1 - errors or commission) is determined by dividing the number of correctly classified points in one map class by the total number of evaluation points originally generated for that class (i.e. the row total). In our example, the users' accuracy for Class B is 4 divided by 5, or 80%.

Overall map accuracy was determined by dividing the number of correct points by the total number of points assessed. A kappa index, which takes into account that some polygons are correctly classified by chance (ESRI et al. 1994, Foody 1992), was also calculated. The overall accuracy and kappa index were calculated based on all map classes for all three analysis scenarios.

Results

The overall accuracy of the final STRI vegetation map, which considered dominant, secondary, or tertiary vegetation types as well as several combined map classes, is 83% with a kappa statistic of 0.79 (79%). The contingency matrix for this scenario, along with a tabulation of user's and producer's accuracy for each map class, is provided in Appendix B, Tables 2a-b. Groupings were created based on a review of the contingency matrix for the fine-scale analysis. Grouped associations included:

a. Cultivated meadows (CEGL004048), Successional Broom-sedge Vegetation (CEGL004044), and other upland native plant restoration sites (NRU)

b. Interior Low Plateau Chinquapin Oak - Mixed Oak Forest (CEGL007699) and Interior Plateau Chinquapin Oak - Shumard Oak Forest (CEGL007808)

A stricter analysis, which considered dominant, secondary, or tertiary vegetation types but no combined map classes, produced an overall accuracy of 66% with a kappa statistic of 0.60 (60%) (Appendix B, Tables 3a-b). The strictest analysis of the STRI map at its finest scale, which considered only the dominant mapped vegetation, resulted in an accuracy of 52% with a kappa statistic of 0.44 (44%) (Appendix B, Tables 4a-b).

Confidence intervals for user's and producer's accuracy were not calculated for STRI because the generally small number of assessment points per map class inflates the size of the confidence interval and thus limits its usefulness for meaningful interpretation.

It is apparent from the comparison of Tables 2-4 that overall map accuracy is considerably higher when classes are grouped and secondary and tertiary mapped vegetation is considered. The fine-scale detail that is available to users of the ungrouped map classes will be invaluable to researchers and managers interested in distinct vegetation associations. However, due to the error inherent in mapping at such fine-scale, it is important that the user take into account the

misclassification rates shown on the contingency tables in Appendix B when using this version of the map. Because much higher accuracies are achieved when vegetation types are grouped, we recommend that users who are less inclined to explore the accuracy assessment in depth be guided to use the coarser scale, higher accuracy version of the map.

Discussion

Overall, the vegetation map for Stones River National Battlefield provides an accurate representation of vegetation types within the park and meets the NPS 80% accuracy standard. Several vegetation classes had zero percent user's or producer's accuracy, and thus users should be very cautious in interpreting areas mapped or identified in the field as belonging to those classes. It should be noted however, that all of the classes with very low accuracy had 3 or fewer assessment points, and together they occupied only 2% of the total park area. The low accuracy recorded may be an artifact of the small sample size for these map classes.

Additionally, due to the comprehensive structure of the vegetation classification and community key used during the assessment field work to identify natural and semi-natural communities, it was possible to identify an assessment point as a small-patch community that may not have been included on the vegetation map. For example, two of the classes observed during field work, Red-cedar - Blue Ash Limestone Woodland (CEGL003754) and Central Limestone Glade (CEGL005153), are small-patch limestone glade communities that were not mapped and likely occur as inclusions smaller than the minimum mapping unit within the mapped glade community, Southern Limestone Glade Margin Shrubland (CEGL003938). This also contributes to the low accuracy recorded for these classes.

While the accuracy assessment is intended to provide a measure of the reliability of the map classes, the reader should be aware that error is also inherent in the field assessment of evaluation points. The overall accuracy of the Stones River vegetation map was relatively low before grouping map classes. At any park, the overall accuracy and user's and producer's accuracy of individual map classes may be affected by the fragmented state and severe changes in management practices, GPS error, data collection error by the field crew, poorly built and/or untested classification keys, poor ecological community concepts, inconsistent interpretation of the classification key, and potential lag times between photointerpretation and accuracy assessment. Two or more community types could be similar enough such that one assessment point could be mistakenly assigned to a particular community type by the field crew when another community type was assigned to the same area by the map producers (Townsend 2000). Points may fall into ecotones or into inclusions within the larger community type and the resulting classification in the field may not be the same as that on the map. While measures were taken to reduce these errors, they are not altogether avoidable and it is not within the scope of this project to discern what mistakes led to errors. **However, it is important to note that mapping error is but one of many types of error that combine to create accuracy issues with any given map.**

Small fragmented parks with active ecosystem management, such as Stones River, are by their nature difficult candidates for accurate mapping to the NVC association level for all map classes.

Disturbed and/or successional vegetation types do not lend themselves easily to being mapped at the association level. Unlike larger and more intact landscapes, Stones River National Battlefield is composed of a patchwork of late successional forest types, managed cultural vegetation, small patch types, and early successional shrub, grassland and forest types resulting in a continuum of spatial and temporal vegetation patterns. Due to floristic similarity in dominant strata, late and early successional upland and palustrine forests were often mistaken for one another in the field. When visiting a polygon, the surveyors were obligated to choose a map class among successional types which often form an aggregation of several classes rather than a homogenous type. In addition, occasionally the field assessment point did not fit well into any community description so the surveyors chose the closest one, which may not have been a perfect fit. However, the temporal aspects of vegetation among successional grasslands and field types were the cause of the majority of map inaccuracy. Many of the successional grassland types had been mowed, managed with herbicide application, or planted with native species during the time between photointerpretation and the accuracy assessment field work. In turn, many of the points visited by the surveyors did not match those classified by the photointerpreters.

Users of the STRI digital vegetation map should familiarize themselves with the results of this accuracy assessment, potential sources of classification error, and the contingency tables provided in Appendix B. When interested in using the map to locate a particular association, it is useful to know what other map classes have been shown to contain points matching that association, and what other vegetation types the mapped association of interest is likely to contain. We recommend that natural resource managers consider combining some commonly confused map classes together for display or other purposes. The results of the accuracy assessment indicate that due to recent restoration activities, areas previously mapped as cultivated meadows (CEGL004048), successional broom-sedge vegetation (CEGL004044), and other upland native plant restoration sites (NRU) can no longer be consistently distinguished from each other and may be best displayed as a combined map class. Likewise, Interior Low Plateau Chinquapin Oak - Mixed Oak Forest (CEGL007699) and Interior Plateau Chinquapin Oak - Shumard Oak Forest (CEGL007808) were difficult for the mappers to distinguish from one another and also may best be displayed as a combined class.

For casual map users and general display purposes, use of the higher-accuracy map which includes these lumped classes will be most useful. For researchers and managers interested in fine-scale detail and rare vegetation types, a version of the map that preserves the full detail as published by UGA should be maintained. This more detailed version of the map, while less accurate for some map classes, contains valuable information for those interested in locating vegetation types that are inherently difficult to map. Used in conjunction with the results of this accuracy assessment, the original map provides the best tool available for understanding the spatial distribution of vegetation types at STRI.

<u>Key Findings:</u>

For users interested in preserving the full detail of the map for the purpose of highly detailed studies or management of the landscape, we recommend use of the fine-scale STRI map as published by UGA. For all other users, we recommend combining map classes as specified

above to allow for an overall map accuracy above 80%. These actions will allow for a map that is useful for the widest audience possible while not losing potentially important fine scale detail.

References

Beyer, H. L. 2004. Hawth's Analysis Tools for ArcGIS. Available at http://www.spatialecology.com/htools.

Cohen, J. 1960. A coefficient of agreement for nominal scales, Educational and Psychological Measurement 20: 37–46.

Environmental Systems Research Institute (ESRI), National Center for Geographic Information and Analysis, and The Nature Conservancy. 1994. NBS/NPS Vegetation Mapping Program: Accuracy Assessment Procedures. Prepared for the United States Department of Interior, National Biological Survey and National Park Service. Washington, D.C.

Foody, G. M. 1992. On the compensation for chance agreement in image classification accuracy assessment. Photogrammetric Engineering and Remote Sensing. 58: 1459-1460.

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.

Jordan, T. and M. Madden. 2008. Digital Vegetation Maps for the NPS Cumberland-Piedmont I&M Network. Athens, GA: The University of Georgia, Center for Remote Sensing and Mapping Science, Department of Geography.

NatureServe. 2004. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of March 29, 2005.

NatureServe. 2007. Procedure for Selecting Assessment Points: Guilford Courthouse Accuracy Assessment Workshop. Durham, North Carolina: NatureServe.

Nordman, C.W. 2004. Vascular plant community classification for Stones River National Battlefield. Durham, North Carolina: NatureServe.

Townsend, P. A. 2000. A quantitative fuzzy approach to assess mapped vegetation classifications for ecological applications. Remote Sensing of Environment 72:253-267.

Appendix A: Revised Vegetation Classification Key

Key to the National Vegetation Classification (NVC) Associations, which occur or potentially occur at Stones River National Battlefield, Murfreesboro, TN (revised July 2008)

Associations, which are documented from Stones River National Battlefield are in **bold type**. Those, which are potential, but undocumented, are in normal type.

KEY TO KEYS

1. Vegetation dominated by trees, either closed forests or open woodlands **2**

1. Vegetation not dominated by trees, trees are absent or very sparse..... **3**

2. Forest, dominated by trees, which provide >60% cover.....***KEY A - FORESTS***

2. Open woodlands in which trees are dominant but canopy is open (and/or patchy) with typically less than 60% cover ..... ***KEY B - WOODLANDS***

3. Shrublands, deciduous or evergreen (includes cane and bamboo shrublands up to 10 m or 33' tall and vine dominated areas (with few or no trees) **4**

3. Vegetation dominated by herbaceous plants..... **5**

4. Evergreen or mixed evergreen – deciduous shrublands
..... ***KEY C - EVERGREEN & MIXED SHRUBLANDS***

4. Deciduous shrublands (or deciduous vine dominated areas) ....***KEY D – DECIDUOUS SHRUBLANDS***

5. Vegetation dominated or characterized by grasses or grass-like plants (perennial or annual)
.....***KEY E – GRAMINOID VEGETATION***

5. Vegetation dominated by forbs (broadleaf herbaceous plants).....
..... ***KEY F – FORB (BROADLEAF) VEGETATION***

KEY A – FORESTS

1. Evergreen forest, dominated (> 60%) by Eastern red-cedar (*Juniperus virginiana*) .....
.....***Red-cedar Successional Forest*** **(CEGL007124)**

1. Deciduous forest or mixed (<60%) Eastern red-cedar (*Juniperus virginiana)* evergreen – deciduous forest **2**

2. Temporarily flooded (or riparian) forests **3**

2. Upland deciduous or mixed Eastern-red-cedar (*Juniperus virginiana)* evergreen - deciduous forests **7**

3. Dominated by willow (*Salix caroliniana* or *Salix nigra*), near river or stream **5**

3. Dominated by either Green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), Sugarberry (*Celtis laevigata*), Box-elder (*Acer negundo*) or some combination of these trees **4**

4. Dominated by either Green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), Sugarberry (*Celtis laevigata*) or some combination of these trees .... ***Southern Green Ash – Elm – Sugarberry Forest* (CEGL002427)**

4. Box-elder (*Acer negundo*) dominated.....***Southern Interior Box-elder Riparian Forest* (CEGL004690)**

5. Forest dominated by Black willow (*Salix nigra*) .....***Black Willow Riparian Forest* (CEGL002103)**

5. Forest or shrubland dominated by Carolina willow (*Salix caroliniana*)..... **6**

6. Forest dominated by single stemmed, canopy sized (> 5 m tall) Carolina willow (*Salix caroliniana*) trees, near river or stream.……*Carolina Willow Temporarily Flooded Forest* (CEGL007373)

6. Shrubland dominated by (multi-stemmed) shrub sized (< 5 m tall) Carolina willow (*Salix caroliniana*), near river or stream……***Carolina Willow Temporarily Flooded Shrubland* (CEGL003899)**

7. Forest dominated by Oaks (*Quercus* spp.)..... **10**

7. Forest dominated by deciduous trees other than Oaks (*Quercus* spp.) **8**

8. Forest with Box-elder (*Acer negundo*) codominant or dominant ..... ***Box-elder Forest* (CEGL005033)**

8. Forest without Box-elder (*Acer negundo*) as a major component or dominant **9**

9. Forest dominated by Northern hackberry (*Celtis occidentalis*), Sugarberry (*Celtis laevigata*), Black walnut (*Juglans nigra),* American elm (*Ulmus americana*), White ash (*Fraxinus americana*) and/or Ohio buckeye (*Aesculus glabra*) in some combination; some stands may contain Osage-orange (*Maclura pomifera*).....***Nashville Basin Sugarberry, Northern Hackberry Successional Forest* (CEGL004697)**

9. Forest dominated by Black walnut (*Juglans nigra)*, Sugar maple (*Acer saccharum)*, and/or Shagbark hickory (*Carya ovata*) in some combination. The high predominance of Sugar maple (*Acer saccharum)* in preference to Oaks (*Quercus* spp.) may, in some cases, be the result of the removal of Oaks (*Quercus* spp.) by logging .....*Nashville Basin Sugar Maple Hickory Forest* (CEGL004741)

10. Forest with Shingle oak (*Quercus imbricaria*) as a major component or codominant .... ***Nashville Basin Shingle Oak – Shumard Oak – Chinquapin Oak Forest* (CEGL003876)**

10. Forest without Shingle oak (*Quercus imbricaria*) as a major component or codominant..... **11**

11. Dry forest dominated by Chinquapin oak (*Quercus muehlenbergii*) and/or Post oak (*Quercus stellata*), Carolina shagbark hickory (*Carya carolinae-septentrionalis*), and Winged elm (*Ulmus alata*) with less Shagbark hickory (*Carya ovata)* and Shumard oak (*Quercus shumardii*)..... ..... ***Interior Low Plateau Chinquapin Oak – Mixed Oak Forest* (CEGL007699)**

11. Dry-mesic to mesic Forest dominated by Shumard oak (*Quercus shumardii*), to a lesser extent Chinquapin oak (*Quercus muehlenbergii*) and other hardwoods other than Oak (*Quercus* spp.), for instance Shagbark hickory (*Carya ovata),* Carolina shagbark hickory (*Carya carolinae-septentrionalis*),

Sugar maple (*Acer saccharum),* generally lacking Southern red oak (*Quercus falcata*), and Post oak (*Quercus stellata*)..... **12**

12. Dry-mesic forest dominated by Shumard oak (*Quercus shumardii*), with Chinquapin oak (*Quercus muehlenbergii*), also containing Carolina shagbark hickory (*Carya carolinae-septentrionalis*), and/or Shagbark hickory (*Carya ovata*) as important components..... ***Interior Low Plateau Chinquapin Oak – Shumard Oak Forest* (CEGL007808)**

12. Mesic forest usually containing Sugar maple (*Acer saccharum)* as an important component, in addition to Oaks (*Quercus* spp.) ..... *Shumard Oak – Chinquapin Oak Mesic Limestone Forest* (CEGL008442)

KEY B - WOODLANDS

1. Evergreen woodland, dominated by (25%-60% cover) trees of Eastern red-cedar (*Juniperus virginiana*) without Blue ash *(Fraxinus quadrangulata*) or Post oak (*Quercus stellata)* codominant ....***Red-cedar Successional Forest* (CEGL007124)**

1. Deciduous or mixed woodland not dominated only by Eastern red-cedar (*Juniperus virginiana)* **2**

2. Woodland with, or dominated by Blue ash *(Fraxinus quadrangulata*) and/or Eastern red-cedar (*Juniperus virginiana*). [At least some examples may have canopies whose densities approach or exceed 60%, the forest/woodland threshold] ..... *Red-cedar – Blue Ash Limestone Woodland* (CEGL003754)

2. Woodland dominated by Post oak (*Quercus stellata)*, Eastern red-cedar (*Juniperus virginiana*) may be a subcanopy tree.....*Nashville Basin Post Oak Woodland* (CEGL003712)

KEY C - EVERGREEN & MIXED SHRUBLANDS

1. Vegetation dominated by Giant cane (*Arundinaria gigantea)* or Golden bamboo (*Phyllostachys aurea)*, shrublands up to 10 m or 33 feet tall..... **2**

1. Vegetation not dominated by cane or bamboo, evergreen or mixed shrublands **3**

2. Vegetation dominated by non-native Golden bamboo (*Phyllostachys aurea)* up to 10 m or 33 feet tall .....*Golden Bamboo Shrubland* (CEGL008560)

2. Vegetation dominated by native Giant cane (*Arundinaria gigantea)* .....*Floodplain Canebrake* (CEGL003836)

3. Vegetation dominated by Chinese privet (*Ligustrum sinense)* or Common privet (*Ligustrum vulgare*) **4**

3. Vegetation not dominated by Chinese privet (*Ligustrum sinense)* or Common privet (*Ligustrum vulgare*)..... **5**

4. Wetlands or bottomlands .....***Chinese Privet Temporarily Flooded Shrubland* (CEGL003837)**

4. Uplands, not generally subject to flooding .....***Chinese Privet Upland Shrubland* (CEGL003807)**

5. Vegetation dominated by Eastern red-cedar (*Juniperus virginiana* var. *virginiana)*, Glade-privet *(Forestiera ligustrina*), Fragrant sumac (*Rhus aromatica)*, and/or Golden St. John's-wort (*Hypericum frondosum*) in some combination.....***Central Basin Limestone Glade Margin Shrubland*** **(CEGL003938)**

5. Vegetation dominated by Southern blackberry (*Rubus argutus)*, Southern dewberry (*Rubus trivialis)* or other blackberries or dewberries (*Rubus spp.)* and Greenbriers (*Smilax* spp.) .... ***Blackberry - Greenbrier Successional Shrubland Thicket*** **(CEGL004732)**

KEY D – DECIDUOUS SHRUBLANDS

1. Temporarily flooded deciduous shrublands (occur in floodplain areas near rivers or creeks) **2**

1. Upland deciduous shrublands (generally not subject to flooding), includes vine areas..... **3**

2. Shrubland dominated by shrub sized Carolina willow (*Salix caroliniana*), near river or stream .....***Carolina Willow Temporarily Flooded Shrubland*** **(CEGL003899)**

2. Shrubland dominated by Smooth alder (*Alnus serrulata*), near a river or stream ..... *Interior Alder Shrubland* (CEGL003894)

3. Vegetation dominated by Kudzu (*Pueraria montana* var. *lobata*), with few or no trees .....*Kudzu Vineland* (CEGL003882)

3. Upland deciduous shrublands dominated by native species (may include grasses and small trees), occurring on disturbed or successional sites **4**

4. Vegetation dominated by blackberries/dewberries (*Rubus argutus, Rubus trivialis*) and Greenbrier species (*Smilax glauca, Smilax rotundifolia*). May have a variety of tree saplings, other shrubs, herbs, and grasses. Successional, generally occurs following canopy removal .....***Blackberry – Greenbrier Successional Shrubland Thicket*** **(CEGL004732)**

4.Vegetation usually dominated by thickets of Roughleaf dogwood (*Cornus drummondii)* and Smooth sumac (*Rhus glabra)*, dominant in places are, Plums (*Prunus americana, Prunus angustifolia, Prunus mexicana*), Fragrant sumac (*Rhus aromatica*), and Coralberry (*Symphoricarpus orbiculatus*) .....*Rough Dogwood – Plum – Sumac Shrubland* (CEGL007933)

KEY E – GRAMINOID VEGETATION

1. Open, generally flat limestone glade with annual grass much of which is Annual dropseed (*Sporobolus vaginiflorus*) only a few inches high (<10 cm) and Gattinger's prairie-clover (*Dalea gattingeri)* in the thin soil areas, but forbs and higher annual grasses can be in areas with thicker soil..... .....***Limestone Annual Grass Glades*** **(CEGL004340)**

1. Vegetation not with the above combination of characteristics **2**

2. Vegetation mainly non-native perennial grasses (or grasses mixed with forbs), may be kept open by mowing or bushhogging. Red fescue (*Festuca rubra*) dominated grasslands also key here **3**

2. Vegetation not with the above combination of characteristics, mainly dominated by native plants **4**

3. Grassland pastures and hayfields, more-or-less cultural, but may no longer be actively maintained, dominated by European tall fescue or Meadow fescue (*Lolium arundinaceum, pratense*). Red fescue (*Festuca rubra*) dominated grasslands which otherwise fit this description should key here .... ***Cultivated Meadow*** **(CEGL004048)**

3. Grass lawns or frequently mowed areas with perennial grasses and forbs (weedy lawns)..... ***Lawns***

4. Vegetation dominated by Common broomsedge (*Andropogon virginicus* var. *virginicus*), a blond colored grass which gets about 1 m tall .....***Successional Broomsedge Vegetation*** **(CEGL004044)**

4. Vegetation not dominated by Common broomsedge (*Andropogon virginicus* var. *virginicus*) **5**

5. Vegetation is characterized by saturation or temporary flooding, mainly in winter or early spring..... **7**

5. Vegetation is not characterized by saturation or temporary flooding, uplands..... **6**

6. Natural vegetation on limestone glades, may be characterized by scattered trees (with cover <25%), such as Chinquapin oak *(Quercus muehlenbergii*) and Eastern red-cedar (*Juniperus virginiana*). Perennial grasses such as Silver bluestem (*Andropogon ternarius),*Elliott's beardgrass (*Andropogon gyrans*), Tall dropseed *(Sporobolus compositus),* or Little bluestem (*Schizachyrium scoparium)* are characteristic..... .....***Central Limestone Glade*** **(CEGL005131)**

6. Restored vegetation in vicinity of earthworks or other ecological restoration sites, vegetation characterized by a wide variety of grasses, forbs and vines, mainly native..... ***Ecological Restoration Site***

7. Open herbaceous glade dominated by some combination of Flat spikerush (*Eleocharis compressa*), Yellow sunnybell (*Schoenolirion croceum*), Crawe's sedge (*Carex crawei*), and/or Nodding onion (*Allium cernuum*) ..... *Limestone Seep Glade* (CEGL004169)

7. Vegetation with robust grasses such as Big bluestem (*Andropogon gerardii),* Yellow Indiangrass (*Sorghastrum nutans)*, River-oats (*Chasmanthium latifolium)* as well as Willowleaf bluestar (*Amsonia tabernaemontana* var. *gattingeri* or var. *salicifolia*)..... *Duck River Scour Prairie* (CEGL004739)

KEY F – FORB (BROADLEAF) VEGETATION

1. Open, generally flat limestone glade with annual grass much of which is Annual dropseed (*Sporobolus vaginiflorus*) only a few inches high (<10 cm) and Gattinger's prairie-clover (*Dalea gattingeri)* in the thin soil areas, but forbs and higher annual grasses can be in areas with thicker soil..... .....***Limestone Annual Grass Glades*** **(CEGL004340)**

1. Vegetation not with the above combination of characteristics **2**

2. Vegetation during the growing season dominated by Soybean (*Glycine max)*.....***Soybean Field***

2. Vegetation without Soybean (*Glycine max)* during the growing season **3**

3. Vegetation flooded (at least temporarily), associated with a river, creek, or pond..... **4**

3. Vegetation may be saturated, especially in early spring, but not flooded..... **5**

4. Rocky bar or shore of river or creek dominated by Common Water-willow (*Justicia americana*) ..... ***Water-willow Rocky Bar and Shore*** **(CEGL004286)**

4. Floating water-primrose (*Ludwigia peploides* ssp. *glabrescens*) mats in slow moving water or ponds and lakes ..... ***Floating Water-primrose Aquatic Marsh*** **(CEGL007835)**

5. Restored vegetation in vicinity of earthworks or other ecological restoration sites, vegetation characterized by a wide variety of grasses, forbs and vines, mainly native..... ***Ecological Restoration Site***

5. Natural vegetation associated with limestone glades, or patches within limestone glade habitats..... **6**

6. Open vegetation characterized by scattered small spring succulent plants, open flat limestone, and (seasonally) patches of the brown gelatinous algae Common nostoc (*Nostoc commune*) ..... ***Interior Low Plateau Limestone Glade Ephemeral Pool*** **(CEGL004346)**

6. Small ephemeral washes in limestone cedar glades, dominated by Axil-flower (*Mecardonia acuminata*), Caribbean miterwort (*Mitreola petiolata*), and sometimes Leafy prairie-clover (*Dalea foliosa)*
.....*Limestone Glade Streamside Meadow* (CEGL004292)

Appendix B: Contingency Matrices and Accuracy Tables

Table 2a
Contingency Matrix Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match), plus Combined Map Classes (7808/7699 and 4044/4048/NRU)
Stones River National Battlefield

		Observed as:													Grand Total:	User's Accuracy:
		2427	3754	3837	3876	3938	4340	4690	4697	5033	5131	7124	7808/7699	NRU/4044/4048		
Mapped as:	2427	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3754	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3837	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3876	0	0	0	2	0	0	0	0	0	0	0	3	0	5	40%
	3938	0	1	0	0	0	0	0	0	0	1	0	0	0	2	0%
	4340	0	0	0	0	0	4	0	0	0	0	0	0	0	4	100%
	4690	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0%
	4697	2	0	0	0	0	0	2	12	0	0	0	0	3	19	63%
	5033	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0%
	5131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	7124	0	0	1	0	0	0	0	0	0	0	25	0	0	26	96%
	7808/7699	0	0	0	1	0	0	0	2	0	0	0	12	0	15	80%
	NRU/4044/4048	0	0	0	0	0	0	0	0	0	0	0	0	35	35	100%
Grand Total		3	1	1	3	0	4	2	14	0	1	25	15	39	108	
Producer's Accuracy:		0%	0%	0%	67%	n/a	100%	0%	86%	n/a	0%	100%	80%	90%		

Overall accuracy= 83.33%
Kappa statistic = 78.70%

Table 2b
Accuracy Calculations Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match), plus Combined Map Classes (7808/7699 and 4044/4048/NRU)
Stones River National Battlefield

Map Class	Producer's Accuracy		User's Accuracy	
	Accuracy	n	Accuracy	n
2427	0%	3	n/a	0
3754	0%	1	n/a	0
3837	0%	1	n/a	0
3876	67%	3	40%	5
3938	n/a	0	0%	2
4340	100%	4	100%	4
4690	0%	2	0%	1
4697	86%	14	63%	19
5033	n/a	0	0%	1
5131	0%	1	n/a	0
7124	100%	25	96%	26
7808/7699	80%	15	80%	15
NRU/4044/4048	90%	39	100%	35

n	The sample size. For user's accuracy, this is the number of points mapped in this class. For producer's accuracy, it is the number of points assigned to that class in the field.
n/a	Not applicable. For user's accuracy, no evaluation points were mapped in this class. For producer's accuracy, no evaluation points were assigned to this class in the field.
--	A confidence interval could not be calculated due to the small sample size.

Table 3a
Contingency Matrix Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match)
Stones River National Battlefield

		Observed as:																	Grand Total	User's Accuracy:
		2427	3754	3837	3876	3938	4044	4048	4340	4690	4697	4732	5033	5131	7124	7699	7808	NRU		
Mapped as:	2427	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3754	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3837	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3876	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2	0	5	40%
	3938	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0%
	4044	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	0	8	75%
	4048	0	0	0	0	0	2	14	0	0	0	0	0	0	0	0	0	10	26	54%
	4340	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	100%
	4690	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0%
	4697	2	0	0	0	0	0	2	0	2	12	0	0	0	0	0	0	1	19	63%
	4732	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0%
	5033	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0%
	5131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	7124	0	0	1	0	0	0	0	0	0	0	0	0	0	25	0	0	0	26	96%
	7699	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	1	0	6	67%
	7808	0	0	0	1	0	0	0	0	0	1	0	0	0	0	3	4	0	9	44%
	NRU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Grand Total		3	1	1	3	0	8	19	4	2	14	0	0	1	25	8	7	12	108	
Producer's Accuracy:		0%	0%	0%	67%	n/a	75%	74%	100%	0%	86%	n/a	n/a	0%	100%	50%	57%	0%		

Overall accuracy= 65.74%
Kappa statistic = 60.22%

Table 3b
Accuracy Calculations Using Mapped Dominant, Secondary, or Tertiary Vegetation (Best Match)
Stones River National Battlefield

Map Class	Producer's Accuracy		User's Accuracy	
	Accuracy	n	Accuracy	n
NRU	0%	12	n/a	0
2427	0%	3	n/a	0
3754	0%	1	n/a	0
3837	0%	1	n/a	0
3876	67%	3	40%	5
3938	n/a	0	0%	2
4044	75%	8	75%	8
4048	74%	19	54%	26
4340	100%	4	100%	4
4690	0%	2	0%	1
4697	86%	14	63%	19
4732	n/a	0	0%	1
5033	n/a	0	0%	1
5131	0%	1	n/a	0
7124	100%	25	96%	26
7699	50%	8	67%	6
7808	57%	7	44%	9

n	The sample size. For user's accuracy, this is the number of points mapped in this class. For producer's accuracy, it is the number of points assigned to that class in the field.
n/a	Not applicable. For user's accuracy, no evaluation points were mapped in this class. For producer's accuracy, no evaluation points were assigned to this class in the field.
--	A confidence interval could not be calculated due to the small sample size.

Table 4a
Contingency Matrix Using Mapped Dominant Vegetation Only
Stones River National Battlefield

		Observed as:																	Grand Total	User's Accuracy:
		NRU	2427	3754	3837	3876	3938	4044	4048	4340	4690	4697	4732	5033	5131	7124	7699	7808		
Mapped as:	NRU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	2427	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3754	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3837	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	3876	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2	5	40%
	3938	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	3	0%
	4044	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	5	60%
	4048	9	0	0	0	0	0	5	14	0	0	0	0	0	0	0	0	0	29	48%
	4340	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	100%
	4690	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0%
	4697	1	2	0	0	0	0	0	2	0	2	6	0	1	0	0	0	0	14	43%
	4732	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100%
	5033	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0%
	5131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
	7124	0	0	1	1	0	0	0	0	0	0	3	0	0	0	21	1	2	29	72%
	7699	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	1	5	60%
	7808	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	4	3	10	30%
Grand Total		11	3	2	1	3	0	8	19	4	2	13	0	1	1	22	9	8	108	
Producer's Accuracy:		0%	0%	0%	0%	67%	n/a	38%	74%	100%	0%	46%	n/a	0%	0%	95%	33%	38%		

Overall accuracy= 51.85%
Kappa statistic = 44.36%

Table 4b
Accuracy Calculations Using Mapped Dominant Vegetation Only
Stones River National Battlefield

Map Class	Producer's Accuracy		User's Accuracy	
	Accuracy	n	Accuracy	n
NRU	0%	11	n/a	0
2427	0%	3	n/a	0
3754	0%	2	n/a	0
3837	0%	1	n/a	0
3876	67%	3	40%	5
3938	n/a	0	0%	3
4044	38%	8	60%	5
4048	74%	19	48%	29
4340	100%	4	100%	4
4690	0%	2	0%	1
4697	46%	13	43%	14
4732	n/a	0	100%	1
5033	0%	1	0%	2
5131	0%	1	n/a	0
7124	95%	22	72%	29
7699	33%	9	60%	5
7808	38%	8	30%	10

n	The sample size. For user's accuracy, this is the number of points mapped in this class. For producer's accuracy, it is the number of points assigned to that class in the field.
n/a	Not applicable. For user's accuracy, no evaluation points were mapped in this class. For producer's accuracy, no evaluation points were assigned to this class in the field.
--	A confidence interval could not be calculated due to the small sample size.