National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania

Vegetation Classification and Mapping of New River Gorge National River, West Virginia

Technical Report NPS/NER/NRTR—2007/092

ON THE COVER

The Endless Wall. Above the cliff face is Cliff Top Virginia Pine Forest. Below the cliff is Oak – Hickory Forest grading downslope to Oak –Hickory – Sugar Maple Forest. In the foreground is a regenerating burned area.
Photograph by: J. P. Vanderhorst.

Vegetation Classification and Mapping of New River Gorge National River, West Virginia

Technical Report NPS/NER/NRTR—2007/092

James P. Vanderhorst[1], James Jeuck[2], and Susan C. Gawler[3]

[1]West Virginia Natural Heritage Program
WV Division of Natural Resources, Wildlife Resources Section
PO Box 67
Elkins, WV 26241

[2]Center for Earth Observation
North Carolina State University
5112 Jordan Hall, Box 7106
Raleigh, NC 27695

[3]NatureServe
Eastern Regional Office
11 Avenue de Lafayette, 5th Floor
Boston, MA 02111

August 2007

U.S. Department of the Interior
National Park Service
Northeast Region
Philadelphia, Pennsylvania

The Northeast Region of the National Park Service (NPS) comprises national parks and related areas in 13 New England and Mid-Atlantic states. The diversity of parks and their resources are reflected in their designations as national parks, seashores, historic sites, recreation areas, military parks, memorials, and rivers and trails. Biological, physical, and social science research results, natural resource inventory and monitoring data, scientific literature reviews, bibliographies, and proceedings of technical workshops and conferences related to these park units are disseminated through the NPS/NER Technical Report (NRTR) and Natural Resources Report (NRR) series. The reports are a continuation of series with previous acronyms of NPS/PHSO, NPS/MAR, NPS/BSO-RNR, and NPS/NERBOST. Individual parks may also disseminate information through their own report series.

Natural Resources Reports are the designated medium for information on technologies and resource management methods; "how to" resource management papers; proceedings of resource management workshops or conferences; and natural resource program descriptions and resource action plans.

Technical Reports are the designated medium for initially disseminating data and results of biological, physical, and social science research that addresses natural resource management issues; natural resource inventories and monitoring activities; scientific literature reviews; bibliographies; and peer-reviewed proceedings of technical workshops, conferences, or symposia.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the National Park Service.

This report was accomplished under Cooperative Agreements 4000-8-9011 and 4560050001 with assistance from the NPS. The statements, findings, conclusions, recommendations, and data in this report are solely those of the author(s), and do not necessarily reflect the views of the U.S. Department of the Interior, National Park Service.

Print copies of reports in these series, produced in limited quantity and only available as long as the supply lasts, or preferably, file copies on CD, may be obtained by sending a request to the address on the back cover. Print copies also may be requested from the NPS Technical Information Center (TIC), Denver Service Center, PO Box 25287, Denver, CO 80225-0287. A copy charge may be involved. To order from TIC, refer to document D-225.

This report may also be available as a downloadable portable document format file from the Internet at http://www.nps.gov/nero/science/.

Please cite this publication as:

Vanderhorst, J. P., J. Jeuck, and S. C. Gawler. 2007. Vegetation Classification and Mapping of New River Gorge National River, West Virginia. Technical Report NPS/NER/NRTR—2007/092. National Park Service. Philadelphia, PA.

NPS D-225 August 2007

Table of Contents

Page

Tables v

Figures vii

Appendixes ix

Abstract xi

Executive Summary xiii

Acknowledgments xv

Introduction 1

Study Area 3

Methods 7

Vegetation Classification 7

Aerial Photography Acquisition and Processing 12

Vegetation Mapping 13

Accuracy Assessment 15

Results 25

Vegetation Classification 25

Vegetation Mapping 28

Accuracy Assessment 35

Discussion 39

Conclusions and Management Recommendations 43

Literature Cited 45

Tables

Page

Table 1. Ecological Land Unit (ELU) specifications, area, and plot sampling stratification. 10

Table 2. Summary of key information for the New River Gorge National River (NERI) digital orthophoto mosaic. 14

Table 3. Thematic accuracy assessment (AA) sampling strategy for the New River Gorge National River vegetation map. 19

Table 4. Associations of the U.S. National Vegetation Classification (USNVC) occurring in New River Gorge National River (NERI). 26

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations. 30

Table 6. Number of polygons and total area of map classes in New River Gorge National River. 36

Table 7. Contingency matrix and calculated errors for the thematic accuracy assessment of the New River Gorge National River vegetation map. 38

Table 8. Associations of the U.S. National Vegetation Classification (USNVC) occurring in New River Gorge National River (NERI) which are likely to be globally and/or WV state rare. 41

Figures

Page

Figure 1. New River Gorge National River and vicinity. 4

Figure 2. Locations of plots, transects, observation points, and mapping zones sampled for vegetation classification and mapping of New River Gorge National River. 8

Figure 3. Ground control points used to calculate horizontal positional accuracy of the Gauley River National Recreation Area, New River Gorge National River, and Bluestone National Scenic River digital orthophoto mosaics. 17

Figure 4. Regions and river segments from which the sample of thematic accuracy assessment points was selected. 20

Figure 5. Locations of the 524 thematic accuracy assessment (AA) points in New River Gorge National River (NERI). 22

Figure 6. Vegetation map of New River Gorge National River, West Virginia. 29

Appendixes

Page

Appendix A. Vegetation plot field form. 51

Appendix B. Physiognomic type definitions. 53

Appendix C. Standard accuracy assessment form for USGS-NPS Vegetation Mapping Program. 55

Appendix D. Examples of photographs taken at thematic accuracy assessment points in New River Gorge National River. 57

Appendix E. Vascular and non-vascular plant taxa found in plots, transect points, mapping zones, and accuracy assessment points in New River Gorge National River. 67

Appendix F. Cluster dendrograms and ordination graphs. 97

Appendix G. Plot floristic cover and constancy statistics for vegetation community types sampled in New River Gorge National River. 105

Appendix H. Key to vegetation community types of New River Gorge National River. 145

Appendix I. Local and global vegetation association descriptions for New River Gorge National River. 159

Appendix J. Bibliography for global vegetation association descriptions from the U.S. National Vegetation Classification System. 401

Appendix K. State and global conservation status rank definitions. 421

Abstract

A vegetation classification and map were developed by the West Virginia Natural Heritage Program for New River Gorge National River following the standards of the U.S. Geological Survey / National Park Service Vegetation Mapping Program. Classification was based, in part, on multivariate analysis of complete floristic data from 277 plots. The classification for the park was cross-walked to the U.S. National Vegetation Classification in consultation with NatureServe. A digital vegetation map was produced using Geographic Information System software. The base layer for vegetation mapping was a digital orthophoto mosaic of the park developed by North Carolina State University from aerial photography flown for this project in April 2003. Spatial and thematic accuracy assessments were performed by North Carolina State University.

The vegetation classification for the park consists of 41 community types (39 associations in the U.S. National Vegetation Classification) including 16 upland forest and woodland types, one lichen type, one sparse vegetation type, 15 riparian types, five headwater wetland types, and three cultural types. Most map classes represent individual community types, but a few represent complexes of multiple classified community types and others represent cultural, disturbed, and non-vegetated areas and features which are not included in the vegetation classification. The vegetation map consists of 47 map classes, including 15 upland forest and woodland vegetation types, one lichen and sparse vegetation type, 15 riparian vegetation types, two headwater wetland vegetation types, three aquatic feature types, eight cultural and disturbed types, and three transportation feature types. Approximately 83% of the park is occupied by upland deciduous forests, but a large proportion of the ecological and species diversity in the park is represented by relatively small areas of cliff, riparian, and wetland communities. Overall thematic accuracy of the vegetation map was estimated to be 96.2%.

Executive Summary

A vegetation classification and map were developed by the West Virginia Natural Heritage Program for New River Gorge National River following the standards of the U.S. Geological Survey / National Park Service Vegetation Mapping Program. These standards include a minimum mapping unit of 0.5 ha (1.2 ac) and classification accuracy of 80% or greater for each map class. The U.S. National Vegetation Classification was used as the classification standard.

Classification was based in part on complete floristic data from 277 plots. Plots were stratified to cover the geographic and ecological ranges within the park. Multivariate analyses of plot data included hierarchical agglomerative cluster analysis, non-metric multidimensional scaling, and indicator species analysis. The vegetation classification for the park was cross-walked to the U.S. National Vegetation Classification in consultation with NatureServe. The vegetation classification for the park consists of 41 community types (39 associations in the U.S. National Vegetation Classification) including 16 upland forest and woodland types, one lichen type, one sparse vegetation type, 15 riparian types, five headwater wetland types, and three cultural types.

A digital vegetation map was produced as a personal geodatabase using Environmental Systems Research Institute ArcGIS software. The base layer for vegetation mapping was a digital orthophoto mosaic of the park developed by North Carolina State University from color infra-red aerial photography flown for this project in April 2003. The geodatabase includes separate point feature classes for plots, transects, and observations, and polygon feature classes (clipped and unclipped by the park boundary) for vegetation and non-vegetated map classes.

The vegetation map consists of 47 map classes, including 15 upland forest and woodland vegetation types, one lichen and sparse vegetation type, 15 riparian vegetation types, two headwater wetland vegetation types, three aquatic feature types, eight cultural and disturbed types, and three transportation feature types. Most map classes for natural and semi-natural vegetation represent individual community types. One map class is predominantly one community type (Sugar Maple - Yellow buckeye - American Basswood Forest) but may have a few inclusions of another community type (Successional Tuliptree / Northern Spicebush Forest) greater than the minimum mapping unit. Four composite map classes (Beaver-influenced Wetland, Cliff, Steep Riparian Edge, and Successional Tuliptree Forest) represent multiple community types. Map classes for aquatic features, cultural and disturbed areas, and transportation features do not correspond to community types in the vegetation classification.

Approximately 83% of the park is occupied by upland deciduous forests, and a large proportion of this is occupied by three major community types. The Sugar Maple - Yellow Buckeye - American Basswood Forest occupies moist, fertile sites on concave, lower, and northerly facing colluvial gorge slopes and has higher ecological amplitude on shale-derived soils. The Oak - Hickory Forest occupies dryer, less fertile sites and predominates on upper gorge slopes and on plateaus with residual soils derived primarily from sandstone. The Oak - Hickory - Sugar Maple Forest is intermediate and predominates on southerly facing, convex, and upper colluvial gorge slopes and on northerly aspects on the plateaus. Smaller, but significant, areas of upland are occupied by Oak / Ericad Forest, Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest, Deciduous Tree / Great Laurel Forest, and successional forest types. Small patch

communities associated with cliffs, riparian zones, wetlands, and other specialized habitats cover a small area but represent a large proportion of the ecological and species diversity in the park. Several community types (Chinquapin Oak - Black Maple Forest, Cliff Top Pitch Pine Woodland, Cliff Top Virginia Pine Forest, Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest, Yellow Birch Cold Cove Forest, Dry Sandstone Cliff, Black Willow Slackwater Woodland, Eastern Red-cedar - Virginia Pine Flatrock Woodland, Lizard's-tail Backwater Slough, Oak - Tuliptree / Mountain Silverbell Floodplain Forest, Riverscour Prairie, Sycamore - Ash Floodplain Forest, Sycamore - River Birch Riverscour Woodland, and Forest Seep) are likely to be state or globally rare.

Spatial and thematic accuracy assessments were performed by North Carolina State University. Thematic accuracy of 19 map classes was assessed, excluding classes for some rare natural vegetation types and all cultural and non-vegetated areas and features. Producer's and user's accuracy of individual map classes ranged from 84.6–100%. Overall thematic accuracy of the vegetation map was estimated to be 96.2%.

Acknowledgments

This project has spanned nine years of effort and many people have contributed in large and small ways. Major contributions were made by the following individuals. Dean Walton initiated and coordinated the project in 1998. Special recognition is due to the workers who helped collect vegetation data in the field: Pam Bailey, David Hulver, Paul Marcum, Leah Ceperley, Brian Streets, and Tom Vogt. GIS expertise was contributed by Joel Harrison, Jeremy Rowan, and Michael Dougherty. Administrative assistance was contributed by Brian McDonald, Walt Kordek, and Karen Eye. Elizabeth Byers assisted with database management and reviewed the draft manuscript of the final report. Celeste Good assisted with assembly of final products including metadata. John Bender developed GIS landform and ecological land unit models. Bryophyte collections were identified by Susan Studlar, and lichen collections were identified by Don Flenniken. North Carolina State University personnel who assisted with accuracy assessment and development of the orthophoto mosaic include Beth Eastman, Debra Savage, Hugh Devine, and Bill Milnor. NatureServe personnel who assisted with the USNVC crosswalk include Lesley Sneddon, Milo Pyne, and Mary Russo. NPS personnel who assisted with contracting, coordination, logistics, and data standards include Ken Stephens, John Perez, Beth Johnson, John Karish, Chris Lea, Laura Pickens, Andy Steele, Sammy Pugh, and Cliff Bobinski.

Introduction

This report describes vegetation classification and mapping for New River Gorge National River (NERI) in southern West Virginia. Work on this project was started in 1998, and a report, plots database, and GIS map products for the northern and southern thirds of the park were released three years later (Vanderhorst 2001). Following this initial effort, standards of the U.S. Geological Survey / National Park Service Vegetation Mapping Program (USGS 2001) were adopted for the completion of a vegetation classification and map for the entire park.

U.S. Geological Survey / National Park Service Vegetation Mapping Program products meet Federal Geographic Data Committee standards for vegetation classification and metadata, and national standards for spatial accuracy. Standards include a minimum mapping unit of 0.5 ha (1.23 ac) and classification accuracy of 80% or greater for each map class. The U.S. National Vegetation Classification (USNVC), maintained by NatureServe, is used as the standard for vegetation classification.

The USNVC represents the terrestrial component in the U.S. of an International Classification of Ecological Communities (Grossman et al. 1998). Ecological communities are classified and mapped to serve as a "coarse filter" for conservation of biological diversity. Although we use plants to classify terrestrial ecological communities, these units also include and represent species in all kingdoms.

The USNVC is a hierarchical system which uses physiognomy to define the coarsest levels, and floristic composition to define the finest levels of the classification (Grossman et al. 1998). The vegetation classification and mapping presented here for NERI utilize the finest level of the USNVC, the association, as the basic unit. The association is floristically based, and is named and described based on dominant and diagnostic plant species. Dominant species are those with the highest cover in each stratum (canopy layer) of vegetation. Diagnostic species are those which differentiate a community from others, either by abundance, constancy, or fidelity. Thus, a typical plant association may be named after dominants of one or two strata (species in the same stratum are divided by a dash, species in different strata are divided by a forward slash) with or without diagnostic taxa added for further refinement. For example *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest indicates a forest where the tree canopy is typically dominated by *Platanus occidentalis* (sycamore) and *Fraxinus pennsylvanica* (green ash), the subcanopy is typically dominated by *Carpinus caroliniana* ssp. *virginiana* (American hornbeam), and *Verbesina alternifolia* (wingstem) has high constancy in the herb layer. Nominate species in parentheses are those which may be important in some examples or geographical range but which may be uncommon or absent in others. Because the USNVC covers a broad geographic range, the association names may not always represent local vegetation very well; it is important to consider the entire concept and description for the association.

This report and related database products also use local, park specific, NERI community type names for each association; thus, for the example above, "Sycamore - Ash Floodplain Forest." Throughout the main body of this report associations are referred to by the NERI community type name. Corresponding scientific names and alphanumeric identifiers ("CEGL" codes) for

associations in the USNVC are listed in tables and in the association descriptions in Appendix I. Because it represents the USNVC, the text of Appendix I refers to associations by their USNVC scientific name and USNVC identifier. The terms “association” and “community type” are conceptually synonymous within the scope of this report, except in one instance where a provisional NERI community type (Tributary Floodplain Forest) has no equivalent USNVC association, and in another instance where two NERI community types (Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest and Deciduous Tree / Great Laurel Forest) represent two phases of a single USNVC association (*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest ([CEGL007543]).

Relationships between community types and map classes are usually one-to-one, but can sometimes be more complex. Most map classes for natural and semi-natural vegetation are more-or-less equivalent (excluding ectotones, inclusions, and errors) to community types (and corresponding USNVC associations) and these are named by the corresponding NERI community type name. For the example above, the Sycamore - Ash Floodplain Forest map class is equivalent to the Sycamore - Ash Floodplain Forest community type. However, due to patchiness of vegetation or mapping constraints of scale and/or photointerpretation, some map classes include multiple community types, thus the Steep Riparian Edge map class includes several riparian community types, including small patches of the Sycamore - Ash Floodplain Forest. Additional map classes which do not correspond to classified NERI community types include aquatic, cultural, and disturbed areas and features.

Vegetation classification and mapping for NERI was completed by the West Virginia Natural Heritage Program (WVNHP), part of the Wildlife Resources Section of the WV Division of Natural Resources (WVDNR). WVNHP classifies, conducts inventories for, maps, and maintains databases on the natural biological diversity of the state, including natural ecological communities and rare plants and animals. North Carolina State University Center for Earth Observation provided supporting products and services for this project, including development of a digital orthophoto mosaic and performance of spatial and thematic accuracy assessment. NatureServe, a private non-profit organization serving as the network coordinator for Natural Heritage Programs throughout the Americas, assisted with the crosswalk to the USNVC.

While contributing to the needs of the NPS, this project has also developed tools and information which can be applied to classification, mapping, and conservation of natural communities on public and private lands throughout the state and region.

Study Area

New River Gorge National River (NERI) is situated along approximately 85 km (53 mi) of the New River from Hinton downstream to Anstead (Figure 1). It is located in Summers, Raleigh, and Fayette counties in southern West Virginia. The proclamation boundaries of the park encompass approximately 29,202 ha (72,161 ac). It is mapped on eleven USGS 1:24,000 topographic maps, including the Hinton, Talcott, Meadow Bridge, Meadow Creek, Prince, Oak Hill, Thurmond, Danese, Winona, Fayetteville, and Beckwith quadrangles.

The park includes the river and numerous tributaries and their shores and floodplains, and extends upslope to include large areas of gorge slopes, rim rock cliffs, rolling plateaus, and mountains. Elevations range from 244 m (835 ft) along the New River near Anstead to 1,000 m (3,281 ft) on Swell Mountain near Hinton.

Ecoregional assignment of the park area is highly variable depending on which mapping system is used. The EPA (Woods et al. 2003) includes the entire park within the Forested Hills and Mountains Level III Ecoregion within the Central Appalachian Level IV Ecoregion. The USFS (Bailey et al. 1994) includes the entire park within the Northern Cumberland Mountains Section of the Central Appalachian Broadleaf Forest - Coniferous Forest - Meadow Province. The Nature Conservancy (TNC) (2003) includes the entire park within the Cumberlands and Southern Ridge and Valley Ecoregion.

The climate of the park is a humid continental type characterized by marked seasonal temperature changes and relatively uniform precipitation throughout the year. Mean monthly temperature normals (NOAA 2002) at the nearby Beckley Airport (elevation 763 m [2504 ft]) range from 30.4ºF in January to 70.7ºF in July. Normal annual precipitation at the Beckley airport is 105.74 cm (41.63 in) and monthly precipitation normals range from 6.70 cm (2.64 in) in October to 12.14 cm (4.78 in) in July (NOAA 2002).

The bedrock geology of the park is mapped as the Pottsville and Mauch Chunk groups with the Pottsville predominating in the north and the Mauch Chunk predominating in the south (Cardwell et al. 1968). The younger Pottsville lies on top of the older Mauch Chunk. The geology of the New River Gorge was described and mapped in detail by Englund et al. (1977, 1982). The Pennsylvanian-aged Pottsville group includes the Kanawha, New River, and Pocahontas formations which consist primarily of sandstones with abundant coal deposits and lesser amounts of siltstones and shale. The prominent cliff bands in the northern section of the park are composed of the Nuttall sandstone in the New River Formation. The Mississippian-aged Mauch Chunk group consists of the Bluestone, Princeton, Hinton, and Bluefield formations which consist primarily of shales and siltstones with lesser amounts of sandstones and limestone. Brooks Falls and Sandstone Falls in the southern section of the park are formed by resistant sandstone outcrops of the Stoney Gap member of the Hinton formation. The thickest limestone beds in the park are included in the Hinton formation.

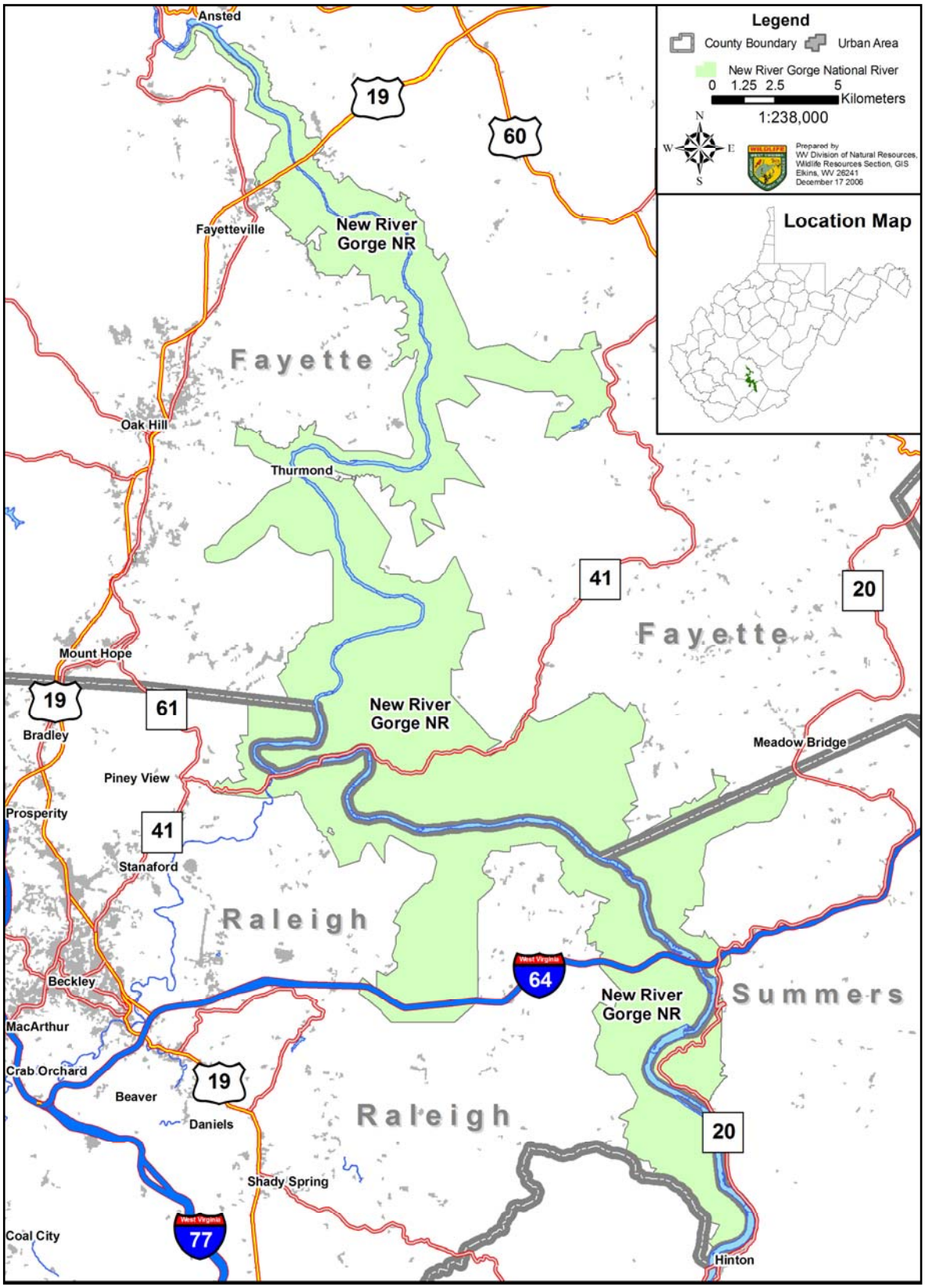


Figure 1. New River Gorge National River and vicinity.

The landforms and soils of the park vary in relation to underlying bedrock geology. In the northern section, on the more resistant formations of the Pottsville group, there is a narrow, steep-sided gorge which is rimmed by prominent cliff bands and nearly level plateaus. Soils derived from these parent materials tend to be coarse textured and highly acidic with relatively low fertility. The river in the northernmost section has a high gradient and nearly continuous rapids. In the southern section, on the more erodible formations of the Mauch Chunk group, there is higher relief, the gorge is wider, and landforms are more rounded. Soils derived from these parent materials tend to be finer textured and somewhat less acidic with higher fertility. The river in this section has a lower gradient and there are larger areas of floodplains. High gradient reaches in the southern section are located where sandstone outcrops occur.

Soils in the park are mapped in five associations (Gorman and Espy 1975; Sponaugle et al. 1984). The Dekalb - Gilpin - Ernest association is mapped on the plateaus in the northern section roughly corresponding to the Pottsville geologic group. The Steep rock land - Dekalb - Gilpin association is mapped on gorge slopes in the northern section roughly corresponding to the Pottsville geologic group. The Calvin - Gilpin association is mapped in areas of Fayette and Raleigh counties roughly corresponding to the Mauch Chunk geologic group. The Calvin high base substratum - Berks - Gilpin association is mapped in upland areas of Summers County roughly corresponding to the Mauch Chunk geologic group. The Monongahela - Kanawha - Chagrin association is mapped in small areas of floodplains in Summers County.

Previous botanical studies in NERI have included floristic inventories, rare plant surveys, and, more recently, ecological research. Phillips (1969) conducted a floristic inventory of several sites along the New River for her PhD dissertation. Grafton and McGraw (1976) surveyed the flora of the New River Gorge, and their pamphlet briefly described plant communities of the gorge with special reference to pioneer communities along the river and cold coves of tributary canyons. Grafton and Eye (1982) listed acreage by wetland class (Cowardin et al. 1979) and dominant and rare vascular plant species present at Kate's Branch wetland. Rouse and McDonald (1986) surveyed several sites in the park for rare plant species, and their report was the first to describe the unique "Appalachian river flatrock" communities at Camp Brookside, Keeney Creek, and Sandstone Falls. A set of vegetation maps was produced for the park in 1988, based on interpretation of 1986 leaf-on infra-red aerial photography. Map classes were based primarily on physiognomy. Details on authorship, methodology, and map class descriptions are lacking, but photos and Mylar quadrangle sheets with classified polygons are housed at NERI headquarters in Glen Jean. A reconnaissance study of vegetation in the vicinity of the Endless Wall was conducted by Fortney et al. (1994). Further qualitative assessment of plant communities at Camp Brookside was made by McDonald and Trianosky (1995). Additional rare plant surveys were conducted in the park by the WVNHP (McDonald 1989; McDonald and Hartman 1990; McDonald 2000a, b). Suiter (1995; Suiter and Evans 1999) conducted a floristic survey of 34 sites within the park for his Master's thesis and classified communities in accordance with early drafts of WVNHP's plant community classification (Trianosky 1994) and TNC's Eastern Region community alliance classification (Sneddon et al. 1994). Recent quantitative ecological studies in the park have focused on conifer-dominated communities, including eastern hemlock forests (Wood 1999), the flatrock woodland at Camp Brookside (Mitchem and Johnson 2001; Mitchem 2004), and the Virginia pine forests along the Endless Wall (Maxwell 2006). This report integrates information from previous reports

(Vanderhorst 2001b, 2002b) which cover the methods and results of early stages of our effort to classify and map the vegetation of NERI.

The vegetation of the park is characterized by extensive upland deciduous forests, smaller areas of conifer-dominated upland forest, and very small areas of specialized communities associated with cliffs, wetlands, and riparian zones. The park is included in the mixed mesophytic forest region of Braun (1950) which she considered to be the most ancient member of the deciduous forest formation. The mixed mesophytic climax forest is composed of a high diversity of tree species adapted to moist environments with no clear dominance by any one species. Important trees in the park include *Aesculus flava* (yellow buckeye), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Tilia americana* (American basswood), *Tsuga canadensis* (eastern hemlock), and species of *Acer* (maples), *Betula* (birches), *Carya* (hickories), *Fraxinus* (ashes), *Magnolia* (magnolias), *Pinus* (pines), and *Quercus* (oaks). Cliff areas include tall, sparsely vegetated rock faces with narrow strips of pine forest and woodland along their tops. Wetlands include small forested seeps and beaver-influenced herbaceous and shrub communities. Riparian zones include forests, woodlands, and prairies.

NERI was established as a National Park Service unit in 1978. In the two centuries before this, vegetation in almost all areas of the park was subject to direct impacts of human activities, including coal mining, logging, burning, farming, transportation, and residence. Many of the forests in the park have been logged multiple times, but currently there are large areas of maturing second-growth and possibly some small old-growth stands. Vegetation has also been impacted by the introduction of exotic species. Root sprouts of *Castanea dentata* (American chestnut) are today common in understories of dryer forests of the park and attest to the importance of this native tree prior to its decline brought on by an exotic fungus, *Cryphonectria parasitica* (chestnut blight), in the early 1900s. Today, eastern hemlock is similarly threatened by an exotic insect pest, *Adelges tsugae* (hemlock wooly adelgid), which has recently been found in the park. Exotic insects and/or diseases also threaten *Fagus grandifolia* (American beech), *Cornus florida* (flowering dogwood), *Morus rubra* var. *rubra* (red mulberry), and other native plant species. Early successional vegetation has reclaimed many areas which were cleared in the past, especially where abandoned farms and mines have been acquired by the NPS. Vegetation in these areas usually includes a large component of exotic plant species, including intentional introductions and adventive weeds. Weedy exotics have also become established in natural vegetation types, especially rich forests and riparian communities. Impacts on vegetation from recreational activities in the park are minimal in most areas of the park, but are concentrated and significant in some areas, especially along the river and cliffs. Natural disturbance processes which affect vegetation in the park include windfall, landslides, flooding, scouring, herbivory, fire, and ice storms.

Methods

Vegetation Classification

Vegetation classification for NERI was based on data from 277 plots sampled in 1998 through 2006 (Figure 2). Two hundred seventy-three plots are located within the proclamation boundaries of the park and four plots are located close to, but outside the park boundary. The strategy for plot sampling was guided by a combination of geographical representation, environmental gradient analysis, aerial imagery interpretation, and recognition of distinct communities and landscape patterns as they were encountered in the field, as constrained by logistics and budgets. For purposes of contract administration, the park was divided into three sections, and sampling methods varied somewhat between sections and years.

Fieldwork for classification and mapping of the lower (northern) section of the park, from Stone Cliff downstream to Anstead, commenced in 1998. Vegetation sampling in this early phase consisted of transects, mapping zones, and plots. Twelve transects were positioned to cross major ecological gradients, including landforms, elevation, and aspect (Figure 2). Coordinates of the start and end points were collected with Trimble Basic Global Positioning System (GPS) units and were post-process differentially corrected. Points were sampled at 50 m (164 ft) intervals along the transects. Data collected at each point included stand physiognomy, estimated cover by dominant vascular plants in each stratum, and environmental variables. A variation of the transect methodology was applied to eight selected areas (Figure 2), mostly floodplains, using mapping zones rather than points. Within each area, sketch maps were hand drawn for zones delineating areas of relatively uniform vegetation; data collected for each zone included stand physiognomy, estimated cover by dominant vascular plants in each stratum, and environmental variables. Data from transects and mapping zones were intended primarily to assist with vegetation mapping, but were also used as ancillary data for classification purposes. Plot sampling was also initiated in 1998 to form the basis for vegetation classification. Forty-one plots were sampled in the lower section in 1998 (Figure 2).

Fieldwork on the upper (southern) section of the park, from Hinton downstream to Prince, was conducted in 1999 when mapping zones in five selected areas and 93 plots were sampled (Figure 2). Data collected in 1998 and 1999 formed the basis for a vegetation classification and map produced for the lower and upper thirds of NERI (Vanderhorst 2001b).

In 2001 through 2006 an additional 143 plots were sampled (Figure 2), concentrating on the middle section of the park from Prince downstream to Stone Cliff and under-sampled areas and community types in the upper and lower sections. Landform and ecological land unit (ELU) models were developed for the park to assist with plot stratification for this final phase of fieldwork. These models were developed using ArcGIS following AML code developed by TNC (Biasi 2001) with modifications appropriate for the study area (Bender 2002). The landform model was developed from a 30 m digital elevation model, using moisture and topographic position indices combined with slope and aspect to classify 12 landform types (cove/ravine N/NE, cove/ravine S/SW, dry flat, flat summit/ridge, sideslope N/NE, sideslope S/SW, slope bottom, slope crest, steep slope N/NE, steep slope S/SW, stream, and upper slope). Due to the scale and precision of the digital elevation model many areas of floodplain along the

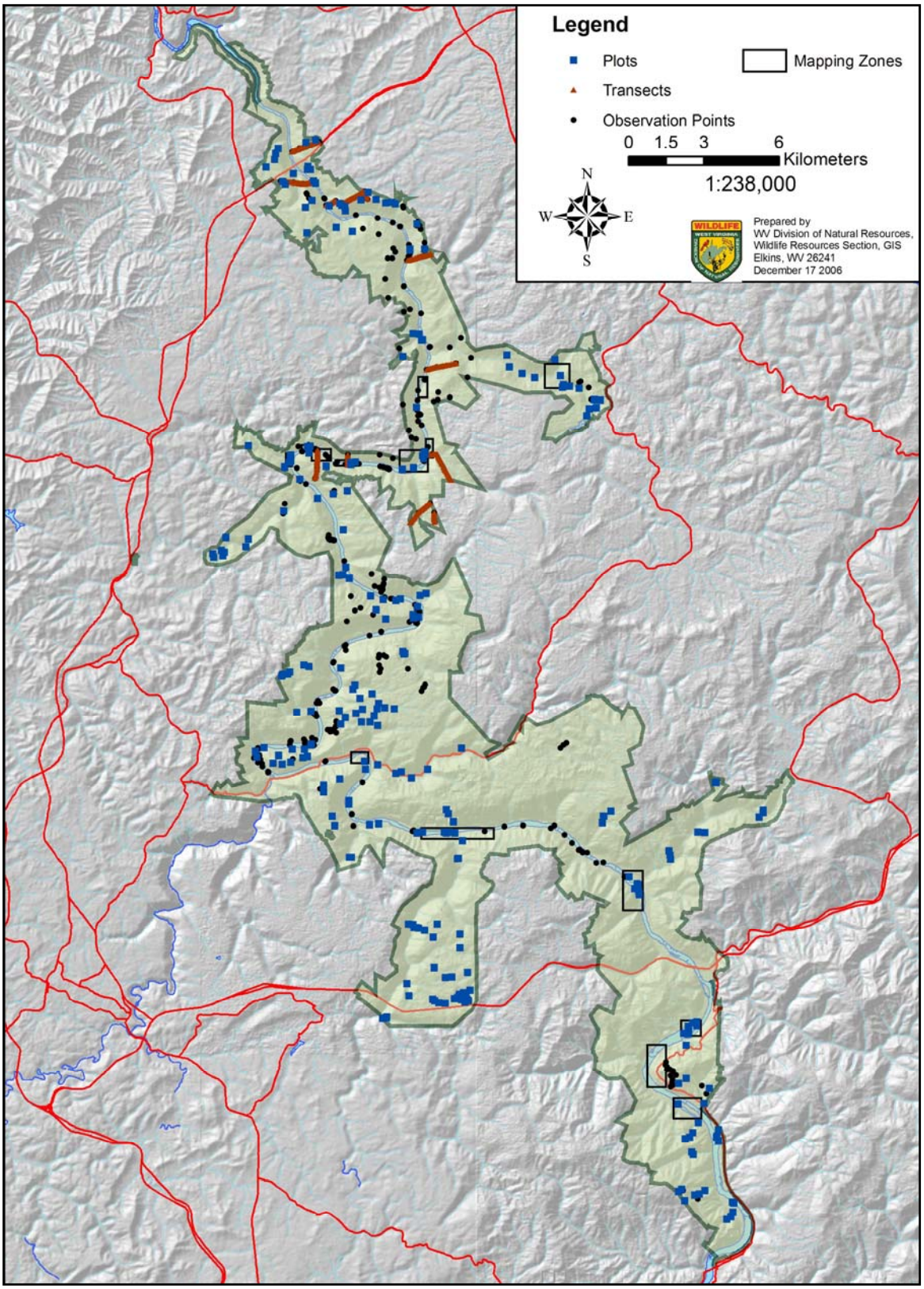


Figure 2. Locations of plots, transects, observation points, and mapping zones sampled for vegetation classification and mapping of New River Gorge National River.

New River were classified as stream. The ELU model concatenates the 12 landforms with 2 elevation classes <426 m and >426 m (<1,400 ft and >1,400 ft) and 2 geology classes (Pottsville and Mauch Chunk) to classify 48 units which occur in the park (Table 1). ELU types of existing plot locations were determined and an attempt was made to place additional plots within ELU types which were under-sampled. Despite this, due to poor GPS reception and other logistical difficulties, some uncommon ELU types were not sampled, and there is some remaining sampling inequity among more common types (Table 1). Plots were also sampled to document unique types which were recognized in the field or from aerial imagery.

Methods for sampling plots for this project are consistent with standards of the U.S. Geological Survey / National Park Service Vegetation Mapping Program (TNC and ESRI 1994a) and the Ecological Society of America (2002). The standard vegetation plot field form (Appendix A) used for this project was Form 3: quantitative community characterization (Sneddon 1993). Plots were placed in the field to sample homogenous vegetation representative of the larger stand (Mueller-Dombois and Ellenberg 1974) and, usually, to avoid disturbed sites and weedy areas. Plots were typically 20×20 m (65×65 ft) (circular in 1998-1999, square in 2001-2006) but size and shape were sometimes altered to accommodate small patch and linear communities. Coordinates for plot locations were collected using Trimble GPS units and these positions were post-process differentially corrected. Starting in 2002, photographs were taken of most plots. Three types of data were collected: metadata, environmental data, and vegetation data. Metadata included plot code, directions to the plot, representativeness, surveyors' names, sampling date, location coordinates, and associated GPS files.

Environmental plot data included environmental comments, landscape comments, slope, aspect, elevation, and information on geology, landform, topographic position, hydrology, and soils. Soil information included a profile description, texture determined by hand in the field, and pH determined in the field. Starting in 2002, soil was collected from plots for chemical analysis. The surface organic layer was scraped off and soil was collected from the top 10-15 cm (4-6 in) of the mineral horizon from three to five subsamples scattered around each plot. Subsamples from each plot were combined and mixed, the soil was dried and sieved, and 50 g (1.6 oz) samples were sent to Brookside Laboratories Inc. (New Knoxville, OH) for chemical analysis; tests included total exchange capacity, pH, % organic matter, estimated N release, and ppm S, P, Ca, Mg, K, Na, B, Fe, Mn, Cu, Zn, and Al.

Vegetation plot data included information on physiognomy (structure) and species composition. Height and percent cover of each stratum (canopy, subcanopy, tall shrub, short shrub, herb or field layer, and nonvascular) were estimated. Physiognomic type (forest, woodland, shrubland, herbaceous, non-vascular, and sparsely vegetated) of the stand was determined according to the definitions provided in Appendix B (adapted from Sneddon 1993; TNC and ESRI 1994a). Diameter at breast height (dbh) was measured for all woody stems greater than 7 cm (2.75 in) dbh. All vascular plants in plots were identified and percent cover in each stratum by each taxon was determined by ocular estimation. Starting in 2002, percent cover by individual bryophytes and lichens was recorded for species having greater than 1% cover. Unknown plant taxa were collected, pressed, and dried for identification in the herbarium. Primary references used in the field to key out vascular plants included Flora of West Virginia (Strausbaugh and Core 1977) and Manual of Vascular Plants of Northeastern United States and Canada (Gleason and Cronquist 1991). Bryophyte collections were identified by Susan Studlar (WV University) and

Table 1. Ecological Land Unit (ELU) specifications, area, and plot sampling stratification. ELUs are listed in order of abundance (hectares) within New River Gorge National River.

ELU	Elevation	Geologic group	Landform	Hectares	# Plots[a]
2230	>1400 ft	Pottsville	dry flat	2961.56	16
2214	>1400 ft	Pottsville	flat summit/ridge	2004.87	24
2233	>1400 ft	Pottsville	slope bottom	1628.75	23
2321	>1400 ft	Mauch Chunk	cove/ravine N/NE	1516.99	9
2323	>1400 ft	Mauch Chunk	cove/ravine S/SW	1443.67	9
2313	>1400 ft	Mauch Chunk	upper slope	1401.59	7
2213	>1400 ft	Pottsville	upper slope	1368.87	6
2223	>1400 ft	Pottsville	cove/ravine S/SW	1301.01	10
2221	>1400 ft	Pottsville	cove/ravine N/NE	1256.94	7
1340	<1400 ft	Mauch Chunk	stream	1109.64	19
2210	>1400 ft	Pottsville	steep slope N/NE	851.57	5
2314	>1400 ft	Mauch Chunk	flat summit/ridge	758.55	4
1333	<1400 ft	Mauch Chunk	slope bottom	737.32	19
2333	>1400 ft	Mauch Chunk	slope bottom	657.85	6
2330	>1400 ft	Mauch Chunk	dry flat	645.87	2
2211	>1400 ft	Pottsville	steep slope S/SW	632.88	6
2311	>1400 ft	Mauch Chunk	steep slope S/SW	547.42	3
2240	>1400 ft	Pottsville	stream	546.13	11
2310	>1400 ft	Mauch Chunk	steep slope N/NE	542.5	4
2320	>1400 ft	Mauch Chunk	sideslope N/NE	480.38	3
2322	>1400 ft	Mauch Chunk	sideslope S/SW	470.73	3
2212	>1400 ft	Pottsville	slope crest	469.79	6
2222	>1400 ft	Pottsville	sideslope S/SW	450.81	3
1323	<1400 ft	Mauch Chunk	cove/ravine S/SW	431.48	3
2220	>1400 ft	Pottsville	sideslope N/NE	424.17	2
1330	<1400 ft	Mauch Chunk	dry flat	413.84	20
1321	<1400 ft	Mauch Chunk	cove/ravine N/NE	413.61	4
1221	<1400 ft	Pottsville	cove/ravine N/NE	387.24	7
1223	<1400 ft	Pottsville	cove/ravine S/SW	382.64	2
2312	>1400 ft	Mauch Chunk	slope crest	324.82	6
2340	>1400 ft	Mauch Chunk	stream	302.41	3
1240	<1400 ft	Pottsville	stream	301.59	7
1233	<1400 ft	Pottsville	slope bottom	248.5	9
1210	<1400 ft	Pottsville	steep slope N/NE	198.81	2
1211	<1400 ft	Pottsville	steep slope S/SW	157.45	1
1310	<1400 ft	Mauch Chunk	steep slope N/NE	110.25	2
1311	<1400 ft	Mauch Chunk	steep slope S/SW	103.16	0
1322	<1400 ft	Mauch Chunk	sideslope S/SW	70.31	0
1320	<1400 ft	Mauch Chunk	sideslope N/NE	59.95	1
1220	<1400 ft	Pottsville	sideslope N/NE	58.91	1
1222	<1400 ft	Pottsville	sideslope S/SW	55.73	0
1230	<1400 ft	Pottsville	dry flat	49.2	0
1313	<1400 ft	Mauch Chunk	upper slope	47.23	1
1213	<1400 ft	Pottsville	upper slope	44.25	0
1314	<1400 ft	Mauch Chunk	flat summit/ridge	19.09	0
1212	<1400 ft	Pottsville	slope crest	5.36	0
1312	<1400 ft	Mauch Chunk	slope crest	2.52	0
1214	<1400 ft	Pottsville	flat summit/ridge	2.22	0
Totals				28400.43	276

[a]One plot is missing from this analysis because it is located outside the boundaries of the ELU model.

lichen collections were identified by Don Flenniken, author of the Macrolichens in West Virginia (Flenniken 1999).

Data from plots, transect points, and mapping zones were entered in the Plots 2.0 database, an Access database developed by NatureServe for the U.S. Geological Survey / National Park Service Vegetation Mapping Program. Plots were assigned alphanumeric plot codes beginning with NERI and transect points and mapping zones were assigned codes beginning with NEWT. Plant species nomenclature follows Harmon et al. (2006), except for *Dichanthelium* and *Panicum* which follow the Flora of North America (Freckmann and Lelong 2003). Alphanumeric plant codes from the Plants database Version 3.1 (USDA NRCS 2001) were used to facilitate data entry and data analysis; codes for those taxa which did not have codes in Plants were created with a "WV" suffix.

Multivariate analysis, utilizing PC-Ord software (McCune and Mefford 1999), was used to provide insight for classification of vegetation. This was an iterative process which involved analyses of various sets and subsets of plot data, using hierarchical agglomerative cluster analysis, non-metric multidimensional scaling (NMS), and indicator species analysis. An earlier iteration of vegetation analysis for the park (Vanderhorst 2001b) utilized two-way indicator species analysis (TWINSPAN), but this method has been criticized in recent years (McCune and Grace 2002) and was not used for this iteration. Data screening for all analyses included elimination of all nonvascular taxa, vascular taxa with uncertain identification or identified to the generic or higher taxonomic level, and taxa which occurred in only one plot. Outlier plots were identified and removed from analyses because they can have large effects on outcomes and conclusions (McCune and Grace 2002). Several data transformations were tried but most analyses performed best with cover values square-root transformed. Cluster analysis was performed on the entire data set and on various subgroups. Cluster analysis was run using the Sorenson distance measure and Flexible Beta group linkage method with Beta set to -0.25. Indicator species analysis (Dufrêne and Legendre 1997) was used to identify the species which help define the groups. NMS was run on smaller subgroups, either defined by the cluster analysis or by physiognomy (e.g. deciduous forest, herbaceous) or hydrology (e.g. wetland, upland, riparian). NMS was run using the Sorenson distance measure and the auto-pilot mode in PC-Ord set to "slow and thorough."

The final vegetation classification for the park also incorporates information gained from plot environmental data, transect points, mapping zones, plot data from other WV sites (Vanderhorst 2000a, 2001a, 2002a; Vanderhorst and Streets 2006; WVNHP 2006; Byers et al. 2007), and aerial imagery interpretation, and has been molded by a need for conformity with the USNVC. Because of this, and the realization that plot sampling is always an imperfect representation of reality, the classification does not conform to the results of any one multivariate analysis. This is illustrated by the graphic results of cluster analysis and NMS. These analyses were run on the classified plot data of natural and semi-natural associations, with plots divided into three subsets representing ecological groups (upland forests and woodlands, riparian communities, and wetlands) using the standard protocols described in the previous paragraph.

After the final classified NERI community types (putative associations) were decided upon, individual plots were attributed to each community type. Ten plots were not assigned to community types because they represented ectotones, disturbed areas, or seemingly unique

vegetation. Indicator species analysis was run on various subgroupings to identify plant species most useful for distinguishing types in the field. Floristic constancy/cover tables and plot floristic synthesis tables were developed for each community type using Access queries and Excel pivot tables. Similar summary tables were produced for environmental variables using Access queries. A key to community types was developed to facilitate identification of associations in the field based on floristic and environmental variables. This key was also used to classify the transect points and mapping zones to serve as an additional mapping tool.

The vegetation classification for the park was "cross-walked" to the USNVC in consultation with NatureServe ecologists. Data from each NERI community type was compared to existing associations in the USNVC and decisions were made either to place the local types in existing associations or to develop new associations. In one case, two NERI community types were lumped into one USNVC association. One other NERI community type was treated as a local provisional type without an equivalent USNVC association. Data from the floristic and environmental tables were used to write local association descriptions and new global USNVC association descriptions, and to edit existing global USNVC association descriptions to accommodate NERI vegetation. Local and global descriptions were entered in Biotics, the central database for biodiversity information maintained by NatureServe.

Aerial Photography Acquisition and Processing

Color infrared, stereo pair, 1:12,000 scale, aerial photography of New River Gorge National River was acquired on March 27, 2003, during leaf-off conditions, by Sanborn Mapping Company, Inc. The photography was delivered to the National Park Service (NPS), quality checked, accepted as provided, and sent to North Carolina State University (NCSU). Upon receipt at NCSU, the aerial photographs were counted to make sure that none were missing, scanned and saved in .tif format, and placed in the data archive that NCSU maintains for the NPS Northeast Region Inventory & Monitoring Program. Associated data and information provided by Sanborn Mapping Company, Inc. that are also stored in the data archive include the airborne global positioning system (GPS) and inertial mapping unit (IMU) data files, the camera calibration certificate, a hardcopy flight report for the photography that crosswalks the airborne GPS and IMU data to the photo frame numbers, and a digital flight index map.

A digital orthophoto mosaic was produced from 471 color infrared aerial photographs, scanned at 600 dpi with 24-bit color depth. Scanned .tif images of the aerial photographs were imported into ERDAS IMAGINE IMG format where a photo block was created using the airborne GPS and IMU data that Sanborn Mapping Company, Inc. supplied with the aerial photography. The photo block was manipulated until it could be triangulated with a root mean square error of less than 1. At this point, single frame orthophotos (one for each aerial photograph) were generated within IMAGINE and exported to IMAGINE LAN format. Then the .lan files were imported into ER Mapper's native (ERS) format, and an ER Mapper algorithm was created which contained the color balancing information and the cutlines created for the final mosaic. Band interleaved by line (BIL) image and header files for the mosaic were generated in ER Mapper, the BIL image was imported into IMAGINE IMG format, and, finally, the IMG image was compressed using MrSID software with a 20:1 compression ratio. The final mosaic, in both IMG and MrSID formats, is stored in the NCSU data archive.

A metadata record for the mosaic was prepared in accordance with the current Federal Geographic Data Committee standards (FGDC 1998a). Metadata were produced in notepad and parsed using the USGS metadata compiler (USGS 2004). After all errors and omissions identified by the parser were corrected, the metadata compiler was used to generate final TXT, HTML, and XML versions of the metadata record which are stored in the data archive. Key information for the mosaic is summarized in Table 2.

Vegetation Mapping

A vegetation map for NERI was developed as a personal geodatabase using ESRI ArcGIS software. The geodatabase includes separate point feature classes for locations of plots, transect points, and observation points, and polygon feature classes (clipped by the park boundary and unclipped) for vegetation and non-vegetated land cover.

Point feature classes (Figure 2) were produced from locational coordinates collected using GPS units (Trimble Basic, Explorer, and GeoExplorer; Garmin 76) or from points mapped by hand on topographic maps. Trimble GPS units were used to collect coordinates of plot locations whenever satellite reception was possible, and were also used for start and end points of transects and for some observation points. GPS data from Trimble units were post-process differentially corrected and exported as attributed GIS files using Trimble Pathfinder Office software. Garmin GPS units were used only for collecting coordinates of observation points. GPS data from Garmin units were exported as attributed GIS files using DNRGarmin software (MDNR 2001). Accuracy of Garmin GPS data was tested by collecting coincident points with Trimble units at several locations. These tests and obvious “mis-mapping” of Garmin GPS points based on interpretation of aerial imagery show that the Garmin units were often significantly less accurate than the Trimble units. When GPS reception was not possible due to poor satellite reception (most common on north slopes and in deep narrow canyons) points were hand mapped on topographic maps and in the geodatabase feature classes. Point feature classes for plots and observations include attribute information on GPS methods for each point. Transect points were mapped by hand in GIS, interpolating between the GPS start and end points with reference to aspect, elevation, and physiognomy recorded on field data sheets and interpretation of aerial imagery. Plot and transect points were attributed with NERI community type names determined by the vegetation classification. Observation points are less completely attributed and were intended primarily for use by the vegetation mapper; these are points with GPS coordinates that represent distinctive vegetation types that were already adequately sampled by plots, or ecotones and boundaries between distinctive vegetation types. A large proportion of the observation points were sampled during a three-day float of the New River from Meadow Creek downstream to Fayette Station in September 2003.

Delineation of vegetation map classes was based on interpretation of digital aerial imagery utilizing additional digital and non-digital data sources. The primary imagery used as a base layer for mapping was the digital orthophoto mosaic of leaf-off color infrared aerial photography flown for this project in late March 2003. Additional digital aerial imagery sets which were used included leaf-off color infra-red digital orthophoto quarter quads flown in spring 1996 (USGS 1995) and true color leaf-off orthophoto quarter quads flown in spring 2003 (WVSAMB 2005).

Table 2. Summary of key information for the New River Gorge National River (NERI) digital orthophoto mosaic.

Title of metadata record:	New River Gorge National River Color Infrared Orthorectified Photomosaic – Leaf-off (ERDAS IMAGINE .img and MrSID formats)
Publication date of mosaic (from metadata):	September 15, 2005
Date aerial photography was acquired:	March 27, 2003
Vendor that provided aerial photography:	Sanborn Mapping Company, Inc.
Scale of photography:	1:12,000
Type of photography:	Color infrared, stereo pairs
Number of aerial photographs delivered:	471
Archive location of aerial photographs, airborne GPS and IMU files, and camera calibration certificate:	North Carolina State University, Center for Earth Observation
Scanning specifications:	600 dpi, 24-bit color depth
Horizontal positional accuracy of mosaic:	1.31 meters, meets Class 1 National Map Accuracy Standard (Calculated for NERI, Gauley River National Recreation Area (GARI) and Bluestone National Scenic River (BLUE) together)
Number of ground control points upon which estimated accuracy is based:	147 (for NERI, GARI, and BLUE together)
Method of calculating positional accuracy:	Root mean square error
Archive location of mosaic and metadata:	North Carolina State University, Center for Earth Observation
Formats of archived mosaic:	IMG (uncompressed) and MrSID (20:1 compression)

Transparencies of leaf-on color infra-red aerial photography flown for this project in October 2003 were examined on a light table to help distinguish signatures, (e.g. oak and tuliptree canopies, American water-willow cobble bars) which are not apparent on leaf-off imagery. Original transparencies used to produce the leaf-off orthophoto mosaic were also examined on a light table to distinguish problematic signatures. Utilization of these multiple sets often helped to overcome deficiencies (e.g. shading) of the primary orthophoto mosaic. Ancillary GIS layers used to assist photointerpretation included digital rastor graphs of USGS topographic maps and the landform and Ecological Land Unit models developed for this project.

Aerial imagery interpretation was initiated by examining signatures throughout the park in relation to GIS-mapped plot, transect, and observation points, and hand-drawn mapping zones. Selection of map classes was driven by the imagery. When individual associations could be reliably mapped, these were chosen as map classes. Composite map classes were used when individual associations could not be distinguished due to tight zonation or patchiness. Map classes were also developed for aquatic and cultural features and vegetation. The stated minimum mapping unit for this project was 0.5 ha (1.23 ac), but smaller polygons were sometimes delineated for small patch (e.g. Cliff Top Virginia Pine Forest) or linear (e.g. roads) types with distinct signatures. Small creeks were mapped to the extent that their courses were visible on photography, with only short gaps estimated. Polygons were drawn using the ArcGIS editing tools with the screen set at various scales, commonly 1:3,000, depending on the vegetation patch size and distinctiveness of boundaries. Polygons were attributed with the name of the map class and, sometimes, comments related to the vegetation or its photo signature. After a relatively complete list of map classes was established, a domain was created to limit map class names to this list. The domain was altered as a few additional map classes were identified. Topology was established to enforce rules for no gaps or overlaps. Mapping was started at a central location of the park and worked outwards to adjacent areas until the entire park was mapped. All areas within the park boundary were mapped and mapping was usually extended somewhat beyond the boundary to insure complete coverage. The completed vegetation polygon feature class was clipped by the park boundary and aerial statistics were calculated to summarize the relative abundance of each map class within the park.

After the vegetation map was delivered to NCSU for thematic accuracy assessment in May 2006 a few changes were made to the geodatabse. One map class, Successional Forest, was eliminated, and the four polygons that were attributed to this class were changed to Successional Tuliptree Forest or Disturbed Area. Changes were also made to the vegetation classification crosswalk to the USNVC and to nomenclature of the NERI community types, but these do not affect the results of accuracy assessment for any map class.

Metadata records for each feature class in the vegetation map geodatabase were prepared in accordance with the current FGDC standards (FGDC 1998a). Metadata records were edited with ESRI ArcGIS, the NPS Metadata Tools and Editor, and Microsoft Notepad and were parsed using the USGS metadata compiler (USGS 2004). All errors and omissions identified by the parser were corrected. Metadata records are included within the final geodatabase for the vegetation map.

Accuracy Assessment

Positional Accuracy Assessment

For purposes of accuracy assessment, mosaics of Bluestone National Scenic River, Gauley River National Recreation Area, and New River Gorge National River were treated as a single entity because the photography was acquired in a single flight with the same camera and with one set of airborne GPS and IMU data. Horizontal positional accuracy of the mosaics was assessed using guidelines of the USGS/NPS Vegetation Mapping Program (ESRI, NCGIA, and TNC 1994). Well-defined positional accuracy ground control points were placed throughout all quadrants of each mosaic in ESRI ArcView 3.3. Ground control points and zoomed-in

screenshots of each point were plotted on hard copy maps with the mosaic as a background. These maps and plots were used to locate the ground control points in the field. Field staff recorded the ground control point coordinates with a Trimble Pro XRS. Mapped ground control points that were physically inaccessible were also noted. The field crew collected accuracy assessment data at 160 ground control points. The coordinate data were collected with real-time GPS and post processed with differential correction using Pathfinder Office software. Prior to calculating accuracy, 13 ground control points were identified as outliers with SAS's JMP program and removed. The field-collected GPS coordinates for the remaining 147 points were compared to the coordinates obtained from each mosaic viewed in ESRI ArcView 3.3. Both pairs of coordinates for each point were entered into a spreadsheet in order to calculate horizontal accuracy (in meters). The accuracy calculation formula is based on root mean square error (FGDC 1998b; MGCGI and MLMIC 1999). Figure 3 shows the distribution of the ground control points within the three parks.

Thematic Accuracy Assessment

The thematic accuracy of the vegetation map was assessed by NCSU's Center for Earth Observation. The assessment was performed on the digital vegetation map dated May 17, 2006, and delivered June 6, 2006, using the vegetation key dated May 30, 2006. The vegetation map was not clipped to the park boundary.

In preparation for selecting the sample of thematic accuracy assessment points, vegetation map polygons were excluded from the sampling frame based on the following criteria:

- Polygons on private land within the park boundary were excluded to avoid potential trespass issues during field data collection.

- Polygons smaller than the minimum mapping unit of 0.5 ha (1.23 ac) were excluded.

- Polygons representing non-vegetated land cover such as roads, railroads, etc., were excluded.

Based on these criteria, the following map classes were eliminated from the accuracy assessment: Black Willow Slackwater Woodland, Riverbank Tall Herbs, Riverscour Prairie, Silver Maple Floodplain Forest, Bridge, Creek, Developed Area, Pond, Railroad, River, Road, Tipple, Cobble, Flatrock Pavement, and Washout.

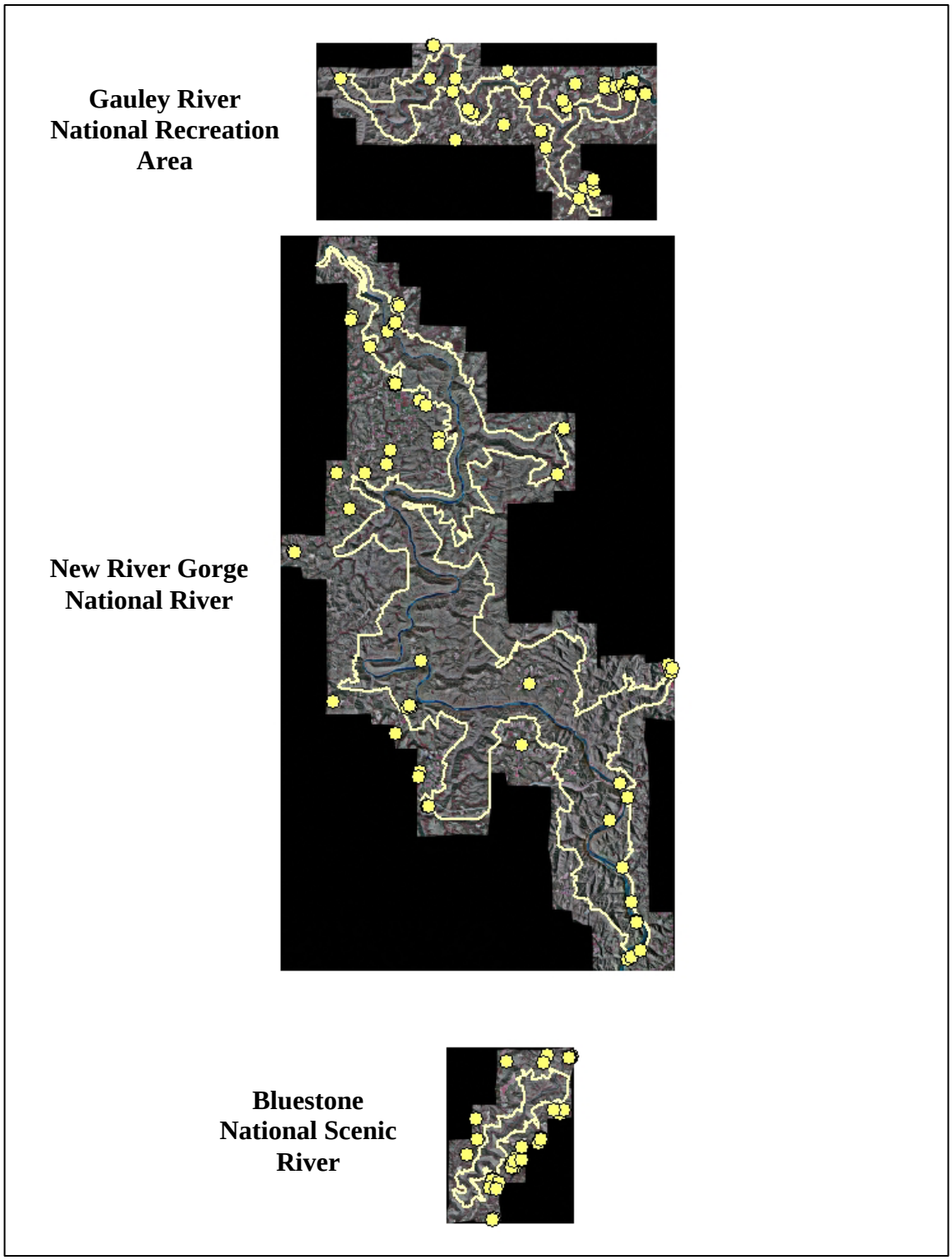


Figure 3. Ground control points used to calculate horizontal positional accuracy of the Gauley River National Recreation Area, New River Gorge National River, and Bluestone National Scenic River digital orthophoto mosaics.

Table 3 shows the map classes that were included in the accuracy assessment. A total of 3,296 polygons covering 24,493 ha (60,523 ac) was used to determine the recommended number of accuracy assessment points for each map class (see Table 3). The recommended number of sample points per map class varies according to the rarity of the class in terms of number of polygons and total area, as follows (TNC and ESRI 1994b):

Scenario A: The class is abundant. It covers more than 50 ha (123 ac) and consists of at least 30 polygons. In this case, the recommended sample size is 30.

Scenario B: The class is relatively abundant. It covers more than 50 ha (123 ac), but consists of fewer than 30 polygons. In this case, the recommended sample size is 20.

Scenario C: The class is relatively rare. It covers less than 50 ha (123.5 ac), but consists of more than 30 polygons. In this case, the recommended sample size is 20.

Scenario D: The class is rare. It has more than 5 but fewer than 30 polygons and covers less than 50 ha (123.5 ac). In this case, the recommended sample size is 5.

Scenario E: The class is very rare. It has fewer than 5 polygons and occupies less than 50 ha (123.5 ac). In this case, it is recommended that the existence of the class be confirmed by sampling one point per polygon.

The sampling frame was further modified to maximize efficiency of fieldwork. Ten regions and two segments of the New River from which the sample of accuracy assessment points would be selected were defined based on accessibility and diversity of vegetation classes. Figure 4 shows these regions and river segments consisting of 1,754 polygons covering 13,592.5 ha (33587.6 ac) (roughly 47% of the total area represented on the vegetation map). The objective was to concentrate field data collection in areas distributed throughout the park that were reasonably accessible and that contained diverse vegetation, and to exclude areas that would be inordinately difficult and time consuming to visit.

A stratified random sample of polygons was selected from the areas shown in Figure 4. Point locations within each sample polygon were generated using a random point generator in ArcGIS 9.1. (ESRI 2005). One random point was generated for each polygon unless accessibility of a particular vegetation class was extremely limited.

Multiple points were generated for polygons of rare, widely scattered, and less accessible vegetation classes such as Forest Seep, Cliff Top Virginia Pine Forest, and Yellow Birch Cold Cove Forest. When multiple points were generated for a polygon, they were adjusted, if necessary, to ensure that they were a minimum of 60 m (196 ft) apart. Sample points located close to polygon boundaries were moved to at least 30 m (98 ft) inside the polygon to avoid ecotones. In some cases, that was not possible, for example, where long, narrow polygons follow a linear pattern associated with the gorge or a riparian zone. Examples of these types of vegetation and land cover classes are Strip Mine Reclamation, Pine Plantation, Steep Riparian Edge, Sycamore - Ash Floodplain Forest, Yellow Birch Cold Cove Forest, and Cliff Top Virginia Pine Forest. In these cases, sample points were moved to a point approximately equidistant from the polygon perimeter. Fortunately, most of these vegetation and land cover classes had fairly discrete boundaries and there was little problem identifying them in the field.

Table 3. Thematic accuracy assessment (AA) sampling strategy for the New River Gorge National River vegetation map.

Map Class	Number of Polygons	Area Mapped (Hectares)	Number of AA Points Recommended by Protocol[a]	Number of AA Points Visited
Vegetation Class				
Cliff Top Pitch Pine Woodland	2	1.45	2	4
Successional Black Locust Woodland	2	3.32	2	1
Chinquapin Oak - Black Maple Forest	3	3.86	3	0
Eastern Red-cedar – Virginia Pine Flatrock Woodland	3	8.86	3	3
Successional Forest[b]	4	9.58	4	0
Successional Box-elder Forest	5	6.51	5	1
Backwater Slough	6	5.42	5	3
Beaver-influenced Wetland	7	18.51	5	2
Successional Virginia Pine Forest	7	13.59	5	2
Tributary Floodplain Forest	7	6.88	5	2
Oak - Tuliptree / Mountain Silverbell Floodplain Forest	11	21.82	5	1
American Water-willow Cobble Bar	25	5.62	5	1
Yellow Birch Cold Cove Forest	25	67.08	20	19
Forest Seep	29	26.84	5	20
Successional Eastern White Pine Forest	30	49.36	20	6
Sycamore - River Birch Riverscour Woodland	31	40.43	20	9
Pine Plantation	49	72.74	30	20
Sycamore - Ash Floodplain Forest	63	148.68	30	23
Steep Riparian Edge	84	254.16	30	27
Cliff Top Virginia Pine Forest	110	151.78	30	33
Successional Tuliptree Forest	125	563.33	30	33
Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest	142	199.16	30	18
Deciduous Tree / Great Laurel Forest	145	395.35	30	32
Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest	230	1,017.69	30	29
Oak - Ericad Forest	373	966.25	30	29
Sugar Maple - Yellow Buckeye - American Basswood Forest	434	7,005.69	30	29
Oak - Hickory - Sugar Maple Forest	473	5,504.89	30	39
Oak - Hickory Forest	534	6,581.81	30	53
Other Land Cover Class				
Cliff	2	5.01	2	0
Kudzu Patch	4	2.91	4	1
Utility Corridor	79	128.97	30	24
Distrubed Area	13	524.76	30	28
Strip Mine Reclamation	150	690.14	30	32
Total	3,296	24,492.97	565	524

[a]TNC and ESRI 1994b

[b]The map class "Successional Forest" appeared in the May 17, 2006 data set, but all polygons were later attributed by the vegetation mapper to other map classes.

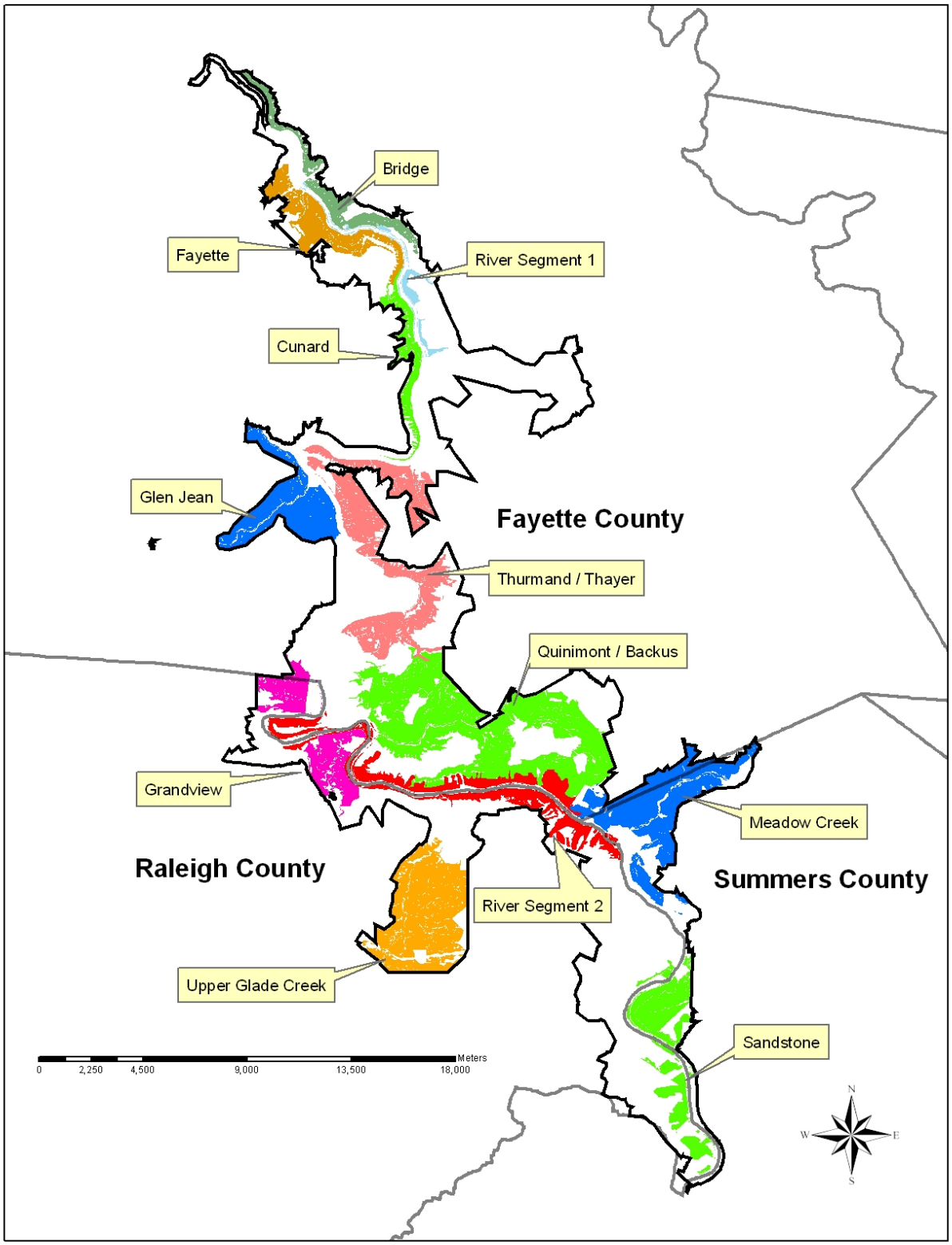


Figure 4. Regions and river segments from which the sample of thematic accuracy assessment points was selected.

An ArcGIS shapefile containing the sample points was created and the attribute table was edited to include fields needed to record the data to be collected at each point. The shapefile was imported into Trimble .ssf format and loaded into a Trimble GeoXP global positioning system (GPS) unit. This allowed the field ecologist to enter data directly into an electronic file in real time, eliminating the need for paper forms.

A field ecologist navigated to sample points using a Trimble GeoXP GPS unit. The following rules were established to deal with anticipated problems with site accessibility and/or GPS satellite signals.

1) Good GPS readings and good access to point
   a. Navigate to the point as close as possible.
   b. Enter field observation data and store the new GPS coordinates.

2) Good GPS readings and poor access to point (point extremely difficult to reach)
   a. Use GPS to navigate to well within the polygon boundary.
   b. Enter field observation data and store the new GPS coordinates.

3) Poor GPS readings and good access to point
   a. Use GPS to navigate as close as possible to the point, then use the Measure Tool in the GPS Navigation screen to obtain a bearing and distance to the point. Compass and pace to the point. Check the topographic map and aerial photography to make sure location is close to the sample point.
   b. Enter field observation data; do not alter GPS coordinates of the sample point.

4) Poor GPS readings and poor access to point (point extremely difficult to reach)
   a. Use GPS to navigate as close as possible to the polygon containing the point; use Measure Tool in the GPS Navigation screen to obtain a bearing and distance to a point well inside the polygon. Compass and pace to the point. Mark and label the point on the topographic map and aerial photograph.
   b. Enter field observation data; do not alter GPS coordinates of the sample point in the field. In the office, obtain coordinates of the point where data were collected from the topographic map and enter them into the shapefile, replacing coordinates of the original sample point.

Differentially correcting the GPS data collected using the first two methods indicated sub-meter accuracy of the planimetric (X, Y) coordinates. Based on uncorrected GPS navigation, compass and pacing, and interpretation of aerial photography, the third method yielded X, Y accuracies of ±10 m (32.8 ft). The last method, based mainly on compass and pacing and interpretation of aerial photography, yielded X, Y accuracies of ±20 m (65.6 ft).

The ecologist collected field data at a total of 524 accuracy assessment points in June 2006 (Figure 5). Prior to fieldwork, the key to NERI community types and tabular data provided with the vegetation map were studied to gain a general understanding of the different map classes. While most map classes have a direct 1:1 relationship with NERI community types, some composite map classes include multiple NERI community types. The vegetation key was used in the field until a thorough understanding of the range of variation of each NERI community type

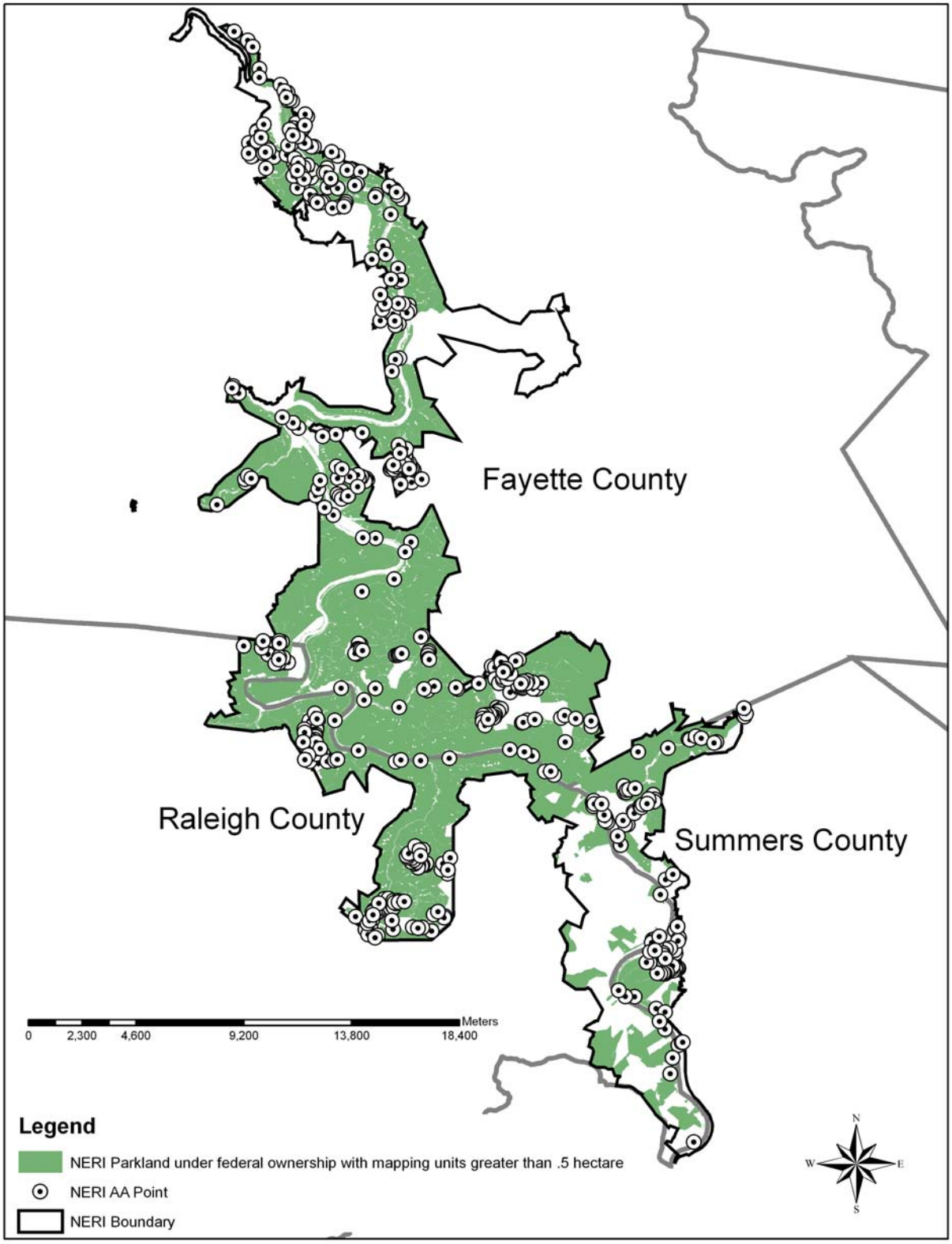


Figure 5. Locations of the 524 thematic accuracy assessment (AA) points in New River Gorge National River (NERI).

and map class was acquired. Following this, identification of composite map classes (Beaver-influenced Wetland, Disturbed Area, Steep Riparian Edge, Strip Mine Reclamation, and Utility Corridor) was based on recognition, rather than using the key. Map classes having a 1:1 relationship with NERI community types were identified according to the vegetation key. The Sugar Maple - Yellow Buckeye - American Basswood Forest map class was also identified according to the vegetation key; although the vegetation mapper had identified possible inclusions of Successional Tuliptree Forest within this map class, none were encountered during accuracy assessment fieldwork.

The minimum area of observation around the sampling point was a circle with a radius of 50 m (164 ft). Data collected for each sample point are described in Appendix C and include all items recommended in the USGS/NPS Vegetation Mapping Program protocol (TNC and ESRI 1994b). Photographs were taken at 258 sample points and are hyperlinked to the corresponding shapefile points. Example photographs are included in Appendix D.

Data from the 524 accuracy assessment points were entered in the AA Observations and AA-Species tables of the Plots 2.0 database. Accuracy assessment points are assigned alphanumeric codes beginning with NERI; therefore, there is overlap in the naming of plots and accuracy assessment points. Map class names, taxonomic nomenclature, and plant symbols entered in the database are consistent with those used for plot, transect, and mapping zone data and throughout this report.

Estimates of thematic accuracy (overall percent accuracy and the Kappa index) were calculated using a contingency matrix that compared the mapped vegetation and land cover classes with the actual vegetation and land cover classes observed in the field. Overall percent accuracy was calculated by dividing the number of correctly classified accuracy assessment points by the total number of accuracy assessment points. The Kappa index is the preferred method of reporting overall thematic accuracy because it takes into account that a certain number of correct classifications will occur by chance (Foody 1992). The USGS/NPS Vegetation Mapping Program protocol requires that the Kappa index exceeds 80% (TNC and ESRI 1994b).

Errors of omission and commission, referred to as Producer’s Accuracy and User’s Accuracy, respectively, were calculated for individual vegetation and land cover classes. Producer’s Accuracy indicates the probability that an accuracy assessment point classification is correct. It is calculated by dividing the number of correctly classified points for a map class by the total number of sample points mapped as that map class. User’s Accuracy indicates the probability that a mapped vegetation or land cover type actually represents the vegetation or land cover on the ground. It is calculated by dividing the number of correctly classified points for a map class by the total number of points that the field observer identified as being of that map class. Producer’s and User’s Accuracy should exceed 80% according to the USGS/NPS Vegetation Mapping Program protocol (TNC and ESRI 1994b).

Results

Vegetation Classification

Forty-one vegetation community types were classified in the park, representing 39 associations in the USNVC (Table 4). These include 16 upland forest and woodland types, one non-vascular type, one sparse vegetation type, 15 riparian types (including jurisdictional wetlands along the river and lower tributaries), five headwater wetland types, and three cultural types. Two upland forest types (Deciduous Tree / Great Laurel Forest and the Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest) are classified and described as distinct NERI community types but are placed in the same USNVC association. One riparian type (Tributary Floodplain Forest) is a placeholder for poorly sampled NERI vegetation with no equivalent USNVC association.

A list of vascular and non-vascular plant taxa identified from plots, transect points, mapping zones, and accuracy assessment points is provided in Appendix E. The list is sorted by scientific name and includes plant symbol, usually as assigned in the Plants database (USDA NRCS 2001), common name, family, and division. One thousand forty-one taxa are listed representing 894 plant species; the additional 147 taxa represent multiple subspecific taxa per species and identifications made to the genus level. One hundred forty-nine families are represented in six divisions, including 113 families in the Magnoliophyta (flowering plants), two families in the Pinophyta (conifers), eight families in the Polypodiophyta (ferns), one family in the Lycopodiophyta (club mosses, spike mosses), one family in the Equisetophyta (horsetails), 17 families in the Bryophyta (mosses), four families in the Marchantiophyta (liverworts), and three families in the Ascomycota (limited to lichens for this project).

Examples of graphic results of cluster analyses and NMS ordinations are provided in Appendix F. These analyses are “middle level” iterations with the plot data set divided into three subsets: upland forests and woodlands, riparian communities, and wetland communities. The final classification of plots is indicated by symbology overlain on the graphics. “Misclassifications” of individual plots are apparent in the cluster analysis dendrograms, but the overall pattern of the classification is supported by the NMS ordinations.

Tables of plot floristic summary statistics (cover and constancy) for each community type are provided in Appendix G. The types are arranged alphabetically by the NERI community name listed in Table 4. To save space, the tables use the plant symbols listed in Appendix C. Plant taxa are sorted in descending order by mean cover, then constancy.

A dichotomous key to vegetation community types is provided in Appendix H.

Global alliance and association descriptions and local association descriptions are provided in Appendix I. Appendix J is the bibliography for the global descriptions. These are arranged within the hierarchical structure of the USNVC (Anderson et al. 1998); however, the hierarchy is not indicated in the table of contents for Appendix I. Vegetation classified in the park is grouped within six classes, arranged in the following order: forest, woodland, shrubland, herbaceous vegetation, non-vascular vegetation, and sparse vegetation. Classes are further divided into groups, formations, alliances, and associations.

Table 4. Associations of the U.S. National Vegetation Classification (USNVC) occurring in New River Gorge National River (NERI).

NERI Community Name	USNVC Association Name	USNVC ELCode
Upland Forests and Woodlands		
Chinquapin Oak - Black Maple Forest	*Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest	CEGL004793
Cliff Top Pitch Pine Woodland	*Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland	CEGL006557
Cliff Top Virginia Pine Forest	*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest	CEGL007119
Deciduous Tree / Great Laurel Forest	*Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest (local subtype of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest)	CELT007543 (CEGL007543)
Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest	*Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest	CEGL008524
Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest	*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest	CEGL007543
Oak / Ericad Forest	*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest	CEGL006271
Oak – Hickory Forest	*Quercus prinus - (Quercus rubra) - Carya* spp. */ Oxydendrum arboreum - Cornus florida* Forest	CEGL007267
Oak – Hickory - Sugar Maple Forest	*Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest	CEGL007268
Successional Black Locust Woodland	*Robinia pseudoacacia* Forest	CEGL007279
Successional Eastern White Pine Forest	*Pinus strobus* Successional Forest	CEGL007944
Successional Tuliptree / Northern Spicebush Forest	*Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest	CEGL007220
Successional Tuliptree - Oak Forest	*Liriodendron tulipifera - Quercus* spp. Forest	CEGL007221
Successional Virginia Pine Forest	*Pinus virginiana* Successional Forest	CEGL002591
Sugar Maple - Yellow Buckeye - American Basswood Forest	*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest	CEGL005222
Yellow Birch Cold Cove Forest	*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest	CEGL007861
Lichen and Sparse Vegetation		
Common Rocktripe Cliff Face	*Umbilicaria mammulata* Nonvascular Vegetation	CEGL004387
Dry Sandstone Cliff	Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation	CEGL006435
Riparian Communities		
American Water-willow Cobble Bar	*Justicia americana* Herbaceous Vegetation	CEGL004286
Black Willow Slackwater Woodland	*Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation	CEGL006463
Eastern Red-cedar - Virginia Pine Flatrock Woodland	*Juniperus virginiana* var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland	CEGL008449
Lizard's-tail Backwater Slough	*Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation	CEGL007696

Table 4. Associations of the U.S. National Vegetation Classification (USNVC) occurring in New River Gorge National River (NERI) (continued).

NERI Community Name	USNVC Association Name	USNVC ELCode
Riparian Communities (continued)		
Oak - Tuliptree / Mountain Silverbell Floodplain Forest	*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest	CEGL006462
Riverbank Annuals	*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation	CEGL006483
Riverbank Tall Herbs	*Verbesina alternifolia - Teucrium canadense - Elymus riparius - (Solidago gigantea)* Herbaceous Vegetation	CEGL006480
Riverscour Prairie	*Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation	CEGL006283
Silver Maple Floodplain Forest	*Acer saccharinum - Ulmus americana* Forest	CEGL002586
Submerged Aquatic Vegetation	*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation	CEGL004725
Successional Box-elder Forest	*Acer negundo* Forest	CEGL005033
Sycamore - Ash Floodplain Forest	*Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest	CEGL006458
Sycamore - River Birch Riverscour Woodland	*Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland	CEGL003725
Tributary Floodplain Forest	Placeholder - no current USNVC association description	CEGL006487
Twisted Sedge Rocky Creekbed	*Carex torta* Herbaceous Vegetation	CEGL004103
Headwater Wetlands		
Bulrush - American Bur-reed Marsh	*Sparganium americanum - Epilobium leptophyllum* Herbaceous Vegetation	CEGL004510
Bushy St. John's-wort Shrub Wetland	*Hypericum densiflorum / Rubus hispidus* Shrubland	CEGL006464
Forest Seep	*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest	CEGL007853
Rice Cutgrass Marsh	*Leersia oryzoides - Sagittaria latifolia* Herbaceous Vegetation	CEGL006461
Smooth Alder Shrub Wetland	*Alnus serrulata* Saturated Southern Shrubland	CEGL003912
Cultural Vegetation		
Kudzu Patch	*Pueraria montana* var. *lobata* Vine-Shrubland	CEGL003882
Old Field	*Lolium (arundinaceum, pratense)* Herbaceous Vegetation	CEGL004048
Pine Plantation	*Pinus strobus* Planted Forest	CEGL007178

Vegetation Mapping

The vegetation map (Figure 6) for NERI includes 47 map classes, arranged in seven categories: upland forests and woodlands, lichen and sparse vegetation (cliffs), riparian communities, headwater wetlands, aquatic features, cultural and disturbed areas, and transportation features.

Relationships between map classes and USNVC associations are usually simple but are sometimes somewhat complex (Table 5). Map classes for natural vegetation are typically equivalent to single associations with names of the map classes corresponding to the NERI community names listed in Table 4. However, extensive association level map classes may contain small inclusions of other associations, and boundaries between these types are likely to be gradual rather than abrupt as portrayed by the map. During the vegetation mapping phase it was thought that some polygons of one association level map class (Sugar Maple - Yellow Buckeye - American Basswood Forest) might have inclusions greater than the minimum mapping unit of the Successional Tuliptree / Northern Spicebush Forest association which could not be delineated on aerial imagery due to heavy shading; however, during the accuracy assessment phase, no inclusions of Successional Tuliptree / Northern Spicebush Forest were encountered within this map class. One association (*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest [CEGL007543]) is divided between two map classes (Deciduous Tree / Great Laurel Forest, Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest) based on presence or absence of *Tsuga canadensis* (eastern hemlock).

Four vegetation complexes (Steep Riparian Edge, Beaver-influenced Wetland, Cliff, and Successional Tuliptree Forest) were mapped which are composed of multiple associations. Steep Riparian Edge is a diverse map class which occurs in a narrow strip along miles of shoreline of the New River. Polygons of Steep Riparian Edge may include small patches of up to 10 different associations and may also include disturbed areas (e.g. steep banks between a railroad and the river). A common pattern within the Steep Riparian Edge map class is for boundaries between associations to be blurred due to tight compression of environmental gradients (i.e. flooding regime) across a narrow zone. The Beaver-influenced Wetland map class is composed of small intermingling patches of up to four shrub and herbaceous wetland associations and also includes areas of open water. The Cliff map class includes two associations which occur in small adjacent patches with distributions related to aspect and seepage. Polygons of the Successional Tuliptree Forest map class may include one or two associations which have distributions related to soil moisture and fertility; the crosswalk to USNVC associations for this map class was changed after accuracy assessment was performed, but in order not to invalidate the accuracy assessment, no attempt was made to attribute individual polygons to individual associations.

Small areas of unvegetated natural riparian disturbance features (Cobble, Flatrock Pavement) were mapped which do not correspond to associations. Map classes for aquatic features, transportation features, disturbed areas, and most cultural areas do not correspond to, but may include, patches of associations. Two cultural vegetation types (Pine Plantation, Kudzu Patch) are mapped as associations. Many associations occur in more than one map class. Map classes in which each association is included are also listed in the key to vegetation types (Appendix H).

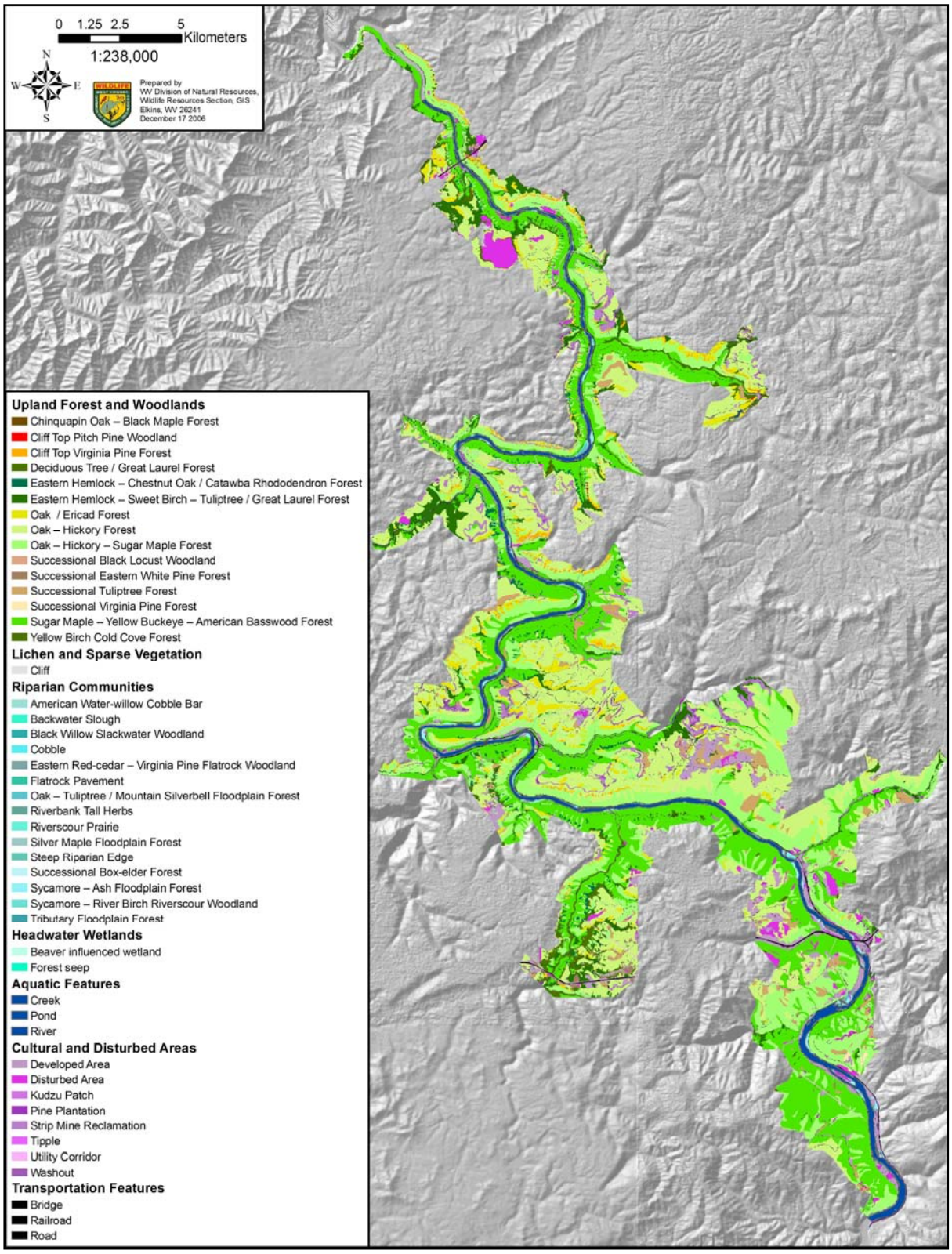


Figure 6. Vegetation map of New River Gorge National River, West Virginia.

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations.

Map class	USNVC Associations	Comments
Upland Forests and Woodlands		
Chinquapin Oak – Black Maple Forest	*Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest [CEGL004793]	Additional small patches likely within the Oak – Hickory – Sugar Maple Forest and Sugar maple – Yellow Buckeye - American Basswood forest map classes.
Cliff Top Pitch Pine Woodland	*Pinus rigida – Quercus coccinea / Vaccinium angustifolium* Woodland [CEGL006557]	Small patch type with discrete boundaries.
Cliff Top Virginia Pine Forest	*Pinus virginiana – Pinus (rigida, echinata) – (Quercus prinus) / Vaccinium pallidum* Forest [CEGL007119]	Small patch type with discrete boundaries.
Deciduous Tree / Great Laurel Forest	*Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum Forest* [CELT007543]	Local subtype of same association as the Eastern Hemlock – Sweet Birch – Tuliptree / Great Laurel Forest map class.
Eastern Hemlock – Chestnut Oak / Catawba Rhododendron Forest	*Quercus prinus / Rhododendron catawbiense – Kalmia latifolia* Forest [CEGL008524]	Small patch type with discrete boundaries.
Eastern Hemlock – Sweet Birch – Tuliptree / Great Laurel Forest	*Liriodendron tulipifera – Betula lenta – Tsuga canadensis / Rhododendron maximum Forest* [CEGL007543]	Same association as the Deciduous Tree / Great Laurel Forest map class.
Oak / Ericad Forest	*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest [CEGL006271]	Grades to Oak – Hickory Forest on less dry sites.
Oak – Hickory Forest	*Quercus prinus – (Quercus rubra) – Carya* spp. / *Oxydendrum arboreum – Cornus florida* Forest [CEGL007267]	Grades to Oak / Ericad Forest on dryer sites and Oak – Hickory – Sugar Maple Forest on less dry sites.
Oak – Hickory – Sugar Maple Forest	*Quercus prinus – Carya ovata – Quercus rubra / Acer saccharum* Forest [CEGL007268]	Grades to Oak – Hickory Forest on dryer sites and Sugar Maple – Yellow Buckeye – American Basswood Forest on wetter sites.
Successional Black Locust Woodland	*Robinia pseudoacacia* Forest [CEGL007279]	Additional patches likely within the Disturbed Area and Strip Mine Reclamation map classes.
Successional Eastern White Pine Forest	*Pinus strobus* Successional Forest [CEGL007944]	Small patch type with discrete boundaries.
Successional Tuliptree Forest	*Liriodendron tulipifera – Quercus* spp. Forest [CEGL007221], *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin) Forest* [CEGL007220]	CEGL007221 occurs on dryer sites more abundant on plateaus. CEGL007220 occurs on wetter sites more abundant on gorge slopes. Additional patches likely within the Disturbed Area, Strip Mine Reclamation, and Sugar Maple – Yellow Buckeye – American Basswood Forest map classes.
Successional Virginia Pine Forest	*Pinus virginiana* Successional Forest [CEGL002591]	Small patch type with discrete boundaries.

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations (continued).

Map class	USNVC Associations	Comments
Upland Forests and Woodlands (continued)		
Sugar Maple – Yellow Buckeye – American Basswood Forest	*Liriodendron tulipifera – Tilia americana* var. *heterophylla – Aesculus flava – Acer saccharum / (Magnolia tripetala)* Forest [CEGL005222], *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest [CEGL007220]	Predominately CEGL005222 but probably includes patches of CEGL007220 on shaded north slopes not distinguishable on aerial imagery. Grades to Oak – Hickory – Sugar Maple Forest on dryer sites.
Yellow Birch Cold Cove Forest	*Betula alleghaniensis – (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest [CEGL007861]	Grades to Deciduous Tree / Great Laurel Forest and Eastern Hemlock – Sweet Birch – Tuliptree / Great Laurel Forest.
Lichen and Sparse Vegetation		
Cliff	Appalachian – Alleghenian Sandstone Dry Cliff Sparse Vegetation [CEGL006435], *Umbilicaria mammulata* Nonvascular Vegetation [CEGL004387]	CEGL006435 is more likely to occur on south aspects and on cliffs without seepage. CEGL004387 is m ore likely on north aspects and on cliffs with seepage. Additional small cliffs likely in all map classes on gorge slopes.
Riparian Communities		
American Water-willow Cobble Bar	*Justicia americana* Herbaceous Vegetation [CEGL004286]	Additional patches within Steep Riparian Edge.
Backwater Slough	*Peltandra virginica – Saururus cernuus – Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation [CEGL007696]	May include areas of standing water and unvegetated mud.
Black Willow Slackwater Woodland	*Salix nigra – Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [CEGL006463]	Additional patches within Steep Riparian Edge.
Cobble	No USNVC association	Natural disturbance feature.
Eastern Red-cedar – Virginia Pine Flatrock Woodland	*Juniperus virginiana var. virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland [CEGL008449]	Small patch type with discrete boundaries.
Flatrock Pavement	No USNVC association	Natural disturbance feature.
Oak – Tuliptree / Mountain Silverbell Floodplain Forest	*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest [CEGL006462]	Additional patches within Steep Riparian Edge.
Riverbank Tall Herbs	*Verbesina alternifolia – Teucrium canadense – Elymus riparius – (Solidago gigantea)* Herbaceous Vegetation [CEGL006480]	Additional patches within Steep Riparian Edge.
Riverscour Prairie	*Andropogon gerardii – Panicum virgatum – Baptisia australis* Herbaceous Vegetation [CEGL006283]	Additional patches within Steep Riparian Edge.

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations (continued).

Map class	USNVC Associations	Comments
Riparian Communities (continued)		
Silver Maple Floodplain Forest	*Acer saccharinum – Ulmus americana* Forest [CEGL002586]	Additional patches within Steep Riparian Edge.
Steep Riparian Edge	*Salix nigra – Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [CEGL006463], *Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest [CEGL006462], *Eragrostis hypnoides – Ludwigia palustris – Lindernia dubia – Cyperus squarrosus* Herbaceous Vegetation [CEGL006483], *Verbesina alternifolia – Teucrium canadense – Elymus riparius – (Solidago gigantea)* Herbaceous Vegetation [CEGL006480], *Andropogon gerardii – Panicum virgatum – Baptisia australis* Herbaceous Vegetation [CEGL006283], *Acer saccharinum – Ulmus americana* Forest [CEGL002586], *Acer negundo Forest* [CEGL005033], *Platanus occidentalis – Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest [CEGL006458], *Platanus occidentalis – (Betula nigra, Salix* spp.*)* Temporarily Flooded Woodland [CEGL003725], *Justicia americana* Herbaceous Vegetation [CEGL004286]	Narrow zone with one to several riparian associations often compressed along a steep elevational gradient without clear boundaries between associations. May also include narrow patches of vegetation which can be distinguished as individual associations. The most abundant associations are probably CEGL006458 and CEGL003725. The upper part of polygons may grade towards the adjacent upland association. Disturbed areas may often be included especially when polygons are located between the river and a railroad or road.
Successional Box-elder Forest	*Acer negundo* Forest [CEGL005033]	Additional patches within Steep Riparian Edge.
Sycamore – Ash Floodplain Forest	*Platanus occidentalis – Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest [CEGL006458]	Additional patches within Steep Riparian Edge.
Sycamore – River Birch Riverscour Woodland	*Platanus occidentalis – (Betula nigra, Salix* spp.) Temporarily Flooded Woodland [CEGL003725]	Additional patches within Steep Riparian Edge.
Tributary Floodplain Forest	No USNVC association	Local placeholder type.
Headwater Wetlands		
Beaver-influenced Wetland	*Alnus serrulata* Saturated Southern Shrubland [CEGL003912], *Sparganium americanum – Epilobium leptophyllum* Herbaceous Vegetation [CEGL004510], *Leersia oryzoides – Sagittaria latifolia* Herbaceous Vegetation [CEGL006461], *Hypericum densiflorum / Rubus hispidus* Shrubland [CEGL006464]	Vegetation complex, usually with patchy mosaic of two or more associations, may also include open water.
Forest Seep	*Acer rubrum – Nyssa sylvatica / Ilex verticillata – Vaccinium fuscatum / Osmunda cinnamomea* Forest [CEGL007853]	Additional small patches most likely on plateaus in Oak – Hickory Forest map class.

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations (continued).

Map class	USNVC Associations	Comments
Aquatic Features		
Creek	May include small patches of *Carex torta* Herbaceous Vegetation [CEGL004103]	Mapped where visible on aerial imagery with small gaps interpolated.
Pond	No USNVC association	
River	May include small patches of *Potamogeton* spp. – *Ceratophyllum* spp. – *Elodea* spp. Permanently Flooded Herbaceous Vegetation [CEGL004725] and *Justicia americana* Herbaceous Vegetation [CEGL004286]	
Cultural and Disturbed Areas		
Developed Area	May include small patches of *Lolium (arundinaceum, pratense)* Herbaceous Vegetation [CEGL004048], *Pinus strobus* Planted Forest [CEGL007178]	Area maintained by human activities. Includes farms, residential areas, recreation areas, commercial areas, and industrial areas. Does not include strip mines.
Disturbed Area	May include patches of *Lolium (arundinaceum, pratense)* Herbaceous Vegetation [CEGL004048], *Robinia pseudoacacia* Forest [CEGL007279], *Liriodendron tulipifera – Quercus* spp. Forest [CEGL007221], *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest [CEGL007220], *Pinus strobus* Successional Forest [CEGL007944], and degraded examples of natural vegetation types.	Area recently disturbed, but not maintained, by human activities. May include patches of semi-natural associations and degraded examples of natural associations. Does not include strip mines.
Kudzu Patch	*Pueraria montana* var. *lobata* Vine-Shrubland [CEGL003882)	
Pine Plantation	*Pinus strobus* Planted Forest [CEGL007178]	Additional small patches in Developed Area and Strip Mine Reclamation map classes.
Strip Mine Reclamation	May include patches of *Lolium (arundinaceum, pratense)* Herbaceous Vegetation [CEGL004048], *Pinus strobus* Planted Forest [CEGL007178], *Robinia pseudoacacia* Forest [CEGL007279], *Liriodendron tulipifera – Quercus* spp. Forest [CEGL007221], *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest [CEGL007220], *Pinus strobus* Successional Forest [CEGL007944]	Areas disturbed in the past by strip mining. Includes semi-natural successional communities, reclamation plantings, bare ground, and roads. Larger patches of Pine Plantations are mapped as a distinct map class.
Tipple	No USNVC association	
Utility Corridor	May include patches of Lolium *(arundinaceum, pratense)* Herbaceous Vegetation [CEGL004048]	Herbaceous and shrub physiognomy usually maintained by humans (herbicides, cutting).
Washout	No USNVC association	

Table 5. Relationships between New River Gorge National River map classes and U.S. National Vegetation Classification (USNVC) associations (continued).

Map class	USNVC Associations	Comments
Transportation Features		
Bridge	No USNVC association	
Railroad	No USNVC association	
Road	No USNVC association	

The number of polygons and area of each map class are summarized in Table 6. Approximately 83% of the park area is mapped as upland forests and woodlands and 83% of this is mapped as three deciduous forest community types (Oak - Hickory Forest, Oak - Hickory - Sugar Maple Forest, and Sugar Maple - Yellow Buckeye - American basswood Forest). Mapped Cliffs occupy 0.024% of the park area. Although riparian communities occupy only about 2.2% of the park area, they include the highest number of map classes. Mapped headwater wetlands occupy 0.22% of the park area. Aquatic features occupy about 4.5% of the park area, most of this represented by the river. About 8.4% of the park is mapped as cultural and disturbed areas. About 1.8% percent is mapped as transportation features.

Accuracy Assessment

Positional Accuracy of Digital Orthophoto Mosaics

The horizontal positional accuracy of the three digital orthophoto mosaics together is 1.31 m (4.29 ft), which meets the Class 1 National Map Accuracy Standard (FGDC 1998b). A copy of the spreadsheet containing the x and y coordinates for each ground control point and the accuracy calculation formula is included in the data archive.

Thematic Accuracy

As described earlier, the sample of thematic accuracy assessment points was selected from accessible, but representative areas of the park (Figure 4). The objective was to concentrate field data collection efforts in areas that were reasonably accessible and that contained a representative diversity of vegetation, in line with recommendations of the USGS-NPS Vegetation Mapping Program Accuracy Assessment Procedures (TNC and ESRI 1994b).

Three map classes for which no accuracy assessment data were collected (see Table 3) were excluded from the thematic accuracy assessment analysis. Also, map classes for which less than five sample points were visited (Table 3) were not included in the contingency matrix, although for all of these there was 100% agreement between the field observation and the mapped class.

Based on the contingency matrix (Table 7), the Kappa index for the vegetation map is 96.0%±1.2% and the overall percent accuracy is estimated to be 96.2%. Both estimates meet the USGS/NPS Vegetation Mapping Program requirement of 80%. User's Accuracy (error of commission) is 100% for 10 of the 19 map classes analyzed and ranges from 84.6%–97.0% for the remaining nine map classes, while Producer's Accuracy (errors of omission) is 100% for 13 map classes and ranges from 86.4–97.0% for the remaining six map classes. Oak - Hickory Forest was the vegetation class most commonly misclassified (86.4% error of omission and 96.2% error of commission). It was most often misclassified as either Oak - Hickory - Sugar Maple Forest or as Oak - Ericad Forest. This is understandable because these three vegetation classes may have wide overlaps of ecotones depending on the environmental gradient. Oak - Hickory - Sugar Maple Forest was misclassified as Sugar Maple - Yellow Buckeye - American Basswood Forest twice in the sample of 39 accuracy assessment points. These two vegetation classes often occur close to each other, and in weak environmental gradients they may have considerable overlap as well. Three sample points mapped as Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest were observed to be Deciduous Tree / Great Laurel Forest. Both

Table 6. Number of polygons and total area of map classes in New River Gorge National River.

Map class	# polygons	Total ha	Total ac
Upland Forests and Woodlands			
Chinquapin Oak - Black Maple Forest	5	4.30	10.63
Cliff Top Pitch Pine Woodland	10	4.39	10.85
Cliff Top Virginia Pine Forest	358	208.76	515.86
Deciduous Tree / Great Laurel Forest	298	487.14	1,203.74
Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest	355	251.46	621.38
Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest	500	1,088.08	2,688.74
Oak / Ericad Forest	577	1,124.19	2,777.95
Oak - Hickory Forest	889	6,871.02	16,978.67
Oak - Hickory - Sugar Maple Forest	689	5,805.46	14,345.59
Successional Black Locust Woodland	1	2.22	5.48
Successional Eastern White Pine Forest	96	73.29	181.11
Successional Tuliptree Forest	222	727.03	1,796.53
Successional Virginia Pine Forest	33	25.82	63.80
Sugar Maple - Yellow Buckeye - American Basswood Forest	622	7,408.17	18,305.99
Yellow Birch Cold Cove Forest	41	102.16	252.43
Total upland forests and woodlands	4,696	24,183.50	59,758.72
Lichen and Sparse Vegetation			
Cliff	23	7.04	17.38
Riparian Communities			
American Water-willow Cobble Bar	56	12.62	31.20
Backwater Slough	22	9.17	22.66
Black Willow Slackwater Woodland	18	3.40	8.40
Cobble	39	3.84	9.49
Eastern Red-cedar - Virginia Pine Flatrock Woodland	6	9.36	23.12
Flatrock Pavement	4	1.14	2.83
Oak - Tuliptree / Mountain Silverbell Floodplain Forest	17	23.43	57.89
Riverbank Tall Herbs	3	0.17	0.41
Riverscour Prairie	14	2.74	6.77
Silver Maple Floodplain Forest	4	1.32	3.27
Steep Riparian Edge	125	278.86	689.08
Successional Box-elder Forest	7	7.08	17.49
Sycamore - Ash Floodplain Forest	122	187.98	464.52
Sycamore - River Birch Riverscour Woodland	158	69.73	172.30
Tributary Floodplain Forest	77	17.29	42.73
Total riparian communities	672	628.14	1,552.18
Headwater Wetlands			
Beaver-influenced Wetland	28	21.43	52.95
Forest Seep	92	42.52	105.08
Total headwater wetland	120	63.95	158.03
Aquatic Features			
Creek	267	95.51	236.00
Pond	64	16.77	41.45
River	21	1,198.81	2,962.32
Total aquatic features	352	1,311.09	3,239.77

Table 6. Number of polygons and total area of map classes in New River Gorge National River (continued).

Map class	# polygons	Total ha	Total ac
Cultural and Disturbed Areas			
Developed Area	622	993.86	2,455.87
Disturbed Area	424	601.71	1,486.85
Kudzu Patch	10	4.46	11.03
Pine Plantation	142	93.70	231.53
Strip Mine Reclamation	230	614.83	1,519.28
Tipple	6	1.78	4.41
Utility Corridor	248	149.55	369.55
Washout	10	1.58	3.90
Total cultural and disturbed areas	1,693	2,461.46	6,082.42
Transportation Features			
Bridge	13	6.88	17.01
Railroad	44	174.80	431.94
Road	694	365.59	903.38
Total transportation features	751	547.27	1,352.34
Grand Total	8,307	29,202.45	72,160.84

of these forest types have a strong rhododendron component, tend to be found in close proximity to each other, and are differentiated by only slight changes in topographic position. Although the vegetation mapper had identified possible inclusions of Successional Tuliptree / Northern Spicebush Forest within the Sugar Maple - Yellow Buckeye - American Basswood Forest map class, none were encountered during accuracy assessment fieldwork.

Table 7. Contingency matrix and calculated errors for the thematic accuracy assessment of the New River Gorge National River vegetation map.

Accuracy Assessment Observation	Mapped Vegetation or Land Cover Class																			Total	Error of Commission- User's Accuracy, (% correct)
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S		
A – Cliff Top Virginia Pine Forest	33																			33	100.0
B – Deciduous Tree / Great Laurel Forest		29				3														32	90.6
C – Disturbed Area			27												1					28	96.4
D – Forest Seep				20																20	100.0
E – Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest					18															18	100.0
F – Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest					1	28														29	96.6
G – Oak - Ericad Forest							26		3											29	89.6
H – Oak - Hickory - Sugar Maple Forest			1					33	3						2					39	84.6
I – Oak - Hickory Forest						1		1	51											53	96.2
J – Pine Plantation			1							19										20	95.0
K – Steep Riparian Edge											27									27	100.0
L – Strip Mine Reclamation												32								32	100.0
M – Successional Tuliptree Forest									1				32							33	97.0
N – Successional Eastern White Pine Forest														6						6	100.0
O – Sugar Maple - Yellow Buckeye - American Basswood Forest									1						28					29	96.6
P – Sycamore - Ash Floodplain Forest																23				23	100.0
Q – Sycamore - River Birch Riverscour Woodland																	9			9	100.0
R – Utility Corridor																		24		24	100.0
S – Yellow Birch Cold Cove Forest																			19	19	100.0
Total	33	29	29	20	19	32	26	34	59	19	27	32	32	6	31	23	9	24	19	503	
Error of Omission – Producer's Accuracy (% correct)	100.0	100.0	93.1	100.0	94.7	87.5	100.0	97.0	86.4	100.0	100.0	100.0	100.0	100.0	90.3	100.0	100.0	100.0	100.0		

Total Points Correct	484
Overall Accuracy	96.22%
Kappa Index	95.98%
90% Confidence Interval	1.19%

Discussion

The vegetation map of NERI provides a comprehensive and detailed view of the vegetation and land cover of the park. A large proportion of the park is currently occupied by natural or semi-natural vegetation of various stand ages and qualities. Areas of natural vegetation are fragmented by cultural and disturbed areas and transportation features. Developed areas are concentrated in private inholdings, mostly on the plateaus and in a few areas along the river.

The predominant natural vegetation types of the park are upland deciduous forests. The distributions of the three major, intergrading, upland deciduous forest community types are probably best explained by soil moisture and fertility gradients which are affected by topographic position, aspect, and geology. The Sugar Maple - Yellow Buckeye - American Basswood Forest occupies moist, fertile sites on concave, lower, and northerly facing colluvial gorge slopes, and has higher ecological amplitude on shale derived soils. The Oak - Hickory Forest occupies dryer, less fertile sites and predominates on plateaus with residual soils derived primarily from sandstone. The Oak - Hickory - Sugar Maple Forest is intermediate and predominates on southerly facing, convex, and upper colluvial gorge slopes and on northerly aspects on the plateaus. The Oak / Ericad Forest is somewhat less extensive compared to the three major community types and occurs on dryer, less fertile sites than the Oak - Hickory Forest. The Chinquapin Oak - Black Maple Forest is an uncommon association restricted to areas with calcareous bedrock. The Yellow Birch Cold Cove Forest is an uncommon association restricted to deep canyons with low solar exposure.

Natural upland forests with a significant conifer component are less abundant than deciduous forests and occur in more specialized habitats. The tops of sandstone cliffs are hot, dry habitats which support small patches and linear zones of Cliff Top Virginia Pine Forest and Cliff Top Pitch Pine Woodland on southerly aspects, and Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest on northerly aspects. The Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest and the related Deciduous Tree / Great Laurel Forest are fairly abundant community types which occur in moist sites (coves, ravines) with acidic, low fertility soils.

Semi-natural vegetation has developed in areas which were cleared by humans then abandoned. Four successional forest community types are represented as map classes and additional patches of these community types and early successional Old Field also occur within the Strip Mine Reclamation and Disturbed Area map classes.

Riparian communities cover a small area but contribute greatly to the overall biological diversity of the park. The riparian data set for multivariate analysis (results presented in Appendix F) included 568 vascular plant species in 75 plots compared to 298 species in 159 plots included in the upland forest and woodland data set. There are nearly as many riparian community types classified in the park (15) as upland forest and woodland community types (16), although the mapped area of upland forests is nearly 39 times greater than the mapped area of riparian communities. Probable reasons for high diversity of species (alpha diversity) and communities (beta diversity) in riparian zones include abundant seed sources, abundant moisture and nutrients, and strong environmental gradients created by variation in flooding intensity and periodicity as affected by relative elevation.

Small areas of headwater wetlands also contribute significantly to species and landscape diversity of the park. The headwater wetland plot data set includes 214 species in 24 plots. Plots from the five headwater wetland community types consistently perform as outliers in multivariate analyses to both the upland and riparian groups due to presence of many obligate wetland plant species.

The vegetation map of NERI presents a snapshot in time, but relationships between community types can also be viewed in terms of succession. Long-term successional patterns are most apparent in the upland forest and woodlands. The entire area of the park was heavily impacted by logging, mining, and other human development in late 1800s through the 1900s. Extensive canopy disturbance resulted in an increase in cover by early successional and shade-intolerant tree species. Following the recovery of forest canopy cover, succession continues by the replacement of shade-intolerant species with shade-tolerant species. Forest soil moisture, organic matter, and fertility increases as time passes since the occurrence of fires or other human-caused disturbances. Seed dispersal acts as a slow agent to reintroduce shade-tolerant understory plant species which were displaced by canopy removal. These processes occur at the stand level and at the landscape level. In the absence of fire or other human-caused canopy and ground disturbances, the aerial cover of upland forest and woodland associations are likely to change in generally predictable ways. Areas of forest and woodland associations adapted to more xeric conditions (Cliff Top Virginia Pine Forest, Cliff Top Pitch Pine Woodland, Oak / Ericad Forest, Oak - Hickory Forest) are likely to decrease over time. Areas of forest and woodland associations adapted to more mesic conditions (Sugar Maple - Yellow Buckeye - American Basswood Forest, Oak - Hickory - Sugar Maple Forest, Deciduous Tree / Great Laurel Forest) are likely to increase. Boundaries between these associations are likely to move upslope. Areas of Eastern Hemlock - Sweet Birch - Tuliptree forest / Great Laurel Forest would be expected to increase, but *Tsuga canadensis* (eastern hemlock) is currently threatened by *Adelges tsugae* (hemlock wooly adelgid), an exotic insect pest. Permanent vegetation plots have been established to monitor changes in eastern hemlock-dominated communities in the park (Wood 1999).

Successional dynamics of riparian and headwater wetland communities in the park are quite different from those of upland communities. Riparian communities are maintained by a disturbance regime of periodic floods. Flooding can maintain open canopies by removing individual trees, or large events can remove entire patches of vegetation. Especially ephemeral riparian vegetation community types include Riverscour Prairie, Riverbank Annuals, and Lizard's-tail Backwater Slough. Catastrophic tributary floods in 2001 during the course of this project resulted in the destruction of mature floodplain forests and deposition of fresh cobble bars and alluvial fans. It has been hypothesized that the Eastern Red-cedar - Virginia Pine Flatrock Woodland at Camp Brookside became established following catastrophic flooding in the late 1800s (McDonald and Trianosky 1995). Successional dynamics and extent of many headwater wetlands are controlled by beaver.

A number of USNVC associations occurring in NERI are likely to be globally and/or state rare. Although formal global and state conservation status ranks (defined in Appendix K) have not been established for many associations, a list of those associations which are likely to be rare is provided in Table 8. A high proportion of these potentially rare associations are associated with riparian zones or cliffs. These are areas of the park where recreational activities (boating,

Table 8. Associations of the U.S. National Vegetation Classification (USNVC) occurring in New River Gorge National River (NERI) which are likely to be globally and/or WV state rare.

NERI community name	USNVC association	Global rank[a]	WV rank[a]
Upland Forests and Woodlands			
Chinquapin Oak – Black Maple Forest	*Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest [CEGL004793]	G4?	SNR
Cliff Top Pitch Pine Woodland	*Pinus rigida – Quercus coccinea / Vaccinium angustifolium* Woodland [CEGL006557]	GNR	SNR
Cliff Top Virginia Pine Forest	*Pinus virginiana – Pinus (rigida, echinata) – (Quercus prinus) / Vaccinium pallidum* Forest [CEGL007119]	G4?	SNR
Eastern Hemlock – Chestnut Oak / Catawba Rhododendron Forest	*Quercus prinus / Rhododendron catawbiense – Kalmia latifolia Forest* [CEGL008524]	G3?	SNR
Yellow Birch Cold Cove Forest	*Betula alleghaniensis – (Tsuga canadensis) / Rhododendron maximum / Leucothoe* fontanesiana Forest [CEGL007861]	G3G4Q	SNR
Lichen and Sparse Vegetation			
Dry Sandstone Cliff	Appalachian – Alleghenian Sandstone Dry Cliff Sparse Vegetation [CEGL006435]	GNR	SNR
Riparian Communities			
Black Willow Slackwater Woodland	*Salix nigra – Betula nigra / Schoenoplectus (pungens, tabernaemontani)* Wooded Herbaceous Vegetation [CEGL006463]	GNA	SNR
Eastern Red-cedar – Virginia Pine Flatrock Woodland	*Juniperus virginiana* var. *virginiana – Pinus virginiana – Quercus stellata / Amelanchier stolonifera / Danthonia spicata – Melica mutica* Woodland [CEGL008449]	G2?	S1
Lizard's-tail Backwater Slough	*Peltandra virginica – Saururus cernuus – Carex crinita / Climacium americanum* Herbaceous Vegetation [CEGL007696]	G2?	SNR
Oak – Tuliptree / Mountain Silverbell Floodplain Forest	*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest [CEGL006462]	GNR	SNR
Riverscour Prairie	*Andropogon gerardii – Panicum virgatum – Baptisia australis* Herbaceous Vegetation [CEGL006283]	G2G3	SNR
Sycamore – Ash Floodplain Forest	*Platanus occidentalis – Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia Forest* [CEGL006458]	GNR	SNR
Sycamore – River Birch Riverscour Woodland	*Platanus occidentalis – (Betula nigra, Salix* spp.) Temporarily Flooded Woodland [CEGL003725]	GNR	SNR
Headwater Wetlands			
Forest Seep	*Acer rubrum – Nyssa sylvatica / Ilex verticillata – Vaccinium fuscatum / Osmunda cinnamomea* Forest [CEGL007853]	G3G4	SNR

[a] Definitions for global and state ranks are provided in Appendix K.

fishing, rock climbing, and sight-seeing) are concentrated and this use may threaten occurrences of these communities and their component plant and animal species. Riparian communities may also be threatened by changes to natural flooding regimes, invasions of exotic invasive species, and water pollution. Occurrences of all of the potentially rare riparian associations may be mapped as pure stands (i.e. the NERI community name is the same as the map class name) and they may also occur within the Steep Riparian Edge map class. Polygons of Steep Riparian Edge should not necessarily be considered inferior conservation units; although many of these polygons are narrow disturbed zones between the river and railroad, others occurring along undisturbed reaches of river shore include high quality natural communities.

Conclusions and Management Recommendations

Although the accuracy of the vegetation map presented here is apparently quite high, errors will inevitably be found and interpretation errors are also likely to occur. Mapping errors may include obvious misattributions of map classes or less-obvious misinterpretations of aerial signatures. These errors could be fixed by updating the geodatabase. Boundaries between similar types, especially the predominant deciduous forest map classes, are represented as lines on the map, but in reality these boundaries will rarely be so definite. Inclusions less than the minimum mapping unit are also likely, especially within more extensive map classes. Although the map may be very useful for office evaluations and planning, field verification of community types using the key to vegetation (Appendix H) is recommended when positive identification is critical.

Spatial distribution and composition of vegetation will change over time, sometimes suddenly, sometimes gradually. Areas of the Cobble Bar map class exposed by floods in 2001 may become revegetated relatively quickly, and would be interesting to revisit in the next few years. Vegetation of the Backwater Slough map class may also be highly dynamic and revisits to sampled plot locations of the Lizard's-tail Backwater Slough community type might help elucidate this. Changes in upland forests are likely to be more gradual and, although it might be tempting to use the vegetation map as a tool to monitor these changes, most boundaries are probably too indefinite to serve this purpose. Revisits to plots with GPS coordinates may be more reliable for detecting long-term changes in these types. However, because cover estimates are subjective and values can vary across short distances, these data are not ideal as a baseline for monitoring.

Photointerpretation may have greater value for detecting changes in conifer signatures. Infestation of *Tsuga canadensis* (eastern hemlock) by *Adelges tsugae* (hemlock wooly adelgid) is now considered to be widespread in the park (NPS, John Perez, Biologist, personal communication, 2007). Many stands of eastern hemlock are likely to die and survival of individual trees or small stands may depend on human intervention. Decline of eastern hemlock may represent the single greatest change to vegetation in the park in the near future. Because canopies with eastern hemlock can usually be distinguished remotely, the vegetation map and aerial imagery developed for this project may be used as a baseline to monitor these changes and to identify stands which have not yet been assessed for adelgid infestation.

Some imminent threats to natural vegetation in the park can be identified and some of these present opportunities for intervention. Priorities can be set based on the occurrence of rare community types and species and likelihood of success. Although eradication of invasive exotic plant species throughout the park is an unrealistic goal, some high priority areas can be identified where eradication may be practical and have high benefits. The two stands of the globally rare Eastern Red-cedar - Virginia Pine Flatrock Woodland at Camp Brookside and Sandstone Falls host a number of rare plant species and should be a high priority for exotic plant removal. Exotic plant species, especially *Rubus phoenicolasius* (wine raspberry) and *Lonicera japonica* (Japanese honeysuckle), have become more abundant in the stand at Camp Brookside since it was treated by prescribed burning in 2001. Exposures of flatrock with Riverscour Prairies at Camp Brookside and Keeney's Creek also host rare plant species and should be targeted for removal of

the exotic plant species *Sedum sarmentosum* (stringy stonecrop) and *Lespedeza cuneata* (sericea lespedeza) which are becoming well established and are rapidly changing successional dynamics of these communities by trapping sediments. Exotic plants are nearly ubiquitous in stands of Sycamore - Ash Floodplain Forests and Tributary Floodplain Forests of the park and are likely to become more abundant; for these community types it may be desirable to choose a small number of polygons as trial areas where populations of exotic plant species such as *Polygonum cuspidatum* (Japanese knotweed) and *Alliaria petiolata* (garlic mustard) are actively controlled. Best management practices for control of exotic invasive plants throughout the park should include avoiding construction of new roads and trails, avoiding use of nonnative plant and fill materials, and controlling populations along existing roads and trails.

Cliff community types should also be given high priority for close monitoring and management. Vegetation of cliff tops with easy access are often heavily trampled by sightseers and climbers, and this visitation may also disturb animals (e.g. common ravens [*Corvus corax*], peregrine falcons [*Falco peregrinus*]) which use cliff habitat. Little is known about the lichen communities of cliff faces or the effects of climbing on these communities. Pedestrian traffic and climbing should be managed to insure that selected areas of high-quality cliff systems remain difficult to access and seldom visited.

Literature Cited

Anderson, M., P. Bougeron, M. T. Bryler, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D. H. Grossman, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A. S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II. The National Vegetation Classification System: list of types. The Nature Conservancy. Arlington, VA. 502 pp.

Bailey, R. G., P. E. Avers, T. King, and W. H. McNab. 1994. Ecoregions and subregions of the United States. USDA Forest Service [map].

Biasi, F. 2001. ELU AML pack: annotated AML code and documentation for generating ecological land units (ELUs) from a DEM and geology grid using ArcInfo. The Nature Conservancy (website) ftp://gis.tnc.org/pub/software/Analysis_tools/eluamls.zip.

Bender, J. R. 2002. New River Gorge ecological land units (ELUs). [rastor dataset, including metadata]. Atlanta, GA.

Braun, E. L. 1950. Deciduous forests of eastern North America. Hafner Press, New York, NY.

Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007 (In preparation). Classification and conservation assessment of high elevation wetlands in the Allegheny Mountains of West Virginia. Natural Heritage Program, WV Division of Natural Resources. Elkins, WV.

Cardwell, D. H., R. B. Erwin, and H. P. Woodward. 1968. Geologic map of West Virginia. West Virginia Geological and Economic Survey. Map 1. Scale 1:250000.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dept. of Interior. Fish and Wildlife Service. U.S. Government Printing Office. Washington, DC. 131 pp.

Dufrêne, M., and P. Legendre. 1997. Species assemblages and indicator species: the need for a flexible asymmetrical approach. Ecological Monographs 67: 345-366.

Ecological Society of America. 2002. Standards for Associations and Alliances of the National Vegetation Classification. Version 1.0. available on the web at http://vegbank.nceas.ucsb.edu/vegbank/panel/standards_v1.pdf.

Englund, K. J., H. H. Arnt, T. W. Henry, C. R. Meissner Jr., J. F. Windolph Jr., and R. C. Warlow. 1977. Geologic map of the New River Gorge Area, Fayette, Raleigh, and Summers Counties, West Virginia: U.S. Geological Survey Open File Report OF-77-76-A.

Englund, K. J., P. L. Johnson, and H. H. Arndt. 1982. Geology of the New River Gorge, West Virginia. In New River Symposium Proceedings, May 6-8, 1982. Beckley, WV. Pp. 136-145.

Environmental Systems Research Institute, Inc. (ESRI). 2005. ArcMap 9.1. Environmental Systems Research Institute, Inc. Redlands, CA 92373.

Environmental Systems Research Institute (ESRI), National Center for Geographic Information and Analysis (NCGIA), and The Nature Conservancy (TNC). November 1994. Accuracy assessment procedures, NBS/NPS Vegetation Mapping Program. Retrieved October 2001 from http://biology.usgs.gov/npsveg/aa/aa.html.

Federal Geographic Data Committee (FGDC). June 1997. Vegetation classification standard (FGDC-STD-005). Retrieved October 2001 from http://www.fgdc.gov/standards/status/sub2_1.html.

Federal Geographic Data Committee (FGDC). 1998a. Content standard for digital geospatial metadata (FGDC-STD-001-1998). Retrieved October 2001 from http://www.fgdc.gov/metadata/contstan.html.

Federal Geographic Data Committee (FGDC). 1998b. Geospatial positioning accuracy standards, Part 3: National Standard for Spatial Data Accuracy. (FGDC-STD-007.3-1998). Retrieved October 2001 from http://www.fgdc.gov/standards/status/sub1_3.html.

Flenniken, D. G. 1999. The macrolichens in West Virginia. Carlisle Printing. Sugarcreek, OH.

Foody, G. M. 1992. On the compensation for chance agreement in image classification accuracy assessment. Photogrammetric Engineering and Remote Sensing. 58(10):1459–1460.

Fortney, R. H., S. L. Stephenson, and H. S. Adams. 1994. Reconnaissance vegetation study of the Bluestone, New and Gauley River gorges. Unpublished report to the National Park Service. Order No. 1443PX478094215. Requisition No. 1732. 51 pp.

Freckmann, R. W., and M. G. Lelong. 2003. Dichanthelium and Panicum sections. *In* Flora of North America north of Mexico. Volume 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2. Ed Flora of North America Editorial Committee. Oxford University Press. New York, NY.

Gleason, H. A., and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. The New York Botanical Garden. Bronx, NY.

Gorman, J. L., and L. E. Espy. 1975. Soil survey of Fayette and Raleigh Counties, West Virginia. U.S. Department of Agriculture, Soil Conservation Service. Washington, DC. 76 pp.

Grafton, W. N., and O. L. Eye. 1982. Vascular flora of eight selected wetlands with special reference to rare species. *In* Proceedings of the symposium on wetlands of the unglaciated Appalachian region. Pp 107-115. West Virginia University. Morgantown. 253 pp.

Grafton, W. N., and C. McGraw. 1976. The vascular flora of New River Gorge, West Virginia. Center for Extension and Continuing Education, West Virginia University,. Beckley. 19 pp.

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.

Harmon, P. J., D. Ford-Werntz, and W. Grafton. 2006. Checklist and atlas of the vascular flora of West Virginia. West Virginia Division of Natural Resources, Wildlife Resources Section. Elkins. 381 pp.

Maxwell, R. S. 2006. Establishing a historic benchmark for rimrock pine communities at New River Gorge National River, West Virginia. M.S. thesis,. West Virginia State University, Morgantown. 90 pp.

McCune, B., and J. B. Grace. 2002. Analysis of ecological communities. MjM Software Design. Gleneden Beach, OR. 300 pp.

McCune, B., and M. J. Mefford. 1999. PC-Ord. Multivariate analysis of ecological data, Versions 4.0–5.02. MjM Software Design. Gleneden Beach, OR.

McDonald, B. R. 1989. Progress report: rare species cooperative agreement, New River Gorge National River, for the period April, 1988–December, 1989. Unpublished report to the National Park Service, Glen Jean. Natural Heritage Program, Division of Natural Resources,. Elkins, WV.

McDonald, B. R. 2000a. Survey of rare species on Camp Brookside–May, 2000. Unpublished report to the National Park Service, Glen Jean. Natural Heritage Program, Division of Natural Resources. Elkins, WV. 2 pp.

McDonald, B. R. 2000b. Survey of rare species on Camp Brookside–August, 2000. Unpublished report to the National Park Service, Glen Jean. Natural Heritage Program, Division of Natural Resources. Elkins, WV. 4 pp.

McDonald, B. R., and P. J. Harmon. 1990. Rare species surveys of the Cunard, Stonecliff, and Southside Junction areas of the New River Gorge National River. Unpublished report to the National Park Service, Glen Jean. Natural Heritage Program, Division of Natural Resources. Elkins, WV. 12 pp + appendix.

McDonald, B. R., and P. Trianosky. 1995. Assessment of and management recommendations for plant communities and rare species of Camp Brookside, New River Gorge National River. Nongame Wildlife and Natural Heritage Program, Wildlife Resources Section, Division of Natural Resources and The Nature Conservancy. Elkins, WV. 25 pp.

Minnesota Department of Natural Resouces (MNDNR). 2001. DNRGarmin Version 5.0.4. St. Paul, MN.

Minnesota Governor's Council on Geographic Information and Minnesota Land Management Information Center. October 1999. Positional accuracy handbook, using the National Standard for Spatial Data Accuracy to measure and report geographic data quality. Retrieved October 2001 from: http://server.admin.state.mn.us/resource.html?Id=1852.

Mitchem, D. O. 2004. Characterization of the vegetation and soils of the forest communities at Camp Brookside in Summers County, West Virginia. Major paper. Virginia Tech. Blacksburg.

Mitchem, D. O., and J. E. Johnson. 2001. Characterization of the overstory and understory vegetation of the flat-rock plant community at Camp Brookside. Department of Forestry, Virginia Tech,. Blacksburg, VA. 48 pp.

Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons. New York, NY. 547 pp.

National Oceanic and Atmospheric Administration (NOAA). 2002. Monthly station normals of temperature, precipitation, and heating and cooling degree days 1971–2000. Climatography of the United States No. 81. National Climatic Data Center,. Ashville, NC.

Phillips, V. J. S. 1969. The botany of the New River Valley between Glen Lyn, Virginia and Gauley Bridge, West Virginia. PhD dissertation. West Virginia University. Morgantown. 127 pp.

Rouse, G. D., and B. R. McDonald. 1986. Rare vascular plant survey: New River Gorge National River. Nongame Wildlife and Natural Heritage Program, Wildlife Resources Section, Division of Natural Resources. Elkins, WV. 55 pp.

Sponaugle, K. N., D. E. McKinney, L. W. Wright, Jr., C. E. Nelson, R. E. Pyle, and C. L. Mara. 1984. Soil Survey of Mercer and Summers Counties, West Virginia. United States Department of Agriculture, Soil Conservation Service. Washington, DC. 173 pp.

Sneddon, L. 1993. Field form instructions for the description of sites and terrestrial, palustrine, and vegetated estuarine communities. The Nature Conservancy, Eastern Task Force. Boston, MA. 69 pp.

Sneddon, L., M. Anderson, and K. Metzler. 1994. A classification and description of terrestrial community alliances in The Nature Conservancy's eastern region: first approximation. The Nature Conservancy. Boston, MA. 116 pp.

Suiter, D. W. 1995. The vascular flora, rare species and plant migrations of New River Gorge National River, West Virginia. Master's thesis. Marshal University. Huntington, WV. 174 pp.

Suiter, D. W, and D. K. Evans. 1999. Vascular flora and rare species of New River Gorge National River, West Virginia. Castanea 64:23-49.

Strausbaugh, P. D., and E. L. Core. 1977. Flora of West Virginia. 2nd edition. Seneca Books. Grantsville, WV. 1,079 pp.

The Nature Conservancy (TNC). 2003. The Cumberlands and Southern Ridge & Valley Ecoregion: a plan for biodiversity conservation. The Nature Conservancy. Arlington, VA.

The Nature Conservancy (TNC) and Environmental Systems Research Institute (ESRI). 1994a. Field methods for vegetation mapping. Prepared for USDI National Biological Survey and National Park Service. Arlington, VA.

The Nature Conservancy (TNC) and Environmental Systems Research Institute (ESRI). 1994b. NBS/NPS Vegetation Mapping Program: Accuracy Assessment Procedures. Report to the National Biological Survey and the National Park Service. Arlington, VA and Redlands, CA. http://biology.usgs.gov/npsveg/standards.html. Last accessed 6 June 2006.

Trianosky, P. A. 1994. A classification of the terrestrial plant communities of West Virginia-draft. Nongame Wildlife and Natural Heritage Program, Wildlife Resources Section, Division of Natural Resources. Elkins, WV. 79 pp.

United States Department of Agriculture, National Resource Conservation Service (USDA NRCS). 2001. The PLANTS Database, Version 3.1. National Plant Data Center. Baton Rouge, LA.

United States Geological Survey (USGS). 1995. Digital orthophoto quarter qudsrangles. Reston, VA. Available ftp://ftp.wvgis.wvu.edu/pub/Clearinghouse/DOQQ/NAD83

United States Geological Survey (USGS). 2001. USGS–NPS Vegetation Mapping Program: Program documents and standards. http://biology.usgs.gov/npsveg/standards.html. Web site last updated 26 June 2001.

United States Geological Survey (USGS). 2004. Tools for creation of formal metadata, a compiler for formal metadata. Retrieved June 2004 from http://geology.usgs.gov/tools/metadata/tools/doc/mp.html

Vanderhorst, J. 2000a. Plant communities of Harper's Ferry National Historical Park: analysis, characterization, and mapping. Natural Heritage Program, West Virginia Division of Natural Resources. Elkins, WV. 37 pp.

Vanderhorst, J. 2001a. Plant community classification and mapping of the Camp Dawson Collective Training Area, Preston County, West Virginia. Natural Heritage Program, WV Division of Natural Resources. Elkins, WV.

Vanderhorst, J. 2001b. Plant communities of the New River Gorge National River, West Virginia: Northern and southern thirds. Non-game Wildlife and Natural Heritage Program, West Virginia Division of Natural Resources. Elkins. 146 pp.

Vanderhorst, J. 2002a. Ecological community classification and mapping of Camp Dawson Collective Training Area, Preston County, West Virginia. Proc. WV Academy of Science. Vol. 74. No. 3:18-26.

Vanderhorst, J. 2002b. Two cliff top pine communities in the north section of New River Gorge National River, West Virginia. Abies Ecology. Elkins, WV. Prepared for National Park Service, Glen Jean, WV. 16 pp.

Vanderhorst, J., and B. P. Streets. 2006. Vegetation Classification and Mapping of Camp Dawson Army Training Site, Preston County, West Virginia: Second Approximation. Natural Heritage Program, West Virginia Division of Natural Resources. Elkins, WV. 80 pp.

West Virginia Natural Heritage Program (WVNHP). 2006. Plots2-WV database of community ecology plots. WV Division of Natural Resources. Elkins, WV.

West Virginia Statewide Addressing and Mapping Board (WVSAMB). 2005. High resolution 7.5' quarter-quad orthoimages for the state of West Virginia, UTM Zone 17 for entire state, MrSID compressed. Sioux Falls, SD. Available ftp://ftp.wvgis.wvu.edu/pub/Clearinghouse/SAMB03/UTM83/utm83zone17n

Wood, J. M. 1999. Hemlock ecosystem inventory and monitoring project of the New River Gorge National River and Gauley River National Recreation Area. Prepared for USDI National Park Service, Glen Jean, WV. 136 pp.

Woods, A. J., J. M. Omernik, and D. D. Brown. 2003. Level III and level IV Ecoregions of EPA Region 3. U.S. Environmental Protection Agency, Corvallis, OR [map]. Available ftp://ftp.epa.gov/wed/ecoregions/reg3/reg3_eco.pd.

Appendix A. Vegetation plot field form.

Form 3: Quantitative Community Characterization **Draft: Spring, 1993**

A. Identifiers (general EOR information)

Sci. name: 1.SNAME: Pinus virginiana / Vaccinium palidum 2.CNAME: NERI.204
3.Site name: New River Gorge
4.Survey site name: Endless Wall
5.Quad name(s): Fayetteville 6.Quad code(s):
7.County name(s): FAYETTE 8.County code(s):
9.Town (LOCALJURIS):
10.Lat: N 11.Long: 0 W 12.Directions:
Endless Wall ~ near first spit south of Fern Creek

GPS file C090415A UTM: 4211645.644 N 494622.882 E
13.Sourcecode: 2001NERI.004 14.Survey date: Sept. 4. 2001
15.Last obs: 16.First obs: 17.State: WV
18.Surveyors: Jim Vanderhorst, Leah Ceperley

B. Environmental Description photos 12, 13

19.Transect / Observation point #

20.Image annotation #

21.Elevation: 1850 ft.

22.Topographic position:
- __Interfluve
- __High slope
- X High level
- __Midslope
- __Low level
- __Channel bed
- __Other
- __Backslope
- __Step in slope
- __Lowslope
- __Toeslope
- __Channel wall
- __Basin floor

23.Topographic sketch:

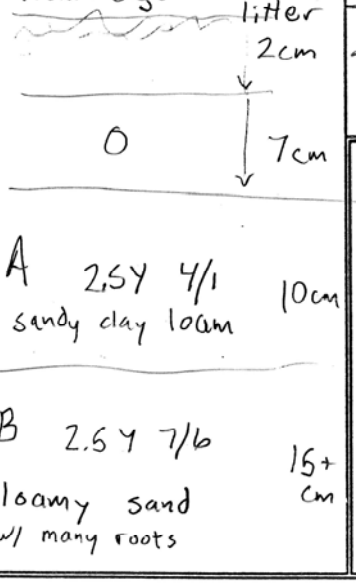
24.Slope degrees: 80°
25.Slope aspect: 220° (SW)
26.Parent material: Sandstone

27.Soil profile description: note depth, texture, and color of each horizon. Note significant changes such as depth to mottling, depth to water table, root penetration depth (SOILCOM)

28.Organic horizon depth: 7cm

29.Organic horizon type:

30.Average pH of mineral soil: 5
in back of plot away from edge



31.Soil moisture regime:
- __Extremely dry
- X Very dry
- __Dry
- __Somewhat moist
- __Moist
- __Somewhat wet
- __Wet
- __Very wet
- __Permanently inundated
- __Periodically inundated

32.Stoniness:
- __Stone free <0.1%
- __Moderately stony 0.1-1%
- __Stony 3-15%
- __Very stony 15-50%
- X Exceedingly stony 50-90%
- __Stone piles >90%

33.Soil drainage:
- X Rapidly drained
- __Well drained
- __Moderately well drained
- __Somewhat poorly drained
- __Poorly drained
- __Very poorly drained

34.Average texture:
- __ sand
- X sandy loam
- __ loam
- __ silt loam
- __ other
- __ clay loam
- __ clay
- __ peat
- __ muck

35.Unvegetated surface:
- 2.0 % Bedrock
- ___ % Large rocks (cobbles, boulders > 10 cm)
- ___ % Small rocks (gravel, 0.2-10 cm)
- ___ % Sand (0.1-2 mm)
- 10 % Bare soil
- 50 % Litter, duff
- 5 % Wood (> 1 cm)
- ___ % Water
- ___ % Other:

36.Environmental Comments: Note homogeneity of vegetation, erosion / sedimentation, inundation, etc. Sandstone rimrock with Pinus virginiana community. Very shallow soils on level bedrock strata. Dense shrub understory of heath and greenbrier. Very low herbaceous diversity. Community is dissected by many adventitous trails

37.Plot representativeness:
narrow zone (ca. 10 m wide) along edge of cliff band

C. Vegetation 38.System: X Terrestrial ___ Palustrine ___ Estuarine 39.Plot number: 204 40.Plot dimensions: 10 x 40 m

41.Leaf type:
- __Broad-leaf
- __Semi-broad-leaf
- __Semi-needle-leaf
- X Needle-leaf
- __Graminoid
- __Broad-leaf herbaceous
- __Pteridophyte

42.Leaf phenology:
- __Deciduous
- __Semi-deciduous
- __Semi-Evergreen
- X Evergreen
- __Perennial
- __Annual

43.Physiognomic type:
- X Forest
- __Sparse woodland
- __Shrubland
- __Dwarf shrubland
- __Sparse dwarf shrubland
- __Non-vascular
- __Woodland
- __Scrub thicket
- __Sparse shrubland
- __Dwarf scrub thicket
- __Herbaceous
- __Sparsely vegetated

44.

	height	% cover
T1 Emergent tree		
T2 Tree canopy	15m	60
T3 Tree sub-canopy	8m	40
S1 Tall shrub	3m	40
S2 Short shrub	.5m	40
H Herbaceous	.1m	20
N Non-vascular		3
E Epiphyte		
V Vine / liana		

45.Species / percent cover: starting with uppermost stratum, list all species and % cover for each in the stratum. For forests and woodlands, list on a separate line below each tree species the DBH of all trees above 10 cm diameter. Separate the measurements with a comma and note whether in cm or inches.

T2 Pinus virginiana	40	S1 Pinus virginiana	10	H Smilax glauca	1
13,19,8,14,23,20,15,14,20,16,21		10,10,10,7,7,8,10,8,8,9		Gaultheria procumbens	10
15,28,22,15,23,34,17,17,22,15,20		Ilex opaca	T	Acer rubrum	T
13,17,18,18,16,		Nyssa sylvatica	1	Andropogon virginicus	T
Populus grandentata 17,	1	snag 10,7.5,7.5,40,10,15	0	Danthonia spicata	1
Quercus prinus 49,12,22,22	10	Amelanchiar "arborea"	3	Dicanthelium	T
Pinus rigida	3	7.5,		Vaccinium pallidum	T
37		Smilax rotundifolia	20	Amelanchiar 'arborea'	T
Quercus velutina 36,17,	5	Rhododendron maximum	5	Pinus virginiana	T
snag 13,14	T	Oxydendron arborea 10,8	5		
T3 Pinus virginiana	20	Acer rubrum	T		
16,7,16,16,19,10,13,25,21		Kalmia latifolia	1		
13,13,13,9,11,12,13,16,13,8,14,13		S2 Vaccinium palidum	10		
13,11,12,17,14,15,		Smilax glauca	3		
		Acer rubrum	1		
		Sasafras albidum	5		
Pinus rigida	3	Oxydendron arborea	5	N Leucobryum ✓	1
14,13,		Betula lenta	T	Dicranum	T
Quercus rubra 10,	1	Gaylussacia baccata	3	Polytrichum	1
Oxydendron arborea	5	Rhus copallinum	T	Umbilicaria	T
10,11,8,10,10		Amelanchiar arborea	T		
Acer rubrum	3	Ilex opaca	1		
7.5,14,10,		Smilax rotundifolia	5		
Snag 10,8,10	0	Quercus	T		

Appendix B. Physiognomic type definitions.

FOREST: Trees usually over 5 m tall with crowns interlocking (generally forming 60–100% cover). Shrubs, herbs, and nonvascular plants may be present at any cover value.

WOODLAND: Open stands of trees usually over 5 m tall with crowns not usually touching (generally forming 25–60% cover). Shrubs, herbs, and nonvascular plants may be present at any cover value.

SHRUBLAND: Shrubs and/or small trees usually 0.5–5.0 m tall with individuals or clumps not touching to interlocking (generally forming >25% canopy cover). Trees may be present, but with cover of 10% or less. Herbs and nonvascular plants may be present at any cover value.

HERBACEOUS: Graminoids and/or forbs (including ferns) generally forming >10% cover. Trees, shrubs, and dwarf shrubs may be present, but with cover 10 percent or less. Nonvascular plants may be present at any cover value.

NON-VASCULAR: Non-vascular vegetation (bryophytes, lichen, or other non-vascular plants) with cover greater than 25%. Trees, shrubs, and herbns may be present, but with cover of 25% or less.

SPARSELY VEGETATED: Substrate is predominantly not vegetated, cover of trees, shrubs, herbs, and non-vascular vegetation combined is 25% or less.

Appendix C. Standard accuracy assessment form for USGS-NPS Vegetation Mapping Program.

Plot Number: _____ Park: _____ Date: _____ Observers: _____

Easting: _ _ _ _ _ _ E Northing _ _ _ _ _ _ _ N EPE/APE: _____ DOP: ____ Map datum: _____ Zone: ____

Topographic Description: _____ Elevation: _____ Aspect: _____ Canopy Closure: _____

Vegetation Association at Point: _____

Veg Assoc 1 w/in 50 m of point: _____

Veg Assoc 2 w/in 50 m of point: _____

Major Species by Strata:

_____

_____

Rationale for Classification:

_____

_____

_____

Comments:

_____

_____

A table containing the fields that appear on this standard accuracy assessment form was created in ArcGIS and converted to a Trimble data dictionary file for use in the field. All field data were entered directly into the electronic data dictionary.

Descriptions of fields:

Plot Number: randomly generated in ArcGIS
Park: NERI - New River Gorge National River
Date: automatically generated in the field
Observers: name of observer
Easting / Northing: UTM coordinates automatically generated in field if GPS satellites were available, otherwise edited in ArcGIS after field data were collected
EPE / APE: estimated from GPS differential correction software if collected, otherwise estimated by observer
DOP: estimated from GPS software
Map Datum: NAD 83
Zone: 17N
Topographic Description: descriptors of slope steepness, shape of slope and position on slope
Elevation: calculated by the GPS software, otherwise taken from a topographic map
Aspect: measured to the nearest 1º Azimuth using a Silva ranger handcompass
Canopy Closure: ocular estimate in percent
Vegetation Association at Point: based on the vegetation key
Vegetation Association 1 and 2 within 50 m of point: based on vegetation key and distance to these are also recorded
Major species by strata: common names of major canopy trees seen at point
Rationale for Classification: indicate if it was a strong match to the vegetation key; if it was not, record reasons why the match was not so good
Comments: any other comments

The following fields that are not on the standard form were added to the data dictionary:
Canopy height: measured to the nearest 5 feet
Minor species: herbaceous, shrub, or minor tree species worth noting

Appendix D. Examples of photographs taken at thematic accuracy assessment points in New River Gorge National River. Each photograph is labeled with the vegetation map class name and accuracy assessment plot number. Photographs were taken by James Jueck in Summer 2006.

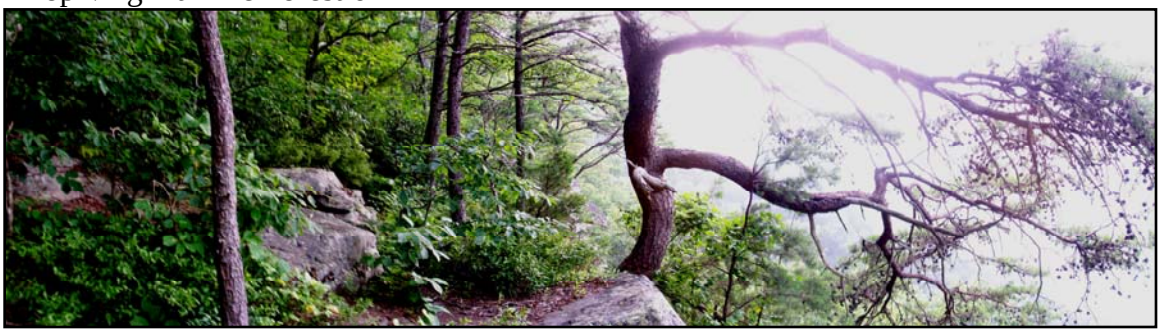
Backwater Slough 3997

Beaver-influenced Wetland 2618

American Water-willow Cobble Bar 3992

Cliff Top Pitch Pine Woodland 2030

Cliff Top Virginia Pine Forest 6211

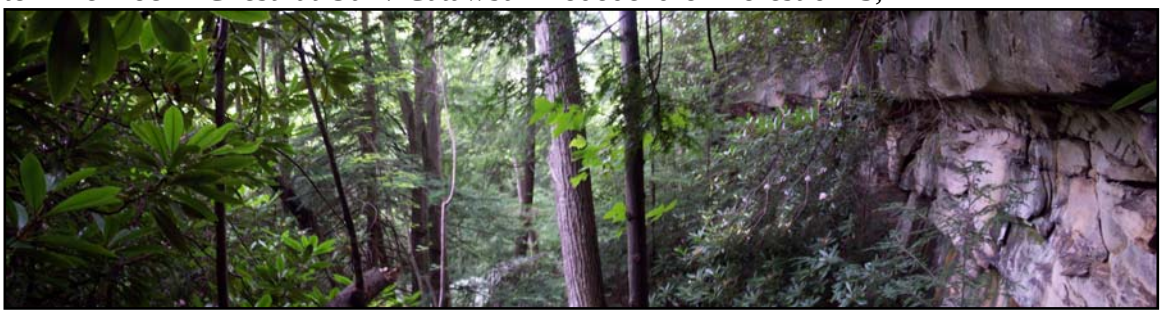


Deciduous Tree / Great Laurel Forest 6217

Disturbed Area 5933

Forest Seep 6185

Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest 6215,



6215a

Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest 2696

Oak - Hickory - Sugar Maple Forest 3073

Oak - Hickory Forest 2689

Oak / Ericad Forest 2572

Pine Plantation 2555

Steep Riparian Edge 2264

Strip Mine Reclamation 2556

Successional Black Locust Woodland 2422

Successional Box-elder Forest 2419

Successional Tuliptree Forest 6199

Sugar Maple - Yellow Buckeye - American Basswood Forest 3061

Sycamore - Ash Floodplain Forest 2480

Sycamore - River Birch Riverscour Woodland 3993

Tributary Floodplain Forest 2574

Utility Corridor 6201

Yellow Birch Cold Cove Forest

Appendix E. Vascular and non-vascular plant taxa found in plots, transect points, mapping zones, and accuracy assessment points in New River Gorge National River.

The following list is sorted by scientific name and includes plant symbol, usually as assigned in the Plants database (USDA, NRCS 2006), common name, family, and division. The plant symbol for a taxon consists of up to eight characters: the first two letters of the genus, followed by the first two letters of the specific epithet, followed by additional letters if needed to reference subspecific rank or if the code deviates from the Plants database (indicated by "WV"), followed by a numerical tie breaker, if needed. Divisions represented by taxa in this list include the Magnoliophyta (flowering plants), the Pinophyta (conifers), the Polypodiophyta (ferns), the Lycopodiophyta (club mosses, spike mosses), the Equisetophyta (horsetails), the Bryophyta (mosses), the Marchantiophyta (liverworts), and the Ascomycota (limited to lichens for this project).

Scientific Name	Plant Symbol	Common Name	Family	Division
Acalypha rhomboidea Raf.	ACRH	common threeseed mercury	Euphorbiaceae	Magnoliophyta
Acer negundo L.	ACNE2	box-elder	Aceraceae	Magnoliophyta
Acer nigrum Michx. f.	ACNI5	black maple	Aceraceae	Magnoliophyta
Acer pensylvanicum L.	ACPE	striped maple	Aceraceae	Magnoliophyta
Acer rubrum L.	ACRU	red maple	Aceraceae	Magnoliophyta
Acer saccharinum L.	ACSA2	silver maple	Aceraceae	Magnoliophyta
Acer saccharum Marsh. var. *saccharum*	ACSAS	sugar maple	Aceraceae	Magnoliophyta
Acer spicatum Lam.	ACSP2	mountain maple	Aceraceae	Magnoliophyta
Achillea millefolium L. var. *occidentalis* DC.	ACMIO	western yarrow	Asteraceae	Magnoliophyta
Acorus calamus L.	ACCA4	calamus	Acoraceae	Magnoliophyta
Actaea L.	ACTAE	baneberry	Ranunculaceae	Magnoliophyta
Actaea pachypoda Ell.	ACPA	white baneberry	Ranunculaceae	Magnoliophyta
Actaea podocarpa DC.	ACPOWV	mountain bugbane	Ranunculaceae	Magnoliophyta
Actaea racemosa L. var. *racemosa*	ACRARWV	black bugbane	Ranunculaceae	Magnoliophyta
Adiantum pedatum L.	ADPE	northern maidenhair	Adiantaceae	Polypodiophyta
Adlumia fungosa (Ait.) Greene ex B.S.P.	ADFU	Allegheny vine	Fumariaceae	Magnoliophyta
Aesculus flava Ait.	AEFL	yellow buckeye	Hippocastanaceae	Magnoliophyta
Agalinis purpurea (L.) *Pennell*	AGPU5	purple false foxglove	Scrophulariaceae	Magnoliophyta
Ageratina altissima (L.) King & H.E. Robins.	AGAL5	white snakeroot	Asteraceae	Magnoliophyta
Agrimonia L.	AGRIM	agrimony	Rosaceae	Magnoliophyta
Agrimonia parviflora Ait.	AGPA6	harvestlice	Rosaceae	Magnoliophyta
Agrimonia pubescens Wallr.	AGPU	soft agrimony	Rosaceae	Magnoliophyta
Agrimonia rostellata Wallr.	AGRO3	beaked agrimony	Rosaceae	Magnoliophyta
Agrostis gigantea Roth	AGGI2	redtop	Poaceae	Magnoliophyta
Agrostis hyemalis (Walt.) B.S.P.	AGHY	winter bentgrass	Poaceae	Magnoliophyta
Agrostis L.	AGROS2	bentgrass	Poaceae	Magnoliophyta
Agrostis perennans (Walt.) Tuckerman	AGPE	upland bentgrass	Poaceae	Magnoliophyta
Ailanthus altissima (P. Mill.) Swingle	AIAL	tree of heaven	Simaroubaceae	Magnoliophyta
Albizia julibrissin Durazz.	ALJU	silktree	Fabaceae	Magnoliophyta
Alisma subcordatum Raf.	ALSU	American water plantain	Alismataceae	Magnoliophyta
Alliaria petiolata (Bieb.) Cavara & Grande	ALPE4	garlic mustard	Brassicaceae	Magnoliophyta
Allium canadense L. var. *canadense*	ALCAC	meadow garlic	Liliaceae	Magnoliophyta
Allium cernuum Roth var. *cernuum*	ALCEC2	nodding onion	Liliaceae	Magnoliophyta
Allium L.	ALLIU	onion	Liliaceae	Magnoliophyta
Allium sativum L.	ALSA2	cultivated garlic	Liliaceae	Magnoliophyta
Allium tricoccum Ait.	ALTR3	wild leek	Liliaceae	Magnoliophyta
Allium vineale L. ssp. *vineale*	ALVIV	wild garlic	Liliaceae	Magnoliophyta
Alnus serrulata (Ait.) Willd.	ALSE2	smooth alder	Betulaceae	Magnoliophyta
Ambrosia artemisiifolia L. var. *elatior* (L.) Descourtils	AMARE	annual ragweed	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Ambrosia L.	AMBRO	ragweed	Asteraceae	Magnoliophyta
Ambrosia trifida L. var. *trifida*	AMTRT2	great ragweed	Asteraceae	Magnoliophyta
Amelanchier arborea (Michx. f.) Fern. var. *arborea*	AMARA4	common serviceberry	Rosaceae	Magnoliophyta
Amelanchier laevis Wieg.	AMLA	Allegheny serviceberry	Rosaceae	Magnoliophyta
Amelanchier Medik.	AMELA	serviceberry	Rosaceae	Magnoliophyta
Amelanchier stolonifera Wieg.	AMST80	running serviceberry	Rosaceae	Magnoliophyta
Amianthium muscitoxicum (Walt.) Gray	AMMU	flypoison	Liliaceae	Magnoliophyta
Amphicarpaea bracteata (L.) Fern.	AMBR2	American hogpeanut	Fabaceae	Magnoliophyta
Andropogon gerardii Vitman	ANGE	big bluestem	Poaceae	Magnoliophyta
Andropogon virginicus L. var. *virginicus*	ANVIV	broomsedge bluestem	Poaceae	Magnoliophyta
Anemone L.	ANEMO	anemone	Ranunculaceae	Magnoliophyta
Anemone lancifolia Pursh	ANLA	mountain thimbleweed	Ranunculaceae	Magnoliophyta
Anemone quinquefolia L. var. *minima* (DC.) Frodin	ANQUM2	nightcaps	Ranunculaceae	Magnoliophyta
Anemone quinquefolia L. var. *quinquefolia*	ANQUQ	nightcaps	Ranunculaceae	Magnoliophyta
Anemone virginiana L. var. *virginiana*	ANVIV2	tall thimbleweed	Ranunculaceae	Magnoliophyta
Anomodon attenuatus (Hedw.) Hüb.	ANAT4	anomodon moss	Anomodontaceae	Bryophyta
Antennaria Gaertn.	ANTEN	pussytoes	Asteraceae	Magnoliophyta
Antennaria plantaginifolia (L.) Richards.	ANPL	woman's tobacco	Asteraceae	Magnoliophyta
Antennaria solitaria Rydb.	ANSO	singlehead pussytoes	Asteraceae	Magnoliophyta
Antennaria virginica Stebbins	ANVI13	shale barren pussytoes	Asteraceae	Magnoliophyta
Anthemis cotula L.	ANCO2	stinking chamomile	Asteraceae	Magnoliophyta
Anthoxanthum odoratum L. ssp. *odoratum*	ANODOWV	sweet vernalgrass	Poaceae	Magnoliophyta
Apios americana Medik.	APAM	groundnut	Fabaceae	Magnoliophyta
Apocynum cannabinum L.	APCA	Indianhemp	Apocynaceae	Magnoliophyta
Apocynum L.	APOCY	dogbane	Apocynaceae	Magnoliophyta
Aquilegia canadensis L.	AQCA	red columbine	Ranunculaceae	Magnoliophyta
Arabis glabra (L.) Bernh.	ARGL	tower rockcress	Brassicaceae	Magnoliophyta
Arabis laevigata (Muhl. ex Willd.) Poir.	ARLA	smooth rockcress	Brassicaceae	Magnoliophyta
Arabis patens Sullivant	ARPA2	spreading rockcress	Brassicaceae	Magnoliophyta
Aralia nudicaulis L.	ARNU2	wild sarsaparilla	Araliaceae	Magnoliophyta
Aralia racemosa L. ssp. *racemosa*	ARRAR	American spikenard	Araliaceae	Magnoliophyta
Aralia spinosa L.	ARSP2	devil's walkingstick	Araliaceae	Magnoliophyta
Arctium minus Bernh.	ARMI2	lesser burdock	Asteraceae	Magnoliophyta
Arisaema dracontium (L.) Schott	ARDR3	green dragon	Araceae	Magnoliophyta
Arisaema triphyllum (L.) Schott	ARTR	Jack in the pulpit	Araceae	Magnoliophyta
Aristolochia macrophylla Lam.	ARMA7	pipevine	Aristolochiaceae	Magnoliophyta
Aristolochia serpentaria L.	ARSE3	Virginia snakeroot	Aristolochiaceae	Magnoliophyta
Arnoglossum atriplicifolium (L.) H.E. Robins.	ARAT	pale Indian plaintain	Asteraceae	Magnoliophyta
Arnoglossum muehlenbergii (Schultz-Bip.) H.E. Robins.	ARMU3	great Indian plaintain	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Arnoglossum Raf.	ARNOG	Indian plaintain	Asteraceae	Magnoliophyta
Arrhenatherum elatius (L.) Beauv. ex J.& K. Presl	AREL3	tall oatgrass	Poaceae	Magnoliophyta
Artemisia L.	ARTEM	sagebrush	Asteraceae	Magnoliophyta
Artemisia vulgaris L. var. *vulgaris*	ARVUV	common wormwood	Asteraceae	Magnoliophyta
Arthraxon hispidus (Thunb.) Makino	ARHI3	small carpgrass	Poaceae	Magnoliophyta
Asarum canadense L.	ASCA	Canadian wildginger	Aristolochiaceae	Magnoliophyta
Asclepias incarnata L. ssp. *pulchra* (Ehrh. ex Willd.) Woods.	ASINP2	swamp milkweed	Asclepiadaceae	Magnoliophyta
Asclepias L.	ASCLE	milkweed	Asclepiadaceae	Magnoliophyta
Asclepias purpurascens L.	ASPU2	purple milkweed	Asclepiadaceae	Magnoliophyta
Asclepias quadrifolia Jacq.	ASQU	fourleaf milkweed	Asclepiadaceae	Magnoliophyta
Asclepias syriaca L.	ASSY	common milkweed	Asclepiadaceae	Magnoliophyta
Asclepias tuberosa L.	ASTU	butterfly milkweed	Asclepiadaceae	Magnoliophyta
Asimina triloba (L.) Dunal	ASTR	pawpaw	Annonaceae	Magnoliophyta
Asplenium platyneuron (L.) B.S.P.	ASPL	ebony spleenwort	Aspleniaceae	Polypodiophyta
Asplenium rhizophyllum L.	ASRH2	walking fern	Aspleniaceae	Polypodiophyta
Asplenium trichomanes L. ssp. *trichomanes*	ASTRT	maidenhair spleenwort	Aspleniaceae	Polypodiophyta
Aster	ASTER	aster	Asteraceae	Magnoliophyta
Athyrium filix-femina (L.) Roth	ATFI	common ladyfern	Dryopteridaceae	Polypodiophyta
Athyrium filix-femina (L.) Roth ssp. *asplenioides* (Michx.) Hultén	ATFIA2	asplenium ladyfern	Dryopteridaceae	Polypodiophyta
Athyrium filix-femina (L.) Roth var. *angustum* (Willd.) Lawson	ATFIA4	northeastern ladyfern	Dryopteridaceae	Polypodiophyta
Atrichum angustatum (Brid.) Bruch & Schimp. in B.S.G.	ATAN3	atrichum moss	Polytrichaceae	Bryophyta
Atrichum undulatum (Hedw.) P. Beauv.	ATUN2	undulate atrichum moss	Polytrichaceae	Bryophyta
Atriplex patula L.	ATPA4	spear saltbush	Chenopodiaceae	Magnoliophyta
Aulacomnium heterostichum (Hedw.) Bruch & Schimp. in B.S.G.	AUHE	aulacomnium moss	Aulacomniaceae	Bryophyta
Aulacomnium palustre (Hedw.) Schwaegr.	AUPA70	aulacomnium moss	Aulacomniaceae	Bryophyta
Aulacomnium Schwaegr.	AULAC2	ribbed moss	Aulacomniaceae	Bryophyta
Aureolaria flava (L.) Farw.	AUFL	smooth yellow false foxglove	Scrophulariaceae	Magnoliophyta
Aureolaria laevigata (Raf.) Raf.	AULA	entireleaf yellow false foxglove	Scrophulariaceae	Magnoliophyta
Aureolaria pedicularia (L.) Raf.	AUPE2	fernleaf yellow false foxglove	Scrophulariaceae	Magnoliophyta
Aureolaria Raf.	AUREO	false foxglove	Scrophulariaceae	Magnoliophyta
Baptisia australis (L.) R. Br. ex Ait. f.	BAAUA	tall blue wild indigo	Fabaceae	Magnoliophyta
Barbarea vulgaris Ait. f.	BAVU	garden yellowrocket	Brassicaceae	Magnoliophyta
Betula alleghaniensis Britt. var. *alleghaniensis*	BEALA	yellow birch	Betulaceae	Magnoliophyta
Betula L.	BETUL	birch	Betulaceae	Magnoliophyta
Betula lenta L.	BELE	sweet birch	Betulaceae	Magnoliophyta
Betula nigra L.	BENI	river birch	Betulaceae	Magnoliophyta
Bidens bipinnata L.	BIBI7	Spanish needles	Asteraceae	Magnoliophyta
Bidens frondosa L.	BIFR	devil's beggartick	Asteraceae	Magnoliophyta
Bidens L.	BIDEN	beggarticks	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Bidens tripartita L.	BITR	threelobe beggarticks	Asteraceae	Magnoliophyta
Bidens vulgata Greene	BIVU	big devils beggartick	Asteraceae	Magnoliophyta
Boehmeria cylindrica (L.) Sw.	BOCY	small-spike false nettle	Urticaceae	Magnoliophyta
Botrychium dissectum Spreng.	BODI2	cutleaf grapefern	Ophioglossaceae	Polypodiophyta
Botrychium virginianum (L.) Sw.	BOVI	rattlesnake fern	Ophioglossaceae	Polypodiophyta
Boykinia aconitifolia Nutt.	BOAC	Allegheny brookfoam	Saxifragaceae	Magnoliophyta
Brachyelytrum erectum (Schreb. ex Spreng.) Beauv.	BRER2	bearded shorthusk	Poaceae	Magnoliophyta
Brachythecium oxycladon (Brid.) Jaeg.	BROX2	brachythecium moss	Brachytheciaceae	Bryophyta
Brachythecium rivulare Schimp. in B.S.G.	BRRI5	brachythecium moss	Brachytheciaceae	Bryophyta
Brachythecium Schimp. in B.S.G.	BRACH10	mat moss	Brachytheciaceae	Bryophyta
Bromus japonicus Thunb. ex Murr.	BRJA	field brome	Poaceae	Magnoliophyta
Bromus kalmii Gray	BRKA2	arctic brome	Poaceae	Magnoliophyta
Bromus L.	BROMU	brome	Poaceae	Magnoliophyta
Bromus pubescens Muhl. ex Willd.	BRPU6	hairy woodland brome	Poaceae	Magnoliophyta
Brotherella recurvans (Michx.) Fleisch.	BRRE3	shiny fern moss	Sematophyllaceae	Bryophyta
Bryhnia graminicolor (Brid.) Grout	BRGR11	bryhnia moss	Brachytheciaceae	Bryophyta
Bryhnia novae-angliae (Sull. & Lesq. in Sull.) Grout	BRNO4	New England bryhnia moss	Brachytheciaceae	Bryophyta
Bryoandersonia illecebra (Hedw.) Robins.	BRIL	bryoandersonia moss	Brachytheciaceae	Bryophyta
Callicladium haldanianum (Grev.) Crum	CAHA32	callicladium moss	Hypnaceae	Bryophyta
Callitriche heterophylla Pursh ssp. *heterophylla*	CAHEH	twoheaded water-starwort	Callitrichaceae	Magnoliophyta
Calystegia sepium (L.) R. Br.	CASE13	hedge false bindweed	Convolvulaceae	Magnoliophyta
Campanula divaricata Michx.	CADI3	small bonny bellflower	Campanulaceae	Magnoliophyta
Campsis radicans (L.) Seem. ex Bureau	CARA2	trumpet creeper	Bignoniaceae	Magnoliophyta
Campylium chrysophyllum (Brid.) J. Lange	CACH31	goldenleaf campylium moss	Amblystegiaceae	Bryophyta
Campylium radicale (P. Beauv.) Grout	CARA18	campylium moss	Amblystegiaceae	Bryophyta
Cardamine angustata O.E. Schulz	CAAN11	slender toothwort	Brassicaceae	Magnoliophyta
Cardamine bulbosa (Schreb. ex Muhl.) B.S.P.	CABU3	bulbous bittercress	Brassicaceae	Magnoliophyta
Cardamine concatenata (Michx.) Sw.	CACO26	cutleaf toothwort	Brassicaceae	Magnoliophyta
Cardamine diphylla (Michx.) Wood	CADI10	crinkleroot	Brassicaceae	Magnoliophyta
Cardamine hirsuta L.	CAHI3	hairy bittercress	Brassicaceae	Magnoliophyta
Cardamine impatiens L.	CAIM	narrowleaf bittercress	Brassicaceae	Magnoliophyta
Cardamine L.	CARDA	bittercress	Brassicaceae	Magnoliophyta
Cardamine parviflora L. var. *arenicola* (Britt.) O.E. Schulz	CAPAA2	sand bittercress	Brassicaceae	Magnoliophyta
Cardamine pensylvanica Muhl. ex Willd.	CAPE3	Pennsylvania bittercress	Brassicaceae	Magnoliophyta
Carex albicans Willd. ex Spreng. var. *albicans*	CAALA	whitetinge sedge	Cyperaceae	Magnoliophyta
Carex albursina Sheldon	CAAL11	white bear sedge	Cyperaceae	Magnoliophyta
Carex amphibola Steud.	CAAM8	eastern narrowleaf sedge	Cyperaceae	Magnoliophyta
Carex annectens (Bickn.) Bickn.	CAAN6	yellowfruit sedge	Cyperaceae	Magnoliophyta
Carex atlantica Bailey ssp. *atlantica*	CAATA2	prickly bog sedge	Cyperaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Carex baileyi Britt.	CABA7	Bailey's sedge	Cyperaceae	Magnoliophyta
Carex blanda Dewey	CABL	eastern woodland sedge	Cyperaceae	Magnoliophyta
Carex bromoides Schkuhr ex Willd. ssp. *bromoides*	CABRBWV	bromelike sedge	Cyperaceae	Magnoliophyta
Carex cephalophora Muhl. ex Willd.	CACE	oval-leaf sedge	Cyperaceae	Magnoliophyta
Carex communis Bailey var. *communis*	CACOC4	fibrousroot sedge	Cyperaceae	Magnoliophyta
Carex crinita Lam.	CACR6	fringed sedge	Cyperaceae	Magnoliophyta
Carex debilis Michx. var. *debilis*	CADED	white edge sedge	Cyperaceae	Magnoliophyta
Carex debilis Michx. var. *rudgei* Bailey	CADER	white edge sedge	Cyperaceae	Magnoliophyta
Carex digitalis Willd. var. *digitalis*	CADIDWV	slender woodland sedge	Cyperaceae	Magnoliophyta
Carex emoryi Dewey	CAEM2	Emory's sedge	Cyperaceae	Magnoliophyta
Carex folliculata L.	CAFO6	northern long sedge	Cyperaceae	Magnoliophyta
Carex frankii Kunth	CAFR3	Frank's sedge	Cyperaceae	Magnoliophyta
Carex gracilescens Steud.	CAGR8	slender looseflower sedge	Cyperaceae	Magnoliophyta
Carex gracillima Schwein.	CAGR2	graceful sedge	Cyperaceae	Magnoliophyta
Carex grayi Carey	CAGR5	Gray's sedge	Cyperaceae	Magnoliophyta
Carex gynandra Schwein.	CAGY4	nodding sedge	Cyperaceae	Magnoliophyta
Carex hirsutella Mackenzie	CAHI6	fuzzy wuzzy sedge	Cyperaceae	Magnoliophyta
Carex hitchcockiana Dewey	CAHI8	Hitchcock's sedge	Cyperaceae	Magnoliophyta
Carex interior Bailey	CAIN11	inland sedge	Cyperaceae	Magnoliophyta
Carex intumescens Rudge	CAIN12	greater bladder sedge	Cyperaceae	Magnoliophyta
Carex jamesii Schwein.	CAJA2	James' sedge	Cyperaceae	Magnoliophyta
Carex L.	CAREX	sedge	Cyperaceae	Magnoliophyta
Carex laxiculmis Schwein.	CALA18	spreading sedge	Cyperaceae	Magnoliophyta
Carex laxiflora Lam.	CALA19	broad looseflower sedge	Cyperaceae	Magnoliophyta
Carex lupulina Muhl. ex Willd.	CALU4	hop sedge	Cyperaceae	Magnoliophyta
Carex lurida Wahlenb.	CALU5	shallow sedge	Cyperaceae	Magnoliophyta
Carex nigromarginata Schwein.	CANI3	black edge sedge	Cyperaceae	Magnoliophyta
Carex oligocarpa Schkuhr ex Willd.	CAOL2	richwoods sedge	Cyperaceae	Magnoliophyta
Carex pensylvanica Lam.	CAPE6	Pennsylvania sedge	Cyperaceae	Magnoliophyta
Carex plantaginea Lam.	CAPL4	plantainleaf sedge	Cyperaceae	Magnoliophyta
Carex platyphylla Carey	CAPL5	broadleaf sedge	Cyperaceae	Magnoliophyta
Carex prasina Wahlenb.	CAPR12	drooping sedge	Cyperaceae	Magnoliophyta
Carex retroflexa Muhl. ex Willd.	CARE9	reflexed sedge	Cyperaceae	Magnoliophyta
Carex rosea Schkuhr ex Willd.	CARO22	rosy sedge	Cyperaceae	Magnoliophyta
Carex scabrata Schwein.	CASC13	eastern rough sedge	Cyperaceae	Magnoliophyta
Carex scoparia Schkuhr ex Willd. var. *scoparia*	CASCS	broom sedge	Cyperaceae	Magnoliophyta
Carex seorsa Howe	CASE6	weak stellate sedge	Cyperaceae	Magnoliophyta
Carex stipata Muhl. ex Willd.	CAST5	owlfruit sedge	Cyperaceae	Magnoliophyta
Carex stricta Lam.	CAST8	upright sedge	Cyperaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Carex swanii (Fern.) Mackenzie	CASW	Swan's sedge	Cyperaceae	Magnoliophyta
Carex torta Boott ex Tuckerman	CATO4	twisted sedge	Cyperaceae	Magnoliophyta
Carex tribuloides Wahlenb.	CATR7	blunt broom sedge	Cyperaceae	Magnoliophyta
Carex umbellata Schkuhr ex Willd.	CAUM4	parasol sedge	Cyperaceae	Magnoliophyta
Carex virescens Muhl. ex Willd.	CAVI4	ribbed sedge	Cyperaceae	Magnoliophyta
Carex vulpinoidea Michx.	CAVU2	fox sedge	Cyperaceae	Magnoliophyta
Carex willdenowii Schkuhr ex Willd.	CAWI2	Willdenow's sedge	Cyperaceae	Magnoliophyta
Carpinus caroliniana Walt. ssp. *virginiana* (Marsh.) Furlow	CACAV	American hornbeam	Betulaceae	Magnoliophyta
Carya alba (L.) Nutt. ex Ell.	CAAL27	mockernut hickory	Juglandaceae	Magnoliophyta
Carya cordiformis (Wangenh.) K. Koch	CACO15	bitternut hickory	Juglandaceae	Magnoliophyta
Carya glabra (P. Mill.) Sweet	CAGL8	pignut hickory	Juglandaceae	Magnoliophyta
Carya Nutt.	CARYA	hickory	Juglandaceae	Magnoliophyta
Carya ovalis (Wangenh.) Sarg.	CAOV3	red hickory	Juglandaceae	Magnoliophyta
Carya ovata (P. Mill.) K. Koch	CAOV2	shagbark hickory	Juglandaceae	Magnoliophyta
Castanea dentata (Marsh.) Borkh.	CADE12	American chestnut	Fagaceae	Magnoliophyta
Catalpa bignonioides Walt.	CABI8	southern catalpa	Bignoniaceae	Magnoliophyta
Catalpa Scop.	CATAL	catalpa	Bignoniaceae	Magnoliophyta
Catalpa speciosa (Warder) Warder ex Engelm.	CASP8	northern catalpa	Bignoniaceae	Magnoliophyta
Caulophyllum thalictroides (L.) Michx.	CATH2	blue cohosh	Berberidaceae	Magnoliophyta
Celastrus orbiculata Thunb.	CEOR	Oriental bittersweet	Celastraceae	Magnoliophyta
Celtis L.	CELTI	hackberry	Ulmaceae	Magnoliophyta
Celtis occidentalis L.	CEOC	common hackberry	Ulmaceae	Magnoliophyta
Cephalanthus occidentalis L.	CEOC2	common buttonbush	Rubiaceae	Magnoliophyta
Cerastium fontanum Baumg. ssp. *vulgare* (Hartman) Greuter & Burdet	CEFOV2	big chickweed	Caryophyllaceae	Magnoliophyta
Cerastium L.	CERAS	mouse-ear chickweed	Caryophyllaceae	Magnoliophyta
Cerastium nutans Raf. var. *nutans*	CENUN	nodding chickweed	Caryophyllaceae	Magnoliophyta
Cercis canadensis L.	CECAC	eastern redbud	Fabaceae	Magnoliophyta
Chamaecrista nictitans (L.) Moench ssp. *nictitans* var. *nictitans*	CHNIN2	sensitive partridge pea	Fabaceae	Magnoliophyta
Chamaesyce humistrata (Engelm.) Small	CHHU3	spreading sandmat	Euphorbiaceae	Magnoliophyta
Chamaesyce maculata (L.) Small	CHMA15	spotted sandmat	Euphorbiaceae	Magnoliophyta
Chasmanthium latifolium (Michx.) Yates	CHLA5	Indian woodoats	Poaceae	Magnoliophyta
Chelone glabra L.	CHGL2	white turtlehead	Scrophulariaceae	Magnoliophyta
Chenopodium album L. var. *album*	CHALA	lambsquarters	Chenopodiaceae	Magnoliophyta
Chenopodium ambrosioides L. var. *ambrosioides*	CHAMA16	Mexican tea	Chenopodiaceae	Magnoliophyta
Chimaphila maculata (L.) Pursh	CHMA3	striped prince's pine	Pyrolaceae	Magnoliophyta
Chionanthus virginicus L.	CHVI3	white fringetree	Oleaceae	Magnoliophyta
Cichorium intybus L.	CIIN	chicory	Asteraceae	Magnoliophyta
Cicuta maculata L. var. *maculata*	CIMAM	spotted water hemlock	Apiaceae	Magnoliophyta
Cinna arundinacea L.	CIAR2	sweet woodreed	Poaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Circaea lutetiana L. ssp. *canadensis* (L.) Aschers. & Magnus	CILUC	broadleaf enchanter's nightshade	Onagraceae	Magnoliophyta
Cirsium muticum Michx.	CIMU	swamp thistle	Asteraceae	Magnoliophyta
Cirsium P. Mill.	CIRSI	thistle	Asteraceae	Magnoliophyta
Cirsium vulgare (Savi) Ten.	CIVU	bull thistle	Asteraceae	Magnoliophyta
Cladina (Nyl.) Nyl.	CLADI3	reindeer lichen	Cladoniaceae	Ascomycota
Cladonia caroliniana Tuck.	CLCA11	Carolina cup lichen	Cladoniaceae	Ascomycota
Cladonia coniocraea auct.	CLCO13	cup lichen	Cladoniaceae	Ascomycota
Cladonia furcata (Hudson) Schrader	CLFU3	cup lichen	Cladoniaceae	Ascomycota
Cladonia grayi G. Merr. ex Sandst.	CLGR7	Gray's cup lichen	Cladoniaceae	Ascomycota
Cladonia P. Browne	CLADO3	cup lichen	Cladoniaceae	Ascomycota
Cladonia robbinsii A. Evans	CLRO7	Robbin's cup lichen	Cladoniaceae	Ascomycota
Cladonia strepsilis (Ach.) Grognot	CLST6	cup lichen	Cladoniaceae	Ascomycota
Cladonia subtenuis (Abbayes) Hale & Culb.	CLSU16	Dixie reindeer lichen	Cladoniaceae	Ascomycota
Claytonia virginica L.	CLVI3	Virginia springbeauty	Portulacaceae	Magnoliophyta
Clematis L.	CLEMA	leather flower	Ranunculaceae	Magnoliophyta
Clematis viorna L.	CLVI4	vasevine	Ranunculaceae	Magnoliophyta
Clematis virginiana L.	CLVI5	devil's darning needles	Ranunculaceae	Magnoliophyta
Clethra acuminata Michx.	CLAC3	mountain sweetpepperbush	Clethraceae	Magnoliophyta
Climacium americanum Brid.	CLAM3	tree moss	Climaciaceae	Bryophyta
Clintonia borealis (Ait.) Raf.	CLBO3	bluebead	Liliaceae	Magnoliophyta
Clintonia umbellulata (Michx.) Morong	CLUM2	white clintonia	Liliaceae	Magnoliophyta
Collinsonia canadensis L.	COCA4	richweed	Lamiaceae	Magnoliophyta
Commelina communis L. var. *communis*	COCOC3	Asiatic dayflower	Commelinaceae	Magnoliophyta
Commelina erecta L.	COER	whitemouth dayflower	Commelinaceae	Magnoliophyta
Commelina L.	COMME	dayflower	Commelinaceae	Magnoliophyta
Commelina virginica L.	COVI3	Virginia dayflower	Commelinaceae	Magnoliophyta
Conocephalum conicum (L.) Dumort.	COCO38	conehead chamber liverwort	Conocephalaceae	Marchantiophyta
Conoclinium coelestinum (L.) DC.	COCO13	blue mistflower	Asteraceae	Magnoliophyta
Conopholis americana (L.) Wallr. f.	COAM	American cancer-root	Orobanchaceae	Magnoliophyta
Convallaria majuscula Greene	COMA19	American lily-of-the-valley	Liliaceae	Magnoliophyta
Convolvulus arvensis L.	COAR4	field bindweed	Convolvulaceae	Magnoliophyta
Conyza canadensis (L.) Cronq. var. *canadensis*	COCAC3	Canadian horseweed	Asteraceae	Magnoliophyta
Coreopsis L.	COREO2	tickseed	Asteraceae	Magnoliophyta
Coreopsis major Walt.	COMA6	greater tickseed	Asteraceae	Magnoliophyta
Coreopsis pubescens Ell. var. *robusta* Gray ex Eames	COPUR	star tickseed	Asteraceae	Magnoliophyta
Coreopsis tripteris L.	COTR4	tall tickseed	Asteraceae	Magnoliophyta
Cornus alternifolia L. f.	COAL2	alternateleaf dogwood	Cornaceae	Magnoliophyta
Cornus amomum P. Mill.	COAM2	silky dogwood	Cornaceae	Magnoliophyta
Cornus florida L.	COFL2	flowering dogwood	Cornaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Cornus L.	CORNU	dogwood	Cornaceae	Magnoliophyta
Cornus rugosa Lam.	CORU	roundleaf dogwood	Cornaceae	Magnoliophyta
Coronilla varia L.	COVA2	crownvetch	Fabaceae	Magnoliophyta
Corydalis flavula (Raf.) DC.	COFL3	yellow fumewort	Fumariaceae	Magnoliophyta
Corydalis sempervirens (L.) Pers.	COSE5	rock harlequin	Fumariaceae	Magnoliophyta
Corylus americana Walt.	COAM3	American hazelnut	Betulaceae	Magnoliophyta
Corylus cornuta Marsh. var. *cornuta*	COCOC2	beaked hazelnut	Betulaceae	Magnoliophyta
Corylus L.	CORYL	hazelnut	Betulaceae	Magnoliophyta
Crataegus crus-galli L.	CRCR2	cockspur hawthorn	Rosaceae	Magnoliophyta
Crataegus L.	CRATA	hawthorn	Rosaceae	Magnoliophyta
Crepis capillaris (L.) Wallr.	CRCA3	smooth hawksbeard	Asteraceae	Magnoliophyta
Crepis pulchra L.	CRPU3	smallflower hawksbeard	Asteraceae	Magnoliophyta
Cryptotaenia canadensis (L.) DC.	CRCA9	Canadian honewort	Apiaceae	Magnoliophyta
Cunila origanoides (L.) Britt.	CUOR	common dittany	Lamiaceae	Magnoliophyta
Cuphea viscosissima Jacq.	CUVI	blue waxweed	Lythraceae	Magnoliophyta
Cuscuta gronovii Willd. ex J.A. Schultes *var. gronovii*	CUGRG	scaldweed	Cuscutaceae	Magnoliophyta
Cymophyllus fraserianus (Ker-Gawl.) Kartesz & Gandhi	CYFR4	Fraser's cymophyllus	Cyperaceae	Magnoliophyta
Cynoglossum virginianum L. var. *virginianum*	CYVIV	wild comfrey	Boraginaceae	Magnoliophyta
Cyperus erythrorhizos Muhl.	CYER2	redroot flatsedge	Cyperaceae	Magnoliophyta
Cyperus esculentus L. var. *leptostachyus* Boeckl.	CYESL	yellow nutsedge	Cyperaceae	Magnoliophyta
Cyperus L.	CYPER	flatsedge	Cyperaceae	Magnoliophyta
Cyperus lancastriensis Porter ex Gray	CYLA3	manyflower flatsedge	Cyperaceae	Magnoliophyta
Cyperus odoratus L.	CYOD	fragrant flatsedge	Cyperaceae	Magnoliophyta
Cyperus squarrosus L.	CYSQ	awned flatsedge	Cyperaceae	Magnoliophyta
Cyperus strigosus L.	CYST	strawcolored flatsedge	Cyperaceae	Magnoliophyta
Cypripedium acaule Ait.	CYAC3	moccasin flower	Orchidaceae	Magnoliophyta
Cypripedium L.	CYPRI	lady's slipper	Orchidaceae	Magnoliophyta
Cypripedium parviflorum Salisb. var. *pubescens* (Willd.) Knight	CYPAP3	greater yellow lady's slipper	Orchidaceae	Magnoliophyta
Cystopteris Bernh.	CYSTO	bladderfern	Dryopteridaceae	Polypodiophyta
Cystopteris protrusa (Weatherby) Blasdell	CYPR4	lowland bladderfern	Dryopteridaceae	Polypodiophyta
Dactylis glomerata L. ssp. *glomerata*	DAGLG	orchardgrass	Poaceae	Magnoliophyta
Danthonia compressa Austin ex Peck	DACO	flattened oatgrass	Poaceae	Magnoliophyta
Danthonia DC.	DANTH	oatgrass	Poaceae	Magnoliophyta
Danthonia spicata (L.) Beauv. ex Roemer & J.A. Schultes	DASP2	poverty oatgrass	Poaceae	Magnoliophyta
Daucus carota L.	DACA6	Queen Anne's lace	Apiaceae	Magnoliophyta
Delphinium tricorne Michx.	DETR	dwarf larkspur	Ranunculaceae	Magnoliophyta
Dennstaedtia punctilobula (Michx.) T. Moore	DEPU2	eastern hayscented fern	Dennstaedtiaceae	Polypodiophyta
Deparia acrostichoides (Sw.) M. Kato	DEAC4	silver false spleenwort	Dryopteridaceae	Polypodiophyta
Desmodium canadense (L.) DC.	DECA7	showy ticktrefoil	Fabaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Desmodium canescens (L.) DC.	DECA8	hoary ticktrefoil	Fabaceae	Magnoliophyta
Desmodium Desv.	DESMO	ticktrefoil	Fabaceae	Magnoliophyta
Desmodium glabellum (Michx.) DC.	DEGL4	Dillenius' ticktrefoil	Fabaceae	Magnoliophyta
Desmodium nudiflorum (L.) DC.	DENU4	nakedflower ticktrefoil	Fabaceae	Magnoliophyta
Desmodium pauciflorum (Nutt.) DC.	DEPA7	fewflower ticktrefoil	Fabaceae	Magnoliophyta
Desmodium perplexum Schub.	DEPE80	perplexed ticktrefoil	Fabaceae	Magnoliophyta
Desmodium rotundifolium DC.	DERO3	prostrate ticktrefoil	Fabaceae	Magnoliophyta
Dianthus armeria L.	DIAR	Deptford pink	Caryophyllaceae	Magnoliophyta
Diarrhena americana Beauv.	DIAM	American beakgrain	Poaceae	Magnoliophyta
Dicentra canadensis (Goldie) Walp.	DICA	squirrel corn	Fumariaceae	Magnoliophyta
Dichanthelium (A.S. Hitchc. & Chase) Gould	DICHA2	rosette grass	Poaceae	Magnoliophyta
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark	DIAC2	tapered rosette grass	Poaceae	Magnoliophyta
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark ssp. *fasciculatum* (Torr.) Freckmann	DIACFWV	western panicgrass	Poaceae	Magnoliophyta
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark ssp. *implicatum* (Scribn.) Freckmann & Lelong	DIACIWV	western panicgrass	Poaceae	Magnoliophyta
Dichanthelium boscii (Poir.) Gould & C.A. Clark	DIBO2	Bosc's panicgrass	Poaceae	Magnoliophyta
Dichanthelium clandestinum (L.) Gould	DICL	deertongue	Poaceae	Magnoliophyta
Dichanthelium commutatum (J.A. Schultes) Gould	DICO2	variable panicgrass	Poaceae	Magnoliophyta
Dichanthelium commutatum (J.A. Schultes) Gould ssp. *ashei* (T.G. Pearson ex Ashei) Freckmann & Lelong	DICOAWV	variable panicgrass	Poaceae	Magnoliophyta
Dichanthelium dichotomum (L.) Gould	DIDI6	cypress panicgrass	Poaceae	Magnoliophyta
Dichanthelium dichotomum (L.) Gould ssp. *dichotomum*	DIDIDWV	cypress panicgrass	Poaceae	Magnoliophyta
Dichanthelium dichotomum (L.) Gould ssp. *microcarpon* (Muhl. ex Elliott) Freckmann & Lelong	DIDIM2WV	roundseed panicgrass	Poaceae	Magnoliophyta
Dichanthelium linearifolium (Scribn. ex Nash) Gould	DILI2	slimleaf panicgrass	Poaceae	Magnoliophyta
Dichanthelium ovale (Elliott) Gould & C.A. Clark ssp. *villosissimum* (Nash) Freckmann & Lelong	DIOVVWV	whitehair rosette grass	Poaceae	Magnoliophyta
Dichanthelium polyanthes (Shult.) Mohlenbr.	DIPO4	roundseed panicgrass	Poaceae	Magnoliophyta
Dichanthelium sphaerocarpon (Ell.) Gould	DISP2	roundseed panicgrass	Poaceae	Magnoliophyta
Dicranum condensatum Hedw.	DICO17	condensed dicranum moss	Dicranaceae	Bryophyta
Dicranum fulvum Hook.	DIFU3	dicranum moss	Dicranaceae	Bryophyta
Dicranum Hedw.	DICRA8	dicranum moss	Dicranaceae	Bryophyta
Dicranum scoparium Hedw.	DISC71	dicranum moss	Dicranaceae	Bryophyta
Digitaria ischaemum (Schreb.) Schreb. ex Muhl.	DIIS	smooth crabgrass	Poaceae	Magnoliophyta
Digitaria sanguinalis (L.) Scop.	DISA	hairy crabgrass	Poaceae	Magnoliophyta
Diodia virginiana L. var. *virginiana*	DIVIV2	Virginia buttonweed	Rubiaceae	Magnoliophyta
Dioscorea oppositifolia L.	DIOP	Chinese yam	Dioscoreaceae	Magnoliophyta
Dioscorea quaternata J.F. Gmel.	DIQU	fourleaf yam	Dioscoreaceae	Magnoliophyta
Dioscorea villosa L.	DIVI4	wild yam	Dioscoreaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Diospyros virginiana L.	DIVI5	common persimmon	Ebenaceae	Magnoliophyta
Diplazium pycnocarpon (Spreng.) Broun	DIPY	glade fern	Dryopteridaceae	Polypodiophyta
Dirca palustris L.	DIPA9	eastern leatherwood	Thymelaeaceae	Magnoliophyta
Doellingeria infirma (Michx.) Greene	DOIN2	cornel-leaf whitetop	Asteraceae	Magnoliophyta
Dryopteris Adans.	DRYOP	woodfern	Dryopteridaceae	Polypodiophyta
Dryopteris carthusiana (Vill.) H.P. Fuchs	DRCA11	spinulose woodfern	Dryopteridaceae	Polypodiophyta
Dryopteris intermedia (Muhl. ex Willd.) Gray	DRIN5	intermediate woodfern	Dryopteridaceae	Polypodiophyta
Dryopteris marginalis (L.) Gray	DRMA4	marginal woodfern	Dryopteridaceae	Polypodiophyta
Duchesnea indica (Andr.) Focke	DUIN	Indian strawberry	Rosaceae	Magnoliophyta
Dulichium arundinaceum (L.) Britt.	DUAR3	threeway sedge	Cyperaceae	Magnoliophyta
Echinochloa crus-galli (L.) Beauv.	ECCR	barnyardgrass	Poaceae	Magnoliophyta
Echinochloa muricata (Beauv.) Fern. var. *muricata*	ECMUM2	rough barnyardgrass	Poaceae	Magnoliophyta
Echium vulgare L.	ECVU	common viper's bugloss	Boraginaceae	Magnoliophyta
Eclipta prostrata (L.) L.	ECPR	false daisy	Asteraceae	Magnoliophyta
Elaeagnus umbellata Thunb. var. *parvifolia* (Royle) Schneid.	ELUMP	autumn olive	Elaeagnaceae	Magnoliophyta
Eleocharis erythropoda Steud.	ELER	bald spikerush	Cyperaceae	Magnoliophyta
Eleocharis obtusa (Willd.) J.A. Schultes	ELOB2	blunt spikerush	Cyperaceae	Magnoliophyta
Eleocharis palustris (L.) Roemer & J.A. Schultes	ELPA3	common spikerush	Cyperaceae	Magnoliophyta
Eleocharis R. Br.	ELEOC	spikerush	Cyperaceae	Magnoliophyta
Eleocharis tenuis (Willd.) J.A. Schultes	ELTE	slender spikerush	Cyperaceae	Magnoliophyta
Elephantopus carolinianus Raeusch.	ELCA3	Carolina elephantsfoot	Asteraceae	Magnoliophyta
Elodea canadensis Michx.	ELCA7	Canadian waterweed	Hydrocharitaceae	Magnoliophyta
Elsholtzia ciliata (Thunb.) Hyl.	ELCI	crested latesummer mint	Lamiaceae	Magnoliophyta
Elymus canadensis L.	ELCA4	Canada wildrye	Poaceae	Magnoliophyta
Elymus hystrix L.	ELHY	eastern bottlebrush grass	Poaceae	Magnoliophyta
Elymus L.	ELYMU	wildrye	Poaceae	Magnoliophyta
Elymus riparius Wieg.	ELRI	riverbank wild rye	Poaceae	Magnoliophyta
Elymus virginicus L. var. *virginicus*	ELVIV	Virginia wildrye	Poaceae	Magnoliophyta
Epifagus virginiana (L.) W. Bart.	EPVI2	beechdrops	Orobanchaceae	Magnoliophyta
Epigaea repens L.	EPRE2	trailing arbutus	Ericaceae	Magnoliophyta
Epilobium ciliatum Raf.	EPCI	fringed willowherb	Onagraceae	Magnoliophyta
Epilobium L.	EPILO	willowherb	Onagraceae	Magnoliophyta
Equisetum arvense L.	EQAR	field horsetail	Equisetaceae	Equisetophyta
Equisetum hyemale L. var. *affine* (Engelm.) A.A. Eat.	EQHYA	scouringrush horsetail	Equisetaceae	Equisetophyta
Equisetum L.	EQUIS	horsetail	Equisetaceae	Equisetophyta
Eragrostis capillaris (L.) Nees	ERCA	lace grass	Poaceae	Magnoliophyta
Eragrostis hypnoides (Lam.) B.S.P.	ERHY	creeping lovegrass	Poaceae	Magnoliophyta
Eragrostis pectinacea (Michx.) Nees ex Steud. var. *pectinacea*	ERPEP2	tufted lovegrass	Poaceae	Magnoliophyta
Eragrostis pilosa (L.) Beauv.	ERPI2	Indian lovegrass	Poaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Eragrostis von Wolf	ERAGR	lovegrass	Poaceae	Magnoliophyta
Erechtites hieraciifolia (L.) Raf. ex DC. var. *hieraciifolia*	ERHIH	American burnweed	Asteraceae	Magnoliophyta
Erigeron annuus (L.) Pers.	ERAN	eastern daisy fleabane	Asteraceae	Magnoliophyta
Erigeron L.	ERIGE2	fleabane	Asteraceae	Magnoliophyta
Erigeron philadelphicus L. var. *philadelphicus*	ERPHP	Philadelphia fleabane	Asteraceae	Magnoliophyta
Erigeron strigosus Muhl. ex Willd. var. *strigosus*	ERSTS2	prairie fleabane	Asteraceae	Magnoliophyta
Erythronium americanum Ker-Gawl. ssp. *americanum*	ERAMA2	dogtooth violet	Liliaceae	Magnoliophyta
Euonymus americana L.	EUAM7	bursting-heart	Celastraceae	Magnoliophyta
Euonymus atropurpurea Jacq. var. *atropurpurea*	EUATA	eastern wahoo	Celastraceae	Magnoliophyta
Euonymus L.	EUONY2	spindletree	Celastraceae	Magnoliophyta
Eupatorium fistulosum Barratt	EUFI	trumpetweed	Asteraceae	Magnoliophyta
Eupatorium L.	EUPAT	thoroughwort	Asteraceae	Magnoliophyta
Eupatorium perfoliatum L. var. *perfoliatum*	EUPEP	common boneset	Asteraceae	Magnoliophyta
Eupatorium purpureum L. var. *purpureum*	EUPUP	sweetscented joepyeweed	Asteraceae	Magnoliophyta
Eupatorium serotinum Michx.	EUSE2	lateflowering thoroughwort	Asteraceae	Magnoliophyta
Eupatorium sessilifolium L.	EUSE3	upland boneset	Asteraceae	Magnoliophyta
Euphorbia commutata Engelm.	EUCO8	tinted woodland spurge	Euphorbiaceae	Magnoliophyta
Euphorbia corollata L.	EUCO10	flowering spurge	Euphorbiaceae	Magnoliophyta
Eurybia divaricata (L.) Nesom	EUDI16	white wood aster	Asteraceae	Magnoliophyta
Eurybia macrophylla (L.) Cass.	EUMA27	bigleaf aster	Asteraceae	Magnoliophyta
Euthamia graminifolia (L.) Nutt. var. *graminifolia*	EUGRG	flat-top goldentop	Asteraceae	Magnoliophyta
Fagus grandifolia Ehrh.	FAGR	American beech	Fagaceae	Magnoliophyta
Festuca rubra L. ssp. *rubra*	FERUR2	red fescue	Poaceae	Magnoliophyta
Festuca subverticillata (Pers.) Alexeev	FESU3	nodding fescue	Poaceae	Magnoliophyta
Fimbristylis autumnalis (L.) Roemer & J.A. Schultes	FIAU2	slender fimbry	Cyperaceae	Magnoliophyta
Flavoparmelia baltimorensis (Gyelnik & Foriss) Hale	FLBA	lichen	Parmeliaceae	Ascomycota
Floerkea proserpinacoides Willd.	FLPR	false mermaidweed	Limnanthaceae	Magnoliophyta
Fragaria L.	FRAGA	strawberry	Rosaceae	Magnoliophyta
Fragaria vesca L.	FRVE	woodland strawberry	Rosaceae	Magnoliophyta
Fragaria virginiana Duchesne ssp. *virginiana*	FRVIV	Virginia strawberry	Rosaceae	Magnoliophyta
Fraxinus americana L.	FRAM2	white ash	Oleaceae	Magnoliophyta
Fraxinus pennsylvanica Marsh.	FRPE	green ash	Oleaceae	Magnoliophyta
Galax urceolata (Poir.) Brummitt	GAUR2	galax	Diapensiaceae	Magnoliophyta
Galearis spectabilis (L.) Raf.	GASP5	showy orchid	Orchidaceae	Magnoliophyta
Galinsoga quadriradiata Cav.	GAQU	shaggy soldier	Asteraceae	Magnoliophyta
Galium aparine L.	GAAP2	stickywilly	Rubiaceae	Magnoliophyta
Galium asprellum Michx.	GAAS2	rough bedstraw	Rubiaceae	Magnoliophyta
Galium circaezans Michx.	GACI2	licorice bedstraw	Rubiaceae	Magnoliophyta
Galium L.	GALIU	bedstraw	Rubiaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Galium lanceolatum Torr.	GALA3	lanceleaf wild licorice	Rubiaceae	Magnoliophyta
Galium latifolium Michx.	GALA4	purple bedstraw	Rubiaceae	Magnoliophyta
Galium obtusum Bigelow ssp. *obtusum*	GAOBO	bluntleaf bedstraw	Rubiaceae	Magnoliophyta
Galium pilosum Ait.	GAPI2	hairy bedstraw	Rubiaceae	Magnoliophyta
Galium tinctorium L.	GATI	stiff marsh bedstraw	Rubiaceae	Magnoliophyta
Galium triflorum Michx.	GATR3	fragrant bedstraw	Rubiaceae	Magnoliophyta
Gaultheria procumbens L.	GAPR2	wintergreen	Ericaceae	Magnoliophyta
Gaylussacia baccata (Wangenh.) K. Koch	GABA	black huckleberry	Ericaceae	Magnoliophyta
Gentiana L.	GENTI	gentian	Gentianaceae	Magnoliophyta
Gentiana villosa L.	GEVI5	striped gentian	Gentianaceae	Magnoliophyta
Geranium L.	GERAN	geranium	Geraniaceae	Magnoliophyta
Geranium maculatum L.	GEMA	spotted geranium	Geraniaceae	Magnoliophyta
Geum canadense Jacq. var. *canadense*	GECAC6	white avens	Rosaceae	Magnoliophyta
Geum L.	GEUM	avens	Rosaceae	Magnoliophyta
Geum laciniatum Murr. var. *laciniatum*	GELAL	rough avens	Rosaceae	Magnoliophyta
Geum vernum (Raf.) Torr. & Gray	GEVE	spring avens	Rosaceae	Magnoliophyta
Geum virginianum L.	GEVI4	cream avens	Rosaceae	Magnoliophyta
Glechoma hederacea L.	GLHE2	ground ivy	Lamiaceae	Magnoliophyta
Gleditsia triacanthos L.	GLTR	honeylocust	Fabaceae	Magnoliophyta
Glyceria melicaria (Michx.) F.T. Hubbard	GLME2	melic mannagrass	Poaceae	Magnoliophyta
Glyceria striata (Lam.) A.S. Hitchc.	GLST	fowl mannagrass	Poaceae	Magnoliophyta
Goodyera pubescens (Willd.) R. Br. ex Ait. f.	GOPU	downy rattlesnake plantain	Orchidaceae	Magnoliophyta
Gratiola neglecta Torr.	GRNE	clammy hedgehyssop	Scrophulariaceae	Magnoliophyta
Grimmia pilifera P. Beauv.	GRPI3	grimmia dry rock moss	Grimmiaceae	Bryophyta
Gymnocarpium dryopteris (L.) Newman	GYDR	western oakfern	Dryopteridaceae	Polypodiophyta
Halesia tetraptera Ellis	HATE3	mountain silverbell	Styracaceae	Magnoliophyta
Hamamelis virginiana L.	HAVI4	American witchhazel	Hamamelidaceae	Magnoliophyta
Hedwigia ciliata (Hedw.) P. Beauv.	HECI5	ciliate hedwigia moss	Hedwigiaceae	Bryophyta
Helenium autumnale L. var. *autumnale*	HEAUA	common sneezeweed	Asteraceae	Magnoliophyta
Helianthemum canadense (L.) Michx.	HECA3	longbranch frostweed	Cistaceae	Magnoliophyta
Helianthus ×laetiflorus Pers. (pro sp.)	HELA	cheerful sunflower	Asteraceae	Magnoliophyta
Helianthus annuus L.	HEAN3	common sunflower	Asteraceae	Magnoliophyta
Helianthus divaricatus L.	HEDI2	woodland sunflower	Asteraceae	Magnoliophyta
Helianthus hirsutus Raf.	HEHI2	hairy sunflower	Asteraceae	Magnoliophyta
Helianthus L.	HELIA3	sunflower	Asteraceae	Magnoliophyta
Helianthus laevigatus Torr. & Gray	HELA2	smooth sunflower	Asteraceae	Magnoliophyta
Helianthus microcephalus Torr. & Gray	HEMI3	small woodland sunflower	Asteraceae	Magnoliophyta
Helianthus occidentalis Riddell ssp. *occidentalis*	HEOCO	fewleaf sunflower	Asteraceae	Magnoliophyta
Helianthus strumosus L.	HEST	paleleaf woodland sunflower	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Helianthus tuberosus L.	HETU	Jerusalem artichoke	Asteraceae	Magnoliophyta
Heliopsis helianthoides (L.) Sweet	HEHE5	smooth oxeye	Asteraceae	Magnoliophyta
Heliopsis helianthoides (L.) Sweet var. *scabra* (Dunal) Fern.	HEHES	smooth oxeye	Asteraceae	Magnoliophyta
Hemerocallis fulva (L.) L.	HEFU	orange daylily	Liliaceae	Magnoliophyta
Hepatica nobilis Schreb. var. *acuta* (Pursh) Steyermark	HENOA	sharplobe hepatica	Ranunculaceae	Magnoliophyta
Hepatica nobilis Schreb. var. *obtusa* (Pursh) Steyermark	HENOO	roundlobe hepatica	Ranunculaceae	Magnoliophyta
Heracleum maximum Bartr.	HEMA80	common cowparsnip	Apiaceae	Magnoliophyta
Hesperis matronalis L.	HEMA3	dames rocket	Brassicaceae	Magnoliophyta
Heteranthera dubia (Jacq.) MacM.	HEDU2	grassleaf mudplantain	Pontederiaceae	Magnoliophyta
Heuchera americana L. var. *americana*	HEAMA2	American alumroot	Saxifragaceae	Magnoliophyta
Heuchera L.	HEUCH	alumroot	Saxifragaceae	Magnoliophyta
Heuchera pubescens Pursh	HEPU7	downy alumroot	Saxifragaceae	Magnoliophyta
Heuchera villosa Michx. var. *villosa*	HEVIV2	hairy alumroot	Saxifragaceae	Magnoliophyta
Hexastylis Raf.	HEXAS	heartleaf	Aristolochiaceae	Magnoliophyta
Hexastylis virginica (L.) Small	HEVI3	Virginia heartleaf	Aristolochiaceae	Magnoliophyta
Hibiscus laevis All.	HILA2	halberdleaf rosemallow	Malvaceae	Magnoliophyta
Hieracium caespitosum Dumort.	HICA10	meadow hawkweed	Asteraceae	Magnoliophyta
Hieracium L.	HIERA	hawkweed	Asteraceae	Magnoliophyta
Hieracium paniculatum L.	HIPA2	Allegheny hawkweed	Asteraceae	Magnoliophyta
Hieracium venosum L.	HIVE	rattlesnakeweed	Asteraceae	Magnoliophyta
Holcus lanatus L.	HOLA	common velvetgrass	Poaceae	Magnoliophyta
Houstonia caerulea L.	HOCA4	azure bluet	Rubiaceae	Magnoliophyta
Houstonia longifolia Gaertn.	HOLO	longleaf summer bluet	Rubiaceae	Magnoliophyta
Houstonia serpyllifolia Michx.	HOSE2	thymeleaf bluet	Rubiaceae	Magnoliophyta
Hybanthus concolor (T.F. Forst.) Spreng.	HYCO6	eastern greenviolet	Violaceae	Magnoliophyta
Hydrangea arborescens L.	HYAR	wild hydrangea	Hydrangeaceae	Magnoliophyta
Hydrastis canadensis L.	HYCA	goldenseal	Ranunculaceae	Magnoliophyta
Hydrophyllum canadense L.	HYCA3	bluntleaf waterleaf	Hydrophyllaceae	Magnoliophyta
Hydrophyllum L.	HYDRO4	waterleaf	Hydrophyllaceae	Magnoliophyta
Hydrophyllum virginianum L.	HYVI	eastern waterleaf	Hydrophyllaceae	Magnoliophyta
Hypericum densiflorum Pursh	HYDE	bushy St. John's-wort	Clusiaceae	Magnoliophyta
Hypericum gentianoides (L.) B.S.P.	HYGE	orangegrass	Clusiaceae	Magnoliophyta
Hypericum hypericoides (L.) Crantz ssp. *multicaule* (Michx. ex Willd.) Robson	HYHYM	St. Andrew's cross	Clusiaceae	Magnoliophyta
Hypericum L.	HYPER	St. John's wort	Clusiaceae	Magnoliophyta
Hypericum mutilum L.	HYMU	dwarf St. John's wort	Clusiaceae	Magnoliophyta
Hypericum perforatum L.	HYPE	common St. John's wort	Clusiaceae	Magnoliophyta
Hypericum prolificum L.	HYPR	shrubby St. John's wort	Clusiaceae	Magnoliophyta
Hypericum punctatum Lam.	HYPU	spotted St. John's wort	Clusiaceae	Magnoliophyta
Hypnum curvifolium Hedw.	HYCU2	curveleaf hypnum moss	Hypnaceae	Bryophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Hypnum imponens Hedw.	HYIM3	flat fern moss	Hypnaceae	Bryophyta
Hypoxis hirsuta (L.) Coville	HYHI2	common goldstar	Iridaceae	Magnoliophyta
Ilex montana Torr. & Gray ex Gray	ILMO	mountain holly	Aquifoliaceae	Magnoliophyta
Ilex opaca Ait. var. *opaca*	ILOPO	American holly	Aquifoliaceae	Magnoliophyta
Ilex verticillata (L.) Gray	ILVE	common winterberry	Aquifoliaceae	Magnoliophyta
Impatiens capensis Meerb.	IMCA	jewelweed	Balsaminaceae	Magnoliophyta
Impatiens L.	IMPAT	touch-me-not	Balsaminaceae	Magnoliophyta
Impatiens pallida Nutt.	IMPA	pale touch-me-not	Balsaminaceae	Magnoliophyta
Ipomoea coccinea L.	IPCO3	redstar	Convolvulaceae	Magnoliophyta
Ipomoea L.	IPOMO	morning-glory	Convolvulaceae	Magnoliophyta
Ipomoea pandurata (L.) G.F.W. Mey.	IPPA	man of the earth	Convolvulaceae	Magnoliophyta
Iris cristata Ait.	IRCR	dwarf crested iris	Iridaceae	Magnoliophyta
Iris pseudacorus L.	IRPS	paleyellow iris	Iridaceae	Magnoliophyta
Isanthus brachiatus (L.) B.S.P.	ISBR3	fluxweed	Lamiaceae	Magnoliophyta
Isopterygium tenerum (Sw.) Mitt.	ISTE3	isopterygium moss	Hypnaceae	Bryophyta
Isotria verticillata Raf.	ISVE	large whorled pogonia	Orchidaceae	Magnoliophyta
Juglans nigra L.	JUNI	black walnut	Juglandaceae	Magnoliophyta
Juncus bufonius L. var. *bufonius*	JUBUB	toad rush	Juncaceae	Magnoliophyta
Juncus canadensis J. Gay ex Laharpe	JUCA3	Canadian rush	Juncaceae	Magnoliophyta
Juncus effusus L.	JUEF	common rush	Juncaceae	Magnoliophyta
Juncus L.	JUNCU	rush	Juncaceae	Magnoliophyta
Juncus tenuis Willd.	JUTE	poverty rush	Juncaceae	Magnoliophyta
Jungermannia gracillima Sm.	JUGR6	bordered roundleaf liverwort	Jungermanniaceae	Marchantiophyta
Juniperus virginiana L. var. *virginiana*	JUVIV	eastern red-cedar	Cupressaceae	Pinophyta
Justicia americana (L.) Vahl	JUAM	American water-willow	Acanthaceae	Magnoliophyta
Kalmia latifolia L.	KALA	mountain laurel	Ericaceae	Magnoliophyta
Krigia virginica (L.) Willd.	KRVI	Virginia dwarfdandelion	Asteraceae	Magnoliophyta
Kummerowia stipulacea (Maxim.) Makino	KUST	Korean clover	Fabaceae	Magnoliophyta
Kyllinga pumila Michx.	KYPU	low spikesedge	Cyperaceae	Magnoliophyta
Lactuca floridana (L.) Gaertn. var. *floridana*	LAFLF	woodland lettuce	Asteraceae	Magnoliophyta
Lactuca hirsuta Muhl. ex Nutt.	LAHI	hairy lettuce	Asteraceae	Magnoliophyta
Lactuca L.	LACTU	lettuce	Asteraceae	Magnoliophyta
Lactuca saligna L.	LASA	willowleaf lettuce	Asteraceae	Magnoliophyta
Laportea canadensis (L.) Weddell	LACA3	Canadian woodnettle	Urticaceae	Magnoliophyta
Lasallia papulosa (Ach.) Llano	LAPA13	blistered naval lichen	Umbilicariaceae	Ascomycota
Lathyrus latifolius L.	LALA4	perennial pea	Fabaceae	Magnoliophyta
Leersia oryzoides (L.) Sw.	LEOR	rice cutgrass	Poaceae	Magnoliophyta
Leersia virginica Willd.	LEVI2	whitegrass	Poaceae	Magnoliophyta
Leptodictyum riparium (Hedw.) Warnst.	LERI6	river conecap moss	Amblystegiaceae	Bryophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Lespedeza cuneata (Dum.-Cours.) G. Don	LECU	sericea lespedeza	Fabaceae	Magnoliophyta
Lespedeza Michx.	LESPE	lespedeza	Fabaceae	Magnoliophyta
Lespedeza procumbens Michx.	LEPR	trailing lespedeza	Fabaceae	Magnoliophyta
Lespedeza repens (L.) W. Bart.	LERE2	creeping lespedeza	Fabaceae	Magnoliophyta
Lespedeza virginica (L.) Britt.	LEVI7	slender lespedeza	Fabaceae	Magnoliophyta
Leucanthemum vulgare Lam.	LEVU	oxeye daisy	Asteraceae	Magnoliophyta
Leucobryum albidum (Brid. ex P. Beauv.) Lindb.	LEAL35	small white cushion moss	Leucobryaceae	Bryophyta
Leucobryum glaucum (Hedw.) Ångstr. in Fries	LEGL19	common white cushion moss	Leucobryaceae	Bryophyta
Leucobryum Hampe	LEUCO9	white cushion moss	Leucobryaceae	Bryophyta
Liatris spicata (L.) Willd.	LISP	dense blazing star	Asteraceae	Magnoliophyta
Ligustrum vulgare L.	LIVU	European privet	Oleaceae	Magnoliophyta
Lilium canadense L.	LICA3	Canada lily	Liliaceae	Magnoliophyta
Lilium L.	LILIU	lily	Liliaceae	Magnoliophyta
Lindera benzoin (L.) Blume	LIBE3	northern spicebush	Lauraceae	Magnoliophyta
Lindernia dubia (L.) Pennell	LIDU	yellowseed false pimpernel	Scrophulariaceae	Magnoliophyta
Lindernia dubia (L.) Pennell var. *dubia*	LIDUD	yellowseed false pimpernel	Scrophulariaceae	Magnoliophyta
Linum L.	LINUM	flax	Linaceae	Magnoliophyta
Linum striatum Walt.	LIST	ridged yellow flax	Linaceae	Magnoliophyta
Liparis liliifolia (L.) L.C. Rich. ex Ker-Gawl.	LILI3	brown widelip orchid	Orchidaceae	Magnoliophyta
Liquidambar styraciflua L.	LIST2	sweetgum	Hamamelidaceae	Magnoliophyta
Liriodendron tulipifera L.	LITU	tuliptree	Magnoliaceae	Magnoliophyta
Lobelia cardinalis L.	LOCA2	cardinalflower	Campanulaceae	Magnoliophyta
Lobelia inflata L.	LOIN	Indian-tobacco	Campanulaceae	Magnoliophyta
Lobelia puberula Michx. var. *puberula*	LOPUP2	downy lobelia	Campanulaceae	Magnoliophyta
Lobelia siphilitica L. var. *siphilitica*	LOSIS2	great blue lobelia	Campanulaceae	Magnoliophyta
Loeskeobryum brevirostre (Brid.) Fleisch. in Broth.	LOBR7	loeskeobryum moss	Hylocomiaceae	Bryophyta
Lolium arundinaceum (Schreb.) S.J. Darbyshire	LOAR10	tall fescue	Poaceae	Magnoliophyta
Lolium perenne L.	LOPE	perennial ryegrass	Poaceae	Magnoliophyta
Lolium pratense (Huds.) S.J. Darbyshire	LOPR7	meadow fescue	Poaceae	Magnoliophyta
Lonicera japonica Thunb.	LOJA	Japanese honeysuckle	Caprifoliaceae	Magnoliophyta
Lonicera L.	LONIC	honeysuckle	Caprifoliaceae	Magnoliophyta
Lonicera morrowii Gray	LOMO2	Morrow's honeysuckle	Caprifoliaceae	Magnoliophyta
Lonicera tatarica L.	LOTA	Tatarian honeysuckle	Caprifoliaceae	Magnoliophyta
Lotus corniculatus L.	LOCO6	bird's-foot trefoil	Fabaceae	Magnoliophyta
Ludwigia alternifolia L.	LUAL2	seedbox	Onagraceae	Magnoliophyta
Ludwigia palustris (L.) Ell.	LUPA	marsh seedbox	Onagraceae	Magnoliophyta
Luzula acuminata Raf.	LUAC	hairy woodrush	Juncaceae	Magnoliophyta
Luzula multiflora (Ehrh.) Lej. ssp. *multiflora* var. *multiflora*	LUMUM2	common woodrush	Juncaceae	Magnoliophyta
Lycopodium digitatum Dill. ex A. Braun	LYDI3	fan clubmoss	Lycopodiaceae	Lycopodiophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Lycopodium L.	LYCOP2	clubmoss	Lycopodiaceae	Lycopodiophyta
Lycopodium obscurum L.	LYOB	rare clubmoss	Lycopodiaceae	Lycopodiophyta
Lycopus americanus Muhl. ex W. Bart.	LYAM	American water horehound	Lamiaceae	Magnoliophyta
Lycopus L.	LYCOP4	waterhorehound	Lamiaceae	Magnoliophyta
Lycopus uniflorus Michx. var. *uniflorus*	LYUNUWV	northern bugleweed	Lamiaceae	Magnoliophyta
Lycopus virginicus L.	LYVI4	Virginia water horehound	Lamiaceae	Magnoliophyta
Lyonia ligustrina (L.) DC. var. *ligustrina*	LYLIL	maleberry	Ericaceae	Magnoliophyta
Lysimachia ciliata L.	LYCI	fringed loosestrife	Primulaceae	Magnoliophyta
Lysimachia L.	LYSIM	yellow loosestrife	Primulaceae	Magnoliophyta
Lysimachia nummularia L.	LYNU	creeping jenny	Primulaceae	Magnoliophyta
Lysimachia quadrifolia L.	LYQU2	whorled yellow loosestrife	Primulaceae	Magnoliophyta
Lysimachia terrestris (L.) B.S.P.	LYTE2	earth loosestrife	Primulaceae	Magnoliophyta
Lythrum L.	LYTHR	loosestrife	Lythraceae	Magnoliophyta
Lythrum salicaria L.	LYSA2	purple loosestrife	Lythraceae	Magnoliophyta
Magnolia acuminata (L.) L.	MAAC	cucumber-tree	Magnoliaceae	Magnoliophyta
Magnolia fraseri Walt.	MAFR	mountain magnolia	Magnoliaceae	Magnoliophyta
Magnolia tripetala (L.) L.	MATR	umbrella-tree	Magnoliaceae	Magnoliophyta
Maianthemum canadense Desf.	MACA4	Canada mayflower	Liliaceae	Magnoliophyta
Maianthemum G.H. Weber ex Wiggers	MAIAN	mayflower	Liliaceae	Magnoliophyta
Maianthemum racemosum (L.) Link ssp. *racemosum*	MARAR	feathery false lily of the valley	Liliaceae	Magnoliophyta
Maianthemum stellatum (L.) Link	MAST4	starry false lily of the valley	Liliaceae	Magnoliophyta
Malus P. Mill.	MALUS	apple	Rosaceae	Magnoliophyta
Malus pumila P. Mill.	MAPU	paradise apple	Rosaceae	Magnoliophyta
Malva sylvestris L.	MASY	high mallow	Malvaceae	Magnoliophyta
Medeola virginiana L.	MEVI	Indian cucumber	Liliaceae	Magnoliophyta
Medicago lupulina L.	MELU	black medick	Fabaceae	Magnoliophyta
Meehania cordata (Nutt.) Britt.	MECO	Meehan's mint	Lamiaceae	Magnoliophyta
Melica mutica Walt.	MEMU	two-flower melicgrass	Poaceae	Magnoliophyta
Melilotus officinalis (L.) Lam.	MEOF	yellow sweetclover	Fabaceae	Magnoliophyta
Menispermum canadense L.	MECA3	common moonseed	Menispermaceae	Magnoliophyta
Mentha ×piperita L. (pro sp.)	MEPI	peppermint	Lamiaceae	Magnoliophyta
Mentha arvensis L.	MEAR4	wild mint	Lamiaceae	Magnoliophyta
Mertensia virginica (L.) Pers. ex Link	MEVI3	Virginia bluebells	Boraginaceae	Magnoliophyta
Microstegium vimineum (Trin.) A. Camus	MIVI	Nepalese browntop	Poaceae	Magnoliophyta
Milium effusum L. var. *cisatlanticum* Fern.	MIEFC	American milletgrass	Poaceae	Magnoliophyta
Mimulus alatus Ait.	MIAL2	sharpwing monkeyflower	Scrophulariaceae	Magnoliophyta
Mimulus ringens L. var. *ringens*	MIRIR	Allegheny monkeyflower	Scrophulariaceae	Magnoliophyta
Mitchella repens L.	MIRE	partridgeberry	Rubiaceae	Magnoliophyta
Mitella diphylla L.	MIDI3	twoleaf miterwort	Saxifragaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Mnium Hedw.	MNIUM2	mnium calcareous moss	Mniaceae	Bryophyta
Mnium hornum Hedw.	MNHO	horn calcareous moss	Mniaceae	Bryophyta
Mnium stellare Hedw.	MNST	stellar calcareous moss	Mniaceae	Bryophyta
Mollugo verticillata L.	MOVE	green carpetweed	Molluginaceae	Magnoliophyta
Monarda clinopodia L.	MOCL	white bergamot	Lamiaceae	Magnoliophyta
Monarda fistulosa L.	MOFI	wild bergamot	Lamiaceae	Magnoliophyta
Monarda fistulosa L. ssp. *brevis* (Fosberg & Artz) Scora, comb. nov. ined.	MOFIB2	Smokehole bergamot	Lamiaceae	Magnoliophyta
Monarda L.	MONAR	beebalm	Lamiaceae	Magnoliophyta
Monotropa uniflora L.	MOUN3	Indianpipe	Monotropaceae	Magnoliophyta
Morus alba L.	MOAL	white mulberry	Moraceae	Magnoliophyta
Morus rubra L. var. *rubra*	MORUR	red mulberry	Moraceae	Magnoliophyta
Muhlenbergia frondosa (Poir.) Fern.	MUFR2	wirestem muhly	Poaceae	Magnoliophyta
Muhlenbergia Schreb.	MUHLE	muhly	Poaceae	Magnoliophyta
Muhlenbergia tenuiflora (Willd.) B.S.P.	MUTE	slimflower muhly	Poaceae	Magnoliophyta
Myosotis laxa Lehm.	MYLA	bay forget-me-not	Boraginaceae	Magnoliophyta
Najas gracillima (A. Braun ex Engelm.) Magnus	NAGR	slender waternymph	Najadaceae	Magnoliophyta
Nyssa sylvatica Marsh.	NYSY	blackgum	Nyssaceae	Magnoliophyta
Oclemena acuminata (Michx.) Greene	OCAC	whorled wood aster	Asteraceae	Magnoliophyta
Oenothera biennis L.	OEBI	common evening-primrose	Onagraceae	Magnoliophyta
Oenothera parviflora L.	OEPA5	northern evening-primrose	Onagraceae	Magnoliophyta
Oenothera perennis L.	OEPE	little evening-primrose	Onagraceae	Magnoliophyta
Onoclea sensibilis L.	ONSE	sensitive fern	Dryopteridaceae	Polypodiophyta
Orobanche uniflora L.	ORUN	oneflowered broomrape	Orobanchaceae	Magnoliophyta
Osmorhiza claytonii (Michx.) C.B. Clarke	OSCL	Clayton's sweetroot	Apiaceae	Magnoliophyta
Osmorhiza longistylis (Torr.) DC.	OSLO	longstyle sweetroot	Apiaceae	Magnoliophyta
Osmorhiza Raf.	OSMOR	sweetroot	Apiaceae	Magnoliophyta
Osmunda cinnamomea L.	OSCIC	cinnamon fern	Osmundaceae	Polypodiophyta
Osmunda claytoniana L.	OSCL2	interrupted fern	Osmundaceae	Polypodiophyta
Osmunda regalis L. var. *spectabilis* (Willd.) Gray	OSRES	royal fern	Osmundaceae	Polypodiophyta
Ostrya virginiana (P. Mill.) K. Koch var. *virginiana*	OSVIV	hophornbeam	Betulaceae	Magnoliophyta
Oxalis grandis Small	OXGR	great yellow woodsorrel	Oxalidaceae	Magnoliophyta
Oxalis L.	OXALI	woodsorrel	Oxalidaceae	Magnoliophyta
Oxalis montana Raf.	OXMO	mountain woodsorrel	Oxalidaceae	Magnoliophyta
Oxalis stricta L.	OXST	common yellow oxalis	Oxalidaceae	Magnoliophyta
Oxalis violacea L.	OXVI	violet woodsorrel	Oxalidaceae	Magnoliophyta
Oxydendrum arboreum (L.) DC.	OXAR	sourwood	Ericaceae	Magnoliophyta
Oxypolis rigidior (L.) Raf.	OXRI	stiff cowbane	Apiaceae	Magnoliophyta
Packera anonyma (Wood) W.A. Weber & A. Löve	PAAN6	Small's ragwort	Asteraceae	Magnoliophyta
Packera aurea (L.) A.& D. Löve	PAAU3	golden ragwort	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Packera obovata (Muhl. ex Willd.) W.A. Weber & A. Löve	PAOB6	roundleaf ragwort	Asteraceae	Magnoliophyta
Panax quinquefolius L.	PAQU	American ginseng	Araliaceae	Magnoliophyta
Panax trifolius L.	PATR2	dwarf ginseng	Araliaceae	Magnoliophyta
Panicum anceps Michx. ssp. *anceps*	PAANAWV	beaked panicgrass	Poaceae	Magnoliophyta
Panicum capillare L. ssp. *capillare*	PACACWV	witchgrass	Poaceae	Magnoliophyta
Panicum dichotomiflorum Michx. ssp. *dichotomiflorum*	PADIDWV	fall panicgrass	Poaceae	Magnoliophyta
Panicum L.	PANIC	panicgrass	Poaceae	Magnoliophyta
Panicum philadelphicum Bernh. ex Trin. ssp. *gattingeri* (Nah) Freckmann & Lelong	PAPHGWV	Gattinger's panicgrass	Poaceae	Magnoliophyta
Panicum rigidulum Bosc ex Nees	PARI4	redtop panicgrass	Poaceae	Magnoliophyta
Panicum rigidulum Bosc ex Nees ssp. *elongatum* (Scribn.) Freckmann & Lelong	PARIEWV	redtop panicgrass	Poaceae	Magnoliophyta
Panicum rigidulum Bosc ex Nees ssp. *rigidulum*	PARIRWV	fall panicgrass	Poaceae	Magnoliophyta
Panicum virgatum L.	PAVI2	switchgrass	Poaceae	Magnoliophyta
Parmotrema hypotropum (Nyl.) Hale	PAHY7	lichen	Parmeliaceae	Ascomycota
Paronychia canadensis (L.) Wood	PACA11	smooth forked nailwort	Caryophyllaceae	Magnoliophyta
Parthenocissus quinquefolia (L.) Planch.	PAQU2	Virginia creeper	Vitaceae	Magnoliophyta
Paspalum laeve Michx.	PALA10	field paspalum	Poaceae	Magnoliophyta
Paspalum setaceum Michx.	PASE5	thin paspalum	Poaceae	Magnoliophyta
Passiflora lutea L.	PALU2	yellow passionflower	Passifloraceae	Magnoliophyta
Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud.	PATO2	princesstree	Scrophulariaceae	Magnoliophyta
Pedicularis canadensis L. ssp. *canadensis*	PECAC3	Canadian lousewort	Scrophulariaceae	Magnoliophyta
Pellia epiphylla (L.) Corda	PEEP3	flap wing liverwort	Pelliaceae	Marchantiophyta
Pellia Raddi nom. cons.	PELLI	wing liverwort	Pelliaceae	Marchantiophyta
Pennisetum glaucum (L.) R. Br.	PEGL2	pearl millet	Poaceae	Magnoliophyta
Penthorum sedoides L.	PESE6	ditch stonecrop	Crassulaceae	Magnoliophyta
Perilla frutescens (L.) Britt.	PEFR4	beefsteakplant	Lamiaceae	Magnoliophyta
Phacelia bipinnatifida Michx.	PHBI2	fernleaf phacelia	Hydrophyllaceae	Magnoliophyta
Phacelia Juss.	PHACE	phacelia	Hydrophyllaceae	Magnoliophyta
Phegopteris hexagonoptera (Michx.) Fée	PHHE11	broad beechfern	Thelypteridaceae	Polypodiophyta
Phleum pratense L.	PHPR3	timothy	Poaceae	Magnoliophyta
Phlox divaricata L.	PHDI5	wild blue phlox	Polemoniaceae	Magnoliophyta
Phlox paniculata L.	PHPA9	fall phlox	Polemoniaceae	Magnoliophyta
Phlox stolonifera Sims	PHST3	creeping phlox	Polemoniaceae	Magnoliophyta
Phlox subulata L.	PHSU3	moss phlox	Polemoniaceae	Magnoliophyta
Photinia pyrifolia (Lam.) Robertson & Phipps	PHPY4	red chokeberry	Rosaceae	Magnoliophyta
Phryma leptostachya L.	PHLE5	American lopseed	Verbenaceae	Magnoliophyta
Physocarpus opulifolius (L.) Maxim. var. *opulifolius*	PHOPO	common ninebark	Rosaceae	Magnoliophyta
Physostegia virginiana (L.) Benth. ssp. *virginiana*	PHVIV	obedient plant	Lamiaceae	Magnoliophyta
Phytolacca americana L. var. *americana*	PHAMA3	American pokeweed	Phytolaccaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Picea rubens Sarg.	PIRU	red spruce	Pinaceae	Pinophyta
Pilea pumila (L.) Gray var. *pumila*	PIPUP	Canadian clearweed	Urticaceae	Magnoliophyta
Pinus resinosa Soland.	PIRE	red pine	Pinaceae	Pinophyta
Pinus rigida P. Mill.	PIRI	pitch pine	Pinaceae	Pinophyta
Pinus strobus L.	PIST	eastern white pine	Pinaceae	Pinophyta
Pinus virginiana P. Mill.	PIVI2	Virginia pine	Pinaceae	Pinophyta
Piptochaetium avenaceum (L.) Parodi	PIAV	blackseed speargrass	Poaceae	Magnoliophyta
Plagiomnium ciliare (C. Müll.) T. Kop.	PLCI3	plagiomnium moss	Mniaceae	Bryophyta
Plagiothecium denticulatum (Hedw.) Schimp. in B.S.G.	PLDE2	toothed plagiothecium moss	Plagiotheciaceae	Bryophyta
Plantago lanceolata L.	PLLA	narrowleaf plantain	Plantaginaceae	Magnoliophyta
Plantago major L.	PLMA2	common plantain	Plantaginaceae	Magnoliophyta
Plantago rugelii Dcne. var. *rugelii*	PLRUR	blackseed plantain	Plantaginaceae	Magnoliophyta
Plantago virginica L.	PLVI	Virginia plantain	Plantaginaceae	Magnoliophyta
Platanthera clavellata (Michx.) Luer	PLCL	small green wood orchid	Orchidaceae	Magnoliophyta
Platanthera lacera (Michx.) G. Don	PLLA2	green fringed orchid	Orchidaceae	Magnoliophyta
Platanthera orbiculata (Pursh) Lindl.	PLOR4	lesser roundleaved orchid	Orchidaceae	Magnoliophyta
Platanus occidentalis L.	PLOC	sycamore	Platanaceae	Magnoliophyta
Platygyrium repens (Brid.) Schimp. in B.S.G.	PLRE5	platygyrium moss	Hypnaceae	Bryophyta
Platyhypnidium riparoides (Hedw.) Dix.	PLRI2	platyhypnidium moss	Brachytheciaceae	Bryophyta
Poa alsodes Gray	POAL3	grove bluegrass	Poaceae	Magnoliophyta
Poa compressa L.	POCO	Canada bluegrass	Poaceae	Magnoliophyta
Poa L.	POA	bluegrass	Poaceae	Magnoliophyta
Poa pratensis L. ssp. *pratensis*	POPRP2	Kentucky bluegrass	Poaceae	Magnoliophyta
Poa sylvestris Gray	POSY	woodland bluegrass	Poaceae	Magnoliophyta
Podophyllum peltatum L.	POPE	mayapple	Berberidaceae	Magnoliophyta
Podostemum ceratophyllum Michx.	POCE3	hornleaf riverweed	Podostemaceae	Magnoliophyta
Polemonium reptans L. var. *reptans*	PORER	Greek valerian	Polemoniaceae	Magnoliophyta
Polygala verticillata L.	POVE	whorled milkwort	Polygalaceae	Magnoliophyta
Polygonatum biflorum (Walt.) Ell.	POBI2	smooth Solomon's seal	Liliaceae	Magnoliophyta
Polygonatum P. Mill.	POLYG2	Solomon's seal	Liliaceae	Magnoliophyta
Polygonatum pubescens (Willd.) Pursh	POPU4	hairy Solomon's seal	Liliaceae	Magnoliophyta
Polygonum amphibium L. var. *emersum* Michx.	POAME	longroot smartweed	Polygonaceae	Magnoliophyta
Polygonum caespitosum Blume var. *longisetum* (de Bruyn) A.N. Steward	POCAL2	Oriental ladysthumb	Polygonaceae	Magnoliophyta
Polygonum cuspidatum Sieb. & Zucc.	POCU6	Japanese knotweed	Polygonaceae	Magnoliophyta
Polygonum hydropiper L.	POHY	marshpepper knotweed	Polygonaceae	Magnoliophyta
Polygonum hydropiperoides Michx.	POHY2	swamp smartweed	Polygonaceae	Magnoliophyta
Polygonum L.	POLYG4	knotweed	Polygonaceae	Magnoliophyta
Polygonum lapathifolium L.	POLA4	curlytop knotweed	Polygonaceae	Magnoliophyta
Polygonum orientale L.	POOR2	kiss me over the garden gate	Polygonaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Polygonum pensylvanicum L.	POPE2	Pennsylvania smartweed	Polygonaceae	Magnoliophyta
Polygonum persicaria L.	POPE3	spotted ladysthumb	Polygonaceae	Magnoliophyta
Polygonum punctatum Ell.	POPU5	dotted smartweed	Polygonaceae	Magnoliophyta
Polygonum sagittatum L.	POSA5	arrowleaf tearthumb	Polygonaceae	Magnoliophyta
Polygonum scandens L.	POSC3	climbing false buckwheat	Polygonaceae	Magnoliophyta
Polygonum virginianum L.	POVI2	jumpseed	Polygonaceae	Magnoliophyta
Polymnia canadensis L.	POCA11	whiteflower leafcup	Asteraceae	Magnoliophyta
Polymnia L.	POLYM	polymnia	Asteraceae	Magnoliophyta
Polypodium virginianum L.	POVI7	rock polypody	Polypodiaceae	Polypodiophyta
Polystichum acrostichoides (Michx.) Schott	POAC4	Christmas fern	Dryopteridaceae	Polypodiophyta
Polytrichum commune Hedw.	POCO38	polytrichum moss	Polytrichaceae	Bryophyta
Polytrichum Hedw.	POLYT5	polytrichum moss	Polytrichaceae	Bryophyta
Polytrichum juniperinum Hedw.	POJU70	juniper polytrichum moss	Polytrichaceae	Bryophyta
Populus grandidentata Michx.	POGR4	bigtooth aspen	Salicaceae	Magnoliophyta
Porteranthus trifoliatus (L.) Britt.	POTR11	Bowman's root	Rosaceae	Magnoliophyta
Portulaca oleracea L.	POOL	little hogweed	Portulacaceae	Magnoliophyta
Potamogeton crispus L.	POCR3	curly pondweed	Potamogetonaceae	Magnoliophyta
Potamogeton epihydrus Raf.	POEP2	ribbonleaf pondweed	Potamogetonaceae	Magnoliophyta
Potamogeton foliosus Raf. ssp. *foliosus*	POFOF4	leafy pondweed	Potamogetonaceae	Magnoliophyta
Potamogeton nodosus Poir.	PONO2	longleaf pondweed	Potamogetonaceae	Magnoliophyta
Potentilla canadensis L. var. *canadensis*	POCAC2	dwarf cinquefoil	Rosaceae	Magnoliophyta
Potentilla L.	POTEN	cinquefoil	Rosaceae	Magnoliophyta
Potentilla norvegica L. ssp. *monspeliensis* (L.) Aschers. & Graebn.	PONOM	Norwegian cinquefoil	Rosaceae	Magnoliophyta
Potentilla recta L.	PORE5	sulphur cinquefoil	Rosaceae	Magnoliophyta
Potentilla simplex Michx.	POSI2	common cinquefoil	Rosaceae	Magnoliophyta
Prenanthes alba L.	PRAL2	white rattlesnakeroot	Asteraceae	Magnoliophyta
Prenanthes altissima L.	PRAL3	tall rattlesnakeroot	Asteraceae	Magnoliophyta
Prenanthes L.	PRENA	rattlesnakeroot	Asteraceae	Magnoliophyta
Prenanthes trifoliolata (Cass.) Fern.	PRTR	gall of the earth	Asteraceae	Magnoliophyta
Prosartes lanuginosa (Michx.) D. Don	PRLAWV	yellow fairybells	Liliaceae	Magnoliophyta
Prunella vulgaris L.	PRVU	common selfheal	Lamiaceae	Magnoliophyta
Prunus americana Marsh.	PRAM	American plum	Rosaceae	Magnoliophyta
Prunus L.	PRUNU	plum	Rosaceae	Magnoliophyta
Prunus serotina Ehrh. var. *serotina*	PRSES	black cherry	Rosaceae	Magnoliophyta
Pteridium aquilinum (L.) Kuhn	PTAQ	western brackenfern	Dennstaedtiaceae	Polypodiophyta
Pueraria montana (Lour.) Merr. var. *lobata* (Willd.) Maesen & S. Almeida	PUMOL	kudzu	Fabaceae	Magnoliophyta
Punctelia rudecta (Ach.) Krog	PURU2	lichen	Parmeliaceae	Ascomycota
Pycnanthemum Michx.	PYCNA	mountainmint	Lamiaceae	Magnoliophyta
Pycnanthemum tenuifolium Schrad.	PYTE	narrowleaf mountainmint	Lamiaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Pycnanthemum verticillatum (Michx.) Pers.	PYVE	whorled mountainmint	Lamiaceae	Magnoliophyta
Pyrola L.	PYROL	wintergreen	Pyrolaceae	Magnoliophyta
Pyrularia pubera Michx.	PYPU	buffalo nut	Santalaceae	Magnoliophyta
Quercus alba L.	QUAL	white oak	Fagaceae	Magnoliophyta
Quercus coccinea Muenchh.	QUCOC	scarlet oak	Fagaceae	Magnoliophyta
Quercus L.	QUERC	oak	Fagaceae	Magnoliophyta
Quercus muehlenbergii Engelm.	QUMU	chinquapin oak	Fagaceae	Magnoliophyta
Quercus prinus L.	QUPR2	chestnut oak	Fagaceae	Magnoliophyta
Quercus rubra L.	QURU	northern red oak	Fagaceae	Magnoliophyta
Quercus stellata Wangenh.	QUST	post oak	Fagaceae	Magnoliophyta
Quercus velutina Lam.	QUVE	black oak	Fagaceae	Magnoliophyta
Ranunculus abortivus L.	RAAB	littleleaf buttercup	Ranunculaceae	Magnoliophyta
Ranunculus allegheniensis Britt.	RAAL2	Allegheny Mountain buttercup	Ranunculaceae	Magnoliophyta
Ranunculus hispidus Michx.	RAHI	bristly buttercup	Ranunculaceae	Magnoliophyta
Ranunculus hispidus Michx. var. *nitidus* (Chapman) T. Duncan	RAHIN	bristly buttercup	Ranunculaceae	Magnoliophyta
Ranunculus L.	RANUN	buttercup	Ranunculaceae	Magnoliophyta
Ranunculus pensylvanicus L. f.	RAPE2	Pennsylvania buttercup	Ranunculaceae	Magnoliophyta
Ranunculus recurvatus Poir. var. *recurvatus*	RARER2	blisterwort	Ranunculaceae	Magnoliophyta
Rhododendron arborescens (Pursh) Torr.	RHAR3	smooth azalea	Ericaceae	Magnoliophyta
Rhododendron calendulaceum (Michx.) Torr.	RHCA4	flame azalea	Ericaceae	Magnoliophyta
Rhododendron catawbiense Michx.	RHCA8	Catawba rhododendron	Ericaceae	Magnoliophyta
Rhododendron L.	RHODO	rhododendron	Ericaceae	Magnoliophyta
Rhododendron maximum L.	RHMA4	great laurel	Ericaceae	Magnoliophyta
Rhododendron periclymenoides (Michx.) Shinners	RHPE4	pink azalea	Ericaceae	Magnoliophyta
Rhododendron prinophyllum (Small) Millais	RHPR	early azalea	Ericaceae	Magnoliophyta
Rhus copallinum L. var. *latifolia* Engl.	RHCOL2	winged sumac	Anacardiaceae	Magnoliophyta
Rhus glabra L.	RHGL	smooth sumac	Anacardiaceae	Magnoliophyta
Rhus L.	RHUS	sumac	Anacardiaceae	Magnoliophyta
Rhus typhina L.	RHTY	staghorn sumac	Anacardiaceae	Magnoliophyta
Rhynchospora capitellata (Michx.) Vahl	RHCA12	brownish beaksedge	Cyperaceae	Magnoliophyta
Rhynchospora recognita (Gale) Kral	RHRE8	globe beaksedge	Cyperaceae	Magnoliophyta
Ribes cynosbati L.	RICY	eastern prickly gooseberry	Grossulariaceae	Magnoliophyta
Ribes L.	RIBES	currant	Grossulariaceae	Magnoliophyta
Riccia bifurca Hoffm.	RIBI5	forked chamber liverwort	Ricciaceae	Marchantiophyta
Robinia pseudoacacia L.	ROPS	black locust	Fabaceae	Magnoliophyta
Rorippa nasturtium-aquaticum (L.) Hayek	RONA2	watercress	Brassicaceae	Magnoliophyta
Rorippa palustris (L.) Bess. ssp. *fernaldiana* (Butters & Abbe) Jonsell	ROPAF2	Fernald's yellowcress	Brassicaceae	Magnoliophyta
Rosa carolina L. var. *carolina*	ROCAC	Carolina rose	Rosaceae	Magnoliophyta
Rosa L.	ROSA5	rose	Rosaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Rosa multiflora Thunb. ex Murr.	ROMU	multiflora rose	Rosaceae	Magnoliophyta
Rosa palustris Marsh.	ROPA	swamp rose	Rosaceae	Magnoliophyta
Rosa rugosa Thunb.	RORU	rugosa rose	Rosaceae	Magnoliophyta
Rubus flagellaris Willd.	RUFL	northern dewberry	Rosaceae	Magnoliophyta
Rubus hispidus L.	RUHI	bristly dewberry	Rosaceae	Magnoliophyta
Rubus L.	RUBUS	blackberry	Rosaceae	Magnoliophyta
Rubus occidentalis L.	RUOC	black raspberry	Rosaceae	Magnoliophyta
Rubus odoratus L. var. *odoratus*	RUODO	purpleflowering raspberry	Rosaceae	Magnoliophyta
Rubus phoenicolasius Maxim.	RUPH	wine raspberry	Rosaceae	Magnoliophyta
Rudbeckia L.	RUDBE	coneflower	Asteraceae	Magnoliophyta
Rudbeckia laciniata L. var. *laciniata*	RULAL	cutleaf coneflower	Asteraceae	Magnoliophyta
Rudbeckia triloba L. var. *triloba*	RUTRT	browneyed Susan	Asteraceae	Magnoliophyta
Ruellia caroliniensis (J.F. Gmel.) Steud. ssp. *caroliniensis* var. *caroliniensis*	RUCAC4	Carolina wild petunia	Acanthaceae	Magnoliophyta
Ruellia L.	RUELL	wild petunia	Acanthaceae	Magnoliophyta
Rumex acetosella L.	RUAC3	common sheep sorrel	Polygonaceae	Magnoliophyta
Rumex crispus L. ssp. *crispus*	RUCRC	curly dock	Polygonaceae	Magnoliophyta
Rumex L.	RUMEX	dock	Polygonaceae	Magnoliophyta
Rumex obtusifolius L.	RUOB	bitter dock	Polygonaceae	Magnoliophyta
Sagittaria latifolia Willd.	SALA2	broadleaf arrowhead	Alismataceae	Magnoliophyta
Salix ×pendulina Wenderoth	SAPE12	Wisconsin weeping willow	Salicaceae	Magnoliophyta
Salix caroliniana Michx.	SACA5	coastal plain willow	Salicaceae	Magnoliophyta
Salix L.	SALIX	willow	Salicaceae	Magnoliophyta
Salix nigra Marsh.	SANI	black willow	Salicaceae	Magnoliophyta
Salix sericea Marsh.	SASE	silky willow	Salicaceae	Magnoliophyta
Salvia lyrata L.	SALY2	lyreleaf sage	Lamiaceae	Magnoliophyta
Sambucus L.	SAMBU	elderberry	Caprifoliaceae	Magnoliophyta
Sambucus nigra L. ssp. *canadensis* (L.) R. Bolli	SANIC4	common elderberry	Caprifoliaceae	Magnoliophyta
Sanguinaria canadensis L.	SACA13	bloodroot	Papaveraceae	Magnoliophyta
Sanicula canadensis L.	SACA15	Canadian blacksnakeroot	Apiaceae	Magnoliophyta
Sanicula L.	SANIC	sanicle	Apiaceae	Magnoliophyta
Sanicula marilandica L.	SAMA2	Maryland sanicle	Apiaceae	Magnoliophyta
Sanicula odorata (Raf.) K.M. Pryer & L.R. Phillippe	SAOD	clustered blacksnakeroot	Apiaceae	Magnoliophyta
Sanicula trifoliata Bickn.	SATR4	largefruit blacksnakeroot	Apiaceae	Magnoliophyta
Saponaria officinalis L.	SAOF4	bouncingbet	Caryophyllaceae	Magnoliophyta
Sassafras albidum (Nutt.) Nees	SAAL5	sassafras	Lauraceae	Magnoliophyta
Saururus cernuus L.	SACE	lizard's-tail	Saururaceae	Magnoliophyta
Saxifraga micranthidifolia (Haw.) Steud.	SAMI6	lettuceleaf saxifrage	Saxifragaceae	Magnoliophyta
Saxifraga virginiensis Michx. var. *virginiensis*	SAVIV	early saxifrage	Saxifragaceae	Magnoliophyta
Schizachyrium scoparium (Michx.) Nash var. *scoparium*	SCSCS	little bluestem	Poaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Schoenoplectus pungens (Vahl) Palla var. *pungens*	SCPUP5	common threesquare	Cyperaceae	Magnoliophyta
Schoenoplectus purshianus (Fern.) M.T. Strong	SCPU13	weakstalk bulrush	Cyperaceae	Magnoliophyta
Schoenoplectus tabernaemontani (K.C. Gmel.) Palla	SCTA2	softstem bulrush	Cyperaceae	Magnoliophyta
Scirpus atrovirens Willd.	SCAT2	green bulrush	Cyperaceae	Magnoliophyta
Scirpus cyperinus (L.) Kunth	SCCY	woolgrass	Cyperaceae	Magnoliophyta
Scirpus expansus Fern.	SCEX	woodland bulrush	Cyperaceae	Magnoliophyta
Scirpus L.	SCIRP	bulrush	Cyperaceae	Magnoliophyta
Scirpus pendulus Muhl.	SCPE4	rufous bulrush	Cyperaceae	Magnoliophyta
Scirpus polyphyllus Vahl	SCPO2	leafy bulrush	Cyperaceae	Magnoliophyta
Scrophularia lanceolata Pursh	SCLA	lanceleaf figwort	Scrophulariaceae	Magnoliophyta
Scutellaria elliptica Muhl. ex Spreng.	SCEL	hairy skullcap	Lamiaceae	Magnoliophyta
Scutellaria L.	SCUTE	skullcap	Lamiaceae	Magnoliophyta
Scutellaria lateriflora L. var. *lateriflora*	SCLALWV	blue skullcap	Lamiaceae	Magnoliophyta
Scutellaria nervosa Pursh	SCNE2	veiny skullcap	Lamiaceae	Magnoliophyta
Scutellaria ovata Hill	SCOV	heartleaf skullcap	Lamiaceae	Magnoliophyta
Scutellaria saxatilis Riddell	SCSA5	smooth rock skullcap	Lamiaceae	Magnoliophyta
Scutellaria serrata Andr.	SCSE5	showy skullcap	Lamiaceae	Magnoliophyta
Sedum sarmentosum Bunge	SESA	stringy stonecrop	Crassulaceae	Magnoliophyta
Sedum ternatum Michx.	SETE3	woodland stonecrop	Crassulaceae	Magnoliophyta
Senna hebecarpa (Fern.) Irwin & Barneby	SEHE3	American senna	Fabaceae	Magnoliophyta
Sericocarpus asteroides (L.) B.S.P.	SEAS3	toothed whitetop aster	Asteraceae	Magnoliophyta
Setaria viridis (L.) Beauv. var. *viridis*	SEVIV	green bristlegrass	Poaceae	Magnoliophyta
Sherardia arvensis L.	SHAR2	blue fieldmadder	Rubiaceae	Magnoliophyta
Sibara virginica (L.) Rollins	SIVI2	Virginia winged rockcress	Brassicaceae	Magnoliophyta
Silene stellata (L.) Ait. f.	SIST	widowsfrill	Caryophyllaceae	Magnoliophyta
Silene virginica L. var. *virginica*	SIVIV	fire pink	Caryophyllaceae	Magnoliophyta
Silphium L.	SILPH	rosinweed	Asteraceae	Magnoliophyta
Silphium perfoliatum L.	SIPE2	cup plant	Asteraceae	Magnoliophyta
Silphium perfoliatum L. var. *connatum* (L.) Cronq.	SIPEC2	cup plant	Asteraceae	Magnoliophyta
Silphium trifoliatum L. var. *trifoliatum*	SITRT	whorled rosinweed	Asteraceae	Magnoliophyta
Sisyrinchium angustifolium P. Mill.	SIAN3	narrowleaf blue-eyed grass	Iridaceae	Magnoliophyta
Sisyrinchium L.	SISYR	blue-eyed grass	Iridaceae	Magnoliophyta
Smallanthus uvedalius (L.) Mackenzie ex Small	SMUV	hairy leafcup	Asteraceae	Magnoliophyta
Smilax ecirrata (Engelm. ex Kunth) S. Wats.	SMEC	upright carrionflower	Smilacaceae	Magnoliophyta
Smilax glauca Walt.	SMGL	cat greenbrier	Smilacaceae	Magnoliophyta
Smilax herbacea L.	SMHE	smooth carrionflower	Smilacaceae	Magnoliophyta
Smilax pulverulenta Michx.	SMPU2	downy carrionflower	Smilacaceae	Magnoliophyta
Smilax rotundifolia L.	SMRO	roundleaf greenbrier	Smilacaceae	Magnoliophyta
Smilax tamnoides L.	SMTA2	bristly greenbrier	Smilacaceae	Magnoliophyta

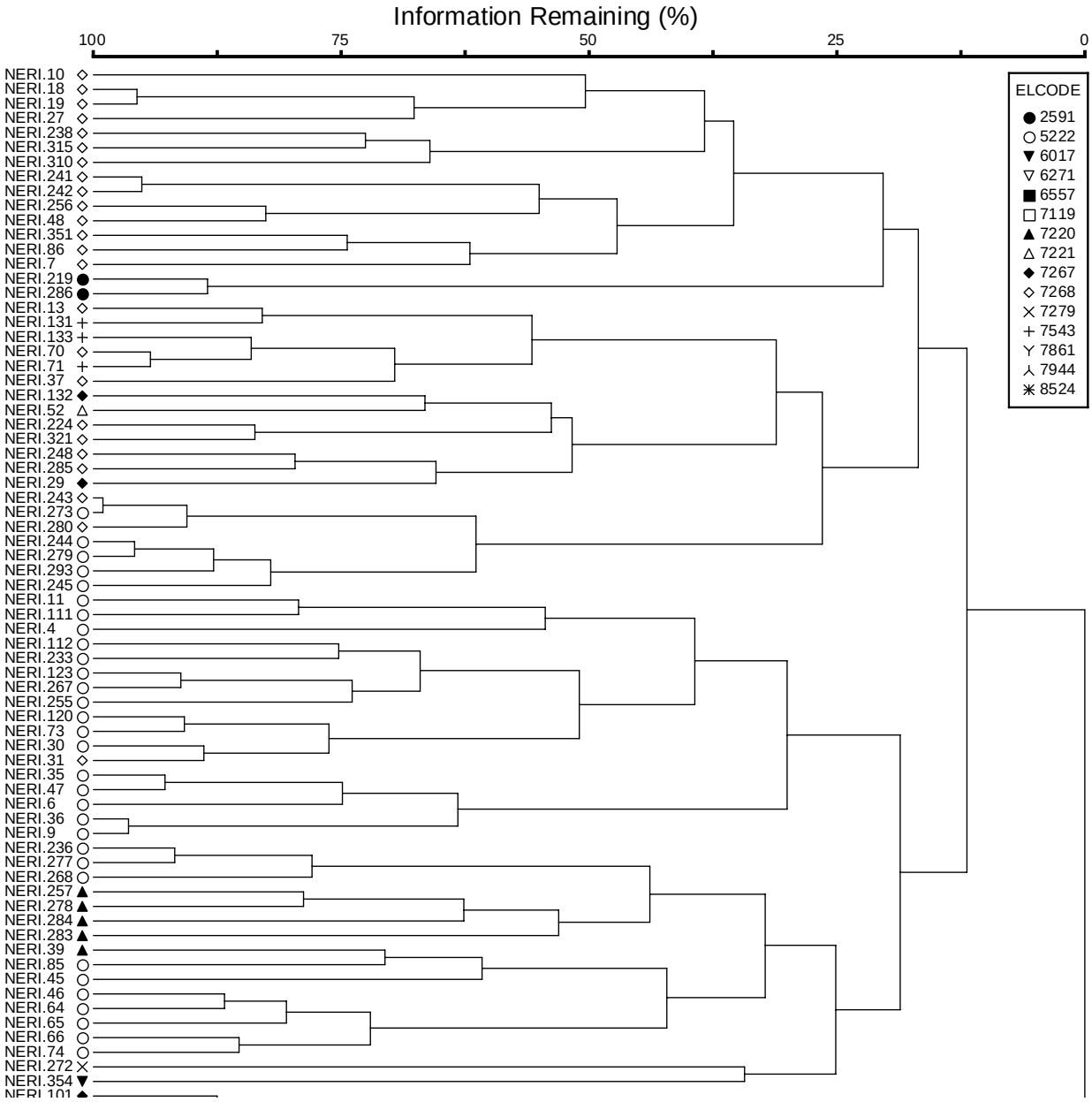
Scientific Name	Plant Symbol	Common Name	Family	Division
Solanum carolinense L. var. *carolinense*	SOCAC4	Carolina horsenettle	Solanaceae	Magnoliophyta
Solanum dulcamara L. var. *dulcamara*	SODUD	climbing nightshade	Solanaceae	Magnoliophyta
Solanum L.	SOLAN	nightshade	Solanaceae	Magnoliophyta
Solanum lycopersicum L.	SOLY2	garden tomato	Solanaceae	Magnoliophyta
Solanum ptychanthum Dunal	SOPT3	West Indian nightshade	Solanaceae	Magnoliophyta
Solidago bicolor L.	SOBI	white goldenrod	Asteraceae	Magnoliophyta
Solidago caesia L.	SOCA4	wreath goldenrod	Asteraceae	Magnoliophyta
Solidago canadensis L.	SOCA6	Canada goldenrod	Asteraceae	Magnoliophyta
Solidago curtisii Torr. & Gray	SOCU	mountain decumbent goldenrod	Asteraceae	Magnoliophyta
Solidago erecta Pursh	SOER	showy goldenrod	Asteraceae	Magnoliophyta
Solidago flexicaulis L.	SOFL2	zigzag goldenrod	Asteraceae	Magnoliophyta
Solidago gigantea Ait.	SOGI	giant goldenrod	Asteraceae	Magnoliophyta
Solidago gracillima Torr. & Gray	SOGR4	Virginia goldenrod	Asteraceae	Magnoliophyta
Solidago juncea Ait. var. *juncea*	SOJUJWV	early goldenrod	Asteraceae	Magnoliophyta
Solidago L.	SOLID	goldenrod	Asteraceae	Magnoliophyta
Solidago nemoralis Ait. var. *nemoralis*	SONEN	gray goldenrod	Asteraceae	Magnoliophyta
Solidago rugosa P. Mill.	SORU2	wrinkleleaf goldenrod	Asteraceae	Magnoliophyta
Solidago simplex Kunth ssp. *randii* (Porter) Ringius var. *racemosa* (Greene) Ringius	SOSIR2	Rand's goldenrod	Asteraceae	Magnoliophyta
Solidago ulmifolia Muhl. ex Willd. var. *ulmifolia*	SOULU2	elmleaf goldenrod	Asteraceae	Magnoliophyta
Sorghastrum nutans (L.) Nash	SONU2	Indiangrass	Poaceae	Magnoliophyta
Sparganium americanum Nutt.	SPAM	American bur-reed	Sparganiaceae	Magnoliophyta
Sparganium chlorocarpum Rydb.	SPCH	burreed	Sparganiaceae	Magnoliophyta
Spartina pectinata Bosc ex Link	SPPE	prairie cordgrass	Poaceae	Magnoliophyta
Sphagnum L.	SPHAG2	peatmoss	Sphagnaceae	Bryophyta
Sphagnum L.	SPHAG2	sphagnum	Sphagnaceae	Bryophyta
Sphagnum quinquefarium (Lindb. ex Braithw.) Warnst.	SPQU	sphagnum	Sphagnaceae	Bryophyta
Stachys L.	STACH	hedgenettle	Lamiaceae	Magnoliophyta
Stachys nuttallii Shuttlw. ex Benth.	STNU2	Nuttall's hedgenettle	Lamiaceae	Magnoliophyta
Staphylea trifolia L.	STTR	American bladdernut	Staphyleaceae	Magnoliophyta
Steerecleus serrulatus (Hedw.) Robins.	STSE9	steerecleus moss	Brachytheciaceae	Bryophyta
Stellaria graminea L.	STGR	grasslike starwort	Caryophyllaceae	Magnoliophyta
Stellaria media (L.) Vill.	STME2	common chickweed	Caryophyllaceae	Magnoliophyta
Stellaria pubera Michx.	STPU	star chickweed	Caryophyllaceae	Magnoliophyta
Symphyotrichum cordifolium (L.) Nesom	SYCO4	common blue wood aster	Asteraceae	Magnoliophyta
Symphyotrichum drummondii (Lindl.) Nesom var. *drummondii*	SYDRD	Drummond's aster	Asteraceae	Magnoliophyta
Symphyotrichum dumosum (L.) Nesom var. *dumosum*	SYDUD2	rice button aster	Asteraceae	Magnoliophyta
Symphyotrichum laeve (L.) A.& D. Löve	SYLA3	smooth blue aster	Asteraceae	Magnoliophyta
Symphyotrichum lanceolatum (Willd.) Nesom ssp. *lanceolatum* var. *lanceolatum*	SYLAL4	white panicle aster	Asteraceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Symphyotrichum lateriflorum (L.) A.& D. Löve	SYLA4	calico aster	Asteraceae	Magnoliophyta
Symphyotrichum lowrieanum (Porter) Nesom	SYLO2	Lowrie's blue wood aster	Asteraceae	Magnoliophyta
Symphyotrichum oblongifolium (Nutt.) Nesom	SYOB	aromatic aster	Asteraceae	Magnoliophyta
Symphyotrichum patens (Ait.) Nesom var. *patens*	SYPAP2	late purple aster	Asteraceae	Magnoliophyta
Symphyotrichum pilosum (Willd.) Nesom	SYPI2	hairy white oldfield aster	Asteraceae	Magnoliophyta
Symphyotrichum praealtum (Poir.) Nesom	SYPR5	willowleaf aster	Asteraceae	Magnoliophyta
Symphyotrichum prenanthoides (Muhl. ex Willd.) Nesom	SYPR6	crookedstem aster	Asteraceae	Magnoliophyta
Symphyotrichum puniceum (L.) A.& D. Löve var. *puniceum*	SYPUP	purplestem aster	Asteraceae	Magnoliophyta
Symphyotrichum undulatum (L.) Nesom	SYUN	wavyleaf aster	Asteraceae	Magnoliophyta
Taraxacum officinale G.H. Weber ex Wiggers ssp. *officinale*	TAOFO	common dandelion	Asteraceae	Magnoliophyta
Tephrosia virginiana (L.) Pers.	TEVI	Virginia tephrosia	Fabaceae	Magnoliophyta
Teucrium canadense L.	TECA3	American germander	Lamiaceae	Magnoliophyta
Thalictrum clavatum DC.	THCL	mountain meadow-rue	Ranunculaceae	Magnoliophyta
Thalictrum L.	THALI2	meadow-rue	Ranunculaceae	Magnoliophyta
Thalictrum pubescens Pursh	THPU2	king of the meadow	Ranunculaceae	Magnoliophyta
Thalictrum thalictroides (L.) Eames & Boivin	THTH2	rue anemone	Ranunculaceae	Magnoliophyta
Thaspium barbinode (Michx.) Nutt.	THBA	hairyjoint meadowparsnip	Apiaceae	Magnoliophyta
Thaspium trifoliatum (L.) Gray	THTR	purple meadowparsnip	Apiaceae	Magnoliophyta
Thelypteris noveboracensis (L.) Nieuwl.	THNO	New York fern	Thelypteridaceae	Polypodiophyta
Thelypteris palustris Schott var. *pubescens* (Lawson) Fern.	THPAP	eastern marsh fern	Thelypteridaceae	Polypodiophyta
Thlaspi arvense L.	THAR5	field pennycress	Brassicaceae	Magnoliophyta
Thuidium delicatulum (Hedw.) Schimp. in B.S.G.	THDE10	delicate fern moss	Thuidiaceae	Bryophyta
Tiarella cordifolia L.	TICO	heartleaf foamflower	Saxifragaceae	Magnoliophyta
Tilia americana L.	TIAM	Appalachian basswood	Tiliaceae	Magnoliophyta
Toxicodendron radicans (L.) Kuntze	TORA2	eastern poison ivy	Anacardiaceae	Magnoliophyta
Tradescantia L.	TRADE	spiderwort	Commelinaceae	Magnoliophyta
Tradescantia ohiensis Raf.	TROH	bluejacket	Commelinaceae	Magnoliophyta
Tradescantia subaspera Ker-Gawl.	TRSU2	zigzag spiderwort	Commelinaceae	Magnoliophyta
Tradescantia virginiana L.	TRVI	Virginia spiderwort	Commelinaceae	Magnoliophyta
Trautvetteria caroliniensis (Walt.) Vail *var. caroliniensis*	TRCAC2	Carolina bugbane	Ranunculaceae	Magnoliophyta
Tridens flavus (L.) A.S. Hitchc. var. *flavus*	TRFLF	purpletop tridens	Poaceae	Magnoliophyta
Trifolium campestre Schreb.	TRCA5	field clover	Fabaceae	Magnoliophyta
Trifolium hybridum L.	TRHY	alsike clover	Fabaceae	Magnoliophyta
Trifolium L.	TRIFO	clover	Fabaceae	Magnoliophyta
Trifolium pratense L.	TRPR2	red clover	Fabaceae	Magnoliophyta
Trifolium repens L.	TRRE3	white clover	Fabaceae	Magnoliophyta
Trillium cernuum L.	TRCE	whip-poor-will flower	Liliaceae	Magnoliophyta
Trillium erectum L.	TRER3	red trillium	Liliaceae	Magnoliophyta
Trillium L.	TRILL	trillium	Liliaceae	Magnoliophyta

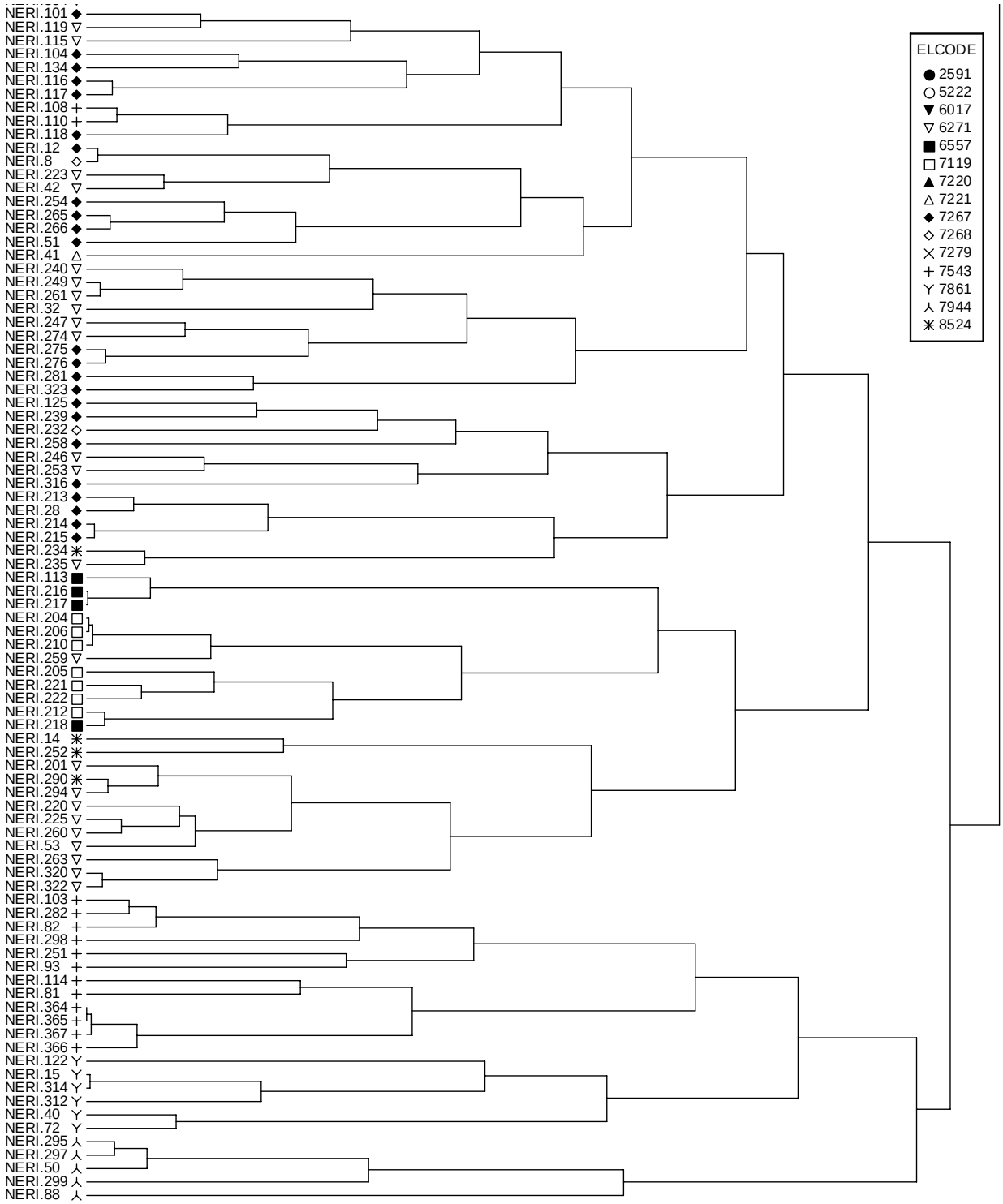
Scientific Name	Plant Symbol	Common Name	Family	Division
Trillium sessile L.	TRSE2	toadshade	Liliaceae	Magnoliophyta
Trillium undulatum Willd.	TRUN	painted trillium	Liliaceae	Magnoliophyta
Triodanis perfoliata (L.) Nieuwl.	TRPE4	clasping Venus' looking-glass	Campanulaceae	Magnoliophyta
Triosteum aurantiacum Bickn. var. *aurantiacum*	TRAUA	orangefruit horse-gentian	Caprifoliaceae	Magnoliophyta
Tripsacum dactyloides (L.) L.	TRDA3	eastern gamagrass	Poaceae	Magnoliophyta
Tsuga canadensis (L.) Carr.	TSCA	eastern hemlock	Pinaceae	Pinophyta
Tussilago farfara L.	TUFA	coltsfoot	Asteraceae	Magnoliophyta
Typha L.	TYPHA	cattail	Typhaceae	Magnoliophyta
Typha latifolia L.	TYLA	broadleaf cattail	Typhaceae	Magnoliophyta
Ulmus americana L.	ULAM	American elm	Ulmaceae	Magnoliophyta
Ulmus L.	ULMUS	elm	Ulmaceae	Magnoliophyta
Ulmus rubra Muhl.	ULRU	slippery elm	Ulmaceae	Magnoliophyta
Umbilicaria Hoffm.	UMBIL2	navel lichen	Umbilicariaceae	Ascomycota
Umbilicaria mammulata (Ach.) Tuck.	UMMA60	common rocktripe	Umbilicariaceae	Ascomycota
Urtica dioica L.	URDI	stinging nettle	Urticaceae	Magnoliophyta
Urtica L.	URTIC	nettle	Urticaceae	Magnoliophyta
Usnea pensylvanica Mot.	USPE	Pennsylvania beard lichen	Parmeliaceae	Ascomycota
Uvularia L.	UVULA	bellwort	Liliaceae	Magnoliophyta
Uvularia perfoliata L.	UVPE	perfoliate bellwort	Liliaceae	Magnoliophyta
Uvularia puberula Michx.	UVPU2	mountain bellwort	Liliaceae	Magnoliophyta
Uvularia sessilifolia L.	UVSE	sessileleaf bellwort	Liliaceae	Magnoliophyta
Vaccinium angustifolium Ait.	VAAN	northern lowbush blueberry	Ericaceae	Magnoliophyta
Vaccinium L.	VACCI	blueberry	Ericaceae	Magnoliophyta
Vaccinium pallidum Ait.	VAPA4	hillside blueberry	Ericaceae	Magnoliophyta
Vaccinium stamineum L.	VAST	deerberry	Ericaceae	Magnoliophyta
Valerianella chenopodiifolia (Pursh) DC.	VACH	goosefoot cornsalad	Valerianaceae	Magnoliophyta
Valerianella locusta (L.) Lat.	VALO	Lewiston cornsalad	Valerianaceae	Magnoliophyta
Vallisneria americana Michx.	VAAM3	American eelgrass	Hydrocharitaceae	Magnoliophyta
Verbascum blattaria L.	VEBL	moth mullein	Scrophulariaceae	Magnoliophyta
Verbascum thapsus L.	VETH	common mullein	Scrophulariaceae	Magnoliophyta
Verbena hastata L. var. *hastata*	VEHAH	swamp verbena	Verbenaceae	Magnoliophyta
Verbena urticifolia L.	VEUR	white vervain	Verbenaceae	Magnoliophyta
Verbesina alternifolia (L.) Britt. ex Kearney	VEAL	wingstem	Asteraceae	Magnoliophyta
Verbesina occidentalis (L.) Walt.	VEOC	yellow crownbeard	Asteraceae	Magnoliophyta
Vernonia noveboracensis (L.) Michx.	VENO	New York ironweed	Asteraceae	Magnoliophyta
Vernonia Schreb.	VERNO	ironweed	Asteraceae	Magnoliophyta
Veronica anagallis-aquatica L.	VEAN2	water speedwell	Scrophulariaceae	Magnoliophyta
Veronica L.	VERON	speedwell	Scrophulariaceae	Magnoliophyta
Veronicastrum virginicum (L.) Farw.	VEVI4	Culver's root	Scrophulariaceae	Magnoliophyta

Scientific Name	Plant Symbol	Common Name	Family	Division
Viburnum acerifolium L.	VIAC	mapleleaf viburnum	Caprifoliaceae	Magnoliophyta
Viburnum dentatum L. var. *dentatum*	VIDED4	southern arrowwood	Caprifoliaceae	Magnoliophyta
Viburnum nudum L. var. *cassinoides* (L.) Torr. & Gray	VINUC	withe-rod	Caprifoliaceae	Magnoliophyta
Viburnum prunifolium L.	VIPR	blackhaw	Caprifoliaceae	Magnoliophyta
Viburnum recognitum Fern.	VIRE7	southern arrowwood	Caprifoliaceae	Magnoliophyta
Vicia americana Muhl. ex Willd. ssp. *americana*	VIAMA3	American vetch	Fabaceae	Magnoliophyta
Vicia L.	VICIA	vetch	Fabaceae	Magnoliophyta
Viola ×palmata L.	VIPA3WV	early blue violet	Violaceae	Magnoliophyta
Viola ×primulifolia L. (pro sp.)	VIPR4	primrose-leaf violet	Violaceae	Magnoliophyta
Viola blanda Willd. var. *blanda*	VIBLB	sweet white violet	Violaceae	Magnoliophyta
Viola canadensis L.	VICA4	Canadian white violet	Violaceae	Magnoliophyta
Viola cucullata Ait.	VICU	marsh blue violet	Violaceae	Magnoliophyta
Viola hastata Michx.	VIHA2	halberdleaf yellow violet	Violaceae	Magnoliophyta
Viola L.	VIOLA	violet	Violaceae	Magnoliophyta
Viola rostrata Pursh	VIRO	longspur violet	Violaceae	Magnoliophyta
Viola rotundifolia Michx.	VIRO2	roundleaf yellow violet	Violaceae	Magnoliophyta
Viola sagittata Ait.	VISA2	arrowleaf violet	Violaceae	Magnoliophyta
Viola sororia Willd.	VISO	common blue violet	Violaceae	Magnoliophyta
Viola striata Ait.	VIST3	striped cream violet	Violaceae	Magnoliophyta
Viola triloba Schwein. var. *triloba*	VITRT2	three-lobe violet	Violaceae	Magnoliophyta
Vitis aestivalis Michx. var. *bicolor* Deam	VIAEB	summer grape	Vitaceae	Magnoliophyta
Vitis L.	VITIS	grape	Vitaceae	Magnoliophyta
Vitis riparia Michx.	VIRI	riverbank grape	Vitaceae	Magnoliophyta
Vitis rupestris Scheele	VIRU2	sand grape	Vitaceae	Magnoliophyta
Vitis vulpina L.	VIVU	frost grape	Vitaceae	Magnoliophyta
Woodsia obtusa (Spreng.) Torr. ssp. *obtusa*	WOOBO	bluntlobe cliff fern	Dryopteridaceae	Polypodiophyta
Xanthium strumarium L. var. *canadense* (P. Mill.) Torr. & Gray	XASTC	Canada cockleburr	Asteraceae	Magnoliophyta
Xanthorhiza simplicissima Marsh.	XASI	yellowroot	Ranunculaceae	Magnoliophyta
Yucca filamentosa L.	YUFI	Adam's needle	Agavaceae	Magnoliophyta
Zanthoxylum americanum P. Mill.	ZAAM	common pricklyash	Rutaceae	Magnoliophyta
Zizia aptera (Gray) Fern.	ZIAP	meadow zizia	Apiaceae	Magnoliophyta
Zizia aurea (L.) W.D.J. Koch	ZIAU	golden zizia	Apiaceae	Magnoliophyta
Zizia trifoliata (Michx.) Fern.	ZITR	meadow alexanders	Apiaceae	Magnoliophyta

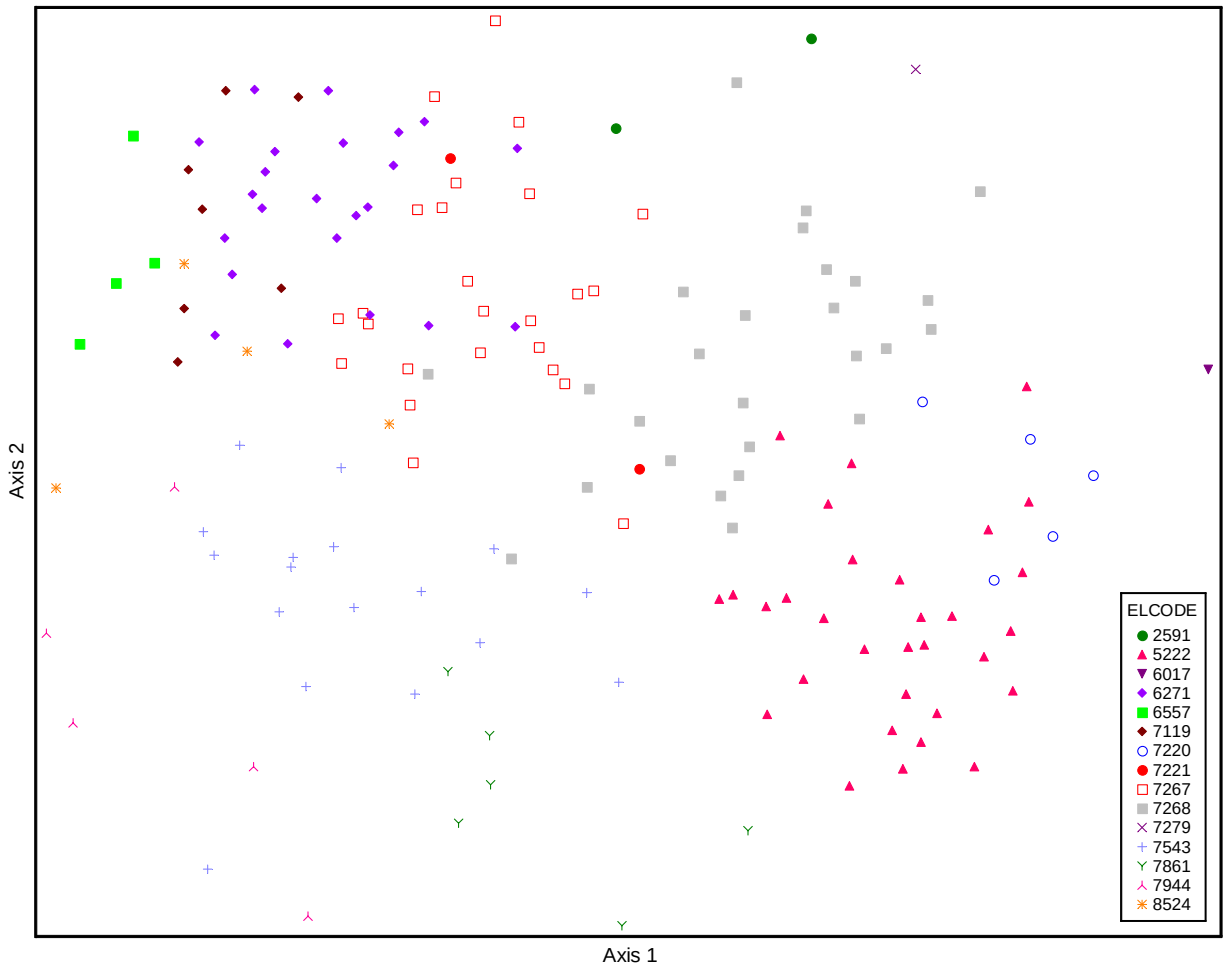
Appendix F. Cluster dendrograms and ordination graphs.



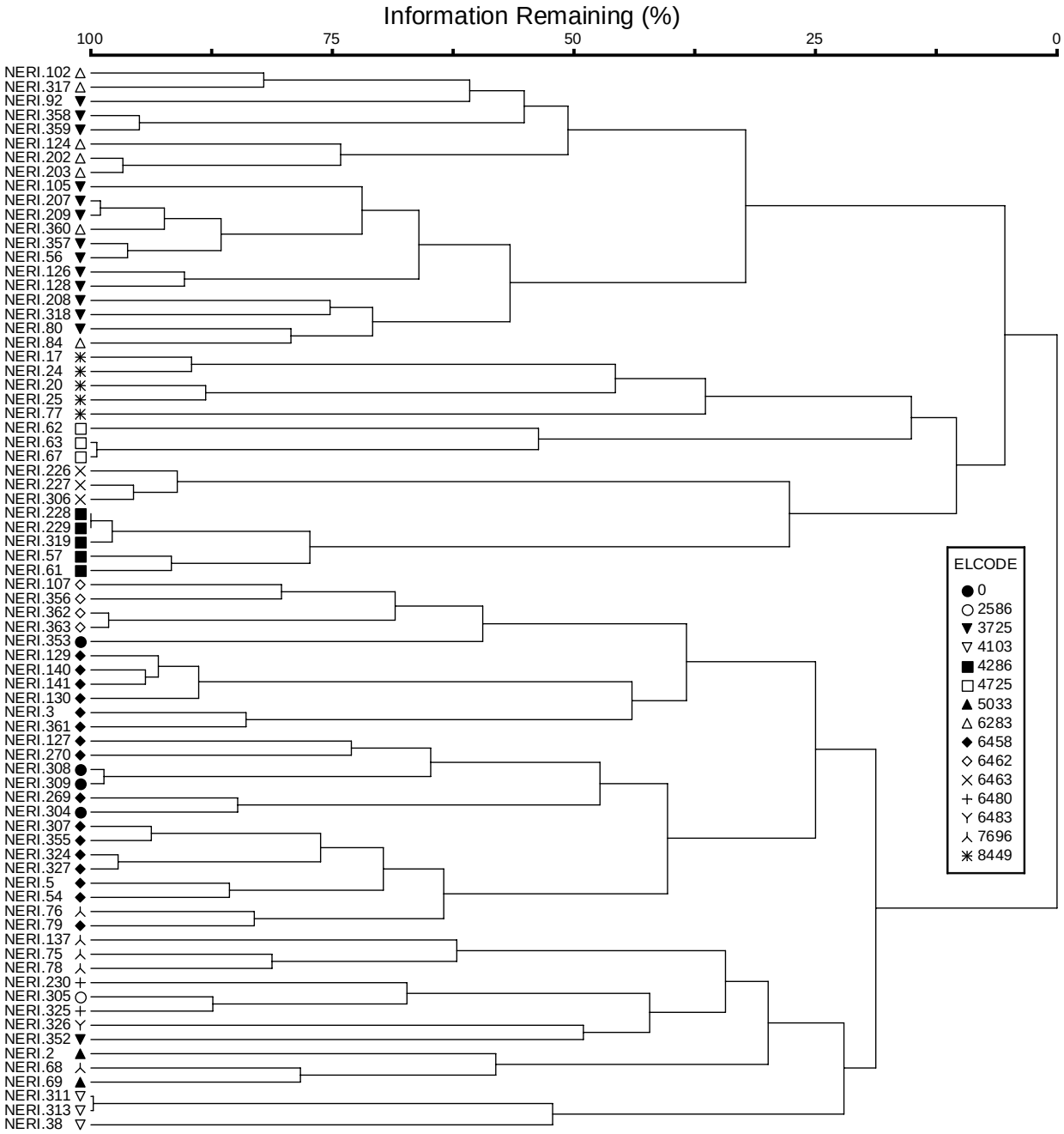
Dendrogram 1 (page 1 of 2). Hierarchical agglomerative cluster analysis of upland forest communities. Symbology indicates USNVC association (element) codes: 2591 = Successional Virginia Pine Forest; 5222 = Sugar Maple - Yellow Buckeye - American Basswood Forest; 6017 = Chinquapin Oak - Black Maple Forest; 6271 = Oak / Ericad Forest; 6557 = Cliff Top Pitch Pine Woodland; 7119 = Cliff Top Virginia Pine Forest; 7220 = Successional Tuliptree / Northern Spicebush Forest; 7221 = Successional Tuliptree - Oak Forest; 7267 = Oak - Hickory Forest; 7268 = Oak - Hickory - Sugar Maple Forest; 7279 = Successional Black Locust Woodland; 7543 = Deciduous Tree / Great Laurel Forest and Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest; 7861 = Yellow Birch Cold Cove Forest; 7944 = Successional Eastern White Pine Forest; 8524 = Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest.



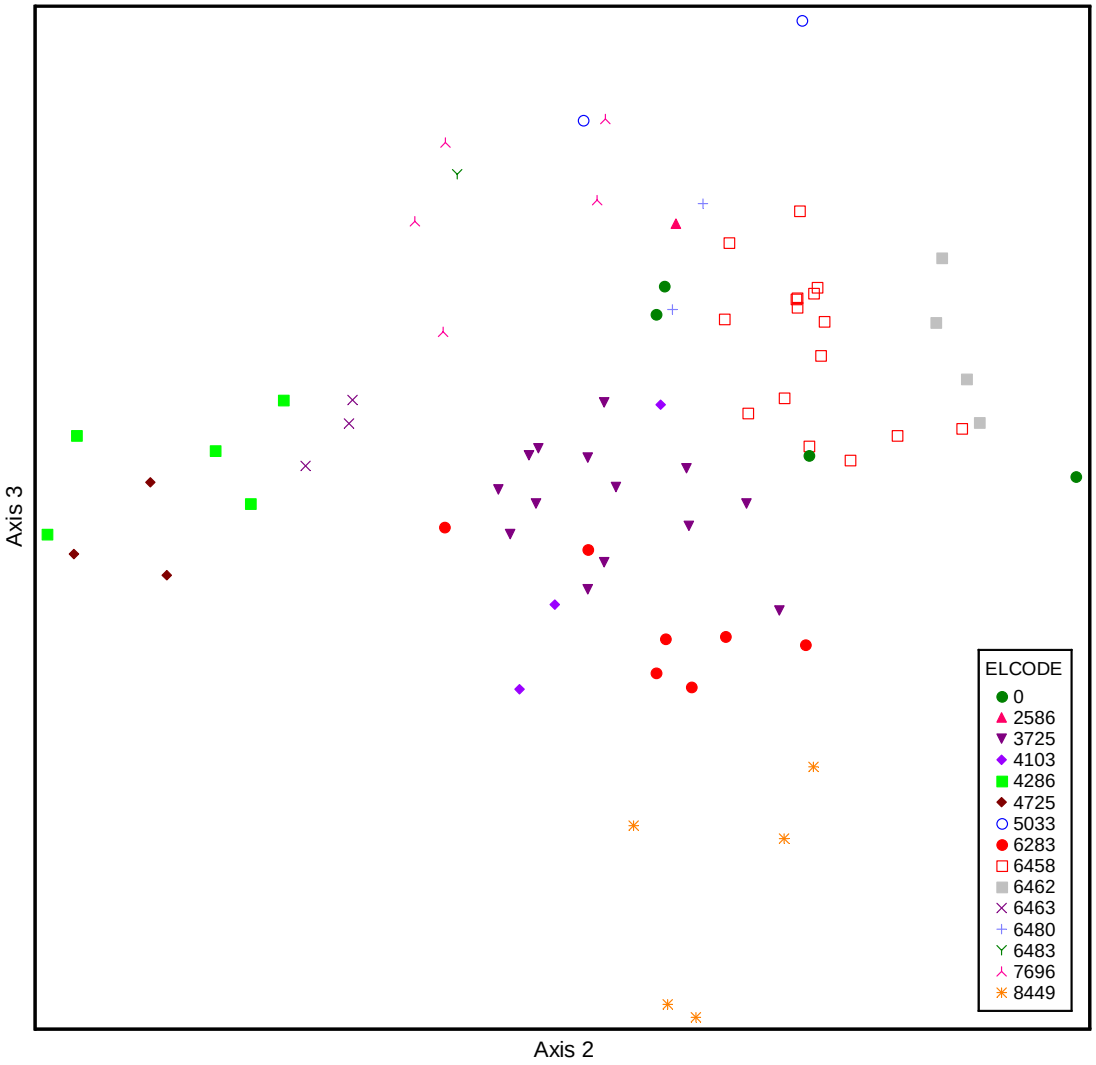
Dendrogram 1 (page 2 of 2). Hierarchical agglomerative cluster analysis of upland forest and woodland communities. Symbology indicates USNVC association (element) codes. See previous page for key to association codes.



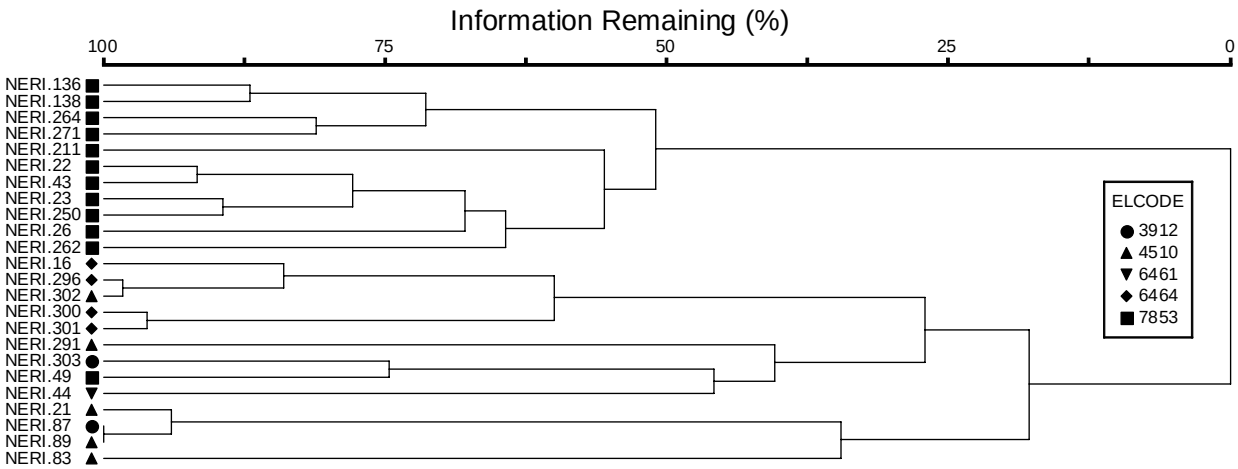
Graph 1. NMS ordination of upland forest and woodland communities. Plots are graphed in two-dimensional species space. Symbology indicates USNVC association (element) codes: 2591 = Successional Virginia Pine Forest; 5222 = Sugar Maple - Yellow Buckeye - American Basswood Forest; 6017 = Chinquapin Oak - Black Maple Forest; 6271 = Oak / Ericad Forest; 6557 = Cliff Top Pitch Pine Woodland; 7119 = Cliff Top Virginia Pine Forest; 7220 = Successional Tuliptree / Northern Spicebush Forest; 7221 = Successional Tuliptree - Oak Forest; 7267 = Oak - Hickory Forest; 7268 = Oak - Hickory - Sugar Maple Forest; 7279 = Successional Black Locust Woodland; 7543 = Deciduous Tree / Great Laurel Forest and Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest; 7861 = Yellow Birch Cold Cove Forest; 7944 = Successional Eastern White Pine Forest; 8524 = Eastern Hemlock –- Chestnut Oak / Catawba Rhododendron Forest.



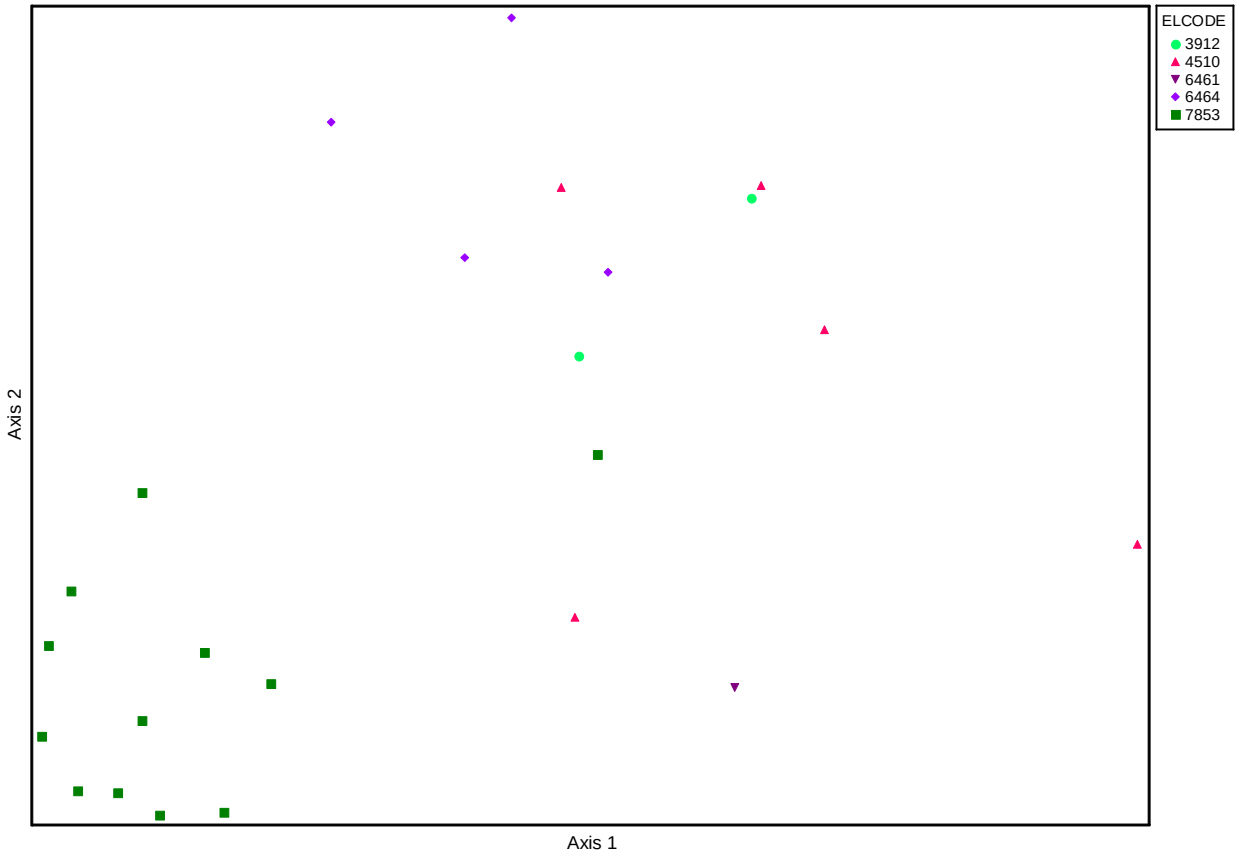
Dendrogram 2. Hierarchical agglomerative cluster analysis of riparian communities. Symbology indicates USNVC association (element) codes: 0 = Tributary Floodplain Forest; 2586 = Silver Maple Floodplain Forest; 3725 = Sycamore - River Birch Riverscour Woodland; 4103 = Twisted Sedge Rocky Creekbed; 4286 = American Water-willow Cobble Bar; 4725 = Submerged Aquatic Vegetation; 5033 = Successional Box-elder Forest; 6283 = Riverscour Prairie; 6458 = Sycamore - Ash Floodplain Forest; 6462 = Oak - Tuliptree / Mountain Silverbell Floodplain Forest; 6463 = Black Willow Slackwater Woodland; 6480 = Riverbank Tall Herbs; 6483 = Riverbank Annuals; 7696 = Lizard's-tail Backwater Slough; 8449 = Eastern Red-cedar - Virginia Pine Flatrock Woodland.



Graph 2. NMS ordination of riparian communities. Plots are graphed in three dimensional species space (Axis 2 and 3 pictured). Symbology indicates USNVC association (element) codes: 0 = Tributary Floodplain Forest; 2586 = Silver Maple Floodplain Forest; 3725 = Sycamore – River Birch Riverscour Woodland; 4103 = Twisted Sedge Rocky Creekbed; 4286 = American Water-willow Cobble Bar; 4725 = Submerged Aquatic Vegetation; 5033 = Successional Box-elder Forest; 6283 = Riverscour Prairie; 6458 = Sycamore - Ash Floodplain Forest; 6462 = Oak - Tuliptree / Mountain Silverbell Floodplain Forest; 6463 = Black Willow Slackwater Woodland; 6480 = Riverbank Tall Herbs; 6483 = Riverbank Annuals; 7696 = Lizard's-tail Backwater Slough; 8449 = Eastern Red-cedar - Virginia Pine Flatrock Woodland.



Dendrogram 3. Hierarchical agglomerative cluster analysis of headwater wetland communities. Symbology indicates USNVC association (element) codes: 3912 = Smooth Alder Shrub Wetland; 4510 = Bulrush - American Bur-reed Marsh; 6461 = Rice Cutgrass Marsh; 6464 = Bushy St. John's-wort Shrub Wetland; 7853 = Forest Seep.



Graph 3. NMS ordination of headwater wetland communities. Plots are graphed in two dimensional species space. See caption of cluster dendrogram above for key to symbology.

Appendix G. Plot floristic cover and constancy statistics for vegetation community types sampled in New River Gorge National River.

American Water-willow cobble bar (*Justicia americana* Herbaceous Vegetation [CEGL004286]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
JUAM	51.00	40	85	1.00
SCPUP5	20.17	0.5	40	0.60
SACE	20.00	5	35	0.60
BENI	4.67	1	10	0.60
PLOC	3.00	1	5	0.60
ACSA2	1.00	1	1	0.40
ELEOC	1.00	1	1	0.20
FRPE	1.00	1	1	0.20
SANI	0.75	0.5	1	0.40
LEVI2	0.50	0.5	0.5	0.60
POCAL2	0.50	0.5	0.5	0.40
POLYG4	0.50	0.5	0.5	0.40
ACRU	0.50	0.5	0.5	0.20
ALJU	0.50	0.5	0.5	0.20
BIDEN	0.50	0.5	0.5	0.20
BOCY	0.50	0.5	0.5	0.20
CATO4	0.50	0.5	0.5	0.20
CYOD	0.50	0.5	0.5	0.20
ELCA7	0.50	0.5	0.5	0.20
LYNU	0.50	0.5	0.5	0.20
LYSA2	0.50	0.5	0.5	0.20
LYUNUWV	0.50	0.5	0.5	0.20
MIVI	0.50	0.5	0.5	0.20
PANIC	0.50	0.5	0.5	0.20
POCR3	0.50	0.5	0.5	0.20
PONO2	0.50	0.5	0.5	0.20
ROPS	0.50	0.5	0.5	0.20
SEVIV	0.50	0.5	0.5	0.20
VAAM3	0.50	0.5	0.5	0.20

Black Willow Slackwater Woodland (*Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [CEGL006463]); 3 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
SCPUP5	21.67	5	40	1.00
SANI	4.33	3	5	1.00
BENI	3.67	3	5	1.00
ELOB2	3.00	3	3	0.33
JUAM	2.75	0.5	5	0.67
ERHY	2.00	1	3	0.67
LEVI2	1.67	1	3	1.00
PLOC	1.67	1	3	1.00
ACSA2	1.33	0.5	3	1.00
CEOC	1.00	1	1	0.33
CEOC2	1.00	1	1	0.33
FRPE	1.00	1	1	0.33
LIDUD	1.00	1	1	0.33
ELEOC	0.75	0.5	1	0.67
EQAR	0.75	0.5	1	0.67
SACE	0.67	0.5	1	1.00
CHLA5	0.50	0.5	0.5	0.67
COCO13	0.50	0.5	0.5	0.67
DICL	0.50	0.5	0.5	0.67
POCAL2	0.50	0.5	0.5	0.67
SOCAC4	0.50	0.5	0.5	0.67
BIFR	0.50	0.5	0.5	0.33
BOCY	0.50	0.5	0.5	0.33
CAEM2	0.50	0.5	0.5	0.33
CYOD	0.50	0.5	0.5	0.33
DIDIDWV	0.50	0.5	0.5	0.33
ECCR	0.50	0.5	0.5	0.33
ERPI2	0.50	0.5	0.5	0.33
EUSE2	0.50	0.5	0.5	0.33
FRVE	0.50	0.5	0.5	0.33
HILA2	0.50	0.5	0.5	0.33
HYMU	0.50	0.5	0.5	0.33
LUPA	0.50	0.5	0.5	0.33
LYCI	0.50	0.5	0.5	0.33
LYUNUWV	0.50	0.5	0.5	0.33
MOVE	0.50	0.5	0.5	0.33
PADIDWV	0.50	0.5	0.5	0.33
PARI4	0.50	0.5	0.5	0.33
PARIRWV	0.50	0.5	0.5	0.33
PIPUP	0.50	0.5	0.5	0.33
POCU6	0.50	0.5	0.5	0.33
POLYG4	0.50	0.5	0.5	0.33
RUOB	0.50	0.5	0.5	0.33
SCCY	0.50	0.5	0.5	0.33
VENO	0.50	0.5	0.5	0.33
XASTC	0.50	0.5	0.5	0.33

Bulrush - American Bur-reed Marsh (*Sparganium americanum - Epilobium leptophyllum* Herbaceous Vegetation [CEGL004510]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
SPAM	31.00	5	90	1.00
DICL	20.00	20	20	0.20
TYLA	13.67	1	30	0.60
RUHI	12.50	5	20	0.40
SCCY	12.50	10	15	0.40
SCEX	8.33	5	10	0.60
HYDE	8.00	1	20	0.60
CAGY4	5.00	5	5	0.20
CAIN11	5.00	5	5	0.20
JUNCU	5.00	5	5	0.20
LOCA2	5.00	5	5	0.20
TSCA	5.00	5	5	0.20
SPHAG2	4.33	1	10	0.60
CACR6	4.00	2	5	0.60
ALSE2	4.00	3	5	0.40
CAATA2	4.00	4	4	0.20
JUEF	3.75	2	5	0.80
HYMU	3.50	1	10	0.80

ACRU	3.00	0.5	10	0.80
DUAR3	3.00	1	5	0.40
RHMA4	3.00	1	5	0.40
SCPU13	3.00	1	5	0.40
BIVU	3.00	3	3	0.20
CABA7	3.00	3	3	0.20
CABRBWV	3.00	3	3	0.20
CASCS	3.00	3	3	0.20
CAVU2	3.00	3	3	0.20
ELEOC	3.00	3	3	0.20
ERHIH	3.00	3	3	0.20
EUFI	3.00	3	3	0.20
EUPUP	3.00	3	3	0.20
KALA	3.00	3	3	0.20
RIBI5	3.00	3	3	0.20
SCIRP	3.00	3	3	0.20
LEOR	2.75	0.5	5	0.40
CAIN12	2.33	1	3	0.60
GATI	2.00	0.5	5	0.80
LYVI4	2.00	1	3	0.40
THNO	2.00	1	3	0.40
ELTE	2.00	2	2	0.20
IMPAT	1.50	1	2	0.40
LUPA	1.33	1	2	0.60
CALU5	1.00	1	1	0.40
LIDU	1.00	1	1	0.40
MNIUM2	1.00	1	1	0.40
OSCIC	1.00	1	1	0.40
BOAC	1.00	1	1	0.20
CAREX	1.00	1	1	0.20
DIACIWV	1.00	1	1	0.20
DIDIM2WV	1.00	1	1	0.20
ELOB2	1.00	1	1	0.20
ERAN	1.00	1	1	0.20
GAAS2	1.00	1	1	0.20
ILVE	1.00	1	1	0.20
JUTE	1.00	1	1	0.20
PAQU2	1.00	1	1	0.20
POHY2	1.00	1	1	0.20
POSA5	1.00	1	1	0.20
POSI2	1.00	1	1	0.20
ROPA	1.00	1	1	0.20
SCAT2	1.00	1	1	0.20
SCLALWV	1.00	1	1	0.20
SMRO	1.00	1	1	0.20
SOCA6	1.00	1	1	0.20
VIPR4	1.00	1	1	0.20
BELE	0.83	0.5	1	0.60
LYUNUWV	0.75	0.5	1	0.40
ONSE	0.75	0.5	1	0.40
LITU	0.50	0.5	0.5	0.40
RUBUS	0.50	0.5	0.5	0.40
AMARA4	0.50	0.5	0.5	0.20
AMLA	0.50	0.5	0.5	0.20
DRIN5	0.50	0.5	0.5	0.20
EUPEP	0.50	0.5	0.5	0.20
LIST	0.50	0.5	0.5	0.20
PIST	0.50	0.5	0.5	0.20
PLCL	0.50	0.5	0.5	0.20
SANIC4	0.50	0.5	0.5	0.20
THPAP	0.50	0.5	0.5	0.20

Bushy St. John's-wort Shrub Wetland (*Hypericum densiflorum / Rubus hispidus* Shrubland [CEGL006464]); 4 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
HYDE	32.50	15	60	1.00
CAIN12	17.50	10	25	0.50
DIDIM2WV	16.50	3	30	0.50
SPAM	15.00	15	15	0.25
ALSE2	12.50	10	15	0.50
RUHI	12.00	3	20	1.00
JUEF	11.67	5	20	0.75
ILVE	10.00	10	10	0.25
SCEX	6.00	3	10	0.75
CAGY4	5.00	5	5	0.25
KALA	5.00	5	5	0.25
PIST	5.00	5	5	0.25
RHPE4	5.00	5	5	0.25
SCPUP5	5.00	5	5	0.25
TYLA	5.00	5	5	0.25
ACRU	4.33	1	10	0.75
CACR6	4.00	3	5	1.00
CABA7	3.00	3	3	0.75
BELE	3.00	3	3	0.25
CAVU2	3.00	3	3	0.25
POSI2	3.00	3	3	0.25
ELEOC	2.50	2	3	0.50
LYUNUWV	2.00	1	3	0.50
ONSE	1.75	0.5	3	0.50
GAAS2	1.67	1	3	0.75
IMPAT	1.50	0.5	3	0.75
THNO	1.00	0.5	2	0.75
BIVU	1.00	1	1	0.50
EUPEP	1.00	1	1	0.50
LOSIS2	1.00	1	1	0.50
POHY2	1.00	1	1	0.50
SOCA6	1.00	1	1	0.50
AGHY	1.00	1	1	0.25
CASCS	1.00	1	1	0.25
GLST	1.00	1	1	0.25
HYMU	1.00	1	1	0.25
HYPE	1.00	1	1	0.25
JUTE	1.00	1	1	0.25
LYVI4	1.00	1	1	0.25
NYSY	1.00	1	1	0.25
OSCIC	1.00	1	1	0.25
PAQU2	1.00	1	1	0.25
POAC4	1.00	1	1	0.25
RUAC3	1.00	1	1	0.25

RUBUS	1.00	1	1	0.25
SANIC4	1.00	1	1	0.25
SOCAC4	1.00	1	1	0.25
VICU	1.00	1	1	0.25
VIPR4	0.67	0.5	1	0.75
HOLA	0.50	0.5	0.5	0.50
LITU	0.50	0.5	0.5	0.50
AGGI2	0.50	0.5	0.5	0.25
CAIN11	0.50	0.5	0.5	0.25
CALU5	0.50	0.5	0.5	0.25
CAST5	0.50	0.5	0.5	0.25
CRPU3	0.50	0.5	0.5	0.25
CYSTO	0.50	0.5	0.5	0.25
DRIN5	0.50	0.5	0.5	0.25
GATI	0.50	0.5	0.5	0.25
PANIC	0.50	0.5	0.5	0.25
POA	0.50	0.5	0.5	0.25
ROMU	0.50	0.5	0.5	0.25
ROSA5	0.50	0.5	0.5	0.25
SCCY	0.50	0.5	0.5	0.25
SMRO	0.50	0.5	0.5	0.25
VERON	0.50	0.5	0.5	0.25

Chinquapin Oak - Black Maple Forest (*Quercus muehlenbergii - Quercus* [*alba, rubra*] *- Carya cordiformis / Viburnum prunifolium* Forest [CEGL004793]); 1 plot.

	% Cover			
Species	Mean	Min	Max	Constancy
ACNI5	40.00	40	40	1.00
QUMU	30.00	30	30	1.00
ASTR	10.00	10	10	1.00
FRAM2	10.00	10	10	1.00
AEFL	5.00	5	5	1.00
AGAL5	3.00	3	3	1.00
ASCA	3.00	3	3	1.00
CACAV	3.00	3	3	1.00
CACO15	3.00	3	3	1.00
DIAM	1.00	1	1	1.00
MIVI	1.00	1	1	1.00
PIPUP	1.00	1	1	1.00
POVI2	1.00	1	1	1.00
THALI2	1.00	1	1	1.00
VEAL	1.00	1	1	1.00
AMBR2	0.50	0.5	0.5	1.00
BRER2	0.50	0.5	0.5	1.00
CAAL11	0.50	0.5	0.5	1.00
CALA19	0.50	0.5	0.5	1.00
CAREX	0.50	0.5	0.5	1.00
CRCA9	0.50	0.5	0.5	1.00
ELHY	0.50	0.5	0.5	1.00
EUDI16	0.50	0.5	0.5	1.00
GATR3	0.50	0.5	0.5	1.00
GECAC6	0.50	0.5	0.5	1.00
LIBE3	0.50	0.5	0.5	1.00
MUTE	0.50	0.5	0.5	1.00
OSMOR	0.50	0.5	0.5	1.00
POAC4	0.50	0.5	0.5	1.00
SETE3	0.50	0.5	0.5	1.00
SMTA2	0.50	0.5	0.5	1.00

Cliff Top Pitch Pine Woodland (*Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland [CEGL006557]); 4 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
PIRI	26.25	20	40	1.00
GABA	23.33	20	30	0.75
PIVI2	20.00	20	20	0.25
GAPR2	15.25	1	40	1.00
KALA	14.00	6	20	1.00
VAST	10.00	10	10	0.25
RHMA4	8.50	0.5	20	0.75
OXAR	7.75	1	10	1.00
VAPA4	6.63	0.5	20	1.00
ACRU	6.50	3	10	1.00
TSCA	6.50	3	10	0.50
QUCOC	4.75	1	10	1.00
PIST	3.83	0.5	10	0.75
NYSY	3.63	0.5	6	1.00
RHCA8	3.00	3	3	0.25
SMRO	2.38	0.5	5	1.00
AMARA4	2.17	0.5	5	0.75
QURU	1.50	0.5	3	0.75
QUVE	1.00	1	1	0.50
AMELA	1.00	1	1	0.25
CEOC	1.00	1	1	0.25
CLAC3	1.00	1	1	0.25
LEUCO9	1.00	1	1	0.25
PTAQ	1.00	1	1	0.25
SAAL5	0.88	0.5	1	1.00
QUAL	0.83	0.5	1	0.75
SMGL	0.83	0.5	1	0.75
CLADI3	0.75	0.5	1	0.50
EPRE2	0.67	0.5	1	0.75
HAVI4	0.63	0.5	1	1.00
DASP2	0.50	0.5	0.5	0.50
LEGL19	0.50	0.5	0.5	0.50
PHPY4	0.50	0.5	0.5	0.50
QUPR2	0.50	0.5	0.5	0.50
ANVIV	0.50	0.5	0.5	0.25
CADE12	0.50	0.5	0.5	0.25
PANIC	0.50	0.5	0.5	0.25
QUERC	0.50	0.5	0.5	0.25
SMTA2	0.50	0.5	0.5	0.25
UMBIL2	0.50	0.5	0.5	0.25

Cliff Top Virginia Pine Forest (*Pinus virginiana - Pinus* [*rigida, echinata*] - [*Quercus prinus*] / *Vaccinium pallidum* Forest [CEGL007119]); 7 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
PIVI2	47.14	40	60	1.00
SMRO	9.33	1	20	0.86
OXAR	9.29	5	20	1.00
ACRU	9.14	1	20	1.00
RHMA4	8.10	0.5	20	0.71
VAPA4	7.30	0.5	20	0.71
SAAL5	6.93	0.5	20	1.00
NYSY	6.71	1	20	1.00
GABA	6.50	3	10	0.29
PIRI	6.50	3	10	0.29
GAPR2	6.17	1	10	0.86
QUPR2	6.00	0.5	10	0.86
LITU	5.00	5	5	0.14
QUVE	4.00	1	5	0.57
KALA	3.83	1	10	0.86
CAGL8	3.00	1	5	0.29
AMARA4	3.00	3	3	0.14
QURU	2.90	0.5	5	0.71
QUAL	2.50	0.5	10	0.71
TSCA	2.40	0.5	10	0.71
SMGL	1.75	0.5	5	0.86
HAVI4	1.75	0.5	3	0.29
MIRE	1.75	0.5	3	0.29
FAGR	1.25	0.5	3	0.57
LEUCO9	1.10	0.5	3	0.71
ILOPO	1.08	0.5	3	0.86
POLYT5	1.00	1	1	0.29
COFL2	1.00	1	1	0.14
CYAC3	1.00	1	1	0.14
POGR4	1.00	1	1	0.14
TORA2	1.00	1	1	0.14
BELE	0.75	0.5	1	0.29
CHMA3	0.75	0.5	1	0.29
VIAC	0.75	0.5	1	0.29
DASP2	0.67	0.5	1	0.43
AMELA	0.50	0.5	0.5	0.43
DIDI6	0.50	0.5	0.5	0.43
EPRE2	0.50	0.5	0.5	0.43
RUBUS	0.50	0.5	0.5	0.43
DICHA2	0.50	0.5	0.5	0.29
HYHYM	0.50	0.5	0.5	0.29
MOUN3	0.50	0.5	0.5	0.29
SMTA2	0.50	0.5	0.5	0.29
SOBI	0.50	0.5	0.5	0.29
UMBIL2	0.50	0.5	0.5	0.29
VITIS	0.5	0.5	0.5	0.29
AGAL5	0.50	0.5	0.5	0.14
ANVIV	0.50	0.5	0.5	0.14
ARNU2	0.50	0.5	0.5	0.14
CADE12	0.50	0.5	0.5	0.14
DICO2	0.50	0.5	0.5	0.14
DICRA8	0.50	0.5	0.5	0.14
FRVIV	0.50	0.5	0.5	0.14
HYPER	0.50	0.5	0.5	0.14
JUVIV	0.50	0.5	0.5	0.14
LEGL19	0.50	0.5	0.5	0.14
LYQU2	0.50	0.5	0.5	0.14
PAQU2	0.50	0.5	0.5	0.14
PHPY4	0.50	0.5	0.5	0.14
PLOR4	0.50	0.5	0.5	0.14
PTAQ	0.50	0.5	0.5	0.14
QUERC	0.50	0.5	0.5	0.14
RHCOL2	0.50	0.5	0.5	0.14
ROPS	0.50	0.5	0.5	0.14
RUHI	0.50	0.5	0.5	0.14
SOCA4	0.50	0.5	0.5	0.14
SOER	0.50	0.5	0.5	0.14
SYPR6	0.50	0.5	0.5	0.14
VIOLA	0.50	0.5	0.5	0.14

Deciduous Tree / Great Laurel Forest (*Liriodendron tulipifera - Betula lenta – Acer rubrum / Rhododendron maximum* Forest [CELT007543], local subtype of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest [CEGL007543]); 6 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
RHMA4	63.33	15	95	1.00
BELE	26.17	15	40	1.00
ACRU	18.83	3	35	1.00
LITU	17.83	5	45	1.00
QUAL	12.00	12	12	0.17
MAFR	11.25	5	20	0.67
MAAC	10.00	10	10	0.17
OXAR	8.33	2	13	1.00
ACSP2	8.00	8	8	0.17
DRIN5	7.50	0.01	15	0.33
ACPE	7.00	7	7	0.17
QURU	6.10	0.5	10	0.83
SAAL5	6.00	3	10	0.50
BEALA	5.00	5	5	0.17
FAGR	5.00	5	5	0.17
PRSES	5.00	5	5	0.17
QUPR2	5.00	5	5	0.17
ROPS	5.00	5	5	0.17
NYSY	4.88	0.5	12	0.67
DRCA11	4.00	4	4	0.17
CAAL27	3.00	1	5	0.33
TSCA	2.50	0.5	5	0.50
LACA3	2.00	2	2	0.17
SCSA5	1.75	0.5	3	0.33
PAQU2	1.25	0.5	2	0.33
ACSAS	1.00	1	1	0.17
ARTR	1.00	1	1	0.17
ASTER	1.00	1	1	0.17

COFL2	1.00	1	1	0.17
HYIM3	1.00	1	1	0.17
OSVIV	1.00	1	1	0.17
VIOLA	0.50	0.01	1	0.50
HAVI4	0.50	0.5	0.5	0.33
RUBUS	0.50	0.5	0.5	0.33
CYSTO	0.50	0.5	0.5	0.17
DEPU2	0.50	0.5	0.5	0.17
GAPR2	0.50	0.5	0.5	0.17
GOPU	0.50	0.5	0.5	0.17
ILOPO	0.50	0.5	0.5	0.17
PIPUP	0.50	0.5	0.5	0.17
POVI7	0.50	0.5	0.5	0.17
THDE10	0.50	0.5	0.5	0.17
TORA2	0.50	0.5	0.5	0.17
UVPU2	0.50	0.5	0.5	0.17
MOUN3	0.34	0.01	0.5	0.50
MIRE	0.25	0.01	0.5	0.33
COAM	0.01	0.01	0.01	0.17
KALA	0.01	0.01	0.01	0.17
POAC4	0.01	0.01	0.01	0.17
SMTA2	0.01	0.01	0.01	0.17
SOCU	0.01	0.01	0.01	0.17

Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest (*Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest [CEGL008524]); 4 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
QURU	32.50	5	60	0.50
RHCA8	22.50	10	30	1.00
TSCA	19.50	3	40	1.00
QUPR2	13.75	10	20	1.00
ACRU	13.33	10	20	0.75
BEALA	12.50	5	20	0.50
OXAR	11.25	5	20	1.00
ROPS	10.00	10	10	0.25
THDE10	10.00	10	10	0.25
VIAC	10.00	10	10	0.25
LEGL19	8.00	1	20	0.75
DICRA8	5.50	1	10	0.50
QUCOC	5.50	1	10	0.50
RHMA4	5.50	1	10	0.50
QUAL	5.00	5	5	0.50
FLBA	5.00	5	5	0.25
PIST	5.00	5	5	0.25
UMMA60	5.00	5	5	0.25
KALA	4.75	1	10	1.00
HAVI4	3.00	1	5	0.75
VAPA4	3.00	1	5	0.75
ACPE	3.00	1	5	0.50
ARNU2	3.00	3	3	0.50
QUVE	3.00	1	5	0.50
DRMA4	3.00	3	3	0.25
GABA	3.00	3	3	0.25
HYAR	3.00	3	3	0.25
BELE	2.83	0.5	5	0.75
CADE12	2.83	0.5	5	0.75
POVI7	2.75	0.5	5	0.50
SMRO	1.25	0.5	3	1.00
NYSY	1.00	1	1	0.50
ACSAS	1.00	1	1	0.25
AMARA4	1.00	1	1	0.25
CAAL27	1.00	1	1	0.25
CAGL8	1.00	1	1	0.25
CLCA11	1.00	1	1	0.25
COAM	1.00	1	1	0.25
EPRE2	1.00	1	1	0.25
HYIM3	1.00	1	1	0.25
PAQU2	1.00	1	1	0.25
SAAL5	1.00	1	1	0.25
GAPR2	0.75	0.5	1	1.00
CYAC3	0.67	0.5	1	0.75
ARMA7	0.50	0.5	0.5	0.25
ARTR	0.50	0.5	0.5	0.25
ASTER	0.50	0.5	0.5	0.25
AUREO	0.50	0.5	0.5	0.25
CHMA3	0.50	0.5	0.5	0.25
DIQU	0.50	0.5	0.5	0.25
GATR3	0.50	0.5	0.5	0.25
HEVIV2	0.50	0.5	0.5	0.25
HIPA2	0.50	0.5	0.5	0.25
HIVE	0.50	0.5	0.5	0.25
RUBUS	0.50	0.5	0.5	0.25
SOCA4	0.50	0.5	0.5	0.25
UVSE	0.50	0.5	0.5	0.25
ZIAU	0.50	0.5	0.5	0.25

Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest (*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest [CEGL007543]); 11 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
TSCA	32.82	15	60	1.00
RHMA4	26.00	4	50	0.73
LITU	13.21	0.5	30	0.64
BELE	12.00	1	30	0.82
ACRU	11.00	1	30	0.91
FAGR	9.89	1	40	0.82
ACSAS	9.40	4	15	0.45
QURU	9.29	0.5	24	0.64
TIAM	7.50	3	12	0.18
OSVIV	7.00	7	7	0.09
QUAL	5.25	0.5	10	0.55
CARYA	5.25	0.5	10	0.18
BEALA	5.00	5	5	0.09
RICY	5.00	5	5	0.09
NYSY	4.30	0.5	10	0.45

MAFR	4.00	1	10	0.55
HAVI4	3.20	2	5	0.45
PRSES	3.08	0.5	10	0.55
OXAR	3.00	1	7	0.27
MATR	3.00	1	5	0.18
AEFL	3.00	3	3	0.09
ILOPO	2.50	1	4	0.18
LACA3	1.83	0.5	4	0.27
THNO	1.75	0.5	5	0.36
SAAL5	1.75	0.5	3	0.18
VITIS	1.75	0.5	3	0.18
MAAC	1.50	0.5	2	0.27
SETE3	1.50	0.5	3	0.27
VAPA4	1.50	1	2	0.18
POAC4	1.31	0.5	5	0.73
PAQU2	1.25	0.5	2	0.36
ACPE	1.10	0.5	3	0.45
EUDI16	1.06	0.5	3	0.73
MIRE	1.00	0.5	4	0.73
ASCA	1.00	1	1	0.18
COFL2	1.00	1	1	0.18
FRAM2	1.00	1	1	0.18
GEMA	1.00	1	1	0.18
HYIM3	1.00	1	1	0.18
THDE10	1.00	1	1	0.18
ACPA	1.00	1	1	0.09
ARNU2	1.00	1	1	0.09
BRER2	1.00	1	1	0.09
CAAL27	1.00	1	1	0.09
CORYL	1.00	1	1	0.09
GATR3	1.00	1	1	0.09
HATE3	1.00	1	1	0.09
HEAMA2	1.00	1	1	0.09
HENOA	1.00	1	1	0.09
LEGL19	1.00	1	1	0.09
LIST2	1.00	1	1	0.09
PECAC3	1.00	1	1	0.09
RHODO	1.00	1	1	0.09
TICO	1.00	1	1	0.09
DRMA4	0.88	0.5	1	0.36
MEVI	0.83	0.5	1	0.27
DRIN5	0.80	0.5	1	0.45
GAPR2	0.75	0.5	1	0.36
VIAC	0.75	0.5	1	0.36
ANQUQ	0.75	0.5	1	0.18
ARTR	0.75	0.5	1	0.18
COAM	0.75	0.5	1	0.18
KALA	0.75	0.5	1	0.18
POVI7	0.75	0.5	1	0.18
VIAEB	0.75	0.5	1	0.18
DIQU	0.70	0.5	1	0.45
PRLAWV	0.67	0.5	1	0.27
QUPR2	0.67	0.5	1	0.27
VIRO2	0.67	0.5	1	0.27
SMRO	0.63	0.5	1	0.73
TORA2	0.60	0.5	1	0.45
UVPU2	0.60	0.5	1	0.45
VIOLA	0.58	0.5	1	0.55
ASTER	0.50	0.5	0.5	0.27
CHMA3	0.50	0.5	0.5	0.27
POBI2	0.50	0.5	0.5	0.27
RUBUS	0.50	0.5	0.5	0.27
SMGL	0.50	0.5	0.5	0.27
CYSTO	0.50	0.5	0.5	0.18
GOPU	0.50	0.5	0.5	0.18
MARAR	0.50	0.5	0.5	0.18
MOUN3	0.50	0.5	0.5	0.18
PANIC	0.50	0.5	0.5	0.18
PRENA	0.50	0.5	0.5	0.18
ACRARWV	0.50	0.5	0.5	0.09
AMARA4	0.50	0.5	0.5	0.09
ANEMO	0.50	0.5	0.5	0.09
ARMA7	0.50	0.5	0.5	0.09
ARSP2	0.50	0.5	0.5	0.09
BOVI	0.50	0.5	0.5	0.09
CACO15	0.50	0.5	0.5	0.09
CAREX	0.50	0.5	0.5	0.09
CLUM2	0.50	0.5	0.5	0.09
CYPRI	0.50	0.5	0.5	0.09
DESMO	0.50	0.5	0.5	0.09
DRYOP	0.50	0.5	0.5	0.09
GALIU	0.50	0.5	0.5	0.09
HENOO	0.50	0.5	0.5	0.09
HEVI3	0.50	0.5	0.5	0.09
JUEF	0.50	0.5	0.5	0.09
LYDI3	0.50	0.5	0.5	0.09
MACA4	0.50	0.5	0.5	0.09
MASY	0.50	0.5	0.5	0.09
POLYG2	0.50	0.5	0.5	0.09
POTEN	0.50	0.5	0.5	0.09
PRAL3	0.50	0.5	0.5	0.09
PYPU	0.50	0.5	0.5	0.09
QUVE	0.50	0.5	0.5	0.09
RUELL	0.50	0.5	0.5	0.09
RUHI	0.50	0.5	0.5	0.09
SANIC4	0.50	0.5	0.5	0.09
SEAS3	0.50	0.5	0.5	0.09
SMTA2	0.50	0.5	0.5	0.09
SOLID	0.50	0.5	0.5	0.09
TRCAC2	0.50	0.5	0.5	0.09
TRER3	0.50	0.5	0.5	0.09
VICA4	0.50	0.5	0.5	0.09
VIHA2	0.50	0.5	0.5	0.09

Eastern Red-cedar - Virginia Pine Flatrock Woodland (*Juniperus virginiana* var. *virginiana* - *Pinus virginiana* - *Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland [CEGL008449]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
HECI5	17.00	17	17	0.20
HYIM3	17.00	17	17	0.20
PIVI2	12.75	3	18	0.80
ROMU	10.50	2	19	0.40
JUVIV	10.40	3	24	1.00
THDE10	9.00	1	17	0.40
ISBR3	9.00	9	9	0.20
DICO17	8.00	6	10	0.40
DISC71	7.67	1	17	0.60
LEGL19	7.25	1	17	0.80
QUST	7.00	4	10	0.40
MEMU	7.00	7	7	0.20
CHVI3	6.00	6	6	0.20
GRPI3	6.00	6	6	0.20
PASE5	6.00	6	6	0.20
POJU70	6.00	6	6	0.20
ALSA2	5.00	5	5	0.20
AMARE	5.00	5	5	0.20
CELTI	5.00	5	5	0.20
CLGR7	5.00	5	5	0.20
CLRO7	5.00	5	5	0.20
RUBUS	4.00	1	13	0.80
CEOC	4.00	4	4	0.20
OSVIV	4.00	4	4	0.20
PURU2	4.00	4	4	0.20
RHTY	4.00	4	4	0.20
ULAM	4.00	4	4	0.20
CLSU16	3.75	2.5	5	0.40
LOJA	3.67	1	7	0.60
FRAM2	3.25	1	9	0.80
RHCOL2	3.17	0.5	5	0.60
VIPR	3.00	1	5	0.60
CECAC	3.00	3	3	0.40
HYPR	3.00	1	5	0.40
CRATA	3.00	3	3	0.20
VAAN	3.00	3	3	0.20
DASP2	2.75	0.5	5	0.40
HYGE	2.75	0.5	5	0.40
CLFU3	2.50	2.5	2.5	0.20
AMST80	2.00	1	4	0.60
TORA2	2.00	1	4	0.60
CARYA	2.00	2	2	0.20
COFL2	2.00	2	2	0.20
DIOVVWV	2.00	2	2	0.20
JUTE	2.00	2	2	0.20
LONIC	2.00	2	2	0.20
PAAN6	2.00	2	2	0.20
RUPH	2.00	2	2	0.20
ULRU	2.00	2	2	0.20
SALY2	1.83	0.5	4	0.60
ASPL	1.80	0.5	4	1.00
SOLID	1.67	1	3	0.60
ANVIV	1.63	0.5	3	0.80
ROCAC	1.33	1	2	0.60
ACSAS	1.25	0.5	2	0.40
OXST	1.00	1	1	0.60
KRVI	1.00	1	1	0.40
VAPA4	1.00	1	1	0.40
ACMIO	1.00	1	1	0.20
AMELA	1.00	1	1	0.20
ARGL	1.00	1	1	0.20
ARLA	1.00	1	1	0.20
CAHI6	1.00	1	1	0.20
CAIM	1.00	1	1	0.20
CLST6	1.00	1	1	0.20
DACA6	1.00	1	1	0.20
GLTR	1.00	1	1	0.20
HYPE	1.00	1	1	0.20
IPOMO	1.00	1	1	0.20
LIVU	1.00	1	1	0.20
MARAR	1.00	1	1	0.20
OXGR	1.00	1	1	0.20
PAHY7	1.00	1	1	0.20
PHSU3	1.00	1	1	0.20
PIAV	1.00	1	1	0.20
PORE5	1.00	1	1	0.20
PRAM	1.00	1	1	0.20
RUAC3	1.00	1	1	0.20
SETE3	1.00	1	1	0.20
SOCAC4	1.00	1	1	0.20
UVPU2	1.00	1	1	0.20
VIAEB	1.00	1	1	0.20
PAQU2	0.83	0.5	1	0.60
POSI2	0.83	0.5	1	0.60
DILI2	0.75	0.5	1	0.40
LEVI2	0.75	0.5	1	0.40
PANIC	0.63	0.5	1	0.80
CAREX	0.50	0.5	0.5	0.60
QUAL	0.50	0.5	0.5	0.60
CAUM4	0.50	0.5	0.5	0.40
EUAM7	0.50	0.5	0.5	0.40
LEVI7	0.50	0.5	0.5	0.40
SYPAP2	0.50	0.5	0.5	0.40
ANGE	0.50	0.5	0.5	0.20
ANTEN	0.50	0.5	0.5	0.20
CACE	0.50	0.5	0.5	0.20
CACO26	0.50	0.5	0.5	0.20
CARA2	0.50	0.5	0.5	0.20
CARDA	0.50	0.5	0.5	0.20
CUVI	0.50	0.5	0.5	0.20
DIAR	0.50	0.5	0.5	0.20
EUCO10	0.50	0.5	0.5	0.20
EUPAT	0.50	0.5	0.5	0.20
GAAP2	0.50	0.5	0.5	0.20
GACI2	0.50	0.5	0.5	0.20

GAPI2	0.50	0.5	0.5	0.20
HICA10	0.50	0.5	0.5	0.20
HOLA	0.50	0.5	0.5	0.20
HYPU	0.50	0.5	0.5	0.20
ISTE3	0.50	0.5	0.5	0.20
LEPR	0.50	0.5	0.5	0.20
LERE2	0.50	0.5	0.5	0.20
LEVU	0.50	0.5	0.5	0.20
LILI3	0.50	0.5	0.5	0.20
LYQU2	0.50	0.5	0.5	0.20
OXVI	0.50	0.5	0.5	0.20
PALU2	0.50	0.5	0.5	0.20
PLCI3	0.50	0.5	0.5	0.20
POBI2	0.50	0.5	0.5	0.20
POOL	0.50	0.5	0.5	0.20
PYCNA	0.50	0.5	0.5	0.20
QUMU	0.50	0.5	0.5	0.20
RUCAC4	0.50	0.5	0.5	0.20
RUCRC	0.50	0.5	0.5	0.20
SAMI6	0.50	0.5	0.5	0.20
SIVIV	0.50	0.5	0.5	0.20
SMGL	0.50	0.5	0.5	0.20
SMTA2	0.50	0.5	0.5	0.20
STME2	0.50	0.5	0.5	0.20
TEVI	0.50	0.5	0.5	0.20
TICO	0.50	0.5	0.5	0.20
ULMUS	0.50	0.5	0.5	0.20
UVSE	0.50	0.5	0.5	0.20
VAST	0.50	0.5	0.5	0.20
VITIS	0.50	0.5	0.5	0.20

Forest Seep (*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest [CEGL007853]); 12 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
GLME2	20.50	0.5	45	0.25
ACRU	19.08	3	50	0.33
LITU	15.20	5	30	0.08
THNO	13.83	1	40	0.25
KALA	13.00	1	25	0.08
QUAL	12.00	5	20	0.08
ATFIA2	10.50	1	20	0.08
QUVE	10.33	1	20	0.17
FAGR	7.00	5	10	0.08
ACPE	6.64	1	20	1.00
NYSY	6.60	0.01	20	0.17
BELE	6.57	1	20	0.08
RHCA4	6.50	3	10	0.33
RHODO	6.25	3	10	0.08
MAAC	5.83	2	10	0.08
VIPR4	5.50	1	10	0.17
OSCIC	5.15	0.5	15	0.17
ATFIA4	5.00	5	5	0.17
DIVI5	5.00	5	5	0.17
HAVI4	5.00	3	9	0.08
GLST	4.50	0.5	10	0.08
RUHI	4.00	1	10	0.25
VAST	4.00	1	10	0.17
ILVE	3.50	2	5	0.08
QURU	3.40	0.01	10	0.25
ATFI	3.38	0.5	5	0.17
OXAR	3.25	0.5	10	0.42
CAAL27	3.20	1	5	0.08
ROPS	3.00	3	3	0.42
QUCOC	3.00	3	3	0.33
CAATA2	3.00	3	3	0.17
ALSE2	3.00	1	5	0.08
CASCS	3.00	3	3	0.08
CIAR2	3.00	3	3	0.08
QUPR2	2.88	0.5	5	0.42
ONSE	2.50	2	3	0.83
VICU	2.50	1	5	0.42
CAOV3	2.50	2	3	0.17
BAVU	2.00	2	2	0.58
VINUC	2.00	2	2	0.42
AEFL	2.00	2	2	0.25
OSCL2	2.00	1	3	0.08
TSCA	2.00	2	2	0.08
ACSAS	1.88	0.5	5	0.08
FRAM2	1.88	0.5	5	0.08
HYIM3	1.75	0.5	3	0.08
ROMU	1.63	0.5	4	0.08
PRSES	1.60	0.5	5	0.83
RUBUS	1.60	1	3	0.42
CABA7	1.50	1	2	0.08
DEAC4	1.50	1	2	0.08
LYUNUWV	1.33	1	3	0.50
PANIC	1.33	1	2	0.17
CAIN12	1.30	0.5	3	0.17
THDE10	1.17	0.5	3	1.00
POAC4	1.15	0.5	3	0.25
UVPU2	1.13	0.5	2	0.33
VIOLA	1.10	0.5	2	0.17
SMRO	1.05	0.5	3	0.25
PIST	1.00	0.01	2	0.17
SMGL	1.00	1	1	0.92
LICA3	1.00	1	1	0.83
PLRE5	1.00	1	1	0.83
PRAL2	1.00	1	1	0.67
MARAR	1.00	1	1	0.50
OSVIV	1.00	1	1	0.50
VIBLB	1.00	1	1	0.50
CADE12	1.00	1	1	0.42
FESU3	1.00	1	1	0.33
ANQUM2	1.00	1	1	0.25
CAPL5	1.00	1	1	0.25
DEPU2	1.00	1	1	0.25
ELTE	1.00	1	1	0.25
STSE9	1.00	1	1	0.25
VAPA4	1.00	0.5	2	0.25

CAGY4	1.00	1	1	0.17	CAHA32	0.75	0.5	1	0.08
CHGL2	1.00	1	1	0.17	HYPER	0.75	0.5	1	0.08
GAOBO	1.00	1	1	0.17	PAQU2	0.75	0.5	1	0.08
JUGR6	1.00	1	1	0.17	JUEF	0.71	0.5	1	0.08
LEVI2	1.00	1	1	0.17	VIHA2	0.70	0.5	1	0.08
MALUS	1.00	1	1	0.17	PRENA	0.69	0.5	1	0.17
MNHO	1.00	1	1	0.17	SYPR6	0.67	0.5	1	0.50
VIAEB	1.00	1	1	0.17	DICL	0.67	0.5	1	0.08
AMLA	1.00	1	1	0.08	GEMA	0.67	0.5	1	0.08
ATUN2	1.00	1	1	0.08	PLCL	0.67	0.5	1	0.08
AULAC2	1.00	1	1	0.08	POCAC2	0.67	0.5	1	0.08
BRER2	1.00	1	1	0.08	CAREX	0.63	0.5	1	0.08
CACR6	1.00	1	1	0.08	SANIC4	0.63	0.5	1	0.08
CAPR12	1.00	0.5	2	0.08	CADER	0.60	0.5	1	0.17
CAST5	1.00	1	1	0.08	MOUN3	0.50	0.5	0.5	0.83
CLADO3	1.00	1	1	0.08	ACMIO	0.50	0.5	0.5	0.58
COFL2	1.00	1	1	0.08	DIDIDWV	0.50	0.5	0.5	0.58
CRATA	1.00	1	1	0.08	IMPAT	0.50	0.5	0.5	0.58
DISC71	1.00	1	1	0.08	LYCOP4	0.50	0.5	0.5	0.50
DRCA11	1.00	1	1	0.08	PLCI3	0.50	0.5	0.5	0.50
DRIN5	1.00	1	1	0.08	CAAL11	0.50	0.5	0.5	0.42
EUDI16	1.00	1	1	0.08	POSA5	0.50	0.5	0.5	0.42
GAPR2	1.00	1	1	0.08	PRLAWV	0.50	0.5	0.5	0.42
GATI	1.00	1	1	0.08	ARTR	0.50	0.5	0.5	0.33
HELA2	1.00	1	1	0.08	ASTER	0.50	0	1	0.33
HYDE	1.00	1	1	0.08	CARA18	0.50	0.5	0.5	0.33
HYMU	1.00	1	1	0.08	RHPE4	0.50	0.5	0.5	0.33
LEAL35	1.00	1	1	0.08	SANIC	0.50	0.5	0.5	0.33
LIBE3	1.00	1	1	0.08	SCSE5	0.50	0.5	0.5	0.33
LOIN	1.00	1	1	0.08	UVPE	0.50	0.5	0.5	0.33
MIRE	1.00	1	1	0.08	GATR3	0.50	0.5	0.5	0.25
MNIUM2	1.00	1	1	0.08	GLHE2	0.50	0.5	0.5	0.25
OSRES	1.00	1	1	0.08	GRNE	0.50	0.5	0.5	0.25
PEEP3	1.00	1	1	0.08	LEOR	0.50	0.5	0.5	0.25
POTEN	1.00	1	1	0.08	STME2	0.50	0.5	0.5	0.25
ROPA	1.00	1	1	0.08	AGPA6	0.50	0.5	0.5	0.17
SCAT2	1.00	1	1	0.08	BRNO4	0.50	0.5	0.5	0.17
SPHAG2	1.00	1	1	0.08	CACO15	0.50	0.5	0.5	0.17
STPU	1.00	0.5	2	0.08	CADIDWV	0.50	0.5	0.5	0.17
VIAC	1.00	1	1	0.08	CAHEH	0.50	0.5	0.5	0.17
MEVI	0.92	0.5	1	0.17	CAVI4	0.50	0.5	0.5	0.17
DIQU	0.86	0.5	1	0.08	COAM	0.50	0.5	0.5	0.17
PAAU3	0.83	0.5	1	0.25	CYAC3	0.50	0.5	0.5	0.17
ANQUQ	0.83	0.5	1	0.17	EUFI	0.50	0.5	0.5	0.17
AGAL5	0.83	0.5	1	0.08	HYHI2	0.50	0.5	0.5	0.17
SAAL5	0.83	0.5	1	0.08	HYPE	0.50	0.5	0.5	0.17
SOLID	0.83	0.5	1	0.08	ILOPO	0.50	0.5	0.5	0.17
TORA2	0.83	0.5	1	0.08	PELLI	0.50	0.5	0.5	0.17
OXRI	0.80	0.5	1	0.25	PIPUP	0.50	0.5	0.5	0.17
POSI2	0.80	0.5	1	0.17	SCPO2	0.50	0.5	0.5	0.17
CAIN11	0.75	0.5	1	0.42	SORU2	0.50	0.5	0.5	0.17
EUPAT	0.75	0.5	1	0.25	AMARA4	0.50	0.5	0.5	0.08
ARNU2	0.75	0.5	1	0.17	AMBR2	0.50	0.5	0.5	0.08
CALU5	0.75	0.5	1	0.17	AUFL	0.50	0.5	0.5	0.08
VISO	0.75	0.5	1	0.17	AUPA70	0.50	0.5	0.5	0.08
CAFO6	0.75	0.5	1	0.08	CABL	0.50	0.5	0.5	0.08

CAGR2	0.50	0.5	0.5	0.08
CARYA	0.50	0.5	0.5	0.08
CHMA3	0.50	0.5	0.5	0.08
CILUC	0.50	0.5	0.5	0.08
CLCO13	0.50	0.5	0.5	0.08
CLUM2	0.50	0.5	0.5	0.08
CLVI5	0.50	0.5	0.5	0.08
COCA4	0.50	0.5	0.5	0.08
COMA19	0.50	0.5	0.5	0.08
DENU4	0.50	0.5	0.5	0.08
GENTI	0.50	0.5	0.5	0.08
GOPU	0.50	0.5	0.5	0.08
HOLA	0.50	0.5	0.5	0.08
LACA3	0.50	0.5	0.5	0.08
LOCA2	0.50	0.5	0.5	0.08
LUPA	0.50	0.5	0.5	0.08
PLOR4	0.50	0.5	0.5	0.08
POCAL2	0.50	0.5	0.5	0.08
POHY	0.50	0.5	0.5	0.08
POPE	0.50	0.5	0.5	0.08
SACA15	0.50	0.5	0.5	0.08
TRUN	0.50	0.5	0.5	0.08
USPE	0.50	0.5	0.5	0.08
VITRTWV	0.50	0.5	0.5	0.08
ZIAU	0.50	0.5	0.5	0.00

Lizard's-tail Backwater Slough (*Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation [CEGL007696]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
SACE	14.00	2	48	1.00
PLOC	13.40	0.01	40	1.00
ASTR	12.00	12	12	0.20
ARHI3	9.50	9	10	0.40
AEFL	9.25	1	28	0.80
LYNU	6.25	1	20	0.80
GLHE2	6.00	2	10	0.80
SODUD	6.00	6	6	0.20
POSA5	5.50	1	10	0.40
SANIC4	5.00	1	9	0.40
PAANAWV	5.00	5	5	0.20
VIRI	5.00	5	5	0.20
APAM	4.00	3	5	0.40
JUNI	4.00	4	4	0.20
MAAC	4.00	4	4	0.20
AMBR2	3.75	1	9	0.80
LIBE3	3.67	2	5	0.60
SALA2	3.00	1	5	0.40
CEOC	3.00	3	3	0.20
GATR3	3.00	3	3	0.20
MEPI	3.00	3	3	0.20
PAAU3	3.00	3	3	0.20
CUGRG	2.75	1	5	0.80
ULRU	2.50	0.5	4	0.60
ERHY	2.50	2	3	0.40
JUAM	2.50	2	3	0.40
LIDU	2.50	2	3	0.40
LUPA	2.50	2	3	0.40
BOCY	2.40	1	5	1.00
IMCA	2.33	1	5	0.60
MIVI	2.33	1	5	0.60
VEAL	2.33	1	5	0.60
IRPS	2.17	0.5	5	0.60
LOJA	2.00	1	3	0.40
POSI2	2.00	1	3	0.40
PRVU	2.00	1	3	0.40
ROMU	2.00	2	2	0.40
ACRH	2.00	2	2	0.20
DECA8	2.00	2	2	0.20
MYLA	2.00	2	2	0.20
POLYG4	2.00	2	2	0.20
PIPUP	1.88	0.5	5	0.80
TORA2	1.75	1	2	0.80
ILVE	1.75	0.5	3	0.40
MEAR4	1.67	1	3	0.60
FRPE	1.50	0.5	3	0.60
COAM2	1.50	1	2	0.40
EUFI	1.50	1	2	0.40
OXST	1.50	1	2	0.40
DICL	1.33	1	2	0.60
LOCA2	1.33	1	2	0.60
ONSE	1.33	1	2	0.60
BIDEN	1.25	1	2	0.80
SIPEC2	1.25	0.5	2	0.40
VIOLA	1.17	0.5	2	0.60
HYMU	1.00	1	1	0.80
LYCI	1.00	1	1	0.60
TECA3	1.00	1	1	0.60
CASE13	1.00	1	1	0.40
EQAR	1.00	1	1	0.40
EUPEP	1.00	1	1	0.40
GATI	1.00	1	1	0.40
GLST	1.00	1	1	0.40
JUEF	1.00	1	1	0.40
MIAL2	1.00	1	1	0.40
MIRIR	1.00	1	1	0.40
PAQU2	1.00	1	1	0.40
PESE6	1.00	1	1	0.40
PHPA9	1.00	1	1	0.40
PLRUR	1.00	1	1	0.40
RUCRC	1.00	1	1	0.40
RULAL	1.00	1	1	0.40
SCLALWV	1.00	1	1	0.40
SOLID	1.00	1	1	0.40
VEAN2	1.00	1	1	0.40
ACCA4	1.00	1	1	0.20
AGPA6	1.00	1	1	0.20
ALSU	1.00	1	1	0.20
AMARE	1.00	1	1	0.20

ANCO2	1.00	1	1	0.20
APCA	1.00	1	1	0.20
ARMI2	1.00	1	1	0.20
ASCA	1.00	1	1	0.20
ASINP2	1.00	1	1	0.20
ASSY	1.00	1	1	0.20
BAVU	1.00	1	1	0.20
BENI	1.00	1	1	0.20
BITR	1.00	1	1	0.20
BROMU	1.00	1	1	0.20
CAAM8	1.00	1	1	0.20
CAFR3	1.00	1	1	0.20
CASC13	1.00	1	1	0.20
CASCS	1.00	1	1	0.20
CHLA5	1.00	1	1	0.20
CHMA15	1.00	1	1	0.20
CIMAM	1.00	1	1	0.20
CLVI5	1.00	1	1	0.20
COCOC3	1.00	1	1	0.20
COER	1.00	1	1	0.20
COVA2	1.00	1	1	0.20
CYER2	1.00	1	1	0.20
CYESL	1.00	1	1	0.20
DIVIV2	1.00	1	1	0.20
ECCR	1.00	1	1	0.20
ELCA3	1.00	1	1	0.20
ELCA7	1.00	1	1	0.20
ELHY	1.00	1	1	0.20
ELOB2	1.00	1	1	0.20
ELPA3	1.00	1	1	0.20
ELYMU	1.00	1	1	0.20
ERSTS2	1.00	1	1	0.20
EUGRG	1.00	1	1	0.20
EUPAT	1.00	1	1	0.20
GAAP2	1.00	1	1	0.20
GAQU	1.00	1	1	0.20
GECAC6	1.00	1	1	0.20
GERAN	1.00	1	1	0.20
HETU	1.00	1	1	0.20
HYPE	1.00	1	1	0.20
IMPAT	1.00	1	1	0.20
IPCO3	1.00	1	1	0.20
JUCA3	1.00	1	1	0.20
LACTU	1.00	1	1	0.20
LEOR	1.00	1	1	0.20
LEVI7	1.00	1	1	0.20
LOIN	1.00	1	1	0.20
LYAM	1.00	1	1	0.20
LYUNUWV	1.00	1	1	0.20
LYVI4	1.00	1	1	0.20
MELU	1.00	1	1	0.20
MEOF	1.00	1	1	0.20
OSLO	1.00	1	1	0.20
PANIC	1.00	1	1	0.20
PARIEWV	1.00	1	1	0.20
PHAMA3	1.00	1	1	0.20
PHLE5	1.00	1	1	0.20
POCAL2	1.00	1	1	0.20
POCU6	1.00	1	1	0.20
POLA4	1.00	1	1	0.20
PONOM	1.00	1	1	0.20
POPU5	1.00	1	1	0.20
POVI2	1.00	1	1	0.20
RAHIN	1.00	1	1	0.20
ROPAF2	1.00	1	1	0.20
ROPS	1.00	1	1	0.20
RUBUS	1.00	1	1	0.20
RUOB	1.00	1	1	0.20
SANI	1.00	1	1	0.20
SAOF4	1.00	1	1	0.20
SCPE4	1.00	1	1	0.20
SCPUP5	1.00	1	1	0.20
SMRO	1.00	1	1	0.20
SMTA2	1.00	1	1	0.20
SOCAC4	1.00	1	1	0.20
SOULU2	1.00	1	1	0.20
STNU2	1.00	1	1	0.20
THBA	1.00	1	1	0.20
THPU2	1.00	1	1	0.20
TROH	1.00	1	1	0.20
TRRE3	1.00	1	1	0.20
TYLA	1.00	1	1	0.20
VEHAH	1.00	1	1	0.20
VERNO	1.00	1	1	0.20
VEUR	1.00	1	1	0.20
ELVIV	0.83	0.5	1	0.60
ACNE2	0.75	0.5	1	0.40
CAIM	0.75	0.5	1	0.40
CRCA9	0.75	0.5	1	0.40
MECA3	0.75	0.5	1	0.40
VIST3	0.75	0.5	1	0.40
ACRU	0.50	0.5	0.5	0.20
CAREX	0.50	0.5	0.5	0.20
CHNIN2	0.50	0.5	0.5	0.20
CIAR2	0.50	0.5	0.5	0.20
HEDU2	0.50	0.5	0.5	0.20
LECU	0.50	0.5	0.5	0.20
OSCL	0.50	0.5	0.5	0.20
POAC4	0.50	0.5	0.5	0.20
QUERC	0.50	0.5	0.5	0.20
VEBL	0.50	0.5	0.5	0.20
ACSA2	0.25	0.01	0.5	0.40
LITU	0.01	0.01	0.01	0.20
LYSA2	0.01	0.01	0.01	0.20

Oak / Ericad Forest (*Quercus* [*prinus, coccinea*] / *Kalmia latifolia / [Galax urceolata, Gaultheria procumbens*] Forest [CEGL006271]); 23 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
UMMA60	30.00	30	30	0.04
QUPR2	21.91	2	40	0.96
QUVE	19.94	1	60	0.78
RHMA4	18.38	0.5	40	0.17
ACRU	17.00	1	40	1.00
QUCOC	13.91	3	40	0.48
GABA	12.75	0.5	40	0.26
OXAR	11.95	1	40	0.96
MAFR	8.57	0.5	40	0.30
QURU	8.06	0.5	20	0.74
KALA	8.00	1	20	0.70
VAPA4	7.74	0.5	20	0.91
LITU	6.20	1	10	0.22
QUAL	6.00	0.01	10	0.52
PIVI2	5.50	0.5	20	0.22
TIAM	5.00	5	5	0.04
NYSY	4.61	0.5	20	0.83
MAAC	4.00	1	10	0.35
HAVI4	3.50	0.5	10	0.26
SAAL5	3.40	0.5	20	0.91
CARYA	3.30	0.5	10	0.22
ROPS	3.13	0.5	10	0.35
ACPE	3.00	0.5	5	0.26
LEGL19	3.00	0.5	10	0.26
ACSAS	3.00	3	3	0.04
LAPA13	3.00	3	3	0.04
CAOV2	2.80	1	5	0.22
VIAC	2.70	0.5	10	0.43
FAGR	2.59	0.5	10	0.48
SMRO	2.50	0.5	10	0.70
COFL2	2.50	1	5	0.17
CACO15	2.33	1	5	0.13
CADE12	2.29	0.01	20	0.61
RHCA4	2.25	1	4	0.17
LEUCO9	2.00	0.5	5	0.26
CAPE6	2.00	0.5	5	0.13
RHCA8	2.00	1	3	0.09
COCOC2	2.00	2	2	0.04
PRUNU	2.00	2	2	0.04
PAQU2	1.88	0.5	3	0.17
TSCA	1.67	0.5	3	0.26
EPRE2	1.50	0.5	3	0.13
HIVE	1.43	0.5	3	0.30
BELE	1.38	0.5	3	0.17
AMARA4	1.30	0.5	3	0.22
EUDI16	1.25	0.5	3	0.17
PANIC	1.25	0.5	2	0.09
PTAQ	1.20	0.5	3	0.22
POSI2	1.06	0.5	3	0.35
GAPR2	1.06	0.5	3	0.39
FRAM2	1.00	1	1	0.09
AEFL	1.00	1	1	0.04
ANSO	1.00	1	1	0.04
ANVI13	1.00	1	1	0.04
ARNU2	1.00	1	1	0.04
CAAL11	1.00	1	1	0.04
DICO2	1.00	1	1	0.04
GEMA	1.00	1	1	0.04
OSVIV	1.00	1	1	0.04
POA	1.00	1	1	0.04
POBI2	1.00	1	1	0.04
RHODO	1.00	1	1	0.04
SEAS3	1.00	1	1	0.04
UMBIL2	1.00	1	1	0.04
MARAR	0.90	0.5	1	0.22
DIQU	0.83	0.5	3	0.52
POAC4	0.80	0.5	1	0.22
VIAEB	0.80	0.5	1	0.22
RUBUS	0.75	0.5	1	0.26
CADIDWV	0.75	0.5	1	0.17
ARMA7	0.75	0.5	1	0.09
CUOR	0.75	0.5	1	0.09
ISVE	0.75	0.5	1	0.09
POTR11	0.75	0.5	1	0.09
SOFL2	0.75	0.5	1	0.09
VAST	0.75	0.5	1	0.09
SMGL	0.68	0.5	1	0.61
HIPA2	0.67	0.5	1	0.13
PRENA	0.67	0.5	1	0.13
VIHA2	0.67	0.5	1	0.13
ZITR	0.67	0.5	1	0.13
LYQU2	0.64	0.5	1	0.30
ASTER	0.63	0.5	1	0.17
GOPU	0.63	0.5	1	0.17
MEVI	0.63	0.5	1	0.17
SMTA2	0.63	0.5	1	0.17
VIOLA	0.63	0.5	1	0.17
DASP2	0.60	0.5	1	0.22
DIDI6	0.60	0.5	1	0.22
PRSES	0.60	0.5	1	0.22
SOCA4	0.60	0.5	1	0.22
HOLO	0.58	0.5	1	0.26
MOUN3	0.50	0.5	0.5	0.17
POLYT5	0.50	0.5	0.5	0.17
AGAL5	0.50	0.5	0.5	0.13
AUFL	0.50	0.5	0.5	0.13
GALA3	0.50	0.5	0.5	0.13
MIRE	0.50	0.5	0.5	0.13
TORA2	0.50	0.5	0.5	0.13
CAVI4	0.50	0.5	0.5	0.09
COAM	0.50	0.5	0.5	0.09
DIBO2	0.50	0.5	0.5	0.09
GAUR2	0.50	0.5	0.5	0.09
HYHI2	0.50	0.5	0.5	0.09
LUMUM2	0.50	0.5	0.5	0.09
SOLID	0.50	0.5	0.5	0.09
STPU	0.50	0.5	0.5	0.09

UVPU2	0.50	0.5	0.5	0.09
AMBR2	0.50	0.5	0.5	0.04
AMELA	0.50	0.5	0.5	0.04
ANPL	0.50	0.5	0.5	0.04
ANVIV	0.50	0.5	0.5	0.04
ASPL	0.50	0.5	0.5	0.04
AULA	0.50	0.5	0.5	0.04
CADED	0.50	0.5	0.5	0.04
CAGL8	0.50	0.5	0.5	0.04
CAREX	0.50	0.5	0.5	0.04
CHMA3	0.50	0.5	0.5	0.04
CLADI3	0.50	0.5	0.5	0.04
CYAC3	0.50	0.5	0.5	0.04
DACO	0.50	0.5	0.5	0.04
DICHA2	0.50	0.5	0.5	0.04
DICOAWV	0.50	0.5	0.5	0.04
DIFU3	0.50	0.5	0.5	0.04
DISC71	0.50	0.5	0.5	0.04
ERIGE2	0.50	0.5	0.5	0.04
EUPUP	0.50	0.5	0.5	0.04
GENTI	0.50	0.5	0.5	0.04
GYDR	0.50	0.5	0.5	0.04
HEDI2	0.50	0.5	0.5	0.04
HELIA3	0.50	0.5	0.5	0.04
HEUCH	0.50	0.5	0.5	0.04
HYPER	0.50	0.5	0.5	0.04
ILOPO	0.50	0.5	0.5	0.04
PAOB6	0.50	0.5	0.5	0.04
PIRU	0.50	0.5	0.5	0.04
POAL3	0.50	0.5	0.5	0.04
POCA11	0.50	0.5	0.5	0.04
POCAC2	0.50	0.5	0.5	0.04
POPE	0.50	0.5	0.5	0.04
POPU4	0.50	0.5	0.5	0.04
POTEN	0.50	0.5	0.5	0.04
POVI7	0.50	0.5	0.5	0.04
PRAL2	0.50	0.5	0.5	0.04
PRLAWV	0.50	0.5	0.5	0.04
RHPR	0.50	0.5	0.5	0.04
SCNE2	0.50	0.5	0.5	0.04
SCOV	0.50	0.5	0.5	0.04
SIVI2	0.50	0.5	0.5	0.04
SIVIV	0.50	0.5	0.5	0.04
SOER	0.50	0.5	0.5	0.04
THNO	0.50	0.5	0.5	0.04
VISO	0.50	0.5	0.5	0.04
VITIS	0.50	0.5	0.5	0.04
WOOBO	0.50	0.5	0.5	0.04

Oak - Hickory Forest (*Quercus prinus* – [*Quercus rubra*] - *Carya spp. / Oxydendrum arboreum - Cornus florida* Forest [CEGL007267]); 25 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ACRU	15.94	0.5	50	1.00
QUVE	15.59	0.5	40	0.44
QUPR2	14.25	0.5	40	0.64
QURU	13.64	0.5	40	0.72
QUAL	12.20	0.5	40	0.80
OXAR	8.61	1	30	0.92
QUCOC	8.30	0.5	20	0.20
CAGL8	8.29	1	20	0.28
CAAL27	7.44	1	30	0.36
BELE	6.55	0.5	20	0.40
CARYA	6.50	0.5	25	0.36
CAOV2	6.25	0.5	20	0.24
LITU	6.14	0.5	20	0.88
THNO	5.20	0.5	20	0.40
CACO15	5.17	0.5	10	0.12
FLBA	5.00	5	5	0.04
COFL2	4.54	0	20	0.52
TSCA	4.00	1	9	0.12
ACSAS	3.93	0.5	6	0.28
ROPS	3.60	0.5	10	0.40
NYSY	3.56	0.5	15	0.72
ARRAR	3.25	0.5	6	0.08
FAGR	3.20	0.5	20	0.60
ACPE	3.00	0.5	10	0.60
RHCA4	3.00	3	3	0.04
UMMA60	3.00	3	3	0.04
MAAC	2.78	0.5	10	0.64
ARSP2	2.50	0.5	5	0.12
PAQU2	2.42	0.5	10	0.52
VAPA4	2.18	0.5	10	0.76
CACAV	2.00	2	2	0.04
CRATA	2.00	2	2	0.04
SMRO	1.98	0.5	10	0.84
MAFR	1.88	0.5	4	0.16
SAAL5	1.85	0.5	5	0.92
FRAM2	1.78	0.5	6	0.36
CADE12	1.68	0.5	10	0.44
RUBUS	1.53	0.5	10	0.76
HYIM3	1.50	0.5	3	0.12
VIAC	1.47	0.5	5	0.68
TORA2	1.46	0.5	3	0.48
AGAL5	1.39	0.5	3	0.36
HAVI4	1.38	0.5	4	0.48
VIAEB	1.32	0.5	6	0.44
AMARA4	1.31	0.5	4	0.32
ILOPO	1.25	0.5	2	0.08
BRER2	1.20	0.5	3	0.20
CAAL11	1.00	1	1	0.08
POCA11	1.00	1	1	0.08
ULRU	1.00	1	1	0.08
ADPE	1.00	1	1	0.04

ANQUQ	1.00	1	1	0.04	GALA3	0.67	0.5	1	0.12
CAJA2	1.00	1	1	0.04	PTAQ	0.67	0.5	1	0.12
CAPE6	1.00	1	1	0.04	ROCAC	0.67	0.5	1	0.12
CAVI4	1.00	1	1	0.04	UVPU2	0.65	0.5	1	0.40
CECAC	1.00	1	1	0.04	VIOLA	0.64	0.5	1	0.56
DICRA8	1.00	1	1	0.04	POSI2	0.64	0.5	1	0.28
EUMA27	1.00	1	1	0.04	GACI2	0.63	0.5	1	0.48
EUPAT	1.00	1	1	0.04	ARTR	0.63	0.5	1	0.16
GLHE2	1.00	1	1	0.04	LEGL19	0.63	0.5	1	0.16
LIBE3	1.00	1	1	0.04	ZITR	0.63	0.5	1	0.16
MNIUM2	1.00	1	1	0.04	PANIC	0.61	0.5	1	0.36
MUHLE	1.00	1	1	0.04	VIHA2	0.61	0	1	0.36
PHHE11	1.00	1	1	0.04	SOCA4	0.60	0.5	1	0.40
POLYT5	1.00	1	1	0.04	PRLAWV	0.58	0.5	1	0.24
RUFL	1.00	1	1	0.04	MOUN3	0.57	0.5	1	0.28
RUODO	1.00	1	1	0.04	SOLID	0.56	0.5	1	0.32
SATR4	1.00	1	1	0.04	ASTER	0.56	0.5	1	0.36
SCEL	1.00	1	1	0.04	UVPE	0.56	0.5	1	0.36
SOFL2	1.00	1	1	0.04	GOPU	0.50	0.5	0.5	0.36
THTH2	1.00	1	1	0.04	PRENA	0.50	0.5	0.5	0.36
POAC4	0.97	0.5	3	0.60	CHMA3	0.50	0.5	0.5	0.32
RHODO	0.94	0.5	2	0.36	DENU4	0.50	0.5	0.5	0.28
DIBO2	0.93	0.5	3	0.28	CLUM2	0.50	0.5	0.5	0.20
GEMA	0.93	0.5	3	0.28	POTEN	0.50	0.5	0.5	0.16
COAM	0.90	0.5	3	0.40	VIBLB	0.50	0.5	0.5	0.16
DESMO	0.83	0.5	2	0.24	CADI3	0.50	0.5	0.5	0.12
OSLO	0.83	0.5	1	0.12	CAPL5	0.50	0.5	0.5	0.12
THDE10	0.83	0.5	1	0.12	EUPUP	0.50	0.5	0.5	0.12
ACRARWV	0.81	0.5	2	0.32	HELIA3	0.50	0.5	0.5	0.12
GAPR2	0.80	0.5	1	0.20	POBI2	0.50	0.5	0.5	0.12
VAST	0.80	0.5	1	0.20	UVSE	0.50	0.5	0.5	0.12
DIQU	0.79	0.5	3	0.96	VITIS	0.50	0.5	0.5	0.12
GATR3	0.78	0.5	1	0.36	AEFL	0.50	0.5	0.5	0.08
EUDI16	0.75	0.5	1	0.48	AGPE	0.50	0.5	0.5	0.08
SMGL	0.75	0.5	1	0.48	ASCA	0.50	0.5	0.5	0.08
PRSES	0.75	0.5	1	0.40	AUFL	0.50	0.5	0.5	0.08
CADIDWV	0.75	0.5	1	0.24	CABL	0.50	0.5	0.5	0.08
DIDI6	0.75	0.5	1	0.16	DEPU2	0.50	0.5	0.5	0.08
GAAP2	0.75	0.5	1	0.16	EUSE3	0.50	0.5	0.5	0.08
ACTAE	0.75	0.5	1	0.08	GALIU	0.50	0.5	0.5	0.08
ATFI	0.75	0.5	1	0.08	HOLO	0.50	0.5	0.5	0.08
AULA	0.75	0.5	1	0.08	HYAR	0.50	0.5	0.5	0.08
DRIN5	0.75	0.5	1	0.08	HYPER	0.50	0.5	0.5	0.08
SACA15	0.75	0.5	1	0.08	LYQU2	0.50	0.5	0.5	0.08
MEVI	0.70	0.5	1	0.40	OCAC	0.50	0.5	0.5	0.08
KALA	0.70	0.5	1	0.20	PACA11	0.50	0.5	0.5	0.08
MIRE	0.70	0.5	1	0.20	PRAL3	0.50	0.5	0.5	0.08
MARAR	0.67	0.5	1	0.36	PRTR	0.50	0.5	0.5	0.08
CAREX	0.67	0.5	1	0.24	ROMU	0.50	0.5	0.5	0.08
AMBR2	0.67	0.5	1	0.12	ROSA5	0.50	0.5	0.5	0.08
AMELA	0.67	0.5	1	0.12	SCSE5	0.50	0.5	0.5	0.08
ANPL	0.67	0.5	1	0.12	SMTA2	0.50	0.5	0.5	0.08
ARNU2	0.67	0.5	1	0.12	STPU	0.50	0.5	0.5	0.08
BOVI	0.67	0.5	1	0.12	THALI2	0.50	0.5	0.5	0.08
COCA4	0.67	0.5	1	0.12	VISA2	0.50	0.5	0.5	0.08
DRMA4	0.67	0.5	1	0.12	VITRTWV	0.50	0.5	0.5	0.08

ZIAU	0.50	0.5	0.5	0.08
AMARE	0.50	0.5	0.5	0.04
AMMU	0.50	0.5	0.5	0.04
ANVIV2	0.50	0.5	0.5	0.04
ARMA7	0.50	0.5	0.5	0.04
BODI2	0.50	0.5	0.5	0.04
BRKA2	0.50	0.5	0.5	0.04
CAWI2	0.50	0.5	0.5	0.04
CLBO3	0.50	0.5	0.5	0.04
CLVI5	0.50	0.5	0.5	0.04
COAL2	0.50	0.5	0.5	0.04
COAM3	0.50	0.5	0.5	0.04
COMA6	0.50	0.5	0.5	0.04
CORNU	0.50	0.5	0.5	0.04
COSE5	0.50	0.5	0.5	0.04
CRCA9	0.50	0.5	0.5	0.04
CYAC3	0.50	0.5	0.5	0.04
CYSTO	0.50	0.5	0.5	0.04
DEPA7	0.50	0.5	0.5	0.04
DEPE80	0.50	0.5	0.5	0.04
DERO3	0.50	0.5	0.5	0.04
DICHA2	0.50	0.5	0.5	0.04
DOIN2	0.50	0.5	0.5	0.04
ELUMP	0.50	0.5	0.5	0.04
EPVI2	0.50	0.5	0.5	0.04
FESU3	0.50	0.5	0.5	0.04
FRAGA	0.50	0.5	0.5	0.04
FRVE	0.50	0.5	0.5	0.04
GABA	0.50	0.5	0.5	0.04
GEVI5	0.50	0.5	0.5	0.04
HEHI2	0.50	0.5	0.5	0.04
HELA	0.50	0.5	0.5	0.04
HENOA	0.50	0.5	0.5	0.04
HIERA	0.50	0.5	0.5	0.04
HIPA2	0.50	0.5	0.5	0.04
HIVE	0.50	0.5	0.5	0.04
HYHYM	0.50	0.5	0.5	0.04
LACTU	0.50	0.5	0.5	0.04
LEAL35	0.50	0.5	0.5	0.04
LERI6	0.50	0.5	0.5	0.04
MACA4	0.50	0.5	0.5	0.04
OSCIC	0.50	0.5	0.5	0.04
OSCL2	0.50	0.5	0.5	0.04
OSVIV	0.50	0.5	0.5	0.04
PECAC3	0.50	0.5	0.5	0.04
PLOR4	0.50	0.5	0.5	0.04
PONOM	0.50	0.5	0.5	0.04
POPE	0.50	0.5	0.5	0.04
POTR11	0.50	0.5	0.5	0.04
PRVU	0.50	0.5	0.5	0.04
RHCOL2	0.50	0.5	0.5	0.04
SANIC	0.50	0.5	0.5	0.04
SANIC4	0.50	0.5	0.5	0.04
SCSA5	0.50	0.5	0.5	0.04
SCUTE	0.50	0.5	0.5	0.04
SETE3	0.50	0.5	0.5	0.04
SMEC	0.50	0.5	0.5	0.04
SOER	0.50	0.5	0.5	0.04
SOULU2	0.50	0.5	0.5	0.04
SYOB	0.50	0.5	0.5	0.04
SYPR6	0.50	0.5	0.5	0.04
THTR	0.50	0.5	0.5	0.04
TIAM	0.50	0.5	0.5	0.04
VIAMA3	0.50	0.5	0.5	0.04
VICIA	0.50	0.5	0.5	0.04
WOOBO	0.50	0.5	0.5	0.04
CYPAP3	0.01	0.01	0.01	0.04

Oak - Hickory - Sugar Maple Forest (*Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest [CEGL007268]); 26 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
EUMA27	24.00	24	24	0.04
ACSAS	21.79	0.5	50	1.00
QUMU	20.00	20	20	0.04
QUPR2	14.25	0.5	40	0.69
QURU	14.15	0.5	55	0.88
CAGL8	12.50	5	20	0.23
LITU	11.90	0.5	40	0.38
QUVE	10.40	2	30	0.38
QUAL	9.20	0.5	30	0.58
CAAL27	9.17	4	20	0.23
PRSES	9.00	1	20	0.15
HATE3	7.80	1	20	0.19
FRAM2	7.16	0.5	20	0.73
CAOV2	6.69	1	20	0.50
RHMA4	6.50	6	7	0.08
BELE	6.00	1	15	0.15
ROPS	5.64	0.5	12	0.54
MAAC	5.60	1	10	0.38
MAFR	5.50	2	9	0.08
ASTR	5.25	0.5	10	0.08
TIAM	5.17	4	7	0.23
CECAC	5.06	0.5	10	0.35
ELHY	5.00	5	5	0.04
LEUCO9	5.00	5	5	0.04
ACRU	4.92	1	15	0.46
HAVI4	4.85	0.5	12	0.38
TSCA	4.75	2	8	0.15
FAGR	4.18	1	10	0.42
ACPE	4.15	0.5	12	0.38
COFL3	4.00	4	4	0.04
IMPA	4.00	4	4	0.04
OSVIV	3.85	0.5	10	0.38
VIAC	3.46	0.5	10	0.50
NYSY	3.33	1	6	0.12
AEFL	3.17	0.5	10	0.35
KALA	3.17	0.5	8	0.12
ACRARWV	3.10	0.5	10	0.38
ULRU	3.00	0.5	12	0.27

OXAR	3.00	1	4	0.15	CAHI3	1.00	1	1	0.04
LIBE3	3.00	1	5	0.08	CARDA	1.00	1	1	0.04
THDE10	3.00	1	5	0.08	COAL2	1.00	1	1	0.04
CHVI3	3.00	3	3	0.04	DICRA8	1.00	1	1	0.04
FRPE	3.00	3	3	0.04	EUPAT	1.00	1	1	0.04
JUNI	3.00	3	3	0.04	GELAL	1.00	1	1	0.04
MECO	3.00	3	3	0.04	HENOO	1.00	1	1	0.04
TORA2	2.57	0.5	15	0.54	HYIM3	1.00	1	1	0.04
PAOB6	2.43	1	5	0.27	ILOPO	1.00	1	1	0.04
SAAL5	2.36	0.5	5	0.27	LAHI	1.00	1	1	0.04
THNO	2.33	1	5	0.12	MOAL	1.00	1	1	0.04
CACO15	2.30	0.5	5	0.19	MUHLE	1.00	1	1	0.04
PAQU2	2.20	0.5	7	0.85	OXALI	1.00	1	1	0.04
POAC4	2.11	0.5	10	0.85	PECAC3	1.00	1	1	0.04
COFL2	2.00	1	5	0.15	PHDI5	1.00	1	1	0.04
CRCA9	2.00	1	3	0.08	POLYT5	1.00	1	1	0.04
ALSE2	2.00	2	2	0.04	RICY	1.00	1	1	0.04
COMA19	2.00	2	2	0.04	ROSA5	1.00	1	1	0.04
ILMO	2.00	2	2	0.04	STGR	1.00	1	1	0.04
VAST	2.00	2	2	0.04	TRAUA	1.00	1	1	0.04
MARAR	1.92	0.5	8	0.23	VIRO	1.00	1	1	0.04
AMARA4	1.83	0.5	6	0.35	EUDI16	0.95	0.5	3	0.81
SMUV	1.75	0.5	3	0.08	SACA15	0.95	0.5	2	0.38
VEOC	1.75	0.5	3	0.08	CADIDWV	0.88	0.5	3	0.31
VIAEB	1.69	0.5	5	0.31	UVPE	0.88	0.5	2	0.31
OXGR	1.64	0.5	5	0.27	GATR3	0.86	0.5	2	0.42
CARYA	1.63	0.5	5	0.31	ASTER	0.86	0.5	3	0.27
VAPA4	1.63	0.5	4	0.15	GALA3	0.86	0.5	2	0.27
GEMA	1.60	0.5	3	0.38	UVPU2	0.86	0.5	2	0.27
SETE3	1.58	0.5	5	0.46	PRLAWV	0.85	0.5	1	0.38
ARMA7	1.56	0.5	5	0.31	VIBLB	0.83	0.5	1	0.12
GAAP2	1.50	0.5	4	0.31	VISA2	0.83	0.5	1	0.12
ROMU	1.50	0.5	3	0.12	VISO	0.83	0.5	1	0.12
LEGL19	1.50	1	2	0.08	VIPA3WV	0.80	0.5	1	0.19
SYLO2	1.50	1	2	0.08	ROCAC	0.75	0.5	1	0.23
DIBO2	1.36	0.5	5	0.27	DESMO	0.75	0.5	1	0.15
TICO	1.33	1	2	0.12	FESU3	0.75	0.5	1	0.15
DRMA4	1.31	0.5	3	0.31	HYAR	0.75	0.5	1	0.15
AGAL5	1.26	0.5	5	0.73	POCA11	0.75	0.5	1	0.15
BRER2	1.17	0.5	5	0.35	ACTAE	0.75	0.5	1	0.08
PANIC	1.17	0.5	4	0.23	AMARE	0.75	0.5	1	0.08
SMRO	1.11	0.5	3	0.69	CAPAA2	0.75	0.5	1	0.08
LACA3	1.10	0.5	3	0.19	CILUC	0.75	0.5	1	0.08
OSLO	1.10	0.5	3	0.19	COAR4	0.75	0.5	1	0.08
STPU	1.06	0.5	3	0.35	EUSE3	0.75	0.5	1	0.08
CAAL11	1.00	0.5	4	0.50	GEVE	0.75	0.5	1	0.08
AMBR2	1.00	0.5	3	0.19	OSCL	0.75	0.5	1	0.08
HENOA	1.00	0.5	2	0.15	PHHE11	0.75	0.5	1	0.08
ANVIV2	1.00	0.5	2	0.12	POVI2	0.75	0.5	1	0.08
HYCA	1.00	1	1	0.08	SMGL	0.75	0.5	1	0.08
ACSP2	1.00	1	1	0.04	SOULU2	0.75	0.5	1	0.08
AGPU	1.00	1	1	0.04	THTH2	0.75	0.5	1	0.08
AGRO3	1.00	1	1	0.04	DIQU	0.73	0.5	1	0.85
ANAT4	1.00	1	1	0.04	SOCA4	0.73	0.5	1	0.42
ARPA2	1.00	1	1	0.04	SOLID	0.72	0.5	1	0.35
BROX2	1.00	1	1	0.04	POPU4	0.70	0.5	1	0.19

VIOLA	0.68	0.5	1	0.42
RUBUS	0.68	0.5	1	0.54
THALI2	0.67	0.5	1	0.23
CARO22	0.67	0.5	1	0.12
PIPUP	0.67	0.5	1	0.12
POSI2	0.67	0.5	1	0.12
ARTR	0.63	0.5	1	0.58
GACI2	0.59	0.5	1	0.42
ASQU	0.58	0.5	1	0.23
CACO26	0.58	0.5	1	0.23
SMTA2	0.57	0.5	1	0.27
COAM	0.56	0.5	1	0.35
PRENA	0.50	0.5	0.5	0.31
CAREX	0.50	0.5	0.5	0.23
BOVI	0.50	0.5	0.5	0.19
MEVI	0.50	0.5	0.5	0.19
MIRE	0.50	0.5	0.5	0.19
POAL3	0.50	0.5	0.5	0.19
ASPL	0.50	0.5	0.5	0.15
CALA19	0.50	0.5	0.5	0.15
POBI2	0.50	0.5	0.5	0.15
VITRTWV	0.50	0	1	0.15
CAPE6	0.50	0.5	0.5	0.12
EUPUP	0.50	0.5	0.5	0.12
GOPU	0.50	0.5	0.5	0.12
PACA11	0.50	0.5	0.5	0.12
RARER2	0.50	0.5	0.5	0.12
SYPAP2	0.50	0.5	0.5	0.12
ACPA	0.50	0.5	0.5	0.08
AGRIM	0.50	0.5	0.5	0.08
ANQUM2	0.50	0.5	0.5	0.08
ARLA	0.50	0.5	0.5	0.08
ASCA	0.50	0.5	0.5	0.08
AUFL	0.50	0.5	0.5	0.08
CABL	0.50	0.5	0.5	0.08
CAPL5	0.50	0.5	0.5	0.08
COCA4	0.50	0.5	0.5	0.08
CYSTO	0.50	0.5	0.5	0.08
EUAM7	0.50	0.5	0.5	0.08
HELIA3	0.50	0.5	0.5	0.08
MONAR	0.50	0.5	0.5	0.08
PAQU	0.50	0.5	0.5	0.08
SACA13	0.50	0.5	0.5	0.08
SANIC	0.50	0.5	0.5	0.08
SAOD	0.50	0.5	0.5	0.08
SOFL2	0.50	0.5	0.5	0.08
VIHA2	0.50	0.5	0.5	0.08
ALTR3	0.50	0.5	0.5	0.04
ARSE3	0.50	0.5	0.5	0.04
ASRH2	0.50	0.5	0.5	0.04
ATFI	0.50	0.5	0.5	0.04
AUPE2	0.50	0.5	0.5	0.04
CACOC4	0.50	0.5	0.5	0.04
CANI3	0.50	0.5	0.5	0.04
CASW	0.50	0.5	0.5	0.04
CAVI4	0.50	0.5	0.5	0.04
CEOC	0.50	0.5	0.5	0.04
CLUM2	0.50	0.5	0.5	0.04
COMME	0.50	0.5	0.5	0.04
DENU4	0.50	0.5	0.5	0.04
DIDI6	0.50	0.5	0.5	0.04
DRIN5	0.50	0.5	0.5	0.04
GALA4	0.50	0.5	0.5	0.04
GAPR2	0.50	0.5	0.5	0.04
GECAC6	0.50	0.5	0.5	0.04
GEUM	0.50	0.5	0.5	0.04
HEAMA2	0.50	0.5	0.5	0.04
HYVI	0.50	0.5	0.5	0.04
IPOMO	0.50	0.5	0.5	0.04
LACTU	0.50	0.5	0.5	0.04
LYQU2	0.50	0.5	0.5	0.04
MEMU	0.50	0.5	0.5	0.04
MOFI	0.50	0.5	0.5	0.04
MOFIB2	0.50	0.5	0.5	0.04
PHLE5	0.50	0.5	0.5	0.04
POA	0.50	0.5	0.5	0.04
POPE	0.50	0.5	0.5	0.04
POVI7	0.50	0.5	0.5	0.04
PRAL2	0.50	0.5	0.5	0.04
RHCA4	0.50	0.5	0.5	0.04
SAMI6	0.50	0.5	0.5	0.04
SCEL	0.50	0.5	0.5	0.04
SCSA5	0.50	0.5	0.5	0.04
SCSE5	0.50	0.5	0.5	0.04
SCUTE	0.50	0.5	0.5	0.04
STME2	0.50	0.5	0.5	0.04
UVSE	0.50	0.5	0.5	0.04
VICIA	0.50	0.5	0.5	0.04
VIST3	0.50	0.5	0.5	0.04
VITIS	0.50	0.5	0.5	0.04
ZITR	0.50	0.5	0.5	0.04
ADPE	0.40	0.01	0.5	0.19

Oak - Tuliptree / Mountain Silverbell Floodplain Forest (*Quercus* [*alba, rubra, velutina*] / *Halesia tetraptera* Forest [CEGL006462]); 4 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
LITU	33.33	20	40	0.75
HATE3	27.50	10	40	1.00
QUVE	25.00	10	50	0.75
QURU	20.00	10	30	0.75
SAAL5	15.00	15	15	0.25
TORA2	15.00	15	15	0.25
ACSAS	10.67	2	20	0.75
FAGR	10.00	10	10	0.25
QUAL	8.33	2	20	0.75
LIBE3	7.33	2	10	0.75
NYSY	6.00	3	10	0.75
CACAV	5.33	1	10	0.75
ACRU	5.25	0.5	10	0.50

DIPA9	5.00	5	5	0.50
MATR	5.00	5	5	0.25
ROPS	5.00	5	5	0.25
CARYA	4.00	3	5	0.50
FRPE	3.83	0.5	10	0.75
MAAC	3.67	3	5	0.75
HAVI4	3.00	1	5	0.50
CAOV2	3.00	3	3	0.25
MAFR	3.00	3	3	0.25
SMRO	3.00	3	3	0.25
HYCA	1.75	0.5	3	0.50
CACO15	1.33	0.5	3	0.75
ASTR	1.25	0.5	2	0.50
AGAL5	1.00	1	1	0.50
ASCA	1.00	1	1	0.25
CECAC	1.00	1	1	0.25
COAL2	1.00	1	1	0.25
HYIM3	1.00	1	1	0.25
POVI2	1.00	1	1	0.25
SACA13	1.00	1	1	0.25
THDE10	1.00	1	1	0.25
VITIS	1.00	1	1	0.25
PAQU2	0.75	0.5	1	1.00
PAAU3	0.75	0.5	1	0.50
MARAR	0.50	0.5	0.5	0.75
ARTR	0.50	0.5	0.5	0.50
CAIM	0.50	0.5	0.5	0.50
CAREX	0.50	0.5	0.5	0.50
CYVIV	0.50	0.5	0.5	0.50
DIBO2	0.50	0.5	0.5	0.50
EUAM7	0.50	0.5	0.5	0.50
GACI2	0.50	0.5	0.5	0.50
GATR3	0.50	0.5	0.5	0.50
SMGL	0.50	0.5	0.5	0.50
TRADE	0.50	0.5	0.5	0.50
VIOLA	0.50	0.5	0.5	0.50
ACTAE	0.50	0.5	0.5	0.25
AMBR2	0.50	0.5	0.5	0.25
ARLA	0.50	0.5	0.5	0.25
BOVI	0.50	0.5	0.5	0.25
CARA2	0.50	0.5	0.5	0.25
CRATA	0.50	0.5	0.5	0.25
CRCA9	0.50	0.5	0.5	0.25
DIQU	0.50	0.5	0.5	0.25
EUDI16	0.50	0.5	0.5	0.25
GEUM	0.50	0.5	0.5	0.25
GLHE2	0.50	0.5	0.5	0.25
GOPU	0.50	0.5	0.5	0.25
IRCR	0.50	0.5	0.5	0.25
LOJA	0.50	0.5	0.5	0.25
MAST4	0.50	0.5	0.5	0.25
MUTE	0.50	0.5	0.5	0.25
OXALI	0.50	0.5	0.5	0.25
POAC4	0.50	0.5	0.5	0.25
POLYG2	0.50	0.5	0.5	0.25
QUPR2	0.50	0.5	0.5	0.25
RUPH	0.50	0.5	0.5	0.25
SACA15	0.50	0.5	0.5	0.25
SETE3	0.50	0.5	0.5	0.25
SMEC	0.50	0.5	0.5	0.25
SMTA2	0.50	0.5	0.5	0.25
SMUV	0.50	0.5	0.5	0.25
THALI2	0.50	0.5	0.5	0.25
UVPE	0.50	0.5	0.5	0.25
VEOC	0.50	0.5	0.5	0.25
VEUR	0.50	0.5	0.5	0.25

Old Field (*Lolium* [*arundinaceum, pratense*] Herbaceous Vegetation [CEGL004048]); 6 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
LECU	30.00	30	30	0.17
SORU2	23.50	17	30	0.33
LOPR7	10.00	8	12	0.67
TORA2	10.00	2	25	0.67
POPRP2	10.00	10	10	0.17
VEOC	10.00	10	10	0.17
DAGLG	7.75	3	18	0.67
SOCA6	7.50	5	10	0.33
APCA	5.50	2	9	0.33
SMGL	5.50	1	10	0.33
PHPR3	5.13	0.5	12	0.67
RUBUS	5.00	0.5	10	1.00
ACMIO	5.00	1	10	0.83
ANVIV	5.00	5	5	0.17
BRJA	5.00	5	5	0.17
PAAN6	5.00	5	5	0.17
RUHI	5.00	5	5	0.17
SOULU2	5.00	5	5	0.17
AGGI2	4.50	2	7	0.33
GLHE2	4.00	4	4	0.17
LOJA	4.00	4	4	0.17
PORE5	4.00	4	4	0.17
TRPR2	3.00	1	5	0.67
AMARE	3.00	3	3	0.33
ASSY	3.00	3	3	0.17
CAHI6	3.00	3	3	0.17
HYPE	3.00	3	3	0.17
JUTE	3.00	3	3	0.17
MEOF	3.00	3	3	0.17
HOLA	2.80	1	5	0.83
CASE13	2.00	1	5	0.67
TRCA5	2.00	1	3	0.67
POSI2	2.00	0.5	5	0.50
ANODOWV	2.00	2	2	0.33
DECA8	2.00	1	3	0.33
VIOLA	2.00	1	3	0.33
BRER2	2.00	2	2	0.17
CAVU2	2.00	2	2	0.17
CRCA3	2.00	2	2	0.17
DIBO2	2.00	2	2	0.17

FRPE	2.00	2	2	0.17
HICA10	2.00	2	2	0.17
JUEF	2.00	2	2	0.17
JUNCU	2.00	2	2	0.17
OEPE	2.00	2	2	0.17
PAANAWV	2.00	2	2	0.17
PANIC	2.00	2	2	0.17
PONOM	2.00	2	2	0.17
TRRE3	2.00	2	2	0.17
VERON	2.00	2	2	0.17
VITIS	2.00	2	2	0.17
FRVIV	1.75	0.5	3	0.33
DACA6	1.67	1	3	0.50
SOCAC4	1.60	1	3	0.83
LEVU	1.50	1	2	0.67
PLLA	1.50	1	2	0.67
ROMU	1.50	1	2	0.67
ERAN	1.50	0.5	3	0.50
ASPU2	1.50	1	2	0.33
ERSTS2	1.50	1	2	0.33
FRAM2	1.50	1	2	0.33
LITU	1.50	1	2	0.33
RUAC3	1.50	1	2	0.33
CAAN6	1.25	0.5	2	0.33
HYPU	1.25	0.5	2	0.33
SIAN3	1.25	0.5	2	0.33
TAOFO	1.25	0.5	2	0.33
ACRU	1.17	0.5	2	0.50
CAREX	1.17	0.5	2	0.50
OXST	1.13	0.5	2	0.67
ALSA2	1.00	1	1	0.33
DICL	1.00	1	1	0.33
ELUMP	1.00	1	1	0.33
EUPAT	1.00	1	1	0.33
ALCAC	1.00	1	1	0.17
ASTER	1.00	1	1	0.17
CIVU	1.00	1	1	0.17
CLVI5	1.00	1	1	0.17
COFL2	1.00	1	1	0.17
CRCR2	1.00	1	1	0.17
DESMO	1.00	1	1	0.17
ERPHP	1.00	1	1	0.17
HYPER	1.00	1	1	0.17
LACTU	1.00	1	1	0.17
LOCO6	1.00	1	1	0.17
PAAU3	1.00	1	1	0.17
PLRUR	1.00	1	1	0.17
PRUNU	1.00	1	1	0.17
PRVU	1.00	1	1	0.17
ROPS	1.00	1	1	0.17
RUCRC	1.00	1	1	0.17
SAAL5	1.00	1	1	0.17
TRHY	1.00	1	1	0.17
ULRU	1.00	1	1	0.17
VERNO	1.00	1	1	0.17
VIAEB	1.00	1	1	0.17
VIVU	1.00	1	1	0.17
BAVU	0.75	0.5	1	0.33
DIACFWV	0.75	0.5	1	0.33
ILOPO	0.75	0.5	1	0.33
PRSES	0.75	0.5	1	0.33
DIAR	0.50	0.5	0.5	0.33
ACNE2	0.50	0.5	0.5	0.17
ASTU	0.50	0.5	0.5	0.17
CACE	0.50	0.5	0.5	0.17
CENUN	0.50	0.5	0.5	0.17
EPILO	0.50	0.5	0.5	0.17
GECAC6	0.50	0.5	0.5	0.17
HYHYM	0.50	0.5	0.5	0.17
LASA	0.50	0.5	0.5	0.17
LERE2	0.50	0.5	0.5	0.17
POCAC2	0.50	0.5	0.5	0.17
POSC3	0.50	0.5	0.5	0.17
PYCNA	0.50	0.5	0.5	0.17
RHTY	0.50	0.5	0.5	0.17
SANIC4	0.50	0.5	0.5	0.17
SHAR2	0.50	0.5	0.5	0.17
SOLID	0.50	0.5	0.5	0.17
STME2	0.50	0.5	0.5	0.17

Pine Plantation (*Pinus strobus* Planted Forest [CEGL007178]); 1 plot.

	% Cover			
Species	Mean	Min	Max	Constancy
PIST	40.00	40	40	1.00
AGAL5	10.00	10	10	1.00
BELE	10.00	10	10	1.00
ROPS	10.00	10	10	1.00
ACPE	5.00	5	5	1.00
ACRU	5.00	5	5	1.00
PAQU2	5.00	5	5	1.00
PIRE	5.00	5	5	1.00
FRAM2	3.00	3	3	1.00
LOPR7	3.00	3	3	1.00
OSVIV	3.00	3	3	1.00
POAC4	3.00	3	3	1.00
PRSES	3.00	3	3	1.00
ROMU	3.00	3	3	1.00
AIAL	1.00	1	1	1.00
AMARA4	1.00	1	1	1.00
COFL2	1.00	1	1	1.00
GATR3	1.00	1	1	1.00
LIBE3	1.00	1	1	1.00
PIVI2	1.00	1	1	1.00
RUBUS	1.00	1	1	1.00
SOCA4	1.00	1	1	1.00
STME2	1.00	1	1	1.00
TORA2	1.00	1	1	1.00
ASPL	0.50	0.5	0.5	1.00
EUDI16	0.50	0.5	0.5	1.00
GECAC6	0.50	0.5	0.5	1.00

POCAL2	0.50	0.5	0.5	1.00
POSC3	0.50	0.5	0.5	1.00
QURU	0.50	0.5	0.5	1.00
SOFL2	0.50	0.5	0.5	1.00
VICA4	0.50	0.5	0.5	1.00

Rice Cutgrass Marsh (*Leersia oryzoides - Sagittaria latifolia* Herbaceous Vegetation [CEGL006461]); 1 plot.

	% Cover			
Species	Mean	Min	Max	Constancy
LEOR	75.00	75	75	1.00
CAHEH	6.00	6	6	1.00
LYUNUWV	5.00	5	5	1.00
CABA7	4.00	4	4	1.00
CAIN12	4.00	4	4	1.00
THNO	2.00	2	2	1.00
CACR6	1.00	1	1	1.00
HYMU	1.00	1	1	1.00
JUEF	1.00	1	1	1.00
KALA	1.00	1	1	1.00
RUBUS	1.00	1	1	1.00
SPCH	1.00	1	1	1.00
ACRU	0.50	0.5	0.5	1.00
BELE	0.50	0.5	0.5	1.00
CADER	0.50	0.5	0.5	1.00
LEVI2	0.50	0.5	0.5	1.00
MIRE	0.50	0.5	0.5	1.00
SANIC4	0.50	0.5	0.5	1.00
VIOLA	0.50	0.5	0.5	1.00

Riverbank Annuals (*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation [CEGL006483]); 1 plot.

	% Cover			
Species	Mean	Min	Max	Constancy
PLOC	40.00	40	40	1.00
GLHE2	20.00	20	20	1.00
ACSA2	5.00	5	5	1.00
MIVI	5.00	5	5	1.00
PADIDWV	5.00	5	5	1.00
POCAL2	5.00	5	5	1.00
DIIS	3.00	3	3	1.00
DIVIV2	3.00	3	3	1.00
ERHY	3.00	3	3	1.00
LEVI2	3.00	3	3	1.00
ACRH	1.00	1	1	1.00
BOCY	1.00	1	1	1.00
CHAMA16	1.00	1	1	1.00
CHHU3	1.00	1	1	1.00
CYST	1.00	1	1	1.00
ECCR	1.00	1	1	1.00
ELCI	1.00	1	1	1.00
MUHLE	1.00	1	1	1.00
OXST	1.00	1	1	1.00
PAPHGWV	1.00	1	1	1.00
VEUR	1.00	1	1	1.00
BENI	0.50	0.5	0.5	1.00
DICL	0.50	0.5	0.5	1.00
ERHIH	0.50	0.5	0.5	1.00
FIAU2	0.50	0.5	0.5	1.00
HYMU	0.50	0.5	0.5	1.00
LIDUD	0.50	0.5	0.5	1.00
LOIN	0.50	0.5	0.5	1.00
SACE	0.50	0.5	0.5	1.00
SOPT3	0.50	0.5	0.5	1.00
VETH	0.50	0.5	0.5	1.00

Riverbank Tall Herbs (*Verbesina alternifolia - Teucrium canadense - Elymus riparius* - [*Solidago gigantea*] Herbaceous Vegetation [CEGL006480]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
DICL	22.50	5	40	1.00
CHLA5	11.50	3	20	1.00
LIBE3	11.50	3	20	1.00
MIVI	10.00	10	10	0.50
RUBUS	10.00	10	10	0.50
SEHE3	10.00	10	10	0.50
VEAL	7.50	5	10	1.00
SOGI	6.50	3	10	1.00
PLOC	5.50	1	10	1.00
BENI	5.00	5	5	0.50
CECAC	5.00	5	5	0.50
GLTR	5.00	5	5	0.50
HEHE5	5.00	5	5	0.50
HEST	5.00	5	5	0.50
PAAU3	5.00	5	5	0.50
SOCA6	5.00	5	5	0.50
GLHE2	4.00	3	5	1.00
POVI2	4.00	3	5	1.00
ACSA2	3.00	3	3	0.50
BOCY	3.00	3	3	0.50
COAM2	3.00	3	3	0.50
ELCA4	3.00	3	3	0.50
EUFI	3.00	3	3	0.50
HEAUA	3.00	3	3	0.50
LEVI2	3.00	3	3	0.50
POSC3	3.00	3	3	0.50
SORU2	3.00	3	3	0.50
SYLA4	3.00	3	3	0.50
SYLAL4	3.00	3	3	0.50
FRPE	2.00	1	3	1.00
ROPS	2.00	1	3	1.00
TORA2	2.00	1	3	1.00
VENO	2.00	1	3	1.00
EUSE2	1.75	0.5	3	1.00
SOCAC4	1.75	0.5	3	1.00

AGPE	1.00	1	1	0.50
AMBR2	1.00	1	1	0.50
ELCA3	1.00	1	1	0.50
ELVIV	1.00	1	1	0.50
TRDA3	1.00	1	1	0.50
VEUR	1.00	1	1	0.50
PHPA9	0.75	0.5	1	1.00
COCO13	0.50	0.5	0.5	1.00
ACSAS	0.50	0.5	0.5	0.50
AGAL5	0.50	0.5	0.5	0.50
ANGE	0.50	0.5	0.5	0.50
ARAT	0.50	0.5	0.5	0.50
ASTR	0.50	0.5	0.5	0.50
BIFR	0.50	0.5	0.5	0.50
CAHI3	0.50	0.5	0.5	0.50
CHMA15	0.50	0.5	0.5	0.50
COREO2	0.50	0.5	0.5	0.50
CYSQ	0.50	0.5	0.5	0.50
CYST	0.50	0.5	0.5	0.50
DACA6	0.50	0.5	0.5	0.50
DISA	0.50	0.5	0.5	0.50
ECCR	0.50	0.5	0.5	0.50
ERCA	0.50	0.5	0.5	0.50
ERPEP2	0.50	0.5	0.5	0.50
LOSIS2	0.50	0.5	0.5	0.50
MECA3	0.50	0.5	0.5	0.50
MOVE	0.50	0.5	0.5	0.50
OXST	0.50	0.5	0.5	0.50
PADIDWV	0.50	0.5	0.5	0.50
PATO2	0.50	0.5	0.5	0.50
POCU6	0.50	0.5	0.5	0.50
RUTRT	0.50	0.5	0.5	0.50

Riverscour Prairie (*Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation [CEGL006283]); 7 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ANGE	14.57	1	40	1.00
HYPR	5.00	1	10	0.86
BAAUA	4.71	0.5	20	1.00
BENI	3.38	0.5	10	0.57
SONU2	3.13	0.5	10	0.57
SOLID	3.00	1	5	0.29
ZIAP	3.00	1	5	0.29
VIRU2	2.75	0.5	5	0.29
TORA2	2.17	0.5	5	0.86
ZITR	2.17	0.5	5	0.43
HYDE	2.00	2	2	0.14
SANI	2.00	2	2	0.14
SOCA6	2.00	2	2	0.14
PLOC	1.93	0.5	4	1.00
ROPS	1.83	0.5	3	0.43
COAM2	1.79	0.5	3	1.00
CECAC	1.75	0.5	3	0.29
FRAM2	1.67	1	3	0.43
CEOC2	1.50	0.5	3	0.43
PAVI2	1.50	0.5	3	0.43
ALSE2	1.50	1	2	0.29
FRPE	1.38	0.5	3	0.57
SACA5	1.33	0.5	3	0.43
ULRU	1.25	0.5	3	0.57
JUAM	1.25	0.5	2	0.29
LECU	1.17	0.5	2	0.43
APCA	1.13	0.5	2	0.57
ROMU	1.10	0.5	2	0.71
EUFI	1.00	0.5	2	0.57
LIST2	1.00	1	1	0.43
ACSA2	1.00	1	1	0.29
ACMIO	1.00	1	1	0.14
ACRH	1.00	1	1	0.14
ALJU	1.00	1	1	0.14
ALVIV	1.00	1	1	0.14
CACAV	1.00	1	1	0.14
CHMA15	1.00	1	1	0.14
COCAC3	1.00	1	1	0.14
CRATA	1.00	1	1	0.14
CYSQ	1.00	1	1	0.14
DESMO	1.00	1	1	0.14
DIAR	1.00	1	1	0.14
ELCA4	1.00	1	1	0.14
ELRI	1.00	1	1	0.14
ERAN	1.00	1	1	0.14
ERHY	1.00	1	1	0.14
EUPAT	1.00	1	1	0.14
HAVI4	1.00	1	1	0.14
IMCA	1.00	1	1	0.14
IPOMO	1.00	1	1	0.14
JUTE	1.00	1	1	0.14
LEOR	1.00	1	1	0.14
LISP	1.00	1	1	0.14
LUPA	1.00	1	1	0.14
MOVE	1.00	1	1	0.14
NYSY	1.00	1	1	0.14
SCPUP5	1.00	1	1	0.14
STACH	1.00	1	1	0.14
SYDUD2	1.00	1	1	0.14
THPU2	1.00	1	1	0.14
TRDA3	1.00	1	1	0.14
VICU	1.00	1	1	0.14
CARA2	0.90	0.5	1	0.71
SOJUJWV	0.88	0.5	1	0.57
ALCEC2	0.83	0.5	1	0.43
CHVI3	0.83	0.5	1	0.43
SYLA3	0.83	0.5	1	0.43
ASTER	0.75	0.5	1	0.57
CHLA5	0.75	0.5	1	0.57
COTR4	0.75	0.5	1	0.57
BIDEN	0.75	0.5	1	0.29
ELVIV	0.75	0.5	1	0.29
HYMU	0.75	0.5	1	0.29

LESPE	0.75	0.5	1	0.29
PANIC	0.75	0.5	1	0.29
PAQU2	0.75	0.5	1	0.29
POCAL2	0.75	0.5	1	0.29
RUBUS	0.75	0.5	1	0.29
TRPR2	0.75	0.5	1	0.29
TRVI	0.75	0.5	1	0.29
ULAM	0.75	0.5	1	0.29
VIRI	0.75	0.5	1	0.29
CYST	0.67	0.5	1	0.43
DIVI5	0.67	0.5	1	0.43
LUAL2	0.67	0.5	1	0.43
RHCA12	0.67	0.5	1	0.43
VIOLA	0.63	0.5	1	0.57
LOCA2	0.50	0.5	0.5	0.57
LITU	0.50	0.5	0.5	0.43
POSI2	0.50	0.5	0.5	0.43
AGPU5	0.50	0.5	0.5	0.29
AIAL	0.50	0.5	0.5	0.29
COCO13	0.50	0.5	0.5	0.29
DICHA2	0.50	0.5	0.5	0.29
DICL	0.50	0.5	0.5	0.29
EUPEP	0.50	0.5	0.5	0.29
LYNU	0.50	0.5	0.5	0.29
SCPE4	0.50	0.5	0.5	0.29
ACNE2	0.50	0.5	0.5	0.14
ACRU	0.50	0.5	0.5	0.14
AGPE	0.50	0.5	0.5	0.14
ANVIV	0.50	0.5	0.5	0.14
ARHI3	0.50	0.5	0.5	0.14
ASSY	0.50	0.5	0.5	0.14
BIBI7	0.50	0.5	0.5	0.14
BIFR	0.50	0.5	0.5	0.14
BOCY	0.50	0.5	0.5	0.14
CAFR3	0.50	0.5	0.5	0.14
CAREX	0.50	0.5	0.5	0.14
COCOC3	0.50	0.5	0.5	0.14
COER	0.50	0.5	0.5	0.14
DACA6	0.50	0.5	0.5	0.14
DIAC2	0.50	0.5	0.5	0.14
DIACFWV	0.50	0.5	0.5	0.14
DIDIDWV	0.50	0.5	0.5	0.14
DIVIV2	0.50	0.5	0.5	0.14
ECCR	0.50	0.5	0.5	0.14
ELCA7	0.50	0.5	0.5	0.14
ELEOC	0.50	0.5	0.5	0.14
ELOB2	0.50	0.5	0.5	0.14
ERAGR	0.50	0.5	0.5	0.14
ERPHP	0.50	0.5	0.5	0.14
EUCO10	0.50	0.5	0.5	0.14
FIAU2	0.50	0.5	0.5	0.14
GLHE2	0.50	0.5	0.5	0.14
HECA3	0.50	0.5	0.5	0.14
HOCA4	0.50	0.5	0.5	0.14
HYHI2	0.50	0.5	0.5	0.14
ILVE	0.50	0.5	0.5	0.14
JUNCU	0.50	0.5	0.5	0.14
KYPU	0.50	0.5	0.5	0.14
LEVI2	0.50	0.5	0.5	0.14
LIDU	0.50	0.5	0.5	0.14
LINUM	0.50	0.5	0.5	0.14
LOIN	0.50	0.5	0.5	0.14
LONIC	0.50	0.5	0.5	0.14
LOSIS2	0.50	0.5	0.5	0.14
LYAM	0.50	0.5	0.5	0.14
LYCI	0.50	0.5	0.5	0.14
LYLIL	0.50	0.5	0.5	0.14
LYSA2	0.50	0.5	0.5	0.14
OXST	0.50	0.5	0.5	0.14
PALA10	0.50	0.5	0.5	0.14
PARIEWV	0.50	0.5	0.5	0.14
PLMA2	0.50	0.5	0.5	0.14
PLRUR	0.50	0.5	0.5	0.14
POLYG4	0.50	0.5	0.5	0.14
POPE2	0.50	0.5	0.5	0.14
POVE	0.50	0.5	0.5	0.14
PYTE	0.50	0.5	0.5	0.14
PYVE	0.50	0.5	0.5	0.14
RHRE8	0.50	0.5	0.5	0.14
RIBES	0.50	0.5	0.5	0.14
SALIX	0.50	0.5	0.5	0.14
SALY2	0.50	0.5	0.5	0.14
SISYR	0.50	0.5	0.5	0.14
SONEN	0.50	0.5	0.5	0.14
SYLA4	0.50	0.5	0.5	0.14
SYPI2	0.50	0.5	0.5	0.14
SYPR5	0.50	0.5	0.5	0.14
TUFA	0.50	0.5	0.5	0.14
TYLA	0.50	0.5	0.5	0.14
XASTC	0.50	0.5	0.5	0.14

Silver Maple Floodplain Forest (*Acer saccharinum* - *Ulmus americana* Forest [CEGL002586]); 1 plot.

	% Cover			
Species	Mean	Min	Max	Constancy
ACSA2	70.00	70	70	1.00
LIBE3	30.00	30	30	1.00
VEAL	20.00	20	20	1.00
FRPE	10.00	10	10	1.00
PLOC	10.00	10	10	1.00
TORA2	10.00	10	10	1.00
CRCA9	5.00	5	5	1.00
GLHE2	5.00	5	5	1.00
ULRU	5.00	5	5	1.00
BOCY	3.00	3	3	1.00
CHLA5	3.00	3	3	1.00
ELVIV	3.00	3	3	1.00
HATE3	3.00	3	3	1.00
HELIA3	3.00	3	3	1.00
IMCA	3.00	3	3	1.00
MECA3	3.00	3	3	1.00

MIVI	3.00	3	3	1.00
MOCL	3.00	3	3	1.00
POVI2	3.00	3	3	1.00
RULAL	3.00	3	3	1.00
AEFL	1.00	1	1	1.00
AMBR2	1.00	1	1	1.00
ASTR	1.00	1	1	1.00
CILUC	1.00	1	1	1.00
COAM2	1.00	1	1	1.00
COAR4	1.00	1	1	1.00
DICL	1.00	1	1	1.00
EQHYA	1.00	1	1	1.00
ROMU	1.00	1	1	1.00
SOLID	1.00	1	1	1.00
VENO	1.00	1	1	1.00
VEUR	1.00	1	1	1.00
VIOLA	1.00	1	1	1.00
VIRI	1.00	1	1	1.00
ACNE2	0.50	0.5	0.5	1.00
AIAL	0.50	0.5	0.5	1.00
ALPE4	0.50	0.5	0.5	1.00
AMTRT2	0.50	0.5	0.5	1.00
ASTER	0.50	0.5	0.5	1.00
CAIM	0.50	0.5	0.5	1.00
CAREX	0.50	0.5	0.5	1.00
CIAR2	0.50	0.5	0.5	1.00
DEAC4	0.50	0.5	0.5	1.00
FESU3	0.50	0.5	0.5	1.00
GECAC6	0.50	0.5	0.5	1.00
SANIC4	0.50	0.5	0.5	1.00
SOCAC4	0.50	0.5	0.5	1.00
TECA3	0.50	0.5	0.5	1.00

Smooth Alder Shrub Wetland (*Alnus serrulata* Saturated Southern Shrubland [CEGL003912]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ALSE2	40.00	40	40	1.00
SPAM	25.00	5	45	1.00
GLST	20.00	20	20	0.50
HYDE	10.50	1	20	1.00
RHMA4	10.00	10	10	0.50
SCCY	10.00	10	10	0.50
SPQU	10.00	10	10	0.50
ACRU	7.00	7	7	0.50
CACR6	5.00	5	5	1.00
RUHI	5.00	5	5	1.00
ACSA2	5.00	5	5	0.50
CALU5	5.00	5	5	0.50
CASE6	5.00	5	5	0.50
GATI	5.00	5	5	0.50
OSRES	5.00	5	5	0.50
LEOR	4.00	3	5	1.00
BIVU	3.00	3	3	0.50
ELEOC	3.00	3	3	0.50
KALA	3.00	3	3	0.50
PIST	3.00	3	3	0.50
VIRE7	3.00	3	3	0.50
SCEX	2.75	0.5	5	1.00
OSCIC	2.50	2	3	1.00
CAIN12	2.00	2	2	0.50
ELTE	2.00	2	2	0.50
ROCAC	2.00	2	2	0.50
HYMU	1.50	1	2	1.00
JUEF	1.25	0.5	2	1.00
BELE	1.00	1	1	0.50
CABA7	1.00	1	1	0.50
CASCS	1.00	1	1	0.50
GAAS2	1.00	1	1	0.50
IMPAT	1.00	1	1	0.50
JUCA3	1.00	1	1	0.50
LYUNUWV	1.00	1	1	0.50
ROMU	1.00	1	1	0.50
SCTA2	1.00	1	1	0.50
TSCA	1.00	1	1	0.50
VICU	1.00	1	1	0.50
DUAR3	0.50	0.5	0.5	0.50
LOSIS2	0.50	0.5	0.5	0.50
LUPA	0.50	0.5	0.5	0.50
LYVI4	0.50	0.5	0.5	0.50
THNO	0.50	0.5	0.5	0.50
TYLA	0.50	0.5	0.5	0.50
VIOLA	0.50	0.5	0.5	0.50

Submerged Aquatic Vegetation (*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation [CEGL004725]); 3 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ELCA7	39.50	0.5	70	1.00
VAAM3	29.00	1	57	0.67
NAGR	9.00	9	9	0.33
POFOF4	2.00	1	3	1.00
POCE3	2.00	2	2	0.33
POCR3	1.00	1	1	0.67
PONO2	0.75	0.5	1	0.67
JUAM	0.50	0.5	0.5	0.33

Successional Black Locust Woodland (*Robinia pseudoacacia* Forest [CEGL007279]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
LOPR7	30.00	30	30	0.50
SOCA6	30.00	30	30	0.50
ROPS	20.00	20	20	1.00
DICL	20.00	20	20	0.50
SORU2	20.00	20	20	0.50
ROMU	6.50	3	10	1.00
DAGLG	5.00	5	5	0.50
ELUMP	5.00	5	5	0.50
VEOC	5.00	5	5	0.50
COFL2	3.00	3	3	0.50
LECU	3.00	3	3	0.50
LIBE3	3.00	3	3	0.50
RHGL	3.00	3	3	0.50
RUOC	3.00	3	3	0.50
STME2	3.00	3	3	0.50
AGAL5	2.00	1	3	1.00
PAQU2	2.00	1	3	1.00
ACRU	1.00	1	1	1.00
POSC3	1.00	1	1	1.00
PRSES	1.00	1	1	1.00
AREL3	1.00	1	1	0.50
CAVI4	1.00	1	1	0.50
CIMU	1.00	1	1	0.50
DACA6	1.00	1	1	0.50
IMPAT	1.00	1	1	0.50
LOCO6	1.00	1	1	0.50
MAPU	1.00	1	1	0.50
MEOF	1.00	1	1	0.50
NYSY	1.00	1	1	0.50
OXAR	1.00	1	1	0.50
PIPUP	1.00	1	1	0.50
POCAC2	1.00	1	1	0.50
SAAL5	1.00	1	1	0.50
SMRO	1.00	1	1	0.50
UVPE	1.00	1	1	0.50
EUDI16	0.75	0.5	1	1.00
ERAN	0.50	0.5	0.5	1.00
ACMIO	0.50	0.5	0.5	0.50
AGPU	0.50	0.5	0.5	0.50
BODI2	0.50	0.5	0.5	0.50
CAAM8	0.50	0.5	0.5	0.50
CADER	0.50	0.5	0.5	0.50
CADIDWV	0.50	0.5	0.5	0.50
CILUC	0.50	0.5	0.5	0.50
CLVI5	0.50	0.5	0.5	0.50
CRCA9	0.50	0.5	0.5	0.50
DIVI4	0.50	0.5	0.5	0.50
DRIN5	0.50	0.5	0.5	0.50
FESU3	0.50	0.5	0.5	0.50
GAAP2	0.50	0.5	0.5	0.50
GATR3	0.50	0.5	0.5	0.50
GECAC6	0.50	0.5	0.5	0.50
HOLA	0.50	0.5	0.5	0.50
HYPE	0.50	0.5	0.5	0.50
ILMO	0.50	0.5	0.5	0.50
JUTE	0.50	0.5	0.5	0.50
LYCI	0.50	0.5	0.5	0.50
OSLO	0.50	0.5	0.5	0.50
OXGR	0.50	0.5	0.5	0.50
PHPR3	0.50	0.5	0.5	0.50
POAC4	0.50	0.5	0.5	0.50
POAL3	0.50	0.5	0.5	0.50
POCO	0.50	0.5	0.5	0.50
POVI2	0.50	0.5	0.5	0.50
SALY2	0.50	0.5	0.5	0.50
SMGL	0.50	0.5	0.5	0.50
SOCAC4	0.50	0.5	0.5	0.50
VIPR4	0.50	0.5	0.5	0.50
VIST3	0.50	0.5	0.5	0.50

Successional Box-elder Forest (*Acer negundo* Forest [CEGL005033]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
CAGR5	40.00	40	40	0.50
ACNE2	29.50	16	43	1.00
BOCY	25.00	25	25	0.50
ULAM	18.00	18	18	0.50
ROPS	16.00	16	16	0.50
AGAL5	15.00	15	15	0.50
PANIC	15.00	15	15	0.50
ACSA2	12.00	12	12	0.50
GLHE2	10.00	5	15	1.00
MIVI	9.00	9	9	0.50
VEAL	7.00	7	7	0.50
LIBE3	4.00	3	5	1.00
MEVI3	3.00	3	3	0.50
PRVU	3.00	3	3	0.50
LYNU	2.25	0.5	4	1.00
LITU	2.00	2	2	0.50
MEAR4	2.00	2	2	0.50
VIOLA	1.50	1	2	1.00
CAIM	1.00	1	1	1.00
AMBR2	1.00	1	1	0.50
CAFR3	1.00	1	1	0.50
FRAM2	1.00	1	1	0.50
IRPS	1.00	1	1	0.50
PAAU3	1.00	1	1	0.50
PAQU2	1.00	1	1	0.50
POLYG4	1.00	1	1	0.50
SAOD	1.00	1	1	0.50
SATR4	1.00	1	1	0.50
TORA2	1.00	1	1	0.50
ZIAP	1.00	1	1	0.50
AIAL	0.50	0.5	0.5	0.50
ALSA2	0.50	0.5	0.5	0.50
CRCA9	0.50	0.5	0.5	0.50

DICL	0.50	0.5	0.5	0.50
GATR3	0.50	0.5	0.5	0.50
IMPAT	0.50	0.5	0.5	0.50
MOCL	0.50	0.5	0.5	0.50
OXST	0.50	0.5	0.5	0.50
PLRUR	0.50	0.5	0.5	0.50
PLVI	0.50	0.5	0.5	0.50
POOR2	0.50	0.5	0.5	0.50
POSY	0.50	0.5	0.5	0.50
RAAL2	0.50	0.5	0.5	0.50

Successional Eastern White Pine Forest (*Pinus strobus* Successional Forest [CEGL7944]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
PIST	60.00	30	80	1.00
KALA	29.00	3	55	0.40
LYOB	21.00	21	21	0.20
POGR4	20.00	20	20	0.20
LYDI3	17.63	0.5	40	0.80
ACSA2	8.00	8	8	0.20
BELE	5.00	5	5	0.20
ACRU	4.25	1	10	0.80
LITU	3.50	0.5	5	0.60
RUHI	3.33	1	8	0.60
OSCIC	3.00	3	3	0.20
THNO	3.00	3	3	0.20
VIAEB	3.00	3	3	0.20
POAL3	1.75	0.5	3	0.40
OXAR	1.50	1	2	0.40
CRATA	1.33	0.5	3	0.60
ACPE	1.25	0.5	3	0.80
ILMO	1.25	0.5	2	0.40
VAPA4	1.00	1	1	0.60
RHODO	1.00	1	1	0.40
ALSE2	1.00	1	1	0.20
SMTA2	1.00	1	1	0.20
TSCA	1.00	1	1	0.20
VAST	1.00	1	1	0.20
VINUC	1.00	1	1	0.20
SMRO	0.90	0.5	1	1.00
AMARA4	0.83	0.5	1	0.60
MIRE	0.80	0.5	1	1.00
LYUNUWV	0.75	0.5	1	0.40
PAQU2	0.75	0.5	1	0.40
SMGL	0.75	0.5	1	0.40
VIBLB	0.75	0.5	1	0.40
MEVI	0.50	0.5	0.5	0.80
POAC4	0.50	0.5	0.5	0.60
POSI2	0.50	0.5	0.5	0.60
PRSES	0.50	0.5	0.5	0.60
CADER	0.50	0.5	0.5	0.40
GAPR2	0.50	0.5	0.5	0.40
HAVI4	0.50	0.5	0.5	0.40
NYSY	0.50	0.5	0.5	0.40
QUAL	0.50	0.5	0.5	0.40
QURU	0.50	0.5	0.5	0.40
RUBUS	0.50	0.5	0.5	0.40
TORA2	0.50	0.5	0.5	0.40
VIOLA	0.50	0.5	0.5	0.40
ATAN3	0.50	0.5	0.5	0.20
BRKA2	0.50	0.5	0.5	0.20
CAREX	0.50	0.5	0.5	0.20
CASW	0.50	0.5	0.5	0.20
CLUM2	0.50	0.5	0.5	0.20
DIDIM2WV	0.50	0.5	0.5	0.20
DRIN5	0.50	0.5	0.5	0.20
GLHE2	0.50	0.5	0.5	0.20
HYCU2	0.50	0.5	0.5	0.20
LIBE3	0.50	0.5	0.5	0.20
LUMUM2	0.50	0.5	0.5	0.20
MAAC	0.50	0.5	0.5	0.20
POCO38	0.50	0.5	0.5	0.20
RHCA4	0.50	0.5	0.5	0.20
ROMU	0.50	0.5	0.5	0.20
SAAL5	0.50	0.5	0.5	0.20
STSE9	0.50	0.5	0.5	0.20
VIAC	0.50	0.5	0.5	0.20
VISO	0.50	0.5	0.5	0.20

Successional Tuliptree / Northern Spicebush Forest (*Liriodendron tulipifera* / [*Cercis canadensis*] / [*Lindera benzoin*] Forest [CEGL007220]); 5 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
LITU	44.60	30	60	1.00
LIBE3	12.75	3	40	0.80
ROMU	11.50	3	20	0.40
ULRU	10.00	3	20	0.60
ARMA7	10.00	10	10	0.20
CAOV2	10.00	10	10	0.20
FAGR	10.00	10	10	0.20
ACSAS	9.20	3	20	1.00
ASTR	6.00	3	9	0.40
SAOD	6.00	2	10	0.40
PAQU2	5.50	2	10	0.80
CECAC	5.50	1	10	0.40
ROPS	5.25	3	10	0.80
HATE3	5.25	0.5	10	0.40
SAAL5	5.00	1	10	0.60
CARYA	5.00	5	5	0.20
MAAC	5.00	5	5	0.20
MECO	5.00	5	5	0.20
POCA11	5.00	5	5	0.20
ACNE2	4.00	3	5	0.40
PECAC3	4.00	4	4	0.20
AGAL5	3.60	1	8	1.00
AEFL	3.40	1	5	1.00
PIPUP	3.25	0.5	6	0.40
TORA2	3.00	3	3	0.60

ASCA	3.00	1	5	0.40
FESU3	3.00	3	3	0.40
AMBR2	3.00	3	3	0.20
CAPL4	3.00	3	3	0.20
COFL2	3.00	3	3	0.20
DRIN5	3.00	3	3	0.20
ELHY	3.00	3	3	0.20
GECAC6	3.00	3	3	0.20
HYCA3	3.00	3	3	0.20
OSVIV	3.00	3	3	0.20
PATO2	3.00	3	3	0.20
RUODO	3.00	3	3	0.20
VIAEB	3.00	3	3	0.20
FRAM2	2.83	0.5	5	0.60
VEAL	2.83	0.5	5	0.60
VIST3	2.50	1	4	0.40
POAC4	2.00	1	3	1.00
CRCA9	2.00	1	3	0.60
EUDI16	2.00	1	3	0.40
CABL	2.00	2	2	0.20
GEMA	2.00	2	2	0.20
MIVI	2.00	2	2	0.20
SETE3	2.00	2	2	0.20
POVI2	1.67	1	3	0.60
IMPAT	1.50	1	2	0.40
GAAP2	1.25	0.5	2	0.40
OSLO	1.13	0.5	2	0.80
SOCA4	1.00	1	1	0.60
HYAR	1.00	1	1	0.40
LACA3	1.00	1	1	0.40
SACA15	1.00	1	1	0.40
VIOLA	1.00	1	1	0.40
AIAL	1.00	1	1	0.20
AMARA4	1.00	1	1	0.20
BRER2	1.00	1	1	0.20
BRPU6	1.00	1	1	0.20
CACO15	1.00	1	1	0.20
CAGR8	1.00	1	1	0.20
CAREX	1.00	1	1	0.20
CHVI3	1.00	1	1	0.20
DRMA4	1.00	1	1	0.20
DUIN	1.00	1	1	0.20
EUPUP	1.00	1	1	0.20
GACI2	1.00	1	1	0.20
HENOA	1.00	1	1	0.20
OSCL	1.00	1	1	0.20
OXMO	1.00	1	1	0.20
PRENA	1.00	1	1	0.20
QUMU	1.00	1	1	0.20
QUVE	1.00	1	1	0.20
RULAL	1.00	1	1	0.20
SANIC4	1.00	1	1	0.20
STME2	1.00	1	1	0.20
TIAM	1.00	1	1	0.20
TRILL	1.00	1	1	0.20
ULAM	1.00	1	1	0.20
UVPE	1.00	1	1	0.20
VISA2	1.00	1	1	0.20
GATR3	0.88	0.5	1	0.80
ARTR	0.83	0.5	1	0.60
POPE	0.83	0.5	1	0.60
SMTA2	0.75	0.5	1	0.80
LOJA	0.50	0.5	0.5	0.40
VISO	0.50	0.5	0.5	0.40
ACPA	0.50	0.5	0.5	0.20
ALTR3	0.50	0.5	0.5	0.20
ASPL	0.50	0.5	0.5	0.20
ASTER	0.50	0.5	0.5	0.20
BOVI	0.50	0.5	0.5	0.20
CAAM8	0.50	0.5	0.5	0.20
CATH2	0.50	0.5	0.5	0.20
CRATA	0.50	0.5	0.5	0.20
DESMO	0.50	0.5	0.5	0.20
DIDI6	0.50	0.5	0.5	0.20
DIPY	0.50	0.5	0.5	0.20
GEUM	0.50	0.5	0.5	0.20
GEVI4	0.50	0.5	0.5	0.20
MECA3	0.50	0.5	0.5	0.20
POAL3	0.50	0.5	0.5	0.20
POCAC2	0.50	0.5	0.5	0.20
POVI7	0.50	0.5	0.5	0.20
SCSE5	0.50	0.5	0.5	0.20
STPU	0.50	0.5	0.5	0.20
SYPAP2	0.50	0.5	0.5	0.20
THALI2	0.50	0.5	0.5	0.20
TRER3	0.50	0.5	0.5	0.20
TSCA	0.50	0.5	0.5	0.20
UVPU2	0.50	0.5	0.5	0.20
VALO	0.50	0.5	0.5	0.20
VIBLB	0.50	0.5	0.5	0.20
VIPA3WV	0.50	0.5	0.5	0.20
PHLE5	0.00	0	0	0.20

Successional Tuliptree - Oak Forest (*Liriodendron tulipifera* - *Quercus* spp. Forest [CEGL007221]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
LITU	36.00	10	62	1.00
DICL	15.00	15	15	0.50
ACPE	10.00	10	10	0.50
NYSY	8.00	6	10	1.00
ACRARWV	7.00	7	7	0.50
QURU	7.00	7	7	0.50
FAGR	5.00	5	5	0.50
QUVE	5.00	5	5	0.50
ROPS	5.00	5	5	0.50
SCSE5	5.00	5	5	0.50
ACRU	4.50	4	5	1.00
HAVI4	4.00	4	4	0.50
PRLAWV	4.00	4	4	0.50

THNO	4.00	4	4	0.50
OXAR	3.00	1	5	1.00
MAAC	3.00	3	3	0.50
MEVI	3.00	3	3	0.50
POAC4	3.00	3	3	0.50
GEMA	2.50	2	3	1.00
DESMO	2.00	1	3	1.00
AMARA4	2.00	2	2	0.50
CAGL8	2.00	2	2	0.50
DIQU	2.00	2	2	0.50
FRAM2	2.00	2	2	0.50
LIBE3	2.00	2	2	0.50
PAQU2	2.00	2	2	0.50
ROCAC	2.00	2	2	0.50
SACA15	2.00	2	2	0.50
TIAM	2.00	2	2	0.50
VAPA4	2.00	2	2	0.50
UVPE	1.25	0.5	2	1.00
SMRO	1.00	1	1	1.00
VIOLA	1.00	1	1	1.00
ANQUM2	1.00	1	1	0.50
ARAT	1.00	1	1	0.50
CAAL11	1.00	1	1	0.50
CAREX	1.00	1	1	0.50
EUDI16	1.00	1	1	0.50
GATR3	1.00	1	1	0.50
PATR2	1.00	1	1	0.50
PHHE11	1.00	1	1	0.50
PRENA	1.00	1	1	0.50
QUAL	1.00	1	1	0.50
RUBUS	1.00	1	1	0.50
SMGL	1.00	1	1	0.50
THALI2	1.00	1	1	0.50
VIAEB	1.00	1	1	0.50
VIRO2	1.00	1	1	0.50
VITRTWV	1.00	1	1	0.50
BOVI	0.75	0.5	1	1.00
GACI2	0.75	0.5	1	1.00
POSI2	0.75	0.5	1	1.00
GOPU	0.50	0.5	0.5	1.00
SOLID	0.50	0.5	0.5	1.00
AGAL5	0.50	0.5	0.5	0.50
ASTER	0.50	0.5	0.5	0.50
CADIDWV	0.50	0.5	0.5	0.50
CARYA	0.50	0.5	0.5	0.50
CILUC	0.50	0.5	0.5	0.50
GEVI5	0.50	0.5	0.5	0.50
LILI3	0.50	0.5	0.5	0.50
OSCL2	0.50	0.5	0.5	0.50
OSLO	0.50	0.5	0.5	0.50
OXST	0.50	0.5	0.5	0.50
PANIC	0.50	0.5	0.5	0.50
QUPR2	0.50	0.5	0.5	0.50
VIHA2	0.50	0.5	0.5	0.50

Successional Virginia Pine Forest (*Pinus virginiana* Successional Forest [CEGL002591]); 2 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
PIVI2	55.00	40	70	1.00
FRAM2	11.50	3	20	1.00
ACSAS	10.00	10	10	1.00
VAST	10.00	10	10	0.50
PRSES	6.50	3	10	1.00
QUVE	6.50	3	10	1.00
FAGR	5.25	0.5	10	1.00
AMARA4	3.00	1	5	1.00
LOJA	3.00	3	3	0.50
MORUR	3.00	3	3	0.50
ACRU	2.75	0.5	5	1.00
PAQU2	2.75	0.5	5	1.00
TORA2	1.75	0.5	3	1.00
CRATA	1.00	1	1	1.00
CAAL27	1.00	1	1	0.50
CECAC	1.00	1	1	0.50
CHMA3	1.00	1	1	0.50
HYHYM	1.00	1	1	0.50
POCAC2	1.00	1	1	0.50
QUCOC	1.00	1	1	0.50
QUPR2	1.00	1	1	0.50
ROMU	1.00	1	1	0.50
SAAL5	1.00	1	1	0.50
SMRO	1.00	1	1	0.50
SYUN	1.00	1	1	0.50
VAPA4	1.00	1	1	0.50
VIAC	1.00	1	1	0.50
VIPR	1.00	1	1	0.50
QUAL	0.75	0.5	1	1.00
SMGL	0.75	0.5	1	1.00
SOCA4	0.75	0.5	1	1.00
AGPE	0.50	0.5	0.5	0.50
CADE12	0.50	0.5	0.5	0.50
CAHI6	0.50	0.5	0.5	0.50
CARYA	0.50	0.5	0.5	0.50
EUDI16	0.50	0.5	0.5	0.50
OXST	0.50	0.5	0.5	0.50

Sugar Maple - Yellow Buckeye - American Basswood Forest (*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum /* [*Magnolia tripetala*] Forest [CEGL005222]); 31 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ACSAS	19.42	5	40	1.00
TIAM	16.81	5	40	0.68
CAAL27	15.00	15	15	0.03
LITU	13.22	3	40	0.74
CAGL8	12.50	5	20	0.06
FRPE	12.50	10	15	0.06
ASTR	11.13	1	35	0.26
QUAL	10.00	5	15	0.06
TSCA	9.33	3	20	0.10
AEFL	9.13	0.5	40	0.97
QUVE	9.00	3	15	0.06
HATE3	8.06	0.5	20	0.29
ROPS	8.04	0.5	20	0.42
BEALA	8.00	6	10	0.06
LACA3	7.46	0.5	35	0.81
MAAC	7.32	0.5	20	0.35
CACAV	6.67	5	10	0.10
FRAM2	6.63	0.5	15	0.65
QURU	6.23	0.5	20	0.35
COCO38	6.00	6	6	0.03
CATH2	5.81	0.5	40	0.42
ULRU	5.25	0.5	17	0.45
FAGR	5.17	0.5	20	0.58
SAAL5	5.17	0.5	10	0.10
TORA2	5.12	0.5	50	0.42
SYLO2	5.00	1	10	0.10
JUNI	5.00	5	5	0.06
PLOC	5.00	5	5	0.06
CEOC	5.00	5	5	0.03
NYSY	5.00	5	5	0.03
VISO	5.00	5	5	0.03
VIAEB	4.60	1	10	0.32
PRSES	4.57	0.5	10	0.23
CAOV3	4.50	4	5	0.06
ACRU	4.33	1	10	0.19
HAVI4	4.00	1	10	0.32
CAOV2	4.00	4	4	0.03
HYCA	4.00	4	4	0.03
VEAL	4.00	4	4	0.03
LIBE3	3.93	0.5	20	0.74
AGAL5	3.83	1	28	0.39
BELE	3.65	0.5	5	0.32
QUPR2	3.00	1	5	0.10
MAPU	3.00	3	3	0.03
RHCA8	3.00	3	3	0.03
ARMA7	2.97	0.5	10	0.52
CACO15	2.86	0.5	5	0.45
AMARA4	2.75	0.5	5	0.06
POAC4	2.70	1	10	0.97
CYSTO	2.70	0.5	10	0.16
VITIS	2.70	0.5	10	0.16
DRMA4	2.50	0.5	10	0.35
PIPUP	2.50	1	7	0.19
MECO	2.50	1	4	0.13
STTR	2.50	2	3	0.06
DIPY	2.21	0.5	8	0.23
DEAC4	2.20	1	6	0.16
ACTAE	2.17	0.5	5	0.10
VICA4	2.10	0.5	7	0.16
ACPE	2.08	0.5	5	0.19
IMPA	2.00	2	2	0.03
RHMA4	2.00	2	2	0.03
HYCA3	1.96	0.5	10	0.45
ASCA	1.91	0.5	10	0.74
PAQU2	1.87	0.5	5	0.84
VIST3	1.75	0.5	5	0.13
ACRARWV	1.69	0.5	7	0.52
SOFL2	1.61	0.5	5	0.29
OSVIV	1.60	0.5	3	0.16
POVI2	1.60	0.5	5	0.16
GAAP2	1.58	0.5	5	0.39
ROMU	1.57	1	4	0.23
SETE3	1.55	0.5	5	0.65
STPU	1.55	0.5	10	0.65
HYAR	1.55	0.5	5	0.32
RUPH	1.50	0.5	4	0.13
VIBLB	1.50	0.5	3	0.10
GLHE2	1.50	1	2	0.06
THNO	1.50	1	2	0.06
COFL2	1.44	0.5	5	0.26
IMPAT	1.44	0.5	5	0.26
CAPL4	1.43	0.5	3	0.23
ACPA	1.42	0.5	3	0.19
DRIN5	1.38	0.5	5	0.39
SACA15	1.38	0.5	2	0.13
OSCL	1.36	0.5	3	0.35
TICO	1.33	0.5	3	0.48
FESU3	1.33	0.5	3	0.10
OSLO	1.30	0.5	5	0.65
SOCA4	1.25	0.5	3	0.13
AGHY	1.25	0.5	2	0.06
ANLA	1.25	0.5	2	0.06
EUDI16	1.22	0.5	3	0.74
SAOD	1.17	0.5	2	0.10
POPE	1.07	0.5	2	0.23
VIAC	1.06	0.5	3	0.26
HYVI	1.06	0.5	3	0.29
GEMA	1.04	0.5	2	0.39
CRCA9	1.04	0.5	2	0.42
PRLAWV	1.00	0.5	3	0.55
THDE10	1.00	1	1	0.19
RUELL	1.00	0.5	2	0.10
AIAL	1.00	1	1	0.06
HYIM3	1.00	1	1	0.06
PHHE11	1.00	1	1	0.06

ACPOWV	1.00	1	1	0.03	ASTER	0.75	0.5	1	0.13
ANAT4	1.00	1	1	0.03	CECAC	0.75	0.5	1	0.13
ANVIV2	1.00	1	1	0.03	SACA13	0.75	0.5	1	0.13
ARRAR	1.00	1	1	0.03	SMTA2	0.75	0.5	1	0.13
BRIL	1.00	1	1	0.03	CADI10	0.75	0.5	1	0.06
BRRE3	1.00	1	1	0.03	CAIM	0.75	0.5	1	0.06
BRRI5	1.00	1	1	0.03	CAJA2	0.75	0.5	1	0.06
CAAM8	1.00	1	1	0.03	COAM	0.75	0.5	1	0.06
CLUM2	1.00	1	1	0.03	LOPUP2	0.75	0.5	1	0.06
COCA4	1.00	1	1	0.03	MACA4	0.75	0.5	1	0.06
COCOC2	1.00	1	1	0.03	MEVI	0.75	0.5	1	0.06
CYVIV	1.00	1	1	0.03	PHDI5	0.75	0.5	1	0.06
DIBO2	1.00	1	1	0.03	RUBUS	0.75	0.5	1	0.06
DICRA8	1.00	1	1	0.03	UVSE	0.75	0.5	1	0.06
ERAMA2	1.00	1	1	0.03	VIPA3WV	0.75	0.5	1	0.06
FLPR	1.00	1	1	0.03	CAAL11	0.72	0.5	1	0.29
GASP5	1.00	1	1	0.03	BOVI	0.70	0.5	1	0.32
LOJA	1.00	1	1	0.03	POCA11	0.70	0.5	1	0.16
MATR	1.00	1	1	0.03	PANIC	0.69	0.5	1	0.26
OSCIC	1.00	1	1	0.03	UVPU2	0.68	0.5	1	0.45
OXGR	1.00	1	1	0.03	CAREX	0.67	0.5	1	0.19
PHAMA3	1.00	1	1	0.03	PAQU	0.67	0.5	1	0.19
PHBI2	1.00	1	1	0.03	CADIDWV	0.67	0.5	1	0.10
POVI7	1.00	1	1	0.03	CARO22	0.67	0.5	1	0.10
RAHI	1.00	1	1	0.03	MECA3	0.67	0.5	1	0.10
RIBES	1.00	1	1	0.03	OXST	0.67	0.5	1	0.10
SCSE5	1.00	1	1	0.03	TRER3	0.67	0.5	1	0.10
VAST	1.00	1	1	0.03	POSI2	0.63	0.5	1	0.13
ZIAU	1.00	1	1	0.03	SATR4	0.63	0.5	1	0.13
GATR3	0.93	0.5	3	0.48	CARYA	0.57	0.5	1	0.23
POPU4	0.93	0.5	2	0.23	EUAM7	0.57	0.5	1	0.23
DRCA11	0.92	0.5	2	0.19	CLVI5	0.50	0.5	0.5	0.16
RARER2	0.92	0.5	1	0.19	ASPL	0.50	0.5	0.5	0.13
THTH2	0.90	0.5	2	0.32	CAPL5	0.50	0.5	0.5	0.10
ANQUM2	0.90	0.5	2	0.16	OCAC	0.50	0.5	0.5	0.10
SOLID	0.90	0.5	1	0.16	ACNE2	0.50	0.5	0.5	0.06
SMRO	0.88	0.5	3	0.65	BAVU	0.50	0.5	0.5	0.06
ANQUQ	0.88	0.5	1	0.13	CILUC	0.50	0.5	0.5	0.06
VIOLA	0.86	0.5	2	0.58	SANIC	0.50	0.5	0.5	0.06
ARTR	0.86	0.5	3	0.68	TRILL	0.50	0.5	0.5	0.06
MIDI3	0.86	0.5	1	0.23	VITRTWV	0.50	0.5	0.5	0.06
CACO26	0.85	0.5	2	0.32	ACSP2	0.50	0.5	0.5	0.03
UVPE	0.85	0.5	2	0.32	AGPU	0.50	0.5	0.5	0.03
ADPE	0.83	0.5	2	0.29	AMBR2	0.50	0.5	0.5	0.03
DESMO	0.83	0.5	1	0.10	ASRH2	0.50	0.5	0.5	0.03
DICA	0.83	0.5	1	0.10	ASTRT	0.50	0.5	0.5	0.03
GACI2	0.83	0.5	1	0.10	BRER2	0.50	0.5	0.5	0.03
POBI2	0.83	0.5	1	0.10	CACE	0.50	0.5	0.5	0.03
DIQU	0.81	0.5	1	0.26	CAHI8	0.50	0.5	0.5	0.03
MARAR	0.80	0.5	1	0.16	CALA19	0.50	0.5	0.5	0.03
SANIC4	0.80	0.5	1	0.16	CARDA	0.50	0.5	0.5	0.03
PRENA	0.79	0.5	1	0.23	CLVI3	0.50	0.5	0.5	0.03
HENOA	0.75	0.5	1	0.45	COAL2	0.50	0.5	0.5	0.03
CABL	0.75	0.5	1	0.26	CYPR4	0.50	0.5	0.5	0.03
GECAC6	0.75	0.5	1	0.19	DETR	0.50	0.5	0.5	0.03
THALI2	0.75	0.5	1	0.19	DIFU3	0.50	0.5	0.5	0.03

ELHY	0.50	0.5	0.5	0.03
ERAN	0.50	0.5	0.5	0.03
ERSTS2	0.50	0.5	0.5	0.03
GALIU	0.50	0.5	0.5	0.03
GENTI	0.50	0.5	0.5	0.03
HEAMA2	0.50	0.5	0.5	0.03
HEVI3	0.50	0.5	0.5	0.03
HYCO6	0.50	0.5	0.5	0.03
LACTU	0.50	0.5	0.5	0.03
PHACE	0.50	0.5	0.5	0.03
POAL3	0.50	0.5	0.5	0.03
POLYM	0.50	0.5	0.5	0.03
POSY	0.50	0.5	0.5	0.03
PRTR	0.50	0.5	0.5	0.03
RANUN	0.50	0.5	0.5	0.03
ROCAC	0.50	0.5	0.5	0.03
RUCAC4	0.50	0.5	0.5	0.03
RUODO	0.50	0.5	0.5	0.03
SMGL	0.50	0.5	0.5	0.03
TRCE	0.50	0.5	0.5	0.03
TRSE2	0.50	0.5	0.5	0.03
VISA2	0.50	0.5	0.5	0.03
QUERC	0.25	0	0.5	0.06

Sycamore - Ash Floodplain Forest (*Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest [CEGL006458]); 16 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ZAAM	44.00	44	44	0.06
JUNI	24.00	10	38	0.13
TIAM	20.00	20	20	0.06
ULMUS	20.00	20	20	0.06
PLOC	19.38	5	60	0.81
LITU	17.92	0.01	50	0.75
ULAM	15.00	3	40	0.31
CACAV	12.00	1	40	0.94
AIAL	12.00	1	25	0.19
ASTR	11.38	0.5	40	0.50
FRAM2	11.25	5	20	0.25
QURU	9.63	1	26	0.50
ULRU	9.50	2	40	0.38
NYSY	9.25	1	26	0.50
LIBE3	7.93	1	20	0.94
ACSAS	7.93	0.5	20	0.44
FRPE	7.50	1	20	0.75
HATE3	6.67	1	40	0.56
ROPS	5.95	0.5	20	0.63
QUVE	5.67	2	10	0.19
BELE	5.50	1	10	0.13
GLTR	5.50	1	10	0.13
BENI	5.25	0.5	10	0.25
ALSE2	5.00	5	5	0.06
PRUNU	5.00	5	5	0.06
QUPR2	5.00	5	5	0.06
CECAC	4.80	1	10	0.31
MIVI	4.60	1	15	0.31
GLHE2	4.50	1	10	0.63
PAAU3	4.30	0.5	20	0.63
CHVI3	4.17	1	10	0.38
QUAL	4.17	0.5	10	0.19
LIST2	4.00	1	6	0.19
MAPU	4.00	4	4	0.06
SATR4	4.00	4	4	0.06
FAGR	3.67	1	5	0.19
HAVI4	3.56	0.5	10	0.56
DIPA9	3.50	1	10	0.25
SAAL5	3.40	1	5	0.31
AEFL	3.25	0.5	5	0.38
ACSA2	3.25	0.5	6	0.13
CRCR2	3.00	3	3	0.06
EUMA27	3.00	3	3	0.06
POCAL2	3.00	3	3	0.06
XASI	3.00	3	3	0.06
SAOD	2.88	0.5	5	0.25
VIST3	2.80	1	10	0.31
TORA2	2.77	0.5	10	0.94
CACO15	2.75	0.5	5	0.13
STTR	2.75	0.5	5	0.13
VIPR	2.50	1	4	0.13
ACRU	2.33	1	5	0.38
VIAEB	2.25	0.5	4	0.13
DIVI4	2.17	0.5	5	0.19
HELIA3	2.17	0.5	5	0.19
ASCA	2.08	0.5	4	0.38
VEAL	2.00	0.5	5	0.81
COFL2	2.00	1	5	0.44
SOFL2	2.00	0.5	5	0.31
IRCR	2.00	1	3	0.19
ANQUM2	2.00	2	2	0.06
ARNU2	2.00	2	2	0.06
MATR	2.00	2	2	0.06
RHMA4	2.00	2	2	0.06
SANIC4	2.00	2	2	0.06
SOSIR2	2.00	2	2	0.06
ZIAU	1.88	1	5	0.50
VEOC	1.88	0.5	3	0.25
POVI2	1.86	1	3	0.44
VIOLA	1.83	0.5	5	0.56
VITIS	1.75	1	3	0.25
ACPE	1.75	0.5	3	0.13
QUMU	1.75	0.5	3	0.13
SAMA2	1.75	0.5	3	0.13
ACNEN	1.67	1	3	0.19
ELHY	1.67	1	3	0.19
LOJA	1.67	1	3	0.19
ELVIV	1.64	0.5	5	0.44
SOLID	1.58	0.5	4	0.38
EUFI	1.50	1	2	0.13
GECAC6	1.50	1	2	0.13

VIRE7	1.50	1	2	0.13					
AGAL5	1.46	0.5	5	0.75	AGAL5	1.46	0.5	5	0.75
ROMU	1.45	0.5	3	0.63	ROMU	1.45	0.5	3	0.63
PAQU2	1.38	0.5	3	0.81	PAQU2	1.38	0.5	3	0.81
CARA2	1.38	0.5	5	0.50	CARA2	1.38	0.5	5	0.50
SETE3	1.38	0.5	4	0.50	SETE3	1.38	0.5	4	0.50
DICL	1.36	0.5	5	0.44	DICL	1.36	0.5	5	0.44
LYCI	1.33	1	2	0.19	LYCI	1.33	1	2	0.19
ZIAP	1.30	0.5	2	0.31	ZIAP	1.30	0.5	2	0.31
CRCA9	1.29	1	2	0.44	CRCA9	1.29	1	2	0.44
CARYA	1.25	0.5	2	0.13	CARYA	1.25	0.5	2	0.13
MOCL	1.25	0.5	2	0.13	MOCL	1.25	0.5	2	0.13
SMRO	1.22	0.5	5	0.56	SMRO	1.22	0.5	5	0.56
PHPA9	1.17	0.5	2	0.19	PHPA9	1.17	0.5	2	0.19
SIPEC2	1.17	0.5	2	0.19	SIPEC2	1.17	0.5	2	0.19
CAREX	1.08	0.5	2	0.38	CAREX	1.08	0.5	2	0.38
CHLA5	1.08	0.5	3	0.38	CHLA5	1.08	0.5	3	0.38
RULAL	1.06	0.5	2	0.56	RULAL	1.06	0.5	2	0.56
ZITR	1.00	0.5	3	0.31	ZITR	1.00	0.5	3	0.31
AMBR2	1.00	0.5	2	0.19	AMBR2	1.00	0.5	2	0.19
CAAM8	1.00	1	1	0.19	CAAM8	1.00	1	1	0.19
SCUTE	1.00	1	1	0.19	SCUTE	1.00	1	1	0.19
ARTR	1.00	1	1	0.13	ARTR	1.00	1	1	0.13
CABU3	1.00	1	1	0.13	CABU3	1.00	1	1	0.13
COAM2	1.00	1	1	0.13	COAM2	1.00	1	1	0.13
COCOC3	1.00	1	1	0.13	COCOC3	1.00	1	1	0.13
DIOP	1.00	1	1	0.13	DIOP	1.00	1	1	0.13
EUPAT	1.00	1	1	0.13	EUPAT	1.00	1	1	0.13
RANUN	1.00	1	1	0.13	RANUN	1.00	1	1	0.13
STPU	1.00	1	1	0.13	STPU	1.00	1	1	0.13
TROH	1.00	1	1	0.13	TROH	1.00	1	1	0.13
VISO	1.00	1	1	0.13	VISO	1.00	1	1	0.13
ALVIV	1.00	1	1	0.06	ALVIV	1.00	1	1	0.06
AMARE	1.00	1	1	0.06	AMARE	1.00	1	1	0.06
ANVIV2	1.00	1	1	0.06	ANVIV2	1.00	1	1	0.06
ARDR3	1.00	1	1	0.06	ARDR3	1.00	1	1	0.06
ARMU3	1.00	1	1	0.06	ARMU3	1.00	1	1	0.06
ARVUV	1.00	1	1	0.06	ARVUV	1.00	1	1	0.06
BIFR	1.00	1	1	0.06	BIFR	1.00	1	1	0.06
BRACH10	1.00	1	1	0.06	BRACH10	1.00	1	1	0.06
CAFO6	1.00	1	1	0.06	CAFO6	1.00	1	1	0.06
CAPL4	1.00	1	1	0.06	CAPL4	1.00	1	1	0.06
COAL2	1.00	1	1	0.06	COAL2	1.00	1	1	0.06
DIPO4	1.00	1	1	0.06	DIPO4	1.00	1	1	0.06
ELRI	1.00	1	1	0.06	ELRI	1.00	1	1	0.06
ELUMP	1.00	1	1	0.06	ELUMP	1.00	1	1	0.06
EUAM7	1.00	1	1	0.06	EUAM7	1.00	1	1	0.06
FLPR	1.00	1	1	0.06	FLPR	1.00	1	1	0.06
HYCA3	1.00	1	1	0.06	HYCA3	1.00	1	1	0.06
HYPE	1.00	1	1	0.06	HYPE	1.00	1	1	0.06
IPOMO	1.00	1	1	0.06	IPOMO	1.00	1	1	0.06
IPPA	1.00	1	1	0.06	IPPA	1.00	1	1	0.06
LONIC	1.00	1	1	0.06	LONIC	1.00	1	1	0.06
LOTA	1.00	1	1	0.06	LOTA	1.00	1	1	0.06
LYNU	1.00	1	1	0.06	LYNU	1.00	1	1	0.06
MEVI3	1.00	1	1	0.06	MEVI3	1.00	1	1	0.06

PRVU	0.67	0.5	1	0.19
RUELL	0.67	0.5	1	0.19
SIST	0.67	0.5	1	0.19
BIDEN	0.63	0.5	1	0.25
BOCY	0.63	0.5	1	0.25
DIQU	0.63	0.5	1	0.25
POBI2	0.63	0.5	1	0.25
THALI2	0.63	0.5	1	0.25
TRVI	0.63	0.5	1	0.25
FESU3	0.60	0.5	1	0.31
SMGL	0.60	0.5	1	0.31
MARAR	0.57	0.5	1	0.44
ARLA	0.50	0.5	0.5	0.19
GEUM	0.50	0.5	0.5	0.19
SOCA4	0.50	0.5	0.5	0.19
UVPU2	0.50	0.5	0.5	0.19
ALJU	0.50	0.5	0.5	0.13
ELYMU	0.50	0.5	0.5	0.13
GACI2	0.50	0.5	0.5	0.13
GEMA	0.50	0.5	0.5	0.13
OSCL	0.50	0.5	0.5	0.13
OSLO	0.50	0.5	0.5	0.13
RAAL2	0.50	0.5	0.5	0.13
SYDUD2	0.50	0.5	0.5	0.13
SYPR6	0.50	0.5	0.5	0.13
THBA	0.50	0.5	0.5	0.13
ACMIO	0.50	0.5	0.5	0.06
ACRARWV	0.50	0.5	0.5	0.06
AGPE	0.50	0.5	0.5	0.06
ALCAC	0.50	0.5	0.5	0.06
ALLIU	0.50	0.5	0.5	0.06
ASPL	0.50	0.5	0.5	0.06
BAVU	0.50	0.5	0.5	0.06
BOVI	0.50	0.5	0.5	0.06
CAOL2	0.50	0.5	0.5	0.06
CEFOV2	0.50	0.5	0.5	0.06
CEOC	0.50	0.5	0.5	0.06
CLVI4	0.50	0.5	0.5	0.06
COCA4	0.50	0.5	0.5	0.06
COMME	0.50	0.5	0.5	0.06
COTR4	0.50	0.5	0.5	0.06
CUGRG	0.50	0.5	0.5	0.06
DACA6	0.50	0.5	0.5	0.06
DIBO2	0.50	0.5	0.5	0.06
ELCA3	0.50	0.5	0.5	0.06
ERPHP	0.50	0.5	0.5	0.06
EUATA	0.50	0.5	0.5	0.06
EUPUP	0.50	0.5	0.5	0.06
GALIU	0.50	0.5	0.5	0.06
HEMA3	0.50	0.5	0.5	0.06
HEMA80	0.50	0.5	0.5	0.06
HEMI3	0.50	0.5	0.5	0.06
HYPER	0.50	0.5	0.5	0.06
HYPR	0.50	0.5	0.5	0.06
LOMO2	0.50	0.5	0.5	0.06
MAAC	0.50	0.5	0.5	0.06

RUELL	0.67	0.5	1	0.19
SIST	0.67	0.5	1	0.19
BIDEN	0.63	0.5	1	0.25
BOCY	0.63	0.5	1	0.25
DIQU	0.63	0.5	1	0.25
POBI2	0.63	0.5	1	0.25
THALI2	0.63	0.5	1	0.25
TRVI	0.63	0.5	1	0.25
FESU3	0.60	0.5	1	0.31
SMGL	0.60	0.5	1	0.31
MARAR	0.57	0.5	1	0.44
ARLA	0.50	0.5	0.5	0.19
GEUM	0.50	0.5	0.5	0.19
SOCA4	0.50	0.5	0.5	0.19
UVPU2	0.50	0.5	0.5	0.19
ALJU	0.50	0.5	0.5	0.13
ELYMU	0.50	0.5	0.5	0.13
GACI2	0.50	0.5	0.5	0.13
GEMA	0.50	0.5	0.5	0.13
OSCL	0.50	0.5	0.5	0.13
OSLO	0.50	0.5	0.5	0.13
RAAL2	0.50	0.5	0.5	0.13
SYDUD2	0.50	0.5	0.5	0.13
SYPR6	0.50	0.5	0.5	0.13
THBA	0.50	0.5	0.5	0.13
ACMIO	0.50	0.5	0.5	0.06
ACRARWV	0.50	0.5	0.5	0.06
AGPE	0.50	0.5	0.5	0.06
ALCAC	0.50	0.5	0.5	0.06

Sycamore - River Birch Riverscour Woodland (*Platanus occidentalis* - [*Betula nigra*, *Salix* spp.] Temporarily Flooded Woodland [CEGL003725]); 14 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
ACSAS	10.00	10	10	0.07
PIVI2	10.00	10	10	0.07
SAPE12	10.00	10	10	0.07
TRDA3	10.00	10	10	0.07
PLOC	8.43	2	20	1.00
BENI	8.00	1	15	1.00
DIVIV2	8.00	8	8	0.07
CABI8	7.00	7	7	0.07
ULRU	6.17	2	20	0.43
ALSE2	6.00	3	10	0.21
COAM2	5.67	1	10	0.64
SANI	5.67	1	15	0.21
CATAL	5.25	0.5	10	0.14
DIVI5	5.00	1	10	0.29
CACAV	5.00	5	5	0.07
COFL2	5.00	5	5	0.07
CRCR2	5.00	5	5	0.07
ELCA4	5.00	5	5	0.07

QUST	5.00	5	5	0.07	BIBI7	1.00	1	1	0.07
SMHE	5.00	5	5	0.07	CASP8	1.00	1	1	0.07
SPPE	5.00	5	5	0.07	CATO4	1.00	1	1	0.07
ANGE	4.90	1	20	0.71	COPUR	1.00	1	1	0.07
ROPS	4.50	1	10	0.29	CORNU	1.00	1	1	0.07
CRATA	4.50	4	5	0.14	CRCA9	1.00	1	1	0.07
FRPE	4.39	0.5	10	0.64	DEGL4	1.00	1	1	0.07
ACNE2	4.00	4	4	0.14	DIBO2	1.00	1	1	0.07
EQHYA	4.00	4	4	0.07	ELEOC	1.00	1	1	0.07
ACSA2	3.63	0.5	10	0.57	ELRI	1.00	1	1	0.07
FRAM2	3.50	0.5	10	0.36	GLHE2	1.00	1	1	0.07
CHVI3	3.50	0.5	5	0.21	HEOCO	1.00	1	1	0.07
POCU6	3.40	0.5	10	0.36	HYIM3	1.00	1	1	0.07
SACA5	3.36	0.5	10	0.50	KUST	1.00	1	1	0.07
BAAUA	3.10	1	10	0.71	MONAR	1.00	1	1	0.07
VIRU2	3.08	0.5	10	0.43	OCAC	1.00	1	1	0.07
APCA	3.06	0.5	8	0.57	PHVIV	1.00	1	1	0.07
SOJUJWV	3.00	3	3	0.21	PLVI	1.00	1	1	0.07
XASI	3.00	1	5	0.14	POAME	1.00	1	1	0.07
CAEM2	3.00	3	3	0.07	RAPE2	1.00	1	1	0.07
CAST8	3.00	3	3	0.07	RULAL	1.00	1	1	0.07
PALU2	3.00	3	3	0.07	SAAL5	1.00	1	1	0.07
POPE2	2.75	0.5	5	0.14	SALY2	1.00	1	1	0.07
VIPR	2.75	0.5	5	0.14	SITRT	1.00	1	1	0.07
TORA2	2.73	0.5	7	0.93	SOGR4	1.00	1	1	0.07
ZIAP	2.50	1	4	0.14	THDE10	1.00	1	1	0.07
HAVI4	2.33	2	3	0.21	TROH	1.00	1	1	0.07
HYPR	2.21	0.5	5	0.50	VEVI4	1.00	1	1	0.07
CHLA5	2.06	0.5	5	0.57	DICL	0.83	0.5	1	0.43
LIST2	2.00	1	3	0.14	LYCI	0.83	0.5	1	0.43
CECAC	2.00	2	2	0.07	EUFI	0.81	0.5	3	0.57
SCSCS	2.00	2	2	0.07	MIVI	0.75	0.5	1	0.29
CEOC2	1.90	0.5	4	0.36	VEAL	0.75	0.5	1	0.29
ROMU	1.75	1	3	0.29	AGROS2	0.75	0.5	1	0.14
IMCA	1.75	0.5	3	0.14	DESMO	0.75	0.5	1	0.14
ULAM	1.75	0.5	3	0.14	DIDIM2WV	0.75	0.5	1	0.14
CARA2	1.61	0.5	4	0.64	ELCA3	0.75	0.5	1	0.14
PAVI2	1.56	0.5	5	0.64	EUCO10	0.75	0.5	1	0.14
CLVI5	1.50	0.5	3	0.21	EUPUP	0.75	0.5	1	0.14
LEVI2	1.50	0.5	3	0.21	EUSE2	0.75	0.5	1	0.14
JUAM	1.36	0.5	3	0.50	PIPUP	0.75	0.5	1	0.14
COCO13	1.25	0.5	3	0.29	POVI2	0.75	0.5	1	0.14
CHMA15	1.25	0.5	2	0.14	SALIX	0.75	0.5	1	0.14
VICU	1.25	0.5	2	0.14	SOSIR2	0.75	0.5	1	0.14
POCAL2	1.13	0.5	3	0.29	SYPR6	0.75	0.5	1	0.14
VIRI	1.13	0.5	2	0.29	TRVI	0.75	0.5	1	0.14
ASTER	1.00	0.5	2	0.29	VITIS	0.75	0.5	1	0.14
SOLID	1.00	0.5	2	0.29	VIOLA	0.69	0.5	1	0.57
HEFU	1.00	1	1	0.21	AMBR2	0.67	0.5	1	0.43
PHPA9	1.00	0.5	2	0.21	LECU	0.67	0.5	1	0.21
LIBE3	1.00	1	1	0.14	LITU	0.67	0.5	1	0.21
PAQU2	1.00	1	1	0.14	LOCA2	0.67	0.5	1	0.21
PRVU	1.00	1	1	0.14	LYNU	0.67	0.5	1	0.21
SMGL	1.00	1	1	0.14	OXST	0.67	0.5	1	0.21
ZIAU	1.00	1	1	0.14	PAAU3	0.67	0.5	1	0.21
AGAL5	1.00	1	1	0.07	PANIC	0.67	0.5	1	0.21

POSI2	0.67	0.5	1	0.21
RUBUS	0.67	0.5	1	0.21
SMRO	0.67	0.5	1	0.21
ASSY	0.63	0.5	1	0.29
BIDEN	0.63	0.5	1	0.29
VENO	0.63	0.5	1	0.29
AGPE	0.50	0.5	0.5	0.29
ELVIV	0.50	0.5	0.5	0.29
ACRU	0.50	0.5	0.5	0.21
AMARE	0.50	0.5	0.5	0.21
BIFR	0.50	0.5	0.5	0.21
BOCY	0.50	0.5	0.5	0.21
SOCAC4	0.50	0.5	0.5	0.21
SYDUD2	0.50	0.5	0.5	0.21
SYPI2	0.50	0.5	0.5	0.21
XASTC	0.50	0.5	0.5	0.21
EQAR	0.50	0.5	0.5	0.14
ERHY	0.50	0.5	0.5	0.14
HYPER	0.50	0.5	0.5	0.14
LYSA2	0.50	0.5	0.5	0.14
MEOF	0.50	0.5	0.5	0.14
PLMA2	0.50	0.5	0.5	0.14
RUOB	0.50	0.5	0.5	0.14
ACRH	0.50	0.5	0.5	0.07
ALCEC2	0.50	0.5	0.5	0.07
ALJU	0.50	0.5	0.5	0.07
ALSU	0.50	0.5	0.5	0.07
AMTRT2	0.50	0.5	0.5	0.07
APAM	0.50	0.5	0.5	0.07
ASCLE	0.50	0.5	0.5	0.07
ASPL	0.50	0.5	0.5	0.07
CAIM	0.50	0.5	0.5	0.07
CARDA	0.50	0.5	0.5	0.07
CAREX	0.50	0.5	0.5	0.07
CATR7	0.50	0.5	0.5	0.07
CHNIN2	0.50	0.5	0.5	0.07
CIIN	0.50	0.5	0.5	0.07
CLVI4	0.50	0.5	0.5	0.07
COREO2	0.50	0.5	0.5	0.07
CUGRG	0.50	0.5	0.5	0.07
CYPER	0.50	0.5	0.5	0.07
CYST	0.50	0.5	0.5	0.07
DACA6	0.50	0.5	0.5	0.07
DAGLG	0.50	0.5	0.5	0.07
DECA7	0.50	0.5	0.5	0.07
DECA8	0.50	0.5	0.5	0.07
DIACFWV	0.50	0.5	0.5	0.07
DICHA2	0.50	0.5	0.5	0.07
DISP2	0.50	0.5	0.5	0.07
ECMUM2	0.50	0.5	0.5	0.07
ERSTS2	0.50	0.5	0.5	0.07
EUPAT	0.50	0.5	0.5	0.07
GALIU	0.50	0.5	0.5	0.07
GATR3	0.50	0.5	0.5	0.07
HEAN3	0.50	0.5	0.5	0.07
HYMU	0.50	0.5	0.5	0.07
HYPE	0.50	0.5	0.5	0.07
ILVE	0.50	0.5	0.5	0.07
IPCO3	0.50	0.5	0.5	0.07
IPOMO	0.50	0.5	0.5	0.07
IPPA	0.50	0.5	0.5	0.07
JUBUB	0.50	0.5	0.5	0.07
LOAR10	0.50	0.5	0.5	0.07
LOIN	0.50	0.5	0.5	0.07
LOMO2	0.50	0.5	0.5	0.07
LONIC	0.50	0.5	0.5	0.07
LUPA	0.50	0.5	0.5	0.07
LYSIM	0.50	0.5	0.5	0.07
MATR	0.50	0.5	0.5	0.07
MOVE	0.50	0.5	0.5	0.07
MUFR2	0.50	0.5	0.5	0.07
OEBI	0.50	0.5	0.5	0.07
ONSE	0.50	0.5	0.5	0.07
OXALI	0.50	0.5	0.5	0.07
PESE6	0.50	0.5	0.5	0.07
PLRUR	0.50	0.5	0.5	0.07
POAC4	0.50	0.5	0.5	0.07
POPE3	0.50	0.5	0.5	0.07
QURU	0.50	0.5	0.5	0.07
RANUN	0.50	0.5	0.5	0.07
ROCAC	0.50	0.5	0.5	0.07
RUCRC	0.50	0.5	0.5	0.07
RUELL	0.50	0.5	0.5	0.07
SACE	0.50	0.5	0.5	0.07
SCPUP5	0.50	0.5	0.5	0.07
SMTA2	0.50	0.5	0.5	0.07
SODUD	0.50	0.5	0.5	0.07
SOFL2	0.50	0.5	0.5	0.07
SOLY2	0.50	0.5	0.5	0.07
SONU2	0.50	0.5	0.5	0.07
TAOFO	0.50	0.5	0.5	0.07
TRCAC2	0.50	0.5	0.5	0.07
TUFA	0.50	0.5	0.5	0.07
ULMUS	0.50	0.5	0.5	0.07
VEOC	0.50	0.5	0.5	0.07
VEUR	0.50	0.5	0.5	0.07
YUFI	0.50	0.5	0.5	0.07
ZITR	0.50	0.5	0.5	0.07
PHOPO	0.01	0.01	0.01	0.07

Tributary Floodplain Forest (NERI placeholder type - no USNVC association]); 4 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
QURU	50.00	50	50	0.25
XASI	50.00	50	50	0.25
FAGR	20.00	20	20	0.25
ULRU	18.33	5	30	0.75
LITU	17.75	1	30	1.00
PLOC	8.67	1	20	0.75
ACNE2	7.50	5	10	0.50
GLHE2	7.50	5	10	0.50
LOMO2	7.50	5	10	0.50
ROPS	7.50	5	10	0.50
PIPUP	6.50	3	10	0.50
MAAC	5.50	1	10	0.50
AEFL	5.33	3	10	0.75
CACAV	5.25	0.5	10	0.50
ELHY	5.17	0.5	10	0.75
COAM3	5.00	5	5	0.25
NYSY	5.00	5	5	0.25
PECAC3	5.00	5	5	0.25
SMGL	5.00	5	5	0.25
LIBE3	4.00	3	5	0.50
CACO15	3.00	1	5	0.75
POCU6	3.00	3	3	0.75
QUAL	3.00	3	3	0.50
QUVE	3.00	1	5	0.50
SMRO	3.00	1	5	0.50
ARMA7	3.00	3	3	0.25
EUDI16	3.00	3	3	0.25
LOJA	3.00	3	3	0.25
RUBUS	3.00	3	3	0.25
TSCA	3.00	3	3	0.25
POAC4	2.00	1	3	0.50
VEOC	1.75	0.5	3	0.50
SYPR6	1.50	0.5	3	0.75
FRAM2	1.00	1	1	0.75
HAVI4	1.00	1	1	0.50
POCAL2	1.00	1	1	0.50
ACRU	1.00	1	1	0.25
AGAL5	1.00	1	1	0.25
AIAL	1.00	1	1	0.25
ARTR	1.00	1	1	0.25
BEALA	1.00	1	1	0.25
CAPL4	1.00	1	1	0.25
COFL2	1.00	1	1	0.25
COVI3	1.00	1	1	0.25
CRCA9	1.00	1	1	0.25
EUMA27	1.00	1	1	0.25
FESU3	1.00	1	1	0.25
HEVI3	1.00	1	1	0.25
MALUS	1.00	1	1	0.25
MATR	1.00	1	1	0.25
MECO	1.00	1	1	0.25
OXAR	1.00	1	1	0.25
OXGR	1.00	1	1	0.25
POPU4	1.00	1	1	0.25
ROMU	1.00	1	1	0.25
RULAL	1.00	1	1	0.25
SANIC4	1.00	1	1	0.25
TECA3	1.00	1	1	0.25
VAST	1.00	1	1	0.25
VICU	1.00	1	1	0.25
VISO	1.00	1	1	0.25
ZITR	1.00	1	1	0.25
AMBR2	0.83	0.5	1	0.75
ACSAS	0.75	0.5	1	0.50
BELE	0.75	0.5	1	0.50
HATE3	0.75	0.5	1	0.50
HYCA3	0.75	0.5	1	0.50
LOPE	0.75	0.5	1	0.50
PAQU2	0.75	0.5	1	0.50
POVI2	0.75	0.5	1	0.50
TORA2	0.75	0.5	1	0.50
VEAL	0.75	0.5	1	0.50
BOVI	0.50	0.5	0.5	0.50
CAREX	0.50	0.5	0.5	0.50
CLVI5	0.50	0.5	0.5	0.50
MARAR	0.50	0.5	0.5	0.50
AMARA4	0.50	0.5	0.5	0.25
ASTR	0.50	0.5	0.5	0.25
BODI2	0.50	0.5	0.5	0.25
CAOV2	0.50	0.5	0.5	0.25
DICHA2	0.50	0.5	0.5	0.25
DICL	0.50	0.5	0.5	0.25
DIDI6	0.50	0.5	0.5	0.25
DRIN5	0.50	0.5	0.5	0.25
ELUMP	0.50	0.5	0.5	0.25
FRVIV	0.50	0.5	0.5	0.25
GECAC6	0.50	0.5	0.5	0.25
GEMA	0.50	0.5	0.5	0.25
GOPU	0.50	0.5	0.5	0.25
HEDI2	0.50	0.5	0.5	0.25
HEXAS	0.50	0.5	0.5	0.25
HYPR	0.50	0.5	0.5	0.25
LUMUM2	0.50	0.5	0.5	0.25
MECA3	0.50	0.5	0.5	0.25
MIRE	0.50	0.5	0.5	0.25
OSCL	0.50	0.5	0.5	0.25

PHST3	0.50	0.5	0.5	0.25
POCA11	0.50	0.5	0.5	0.25
POSC3	0.50	0.5	0.5	0.25
PRAL2	0.50	0.5	0.5	0.25
PRSES	0.50	0.5	0.5	0.25
SAAL5	0.50	0.5	0.5	0.25
SMTA2	0.50	0.5	0.5	0.25
SOFL2	0.50	0.5	0.5	0.25
STPU	0.50	0.5	0.5	0.25
SYCO4	0.50	0.5	0.5	0.25
TRUN	0.50	0.5	0.5	0.25
VIAC	0.50	0.5	0.5	0.25
VISA2	0.50	0.5	0.5	0.25

Twisted Sedge Rocky Creekbed (*Carex torta* Herbaceous Vegetation [CEGL004103]); 3 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
CLAM3	10.00	10	10	0.33
QUAL	10.00	10	10	0.33
CATO4	8.33	5	10	1.00
PLOC	5.33	3	10	1.00
CACAV	5.00	5	5	0.33
BEALA	4.00	1	10	1.00
RHMA4	3.00	1	5	0.67
ROMU	2.00	1	3	0.67
ASTER	2.00	2	2	0.33
LIBE3	2.00	2	2	0.33
PANIC	2.00	2	2	0.33
FRAM2	1.75	0.5	3	0.67
ALSE2	1.50	0.5	3	1.00
TRCAC2	1.50	0.5	3	1.00
ACRU	1.00	1	1	0.67
EUDI16	1.00	1	1	0.67
POAC4	1.00	1	1	0.67
AEFL	1.00	1	1	0.33
AGAL5	1.00	1	1	0.33
APCA	1.00	1	1	0.33
CABL	1.00	1	1	0.33
COAM2	1.00	1	1	0.33
CRCA9	1.00	1	1	0.33
DICL	1.00	1	1	0.33
GATR3	1.00	1	1	0.33
MECO	1.00	1	1	0.33
PAQU2	1.00	1	1	0.33
POOR2	1.00	1	1	0.33
POVI7	1.00	1	1	0.33
RUBUS	1.00	1	1	0.33
SETE3	1.00	1	1	0.33
SOLID	1.00	1	1	0.33
VEAL	1.00	1	1	0.33
VIOLA	1.00	1	1	0.33
CLVI5	0.75	0.5	1	0.67
DIACFWV	0.75	0.5	1	0.67
EUFI	0.75	0.5	1	0.67
HOCA4	0.75	0.5	1	0.67
QURU	0.75	0.5	1	0.67
SOCA6	0.75	0.5	1	0.67
SYPR6	0.75	0.5	1	0.67
THALI2	0.75	0.5	1	0.67
TORA2	0.75	0.5	1	0.67
TSCA	0.75	0.5	1	0.67
VICU	0.75	0.5	1	0.67
LITU	0.50	0.5	0.5	1.00
PRVU	0.50	0.5	0.5	1.00
AGGI2	0.50	0.5	0.5	0.67
HEAUA	0.50	0.5	0.5	0.67
HYMU	0.50	0.5	0.5	0.67
HYPE	0.50	0.5	0.5	0.67
LOCA2	0.50	0.5	0.5	0.67
POAL3	0.50	0.5	0.5	0.67
RHAR3	0.50	0.5	0.5	0.67
ARAT	0.50	0.5	0.5	0.33
ATPA4	0.50	0.5	0.5	0.33
BIVU	0.50	0.5	0.5	0.33
CARA2	0.50	0.5	0.5	0.33
DRIN5	0.50	0.5	0.5	0.33
EPCI	0.50	0.5	0.5	0.33
GAAP2	0.50	0.5	0.5	0.33
GECAC6	0.50	0.5	0.5	0.33
GLST	0.50	0.5	0.5	0.33
HYPU	0.50	0.5	0.5	0.33
LOPR7	0.50	0.5	0.5	0.33
LYUNUWV	0.50	0.5	0.5	0.33
MIRIR	0.50	0.5	0.5	0.33
OXST	0.50	0.5	0.5	0.33
RAAB	0.50	0.5	0.5	0.33
RARER2	0.50	0.5	0.5	0.33
RONA2	0.50	0.5	0.5	0.33
ROPS	0.50	0.5	0.5	0.33
SASE	0.50	0.5	0.5	0.33
SCLALWV	0.50	0.5	0.5	0.33
SMTA2	0.50	0.5	0.5	0.33
TAOFO	0.50	0.5	0.5	0.33
THBA	0.50	0.5	0.5	0.33
TICO	0.50	0.5	0.5	0.33

Yellow Birch Cold Cove Forest (*Betula alleghaniensis* - [*Tsuga canadensis*] / *Rhododendron maximum / Leucothoe fontanesiana* Forest [CEGL007861]); 6 plots.

	% Cover			
Species	Mean	Min	Max	Constancy
BEALA	26.50	17	45	1.00
RHMA4	20.00	1	50	1.00
TIAM	10.75	1	20	0.67
BELE	10.50	5	18	0.67
CYFR4	10.00	10	10	0.17
QURU	8.75	1	20	0.67
TSCA	6.83	1	10	1.00
LITU	6.10	0.5	18	0.83
DRCA11	5.00	2	8	0.33
OSVIV	5.00	5	5	0.17
ACSAS	4.38	0.5	7	0.67
FAGR	4.00	3	5	0.33
MAAC	4.00	4	4	0.17
ACRU	3.67	1	5	0.50
HAVI4	3.00	1	5	0.83
HYAR	3.00	1	5	0.33
VIAEB	3.00	1	5	0.33
RICY	3.00	3	3	0.17
LOBR7	2.75	0.5	5	0.33
ACSP2	2.50	2	3	0.33
ACPOWV	2.00	2	2	0.17
AGAL5	2.00	2	2	0.17
AQCA	2.00	2	2	0.17
DEAC4	2.00	2	2	0.17
LACA3	2.00	2	2	0.17
DRMA4	1.50	0.5	2	0.50
ASCA	1.50	1	2	0.33
TICO	1.50	1	2	0.33
HYVI	1.25	0.5	2	0.33
SETE3	1.25	0.5	2	0.33
EUDI16	1.17	0.5	2	0.50
POAC4	1.00	0.5	2	1.00
ARTR	1.00	1	1	0.50
PAQU2	1.00	1	1	0.50
GATR3	1.00	1	1	0.33
POVI7	1.00	1	1	0.33
VIOLA	1.00	1	1	0.33
AEFL	1.00	1	1	0.17
CARYA	1.00	1	1	0.17
CYSTO	1.00	1	1	0.17
DEPU2	1.00	1	1	0.17
DICRA8	1.00	1	1	0.17
EUONY2	1.00	1	1	0.17
FRPE	1.00	1	1	0.17
HENOA	1.00	1	1	0.17
HEVIV2	1.00	1	1	0.17
IMPAT	1.00	1	1	0.17
MIDI3	1.00	1	1	0.17
OSCIC	1.00	1	1	0.17
OSLO	1.00	1	1	0.17
PANIC	1.00	1	1	0.17
PRENA	1.00	1	1	0.17
PRSES	1.00	1	1	0.17
PRVU	1.00	1	1	0.17
QUPR2	1.00	1	1	0.17
ROMU	1.00	1	1	0.17
RUBUS	1.00	1	1	0.17
SACA15	1.00	1	1	0.17
SOLID	1.00	1	1	0.17
THALI2	1.00	1	1	0.17
VEAL	1.00	1	1	0.17
ACPE	0.75	0.5	1	0.33
ASRH2	0.75	0.5	1	0.33
CAREX	0.75	0.5	1	0.33
EUFI	0.75	0.5	1	0.33
SYPR6	0.75	0.5	1	0.33
TRCAC2	0.75	0.5	1	0.33
UVPU2	0.75	0.5	1	0.33
ARMA7	0.67	0.5	1	0.50
DRIN5	0.67	0.5	1	0.50
FRAM2	0.67	0.5	1	0.50
MIRE	0.50	0.5	0.5	0.50
POPU4	0.50	0.5	0.5	0.50
ASTER	0.50	0.5	0.5	0.33
HEVI3	0.50	0.5	0.5	0.33
ANAT4	0.50	0.5	0.5	0.17
ASTRT	0.50	0.5	0.5	0.17
AUHE	0.50	0.5	0.5	0.17
BETUL	0.50	0.5	0.5	0.17
BRGR11	0.50	0.5	0.5	0.17
BRIL	0.50	0.5	0.5	0.17
CAAN11	0.50	0.5	0.5	0.17
CACH31	0.50	0.5	0.5	0.17
CLVI5	0.50	0.5	0.5	0.17
DESMO	0.50	0.5	0.5	0.17
DIACFWV	0.50	0.5	0.5	0.17
HYCU2	0.50	0.5	0.5	0.17
HYIM3	0.50	0.5	0.5	0.17
KALA	0.50	0.5	0.5	0.17
LIBE3	0.50	0.5	0.5	0.17
LOCA2	0.50	0.5	0.5	0.17
LOIN	0.50	0.5	0.5	0.17
MEVI	0.50	0.5	0.5	0.17
MNST	0.50	0.5	0.5	0.17
NYSY	0.50	0.5	0.5	0.17

OCAC	0.50	0.5	0.5	0.17
PLDE2	0.50	0.5	0.5	0.17
PLRI2	0.50	0.5	0.5	0.17
POAL3	0.50	0.5	0.5	0.17
RHAR3	0.50	0.5	0.5	0.17
SMRO	0.50	0.5	0.5	0.17
STPU	0.50	0.5	0.5	0.17
THDE10	0.50	0.5	0.5	0.17
UVSE	0.50	0.5	0.5	0.17
VEOC	0.50	0.5	0.5	0.17
VIBLB	0.50	0.5	0.5	0.17
VIRO2	0.50	0.5	0.5	0.17

Appendix H. Key to vegetation community types of New River Gorge National River.

The following key is designed for field identification of natural and semi-natural vegetation community types within the New River Gorge National River. Cultural vegetation (yards, farmlands, etc.), aquatic features (river, creek, pond), and development features (buildings, parking lots, roads, etc.) are not included in the key. Although semi-natural vegetation types are included, the key is not designed to apply to all areas which have been repeatedly or significantly impacted by human-caused disturbance, such as recently logged areas, abandoned farms, strip mines, utility corridors, and other disturbed or developed areas.

Dominant species are those which have the highest cover values in the community. Canopy cover includes trees in both the upper canopies (T1, T2) and the subcanopy (T3). Species with high indicator value are those which are helpful for distinguishing the community type from other similar types; they may only occur in small amounts or be missing from some stands.

For each final lead, the NERI community type name (underlined) is listed first followed by the [USNVC association name and element code] (in brackets). Map classes in which each community type occurs are listed following the association information.

1. Wetland and riparian communities. Vegetation affected by flooding or seepage. Includes jurisdictional wetlands and other areas which are seasonally, temporarily, or occasionally flooded. Frequency of flooding may range from intervals of decades to semi-permanent. Located in slope-bottom and level-landscape positions on alluvial landforms adjacent to the river or streams or in low-gradient drainages on the plateau with seepage or intermittent flows.
   - 1.1. Wetland communities in low-gradient drainages on the plateaus.
     - 1.1.1. Forest seeps. Trees may be rooted on edges or within the stand and usually provide >60% canopy cover. Common trees include *Acer rubrum, Liriodendron tulipifera, Nyssa sylvatica,* and *Quercus alba*. There may be a canopy gap in the center of the community. Wetland communities fed by seepage, not subject to flooding associated with beaver dams. Plant species with high indicator value include *Thelypteris noveboracensis, Oxypolis rigidior*, and *Platanthera clavellata*. Forest Seep [*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest - CEGL007853] map classes: Forest Seep, inclusions within Oak - Hickory Forest, inclusions within Oak - Hickory - Sugar Maple Forest.
     - 1.1.2. Open communities dominated by shrubs and herbs. Trees may be scattered or provide some cover along the edge of the opening. Dead standing trees often present. Beaver-influenced wetlands [map class: Beaver-influenced Wetland].
       - 1.1.2.1. Shrub communities. Cover by woody plants over 0.5 meter tall >25%.
         - 1.1.2.1.1. Cover by *Alnus serrulata* > cover by *Hypericum densiflorum*. Plant species with high indicator value include *Viburnum recognitum, Osmunda cinnamomea*, and *Hypericum mutilum*. Smooth Alder Shrub Wetland [*Alnus serrulata* Saturated Southern Shrubland - CEGL003912] map class: Beaver-influenced Wetland.
         - 1.1.2.1.2. Cover by *Hypericum densiflorum* > cover by *Alnus serrulata*. Plant species with high indicator value include *Carex baileyi, Rubus hispidus*, and *Juncus effusus*. Bushy St. John's-wort Shrub Wetland

[*Hypericum densiflorum / Rubus hispidus* Shrubland - CEGL006464] map class: Beaver-influenced Wetland.

1.1.2.2. Herbaceous communities. Cover by woody species over 0.5 meter tall < 25%.

1.1.2.2.1. Communities dominated by *Sparganium americanum* and bulrushes (*Scirpus cyperinus, Scirpus atrovirens, Scirpus expansus, Schoenoplectus purshianus*). Plant species with high indicator value include *Typha latifolia,* and *Galium tinctorium.* Bulrush - American Bur-reed Marsh [*Sparganium americanum – Epilobium leptophyllum* Herbaceous Vegetation - CEGL004510] map class: Beaver-influenced Wetland.

1.1.2.2.2. Communities dominated by *Leersia oryzoides*. Rice Cutgrass Marsh [*Leersia oryzoides - Sagittaria latifolia* Herbaceous Vegetation - CEGL006461] map class: Beaver-influenced Wetland.

1.2. Wetland and riparian communities along the river, and along larger, high-gradient tributaries in steep walled canyons.

1.2.1. Forests and woodlands. Trees have >25% canopy cover.

1.2.1.1. Forests and woodlands dominated by the conifers *Pinus virginiana* and/or *Juniperus virginiana* var. *virginiana*. Occurs on flat bedrock which is flooded very rarely. Plant species with high indicator value include *Asplenium platyneuron, Amelanchier stolonifera, Rhus copallinum* var. *latifolia,* and *Dicranum scoparium* (moss). Eastern Red-cedar - Virginia Pine Flatrock Woodland [*Juniperus virginiana* var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland - CEGL008449] map class: Eastern Red-cedar - Virginia Pine Flatrock Woodland.

1.2.1.2. Forests and woodlands dominated by deciduous trees.

1.2.1.2.1. Forests along tributary streams.

1.2.1.2.1.1. *Betula alleghaniensis* var. *alleghaniensis* present, usually common or dominant. Occurs along steep banked, high gradient streams in cold, deep canyons. The conifer *Tsuga canadensis* may be codominant. *Rhododendron maximum* is often dominant in the tall shrub layer. Yellow Birch Cold Cove Forest [*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest - CEGL007861] map class: Yellow Birch Cold Cove Forest.

1.2.1.2.1.2. *Betula allegheniensis* var. *alleghaniensis* absent. Canopy trees typically include *Platanus occidentalis, Ulmus rubra,* and *Liriodendron tulipifera.* Occurs along reaches of tributary streams with narrow floodplain terrace development. Plant species with high indicator value include *Lonicera morrowii, Elymus hystrix, Polygonum cuspidatum,* and *Carya cordiformis.* Tributary Floodplain Forest [NERI placeholder type, no USNVC association] map classes: Tributary Floodplain Forest, streamside inclusions within Creek,

streamside inclusions within Sugar Maple - Yellow Buckeye - American Basswood Forest.

1.2.1.2.2. Floodplain forests and woodlands along the main river.

1.2.1.2.2.1. Forests or woodlands with a canopy dominated by *Acer negundo*. Successional in abandoned clearings. Plant species with high indicator value include *Lysimachia nummularia***,** *Cardamine impatiens,* and *Glechoma hederacea*. Successional Box-elder Forest [*Acer negundo* Forest - CEGL005033] map classes: successional box-elder forest, Steep Riparian Edge, inclusions within Sycamore - Ash Floodplain Forest.

1.2.1.2.2.2. *Acer negundo*, if present, not dominant in the upper canopy.

1.2.1.2.2.2.1. Woodlands or open forests close to the river's edge. Canopies are kept open by loss of individuals and surviving trees are often short and battered by frequent high energy floods. *Betula nigra* usually present to dominant.

1.2.1.2.2.2.1.1. *Salix nigra* usually common, codominant, or dominant in canopy. Woodlands along slack water sections of river, usually just downstream from rapids. Substrate usually wet sand. Plant species with high indicator value include *Schoenoplectus pungens* var. *pungens, Equisetum arvense,* and *Leersia virginica*. Black Willow Slackwater Woodland [*Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation - CEGL006463] map classes: Black Willow Slackwater Woodland, Steep Riparian Edge, inclusions in Sycamore - River Birch Riverscour Woodland, inclusions within Sycamore - Ash Floodplain Forest.

1.2.1.2.2.2.1.2. Canopy typically codominated by *Platanus occidentalis* and *Betula nigra*. Woodlands along rapid sections of river. Substrate usually well-drained boulders, cobbles, and sand. Plant species with high indicator value include *Panicum virgatum, Salix caroliniana, Campsis radicans,* and *Vitis rupestris.* Sycamore - River Birch Riverscour Woodland [*Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland - CEGL003725] map classes: Sycamore - River Birch Riverscour Woodland, Steep Riparian Edge, inclusions within Sycamore - Ash Floodplain Forest.

1.2.1.2.2.2.2. Forests on well developed alluvial terraces somewhat away from the river edge. Unless young, trees are usually tall. Flooding frequency ranges from occasional to frequent, but flows are not usually of sufficient energy or duration to

open canopy by removing trees or to inhibit canopy height. *Betula nigra* is usually absent to uncommon.

1.2.1.2.2.2.2.1. Forests or woodlands dominated by *Acer saccharinum*. Along the New River usually occurring in very small patches or linear zones on sandy banks and levees. Silver Maple Floodplain Forest [*Acer saccharinum* - *Ulmus americana* Forest - CEGL002586] map classes: Silver Maple Floodplain Forest, Steep Riparian Edge**,** inclusions within Sycamore - Ash Floodplain Forest.

1.2.1.2.2.2.2.2. *Acer saccharinum* not dominant, but may be present.

1.2.1.2.2.2.2.2.1. Forests on lower alluvial terraces, flooded in most years. *Platanus occidentalis* usually dominant or codominant. Other important trees include *Liriodendron tulipifera, Fraxinus pensylvanica, Ulmus americana,* and *Ulmus rubra.* Plant species with high indicator value include *Carpinus caroliniana* ssp. *virginiana* and *Zizia aurea*. Sycamore - Ash Floodplain Forest [Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia Forest - CEGL006458] map classes: Sycamore - Ash Floodplain Forest, Steep Riparian Edge.

1.2.1.2.2.2.2.2.2. Forests on less frequently flooded upper alluvial terraces. Canopy typically dominated by oaks (*Quercus rubra, Q. velutina*) and *Liriodendron tulipifera*. *Platanus occidentalis* and *Fraxinus* spp. are less common. Plant species with high indicator value include *Halesia tetraptera, Cynoglossum virginianum* var. *virginianum, Hydrastis canadensis,* and *Dirca palustris.* Oak - Tuliptree / Mountain Silverbell Floodplain Forest [*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest - CEGL006462] map classes: Oak - Tuliptree / Mountain Silverbell Floodplain Forest, Steep Riparian Edge, inclusions within Sycamore - Ash Floodplain Forest.

1.2.2. Shrub, herbaceous, and sparse vegetation. Trees have <25% canopy cover.

1.2.2.1. Shrub and herb dominated vegetation which is temporarily flooded by river flows for brief periods but which remains well above the water table for extended periods throughout the growing season. Obligate wetland species may be present in microsites but are not dominant. Note: three choices below.

1.2.2.1.1. *Andropogon gerardii* and *Baptisia australis* usually dominant. Occurs on terraces along rapid sections of the river. Substrate usually well-drained cobble and sand but may also occur on bedrock. Plant species with high indicator value include *Sorghastrum nutans, Coreopsis tripteris,* and *Hypericum prolificum.* Riverscour Prairie [Andropogon gerardii - Panicum virgatum - Baptisia australis Herbaceous Vegetation - CEGL006283] map classes: Riverscour Prairie, Steep Riparian Edge, inclusions within Sycamore - River Birch Riverscour Woodland.

1.2.2.1.2. Herbaceous community (sometimes partially shaded by overhanging trees) dominated by tall perennial forbs. Occurs on top of steep-sided sandy banks along slower sections of the river. Plant species with high indicator value include *Vernonia noveboracensis, Solidago gigantea, Chasmanthium latifolium, Polygonum virginianum, Verbesina alternifolia, Eupatorium serotinum,* and *Dichanthelium clandestinum.* Riverbank Tall Herbs [*Verbesina alternifolia - Teucrium canadense - Elymus riparius - (Solidago gigantea)* Herbaceous Vegetation - CEGL006480] map classes: Riverbank Tall Herbs, Steep Riparian Edge, inclusions within Sycamore - Ash Floodplain Forest, inclusions within Silver Maple Floodplain Forest.

1.2.2.1.3. Narrow zones along the river edge dominated by annuals such as *Acalypha rhomboidea, Chamaesyce humistrata, Eragrostis hypnoides, Fimbristylis autumnalis, and Panicum dichotomiflorum* ssp. *dichotimiflorum.* Riverbank Annuals [*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation - CEGL006483] map classes: inclusions within Steep Riparian Edge, inclusions within river, inclusions within Black Willow Slackwater Woodland, inclusions within Sycamore - River Birch Riverscour Woodland, inclusions within Backwater Slough, inclusions within Sycamore - Ash Floodplain Forest.

1.2.2.2. Herbaceous vegetation which is flooded or saturated for extended periods during the growing season. Communities dominated by obligate wetland species.

1.2.2.2.1. *Carex torta* dominant. Vegetation occurring in narrow zones and small patches in the channels of high gradient tributary streams. Plant species with high indicator value include *Trautvetteria caroliniensis* var. *caroliniensis, Houstonia caerulea,* and *Rhododendron arborescens.* Twisted Sedge Rocky Creekbed [Carex torta Herbaceous Vegetation - CEGL004103] map classes: streamside inclusions within Creek, streamside inclusions within Tributary Floodplain Forest, streamside inclusions within Yellow Birch Cold Cove Forest, streamside inclusions within Sugar Maple - Yellow Buckeye - American Basswood Forest.

1.2.2.2.2. *Carex torta* not dominant. Vegetation in and along the main river.

1.2.2.2.2.1. Vegetation within the main river channel or backchannels subject to high energy flows. Communities dominated by a low diversity of specialized emergent or aquatic plants.

1.2.2.2.2.1.1. *Justicia americana* dominant, often in near monoculture, emergent on cobble bars and bedrock shelves in shallow water which can become exposed during low flows. *Saururus cernuus* may be present but has < cover than *Justicia americana.* American Water-willow Cobble Bar [Justicia americana Herbaceous Vegetation - CEGL004286] map classes: American Water-willow Cobble Bar, Steep Riparian Edge, inclusions within river, inclusions within Backwater Slough, inclusions within Flatrock Pavement, inclusions within Sycamore - River Birch Riverscour Woodland.

1.2.2.2.2.1.2. Communities in the river channel dominated by submerged aquatic plants. Plant species with high indicator value include *Potamogeton foliosus* ssp. *foliosus, Elodea canadensis, Vallisneria americana, Potamogeton crispus,* and *Potamogeton nodosus*. Submerged Aquatic Vegetation [*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation - CEGL004725] map class: inclusions in river.

1.2.2.2.2.2. Vegetation in backchannels or slackwater positions along the main channel of the river. Communities with high diversity of herbs including many annuals and weedy species.

1.2.2.2.2.2.1. Zonal wetlands in back channels and embayments. *Saururus cernuus* is usually present and often dominant. High herb diversity may develop on the edges or as the substrate dries out later in the season. Plant species with high indicator value include *Cuscuta gronovii* var. *gronovii, Saururus cernuus, Amphicarpaea bracteata, Lysimachia ciliata, Apios americana,* and *Iris pseudacorus*. Lizard's-tail Backwater Slough [*Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation - CEGL007696] map class: inclusions in Backwater Slough.

1.2.2.2.2.2.2. Narrow zones along the river edge dominated by annuals such as *Acalypha rhomboidea, Chamaesyce humistrata, Eragrostis hypnoides, Fimbristylis autumnalis, and Panicum dichotomiflorum* ssp. *Dichotimiflorum.* Riverbank Annuals [*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation - CEGL006483] map classes: inclusions within Steep Riparian Edge, inclusions within river, inclusions within Black Willow Slackwater Woodland, inclusions within Sycamore - River Birch

Riverscour Woodland, inclusions within Backwater Slough, inclusions within Sycamore - Ash Floodplain Forest.

2. Upland communities not including riparian jurisdictional uplands. Located on plateaus, ridges, gorge and mountain slopes and benches, in coves and ravines, on cliffs, and in positions along streams which are never flooded.
   - 2.1. Shrub, vine, and herbaceous dominated vegetation. Trees with <25% canopy cover. Disturbed or early successional communities on abandoned farmland, mines, and townsites.
     - 2.1.1. Disturbed sites dominated by the exotic vine *Pueraria montana* var. *lobata*. Kudzu Patch [*Pueraria montana* var. *lobata* Vine-Shrubland - CEGL003882] map classes: Kudzu Patch, inclusions in Disturbed Area, inclusions within Utility Corridor.
     - 2.1.2. *Pueraria montana* var. *lobata* not dominant (usually absent). Successional communities dominated by a mixture of exotic and native tall grasses and forbs with varying degrees of woody encroachment. Plant species with high indicator value include *Holcus lanatus, Trifolium pratense, Calystegia sepium,* and *Phleum pratense.* Old Field [*Lolium (arundinaceum, pratense)* Herbaceous Vegetation - CEGL004048] map classes: Disturbed Area, Developed Area, Strip Mine Reclamation, Utility Corridor.
   - 2.2. Forests and woodlands.
     - 2.2.1. Forests and woodlands with conifers having >25% cover in the canopy.
       - 2.2.1.1. Forests and woodlands dominated by species of *Pinus*.
         - 2.2.1.1.1. Planted forests dominated by *Pinus resinosa, Pinus strobus*, and/or other *Pinus* spp. Pine Plantation [*Pinus strobus* Planted Forest - CEGL007178] map classes: Pine Plantation, inclusions within Strip Mine Reclamation, inclusions within Disturbed Area, inclusions within Developed Area.
         - 2.2.1.1.2. Forests not planted. May be successional or persisting long term due to edaphic conditions.
           - 2.2.1.1.2.1. Successional forests dominated by *Pinus strobus*. Plant species with high indicator value include *Pinus strobus* and *Lycopodium digitatum*. Successional Eastern White Pine Forest [*Pinus strobus* Successional Forest - CEGL007944] map classes: Successional Eastern White Pine Forest, inclusions within Disturbed Area, inclusions within Developed Area.
           - 2.2.1.1.2.2. Successional or edaphic pine forests and woodlands dominated by *Pinus virginiana* or *Pinus rigida* (note: also see Eastern Red-cedar - Virginia Pine Flatrock Woodland in the riparian/wetland section of this key, lead 1.2.1.1.).
             - 2.2.1.1.2.2.1. Forests or woodlands dominated by *Pinus rigida*. Physiognomy typically woodland (<60% canopy cover). Cliff Top Pitch Pine Woodland [*Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland - CEGL006557] map class: Cliff Top Pitch Pine Woodland.
             - 2.2.1.1.2.2.2. Forests or woodlands dominated by *Pinus virginiana.*

2.2.1.1.2.2.2.1. Successional forests on shale. Plant species with high indicator value include *Solidago caesia, Fraxinus americana, Amelanchier arborea* var. *arborea*, and *Prunus serotina* var. *serotina*. Successional Virginia Pine Forest [*Pinus virginiana* Successional Forest - CEGL002591] map class: Successional Virginia Pine Forest.

2.2.1.1.2.2.2.2. Edaphic and successional forests or woodlands on sandstone, typically found in a narrow band along the tops of southerly facing cliffs. Plant species with high indicator value include *Sassafras albidum* and *Smilax rotundifolia*. Cliff Top Virginia Pine Forest [*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest - CEGL007119] map class: Cliff Top Virginia Pine Forest.

2.2.1.2. Forests dominated or codominated by *Tsuga canadensis.*

2.2.1.2.1. Forests along tributary streams with *Betula alleghaniensis* var. *alleghaniensis* common to codominant. Occurs along steep banked, high gradient streams in cold, deep canyons. Yellow Birch Cold Cove Forest [*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest - CEGL007861] map class: Yellow Birch Cold Cove Forest.

2.2.1.2.2. Forests along tributary streams or in other landscape positions. If *Betula alleghaniensis* var. *alleghaniensis* is common then community is not along a tributary stream.

2.2.1.2.2.1. *Betula lenta* usually codominant or common. *Liriodendron tulipifera* and *Fagus grandifolia* often present. *Rhododendron maximum* usually dominant in shrub layer. Forests occurring in protected positions, on north slopes, in ravines, or below cliffs. Plant species with high indicator value include *Mitchella repens* and *Fagus grandifolia*. Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest [*Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest - CEGL007543] map classes: Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest, inclusions within Sugar Maple - Yellow Buckeye - American Basswood Forest, inclusions within Deciduous Tree / Great Laurel Forest.

2.2.1.2.2.2. *Quercus prinus* usually dominant or codominant. *Rhododendron maximum* may be abundant. *Rhododendron catawbiense* usually present. *Betula alleghaniensis* var. *alleghaniensis* may be present. Forests or woodlands occurring in exposed positions on north slopes on top of cliffs or along crests of ridge spurs. Plant species with high indicator value include *Rhododendron catawbiense* and *Aralia nudicaulis.*

Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest [*Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest - CEGL008524] map class: Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest.

2.2.2. Deciduous forests. Forests having <25% canopy cover by conifers.

2.2.2.1. Woodlands or forests dominated by *Robinia pseudoacacia*. Successional on abandoned agricultural or mine lands. Successional Black Locust Woodland [*Robinia pseudoacacia* Forest - CEGL007279] map classes: Successional Black Locust Woodland, Strip Mine Reclamation, Disturbed Area, Developed Area.

2.2.2.2. *Robinia pseudoacacia*, if present, not dominant.

2.2.2.2.1. Deciduous forests with a dense tall shrub layer (>1 meter) with 25% or greater cover by *Rhododendron maximum*.

2.2.2.2.1.1. Forests along tributary streams with *Betula alleghaniensis* var. *alleghaniensis* common to codominant. Occurs along steep banked, high gradient streams in cold, deep canyons. The conifer *Tsuga canadensis* may be codominant. Yellow Birch Cold Cove Forest [*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest - CEGL007861] map class: Yellow Birch Cold Cove Forest.

2.2.2.2.1.2. *Betula alleghaniensis* var. *alleghaniensis* absent or uncommon. Trees commonly include species of *Quercus, Liriodendron tulipifera, Betula lenta, Acer rubrum*, and others. Deciduous Tree / Great Laurel Forest [*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest - CELT007543, a local subtype of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest - CEGL007543] map classes: Deciduous Tree / Great Laurel Forest, inclusions within Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest, inclusions within Sugar Maple - Yellow Buckeye - American Basswood Forest.

2.2.2.2.2. *Rhododendron maximum* not dominant in the tall shrub layer.

2.2.2.2.2.1. Forests with canopy dominated by species of *Quercus*. *Acer saccharum* var. s*accharum* may be common in the understory or codominant in subcanopy. *Liriodendron tulipifera* and *Carya* spp. may be common or codominant. *Tilia americana* and *Aesculus flava* are usually uncommon or absent.

2.2.2.2.2.1.1. *Acer saccharum* var. *saccharum* or *Acer nigrum* common in subcanopy, may be codominant in the canopy.

2.2.2.2.2.1.1.1. *Quercus muehlenbergii* dominant or codominant in the canopy or subcanopy. Rare community occurring in small patches and narrow zones on lower slopes below calcium-rich rock outcrops. Chinquapin Oak - Black Maple Forest [*Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest

(CEGL004793)] map classes: Chinquapin Oak - Black Maple Forest, inclusions within Sugar Maple - Yellow Buckeye - American Basswood Forest, inclusions within Oak - Hickory - Sugar Maple Forest.

2.2.2.2.2.1.1.2. *Quercus muehlenbergii* usually absent. Forests typically dominated by *Quercus prinus* and *Quercus rubra* with *Acer saccharum* var. *saccharum* common in the canopy or understory strata. Other common canopy trees include *Fraxinus americana, Quercus alba* and species of *Carya.* Extensive matrix forest type on middle to lower slopes. Plant species with high indicator value include *Acer saccharum* var. *saccharum, Asclepias quadrifolia, Packera obovata, Fraxinus americana, Carex albursina, Cercis canadensis* and *Carya ovata.* Oak - Hickory - Sugar Maple Forest [*Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest - CEGL007268] map classes: Oak - Hickory - Sugar Maple Forest, inclusions within and grading towards oak - hickory forest, inclusions within and grading towards Sugar Maple - Yellow Buckeye - American Basswood Forest.

2.2.2.2.2.1.2. *Acer saccharum* var. *saccharum* and *Acer nigrum* absent or uncommon. *Acer rubrum* usually common or codominant with oaks (*Quercus prinus, Quercus alba, Quercus rubra, Quercus velutina, Quercus coccinea*).

2.2.2.2.2.1.2.1. *Liriodendron tulipifera* and/or species of *Carya* often common or codominant in canopy. Ericaceous shrubs (*Kalmia latifolia, Gaylussacia baccata, Vaccinium* spp., *Rhododendron* spp.) may be present but do not usually provide >5% cover. Extensive matrix forest on plateaus and upper gorge slopes. Plant species with high indicator value include *Dioscorea quaternata, Thelypteris noveboracensis, Chimaphila maculata, Cornus florida, Galium circaezans* and *Acer pensylvanicum.* Oak - Hickory Forest [*Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida Forest* - CEGL007267] map classes: Oak - Hickory Forest, inclusions within and grading towards Oak - Hickory - Sugar Maple Forest, inclusions within and grading towards Oak / Ericad Forest.

2.2.2.2.2.1.2.2. Species of *Carya* and *Liriodendron tulipifera* uncommon. Ericaceous shrubs (*Kalmia latifolia,*

Gaylussacia baccata, Vaccinium spp., *Rhododendron* spp.) dominant in short shrub layer. Small patch to large patch forest on convex landforms and warm aspects. Plant species with high indicator value include *Vaccinium pallidum, Sassafras albidum, Castanea dentata,* and *Kalmia latifolia.* Oak / Ericad Forest [*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest - CEGL006271] map classes: Oak / Ericad Forest, inclusions within and grading towards Oak - Hickory Forest, inclusions within and grading towards Oak - Hickory - Sugar Maple Forest.

2.2.2.2.2.2. Forests with canopies dominated by species other than *Quercus*. *Quercus* spp. may be present but do not collectively provide greater than 25% of total canopy cover.

2.2.2.2.2.2.1. Forests along tributary streams with *Betula alleghaniensis* var. *alleghaniensis* common to codominant. Occurs along steep banked, high gradient streams in cold, deep canyons. The conifer *Tsuga canadensis* may be codominant. *Rhododendron maximum* is often dominant in the tall shrub layer. Yellow Birch Cold Cove Forest [*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest - CEGL007861] map class: Yellow Birch Cold Cove Forest.

2.2.2.2.2.2.2. *Betula alleghaniensis* var. *alleghaniensis* uncommon or absent.

2.2.2.2.2.2.2.1. Successional forests strongly dominated by *Liriodednron tulipifera*.

2.2.2.2.2.2.2.1.1. Forests on relatively dry, acidic sites often having abundant *Quercus* spp. in the canopies. Successional Tuliptree - Oak Forest [Liriodendron tulipifera - Quercus spp. Forest - CEGL007221] map classes: Successional Tuliptree Forest, Strip Mine Reclamation, Disturbed Area, inclusions within Oak - Hickory Forest.

2.2.2.2.2.2.2.1.2. Forests on moist, rich sites. Plant species with high indicator value include *Lindera benzoin* and *Cercis canadensis.* Successional Tuliptree / Northern Spicebush Forest [*Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest - CEGL007220] map classes: Successional Tuliptree Forest, Sugar Maple - Yellow Buckeye - American Basswood Forest, Strip Mine Reclamation, Disturbed Area.

2.2.2.2.2.2.2.2. Forests dominated by a mixture of species including, in various combinations, *Acer saccharum* var. *saccharum, Aesculus flava, Fraxinus americana*., *Ulmus rubra, Tilia americana, Robinia pseudoacacia, Magnolia acuminata, Quercus rubra, Carya cordiformis* and others. *Liriodendron tulipifera* may be present or codominant but does not provide >50% of total canopy cover. Extensive matrix forests on cool aspects and lower gorge slopes. Plant species with high indicator value include *Lindera benzoin, Laportea canadensis, Aesculus flava, Caulophyllum thalictroides, Hydrophyllum canadense,* and *Asarum canadense*. Sugar Maple - Yellow Buckeye - American basswood Forest [*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest - CEGL005222] map classes: Sugar Maple - Yellow Buckeye - American Basswood Forest, Steep Riparian Edge, inclusions in and grading to Oak - Hickory - Sugar Maple Forest, inclusions within and grading towards Oak - Hickory Forest.

Appendix I. Local and global vegetation association descriptions for New River Gorge National River.

INTERNATIONAL ECOLOGICAL CLASSIFICATION STANDARD:

TERRESTRIAL ECOLOGICAL CLASSIFICATIONS

New River Gorge National River

14 May 2007

by

NatureServe

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

256 Guptill Road; Belgrade, ME 04917

This subset of the International Ecological Classification Standard covers vegetation associations attributed to New River Gorge National River. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC <mary_russo@natureserve.org> and Sue Gawler, Regional Ecologist, Boston, MA <sue_gawler@natureserve.org>.

NatureServe
A Network Connecting Science With Conservation

Copyright © 2007 NatureServe, 1101 Wilson Blvd, 15th floor
Arlington, VA 22209, U.S.A. All Rights Reserved.

Citations:

The following citation should be used in any published materials which reference ecological system and/or International Vegetation Classification (IVC hierarchy) and association data:

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 8 January 2007.

Restrictions on Use: Permission to use, copy and distribute these data is hereby granted under the following conditions:

1. The above copyright notice must appear in all documents and reports;
2. Any use must be for informational purposes only and in no instance for commercial purposes;
3. Some data may be altered in format for analytical purposes, however the data should still be referenced using the citation above.

Any rights not expressly granted herein are reserved by NatureServe. Except as expressly provided above, nothing contained herein shall be construed as conferring any license or right under any NatureServe copyright.

Information Warranty Disclaimer: All data are provided as is without warranty as to the currentness, completeness, or accuracy of any specific data. The absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. NatureServe hereby disclaims all warranties and conditions with regard to these data, including but not limited to all implied warranties and conditions of merchantability, fitness for a particular purpose, and non-infringement. In no event shall NatureServe be liable for any special, indirect, incidental, consequential damages, or for damages of any kind arising out of or in connection with the use of these data. Because the data in the NatureServe Central Databases are continually being updated, it is advisable to refresh data at least once a year after receipt.

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

These data are extracted from:

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 14 May 2007.

This document may be generally cited as follows:

NatureServe[1]. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. Associations of New River Gorge National River. NatureServe Central Databases. Arlington, VA. Data current as of 14 May 2007.

Table of Contents

Page

Common Name (Park-specific): Pine Plantation 165

Common Name (Park-specific): Successional Eastern White Pine Forest 169

Common Name (Park-specific): Cliff Top Virginia Pine Forest 175

Common Name (Park-specific): Successional Virginia Pine Forest 183

Common Name (Park-specific): Sugar Maple - Yellow Buckeye -
American Basswood Forest 189

Common Name (Park-specific): Successional Tuliptree - Oak Forest 197

Common Name (Park-specific): Successional Tuliptree / Northern
Spicebush Forest 203

Common Name (Park-specific): Chinquapin Oak - Black Maple Forest 209

Common Name (Park-specific): Oak / Ericad Forest 215

Common Name (Park-specific): Eastern Hemlock - Chestnut Oak /
Catawba Rhododendron Forest 221

Common Name (Park-specific): Oak - Hickory - Sugar Maple Forest 227

Common Name (Park-specific): Oak - Hickory Forest 233

Common Name (Park-specific): Successional Black Locust Woodland 239

Common Name (Park-specific): Successional Box-elder Forest 243

Common Name (Park-specific): Silver Maple Floodplain Forest 247

Common Name (Park-specific): Oak - Tuliptree / Mountain Silverbell
Floodplain Forest 253

Common Name (Park-specific): Sycamore - Ash Floodplain Forest 259

Common Name (Park-specific): Forest Seep 267

Common Name (Park-specific): Yellow Birch Cold Cove Forest 275

Common Name (Park-specific): Deciduous Tree / Great Laruel Forest 283

Table of Contents (continued)

Page

Common Name (Park-specific): Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest 287

Common Name (Park-specific): Cliff Top Pitch Pine Woodland 295

Common Name (Park-specific): Eastern Red-cedar - Virginia Pine Flatrock Woodland 299

Common Name (Park-specific): Sycamore - River Birch Riverscour Woodland 305

Common Name (Park-specific): Kudzu Patch 311

Common Name (Park-specific): Smooth Alder Shrub Wetland..... 315

Common Name (Park-specific): Bushy St. John's-wort Shrub Wetland 321

Common Name (Park-specific): Old Field 327

Common Name (Park-specific): Riverscour Prairie 333

Common Name (Park-specific): Twisted Sedge Rocky Creekbed 339

Common Name (Park-specific): Rice Cutgrass Marsh..... 345

Common Name (Park-specific): Bulruch - American Bur-reed Marsh 349

Common Name (Park-specific): Black Willow Slackwater Woodland 355

Common Name (Park-specific): Riverbank Tall Herbs 361

Common Name (Park-specific): American Water-willow Cobble Bar..... 367

Common Name (Park-specific): Lizard's-tail Backwater Slough 373

Common Name (Park-specific): Submerged Aquatic Vegetation 379

Common Name (Park-specific): Riverbank Annuals 383

Common Name (Park-specific): Common Rocktripe Cliff Face 389

Common Name (Park-specific): Dry Sandstone Cliff 393

Common Name (Park-specific): Tributary Floodplain Forest 397

COMMON NAME (PARK-SPECIFIC): PINE PLANTATION

SYNONYMS
NVC English Name: **Eastern White Pine Planted Forest**
NVC Scientific Name: ***Pinus strobus* Planted Forest**
NVC Identifier: **CEGL007178**

LOCAL INFORMATION

Environmental Description: Most plantations of *Pinus strobus* (eastern white pine) have been established as reclamation vegetation on strip mines. They occur on benches cut from upper gorge slopes and on plateaus above the gorge. Underlying bedrock on mine sites is mostly acidic sandstone of the Pottsville group, but soil pH and levels of nutrients may be elevated due to disturbance by mining. A few stands have been planted on farms and in other developed areas where soils may be derived from sandstones or shales of the Pottsville or Mauch Chunk groups. Elevations of mapped stands range from 381 to 797 m. Slopes range from nearly flat to steep, but most stands occur on gentle slopes (mapping unit values range from 0.7 to 44 degrees, mean = 13 degrees).
Vegetation Description: Pine plantations at New River Gorge are comprised mostly of *Pinus strobus* (eastern white pine) but also include *Pinus resinosa* (red pine) and possibly other planted conifers. Natural trees which may occur in the canopies of these stands include *Robinia pseudoacacia* (black locust), *Betula lenta* (sweet birch), and *Acer rubrum* (red maple). Understory vegetation is usually sparse in older stands but is more abundant in younger stands where there is typically a large component of exotic species such as *Rosa multiflora* (multiflora rose), *Lolium pratense* (meadow ryegrass), and *Polygonum caespitosum var. longisetum* (oriental ladysthumb). Abundant native species in the one sampled plot include *Acer pensylvanicum* (striped maple), *Prunus serotina var. serotina* (black cherry), and *Ostrya virginiana var. virginiana* (hophornbeam) in the shrub layers, and *Ageratina altissima* (white snakeroot), *Parthenocissus quinquefolia* (Virginia creeper), and *Polystichum acrostichoides* (Christmas fern) in the ground layer. Vascular plant species richness in the one sampled plot is 32.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus* (eastern white pine)

Characteristic Species: *Pinus strobus* (eastern white pine).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA			[not crosswalked]	

Local Range: The distribution of pine plantations is highly correlated with coal mines, which are found in the northern two-thirds of the park. They are most abundant in the middle section of the park which has been mined more recently than the northern section. The few occurrences in the southern section are associated with farms and other developed areas.
Classification Comments: Information not available.
Other Comments: Information not available.
Local Description Authors: J.P. Vanderhorst.
Plots: NERI.288.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Planted/Cultivated temperate or subpolar needle-leaved evergreen forest (I.A.8.C.)
Formation	Planted/cultivated temperate or subpolar needle-leaved evergreen forest (I.A.8.C.x.)
Alliance	*Pinus strobus* Planted Forest Alliance (A.98)
Alliance (English name)	Eastern White Pine Planted Forest Alliance
Association	*Pinus strobus* Planted Forest
Association (English name)	Eastern White Pine Planted Forest
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This white pine plantation type is found throughout the northeastern and midwestern United States and adjacent Canada. Stands contain plantations of *Pinus strobus* (eastern white pine) that are maintained for the extraction of forest products. Some have been planted as reclamation projects (e.g., following strip-mining). At maturity, the tree canopy is usually dense and contains a monospecific layer of *Pinus strobus* (eastern white pine). *Pinus resinosa* (red pine) is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and *Prunus serotina* (black cherry); *Robinia pseudoacacia* (black locust) and *Betula lenta* (sweet birch) are occasionally present. *Acer pensylvanicum* (striped maple) and *Ostrya virginiana* (hophornbeam) are common small trees. The shrub layer is typically sparse and mostly consists of smaller individuals of the tree species. The field layer varies from sparse to absent; it may be locally well-developed in small openings, with variable composition. In some stands, mosses may be abundant. Susceptibility to a variety of pests or diseases, including white pine blister rust (*Cronartium ribicola*) and southern pine beetle (*Dendroctonus frontalis*), has had some impact on its commercial use.

Environmental Description: Stands contain plantations of *Pinus strobus* (eastern white pine) that are maintained for the extraction of forest products. The type does well on a variety of soils. Some have been planted on strip-mine reclamation sites.

Vegetation Description: The tree canopy at maturity is usually dense and contains a monospecific layer of *Pinus strobus* (eastern white pine). *Pinus resinosa* (red pine) is occasionally present in small amounts. In older stands or gaps, regenerating trees may include *Fagus grandifolia* (American beech), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), and *Prunus serotina* (black cherry); *Robinia pseudoacacia* (black locust) and *Betula lenta* (sweet birch) are occasionally present. *Acer pensylvanicum* (striped maple) and *Ostrya virginiana* (hophornbeam) are common small trees. The shrub layer is typically sparse and mostly consists of smaller individuals of the tree species. The field layer varies from sparse to absent; it may be locally well-developed in small openings, with variable composition. In some stands, mosses may be abundant.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus* (eastern white pine)

Characteristic Species: *Pinus strobus* (eastern white pine).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This white pine plantation type is found throughout the northeastern and midwestern United States and adjacent Canada.
States/Provinces: GA, KY, MD, NC, NH, NY, PA, SC, TN, VA, VT, WV.
Federal Lands: DOD (Camp Dawson); NPS (Blue Ridge Parkway, Booker T. Washington, Chickamauga-Chattanooga, Marsh-Billings-Rockefeller, New River Gorge, Valley Forge); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains)); USFWS (Chesapeake Marshlands).

CONSERVATION STATUS

Rank: GNA (cultural) (8-Aug-2000).
Reasons: This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: There was a lot of planting of white pine from the 1930s into the 1950s, but there has been very little planting since then (P. Manion pers. comm. 2001). On the Daniel Boone National Forest of Kentucky, *Pinus strobus* (eastern white pine) plantings are of limited extent and are related to wildlife plantings. In the southern part of this type's range, there has been some damage from southern pine beetle (*Dendroctonus frontalis*). These plantations have been observed in the Peters Mountain area (James River Ranger District) and various other sites in the George Washington and Jefferson national forests.
Similar Associations:
- *Pinus* spp. Planted Forest (CEGL006313).
- *Pinus strobus* Successional Forest (CEGL007944).

Related Concepts:
- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B
- Unclassified Clearcut Regeneration (Fleming and Moorhead 2000) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. S. C. Gawler.
References: Allard 1990, Fleming and Coulling 2001, Fleming and Moorhead 2000, Reschke 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL EASTERN WHITE PINE FOREST

SYNONYMS
NVC English Name: **Eastern White Pine Successional Forest**
NVC Scientific Name: ***Pinus strobus* Successional Forest**
NVC Identifier: **CEGL007944**

LOCAL INFORMATION

Environmental Description: This successional forest occurs primarily on abandoned farmland on plateaus but may also occur on other disturbed sites. Areas of many stands are mapped as open (white) on older topographic maps or are adjacent to mapped open areas. There is a large concentration of this association on the rolling plateau near Kate's Branch where all the plots of this type were sampled. Most of this area is upland, but it includes some wetland fringe and depressions. Soils in this area are derived from sandstone of the Pottsville group, are very strongly acidic, with low levels of organic matter and most nutrients (Ca, K, Mg, Mn, N, P, Zn), and are covered by a layer of pine needles. Additional stands were mapped on soils derived from shale of the Mauch Chunk group, but no plots were sampled. Soils on shale are likely to have finer textures, higher levels of nutrients, and may occur on steeper topography. Elevations of mapped stands range from 458 to 888 m. Slopes range from nearly flat to steep, but most stands occur on gentle slopes (mapping unit values range from 0 to 33 degrees, mean = 9 degrees).
Vegetation Description: Stands of this association are strongly dominated by even-aged, closed canopies of *Pinus strobus* (eastern white pine). Representation of *Pinus strobus* (eastern white pine) decreases in the lower strata but may include repressed or dead trees in the subcanopy and a few live saplings and seedlings. Deciduous trees which occur in lesser amounts in the canopy and subcanopy include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), and *Populus grandidentata* (bigtooth aspen). Understory vegetation is usually sparse due to heavy shade and sterile soils, but adjacent to the open wetland at Kate's Branch, the evergreen shrub *Kalmia latifolia* (mountain laurel) has high cover probably due to increased sunlight at the edge of the stand. Woody understory species in more typical plots include *Acer pensylvanicum* (striped maple), *Amelanchier arborea var. arborea* (common serviceberry), *Prunus serotina var. serotina* (black cherry), *Smilax rotundifolia* (roundleaf greenbrier), and *Vaccinium pallidum* (Blue Ridge blueberry). The ground layer includes clonal patches of *Lycopodium digitatum* (fan clubmoss), which may attain high cover. Herbs which occur in trace amounts with high constancy include *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), and *Potentilla simplex* (common cinquefoil). Mosses which occur in trace amounts include *Atrichum angustatum* (atrichum moss), *Hypnum curvifolium* (curveleaf hypnum moss), *Polytrichum commune* (polytrichum moss), and *Steerecleus serrulatus* (steerecleus moss). On the wetland fringe at Kate's Branch, *Lycopodium obscurum* (rare clubmoss) and *Osmunda cinnamomea* (cinnamon fern) become common in the herb layer. Vascular plant species richness in the 5 sampled plots ranges from 19 to 30 taxa (mean = 23.6).
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus* (eastern white pine)
Herb (field)	Fern or fern ally	*Lycopodium digitatum* (fan clubmoss)

Characteristic Species: *Liriodendron tulipifera* (tuliptree), *Lycopodium digitatum* (fan clubmoss), *Populus grandidentata* (bigtooth aspen).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs in mostly small patches on the plateaus of the northern two-thirds and on benches and gorge/mountain slopes in the southern third of New River Gorge National River. There is a concentration of this association on the plateau around Kate's Branch in the middle section of the park.
Classification Comments: There has been some disagreement in the past as to whether the stands of *Pinus strobus* (eastern white pine) around Kate's Branch are semi-natural successional communities or cultural plantations. Planted stands of *Pinus strobus* (eastern white pine) also occur at New River Gorge National River, usually associated with strip mine reclamation, but these stands have trees planted in rows which are readily apparent on the ground and on aerial photography. This feature is lacking in the mapped stands of *Pinus strobus* (eastern white pine) Successional Forest. Stands of this association on soils derived from shale were not sampled during this study and may have somewhat different floristic composition.
Other Comments: Information not available.
Local Description Authors: J.P. Vanderhorst.
Plots: NERI.50, NERI.88, NERI.295, NERI.297, NERI.299.
New River Gorge National River Inventory Notes: Stands of this association on soils derived from shale were not sampled during this study and may have somewhat different floristic composition.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	*Pinus strobus* Forest Alliance (A.128)
Alliance (English name)	Eastern White Pine Forest Alliance
Association	*Pinus strobus* Successional Forest
Association (English name)	Eastern White Pine Successional Forest
Ecological System(s):	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Northeastern Interior Dry-Mesic Oak Forest (CES202.592).

GLOBAL DESCRIPTION

Concept Summary: This forest is an early-successional forest dominated by *Pinus strobus* (eastern white pine), typically with a very dense canopy and little understory. This successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of the *Pinus strobus* Forest Alliance (A.128). Associated woody and

herbaceous species vary with geography. In the northeastern states, the tree canopy is often monotypic and even-aged, with occasional associates including *Acer rubrum* (red maple), *Juniperus virginiana* (eastern redcedar), or scattered *Quercus rubra* (northern red oak) or *Quercus velutina* (black oak). In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple). The understory is poorly developed or characterized by scattered individuals found in the canopy. The herbaceous cover is variable depending on the density of tree and shrub cover. In more open stands, typical species are those associated with old fields: *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Anthoxanthum odoratum* (sweet vernalgrass), *Poa pratensis* (Kentucky bluegrass), *Schizachyrium scoparium* (little bluestem), *Elymus repens* (quackgrass), *Bromus inermis* (smooth brome), *Agrostis gigantea* (redtop), *Euthamia graminifolia* (flat-top goldentop), *Achillea millefolium* (common yarrow), and *Daucus carota* (Queen Anne's lace). In stands that are more heavily forested, typical herbs include *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Mitchella repens* (partridgeberry), and *Lycopodium* (clubmoss) species. The substrate is usually covered by a thick layer of pine needle duff. In the Southern Blue Ridge, where this association was originally defined, typical canopy and subcanopy associates include *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Pinus rigida* (pitch pine), and *Liquidambar styraciflua* (sweetgum), with *Tsuga canadensis* (eastern hemlock) often forming a dense shrub stratum. The understory is typically made up of ruderal or exotic species that favor openings or disturbance. In this ecoregion, it occurs in former old fields and on formerly cleared flats along streams. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* (eastern white pine) is spreading from plantings, especially in the Red River Gorge.

Environmental Description: This wide-ranging successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of the *Pinus strobus* Forest Alliance (A.128). It typically occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed, developing as *Pinus strobus* (eastern white pine) colonizes the open fields. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

Vegetation Description: The tree canopy ranges from woodland to forest closure, with 25-85% cover. It is often monotypic and even-aged *Pinus strobus* (eastern white pine), with occasional associates, including *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Juniperus virginiana* (eastern redcedar), or scattered *Quercus rubra* (northern red oak) or *Quercus velutina* (black oak). *Liriodendron tulipifera* (tuliptree) is a common minor associate in the southeastern portion of the range. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* (white ash) and *Acer saccharum* (sugar maple). The understory is poorly developed or characterized by scattered individuals found in the canopy. Shrubs are often present in the more open stands and include native species, such as *Cornus racemosa* (gray dogwood), *Rhus glabra* (smooth sumac), *Viburnum prunifolium* (blackhaw), and *Rubus* (blackberry) spp., as well as exotics, such as *Elaeagnus umbellata* (autumn olive), *Rosa multiflora* (multiflora rose), *Lonicera morrowii* (Morrow's honeysuckle), and *Berberis thunbergii* (Japanese barberry). The herbaceous cover is variable depending on the density of tree and shrub cover. In more open stands, typical species are those associated with old fields: *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Anthoxanthum odoratum* (sweet vernalgrass), *Poa pratensis* (Kentucky bluegrass), *Schizachyrium scoparium* (little bluestem), *Elymus repens* (quackgrass), *Bromus inermis* (smooth brome), *Agrostis gigantea* (redtop), *Euthamia*

graminifolia (flat-top goldentop), *Achillea millefolium* (common yarrow), and *Daucus carota* (Queen Anne's lace). In stands that are more heavily forested, typical herbs include *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Medeola virginiana* (Indian cucumber), *Trientalis borealis* (starflower), *Mitchella repens* (partridgeberry), and *Lycopodium* (clubmoss) species. The substrate is usually covered by a thick layer of pine needle duff. In the Southern Blue Ridge, where this association was originally defined, typical canopy and subcanopy associates include *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Pinus rigida* (pitch pine), and *Liquidambar styraciflua* (sweetgum), with *Tsuga canadensis* (eastern hemlock) often forming a dense shrub stratum. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* (eastern white pine) is spreading from plantings, especially in the Red River Gorge.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus strobus* (eastern white pine)

Characteristic Species: *Pinus strobus* (eastern white pine).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This weedy type may be expected to occur throughout the range of the alliance (i.e., from Michigan, northern Wisconsin, northern and eastern Minnesota, extreme northeastern Iowa, and from Maine and New Hampshire south to Georgia and Tennessee, as well as in Ontario, Canada). It has only been documented in areas where project-specific needs have required it.
States/Provinces: CT, GA, KY, MA, MD?, ME, MI, MN, NC, NH, NJ, NY, PA, RI, SC, TN, VA, VT, WI, WV.
Federal Lands: NPS (Big South Fork, Blue Ridge Parkway, Carl Sandburg Home, Delaware Water Gap, Gettysburg, Great Smoky Mountains, Marsh-Billings-Rockefeller, New River Gorge, Obed, Saint-Gaudens); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson); USFWS (Great Meadows, Moosehorn).

CONSERVATION STATUS

Rank: GNA (ruderal) (11-Feb-2001).
Reasons: This forest represents early-successional vegetation and is thus not of conservation concern and does not receive a conservation status rank.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: This weedy type may be expected to occur throughout the range of the alliance but has only been attributed in areas where The Nature Conservancy ecoregional planning or other project-specific needs have documented its occurrence. Rangewide review should greatly expand its geographic scope.
Similar Associations:

- *Pinus strobus* Planted Forest (CEGL007178).

Related Concepts:

- *Pinus strobus / (Diphasiastrum digitatum, Lycopodium obscurum)* forest (Vanderhorst 2001b) =
- White Pine - White Oak - Chestnut Oak Type (Schmalzer and DeSelm 1982) B

SOURCES

Description Authors: K. D. Patterson, mod. L. A. Sneddon and S. C. Gawler.

References: Fleming and Coulling 2001, NatureServe Ecology - Southeastern U.S. unpubl. data, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): CLIFF TOP VIRGINIA PINE FOREST

SYNONYMS

NVC English Name:	**Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Chestnut Oak) / Hillside Blueberry Forest**
NVC Scientific Name:	***Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest**
NVC Identifier:	**CEGL007119**

LOCAL INFORMATION

Environmental Description: This association occurs on cliff tops and rocky spur ridges and upper gorge slopes weathered from sandstone of the New River Formation (Pottsville group). Aspects are mostly southerly, and soils are dry, sandy, and very highly acidic. Slopes range from nearly flat to very steep (mapping unit values range from 1.4 to 48 degrees, mean = 29 degrees). Elevations of mapped stands range from 304 to 845 m. On top of major cliff bands such as the Endless Wall, stands occur more or less continuously in narrow zones (less than 100 m wide), but where massive cliff bands are absent, small patches are scattered along an elevational zone on convex positions around rock outcrops. Along the edges of cliff tops, there is usually a narrow zone of exposed bedrock pavement and patches of very shallow soil, but soils become progressively deeper back from the cliff edge. Portions of the stands along the cliff edge are likely to be edaphic climax communities, but further back from the edge, they are likely to be successional following fire (Vanderhorst 2002, Maxwell 2006). Historical photographs from the first half of the 20th century show that the cliff top stands of *Pinus virginiana* (Virginia pine) extended further back from the cliff edge than they do today (Maxwell 2006) in areas that are now occupied by deciduous forests. The area occupied by *Pinus virginiana* (Virginia pine) may have increased following settlement due to logging and frequent fires ignited by the coal and railroad industries, but the area now appears to be contracting due to fire suppression and lack of ignition sources. Cliff-top stands of this association near popular recreational areas such as the Endless Wall may be heavily trampled, and damage to trees from top roping by recreational climbers is common in these areas.

Vegetation Description: Stands of this association in New River Gorge are woodlands or open forests strongly dominated by *Pinus virginiana* (Virginia pine) but may also include deciduous trees in the canopy. The canopy is typically short (<20 m) with tree height and canopy cover decreasing with increasing severity of the microsite. *Pinus rigida* (pitch pine) occurs as an associate in some stands but is not dominant. The most common associated deciduous tree in the canopy is *Quercus prinus* (chestnut oak). Additional deciduous canopy trees include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Quercus velutina* (black oak). One plot back from the cliff edge sampled to represent a successional patch has some *Liriodendron tulipifera* (tuliptree) in the canopy. Above the Endless Wall, abundance of *Pinus virginiana* (Virginia pine) decreases and abundance of deciduous trees increases with distance from the cliff edge (Maxwell 2006). Subcanopies may include smaller individuals of *Pinus virginiana* (Virginia pine), but are typically dominated by deciduous species, including *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Oxydendrum arboreum* (sourwood). Shrub layers are typically dense and consist of tree saplings and ericaceous and other acid-tolerant shrubs. Common species in the shrub layers in addition to saplings of the canopy species include *Gaylussacia baccata* (black huckleberry), *Ilex opaca* var. *opaca* (American holly), *Kalmia*

latifolia (mountain laurel), *Rhododendron maximum* (great laurel), *Sassafras albidum* (sassafras), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Vaccinium pallidum* (Blue Ridge blueberry). Regeneration of *Pinus virginiana* (Virginia pine) in the shrub layers decreases with distance from the cliff edge (Maxwell 2006). The ericaceous subshrubs *Epigaea repens* (trailing arbutus) and *Gaultheria procumbens* (eastern teaberry) have high constancy and abundance. The herb layer has sparse cover and low diversity, consisting of a few stems of drought- and acid-tolerant species such as *Cypripedium acaule* (moccasin flower), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Mitchella repens* (partridgeberry), *Monotropa uniflora* (Indianpipe), and *Pteridium aquilinum* (western brackenfern). Mosses collected from this community include *Dicranum scoparium* (dicranum moss), *Leucobryum albidum* (leucobryum moss), *Leucobryum glaucum* (leucobryum moss), and *Polytrichum juniperinum* (juniper polytrichum moss). Vascular plant species richness in the 7 sampled plots ranges from 20 to 37 taxa (mean = 24.9).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum* (Blue Ridge blueberry)

Characteristic Species: *Acer rubrum* (red maple), *Gaultheria procumbens* (eastern teaberry), *Kalmia latifolia* (mountain laurel), *Leucobryum glaucum* (leucobryum moss), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Quercus prinus* (chestnut oak), *Sassafras albidum* (sassafras), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association occurs on upper slopes of the New River Gorge and tributary gorges (Glade Creek, Mann's Creek, and Ephraim Creek) in the northern two-thirds of the park.

Classification Comments: Some patches of *Pinus virginiana* (Virginia pine) (e.g., plot NERI.221) and parts of others which occur on sandstone-derived soils in the vicinity of cliffs and rock outcrops in the northern two-thirds of the park may be successional, but they are classified and mapped as this association due to possibly natural fire ecology and high floristic similarity and proximity to edaphically maintained patches. Patches of clearly successional *Pinus virginiana* (Virginia pine) which occur on shale-derived soils in the southern third of the park are classified as *Pinus virginiana* (Virginia pine) Successional Forest (CEGL002591).

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.204, NERI.205, NERI.206, NERI.210, NERI.212, NERI.221, NERI.222.

New River Gorge National River Inventory Notes: Plots were sampled only in the area of the Endless Wall and Beauty Mountain where this association has its largest and best developed occurrence.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	*Pinus virginiana* Forest Alliance (A.131)
Alliance (English name)	Virginia Pine Forest Alliance
Association	*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest
Association (English name)	Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Chestnut Oak) / Hillside Blueberry Forest
Ecological System(s):	Cumberland Sandstone Glade and Barrens (CES202.337) Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692) Southern Appalachian Montane Pine Forest and Woodland (CES202.331) Southern Appalachian Low-Elevation Pine Forest (CES202.332) Central Appalachian Dry Oak-Pine Forest (CES202.591) Cumberland Acidic Cliff and Rockhouse (CES202.309).

GLOBAL DESCRIPTION

Concept Summary: This community includes *Pinus virginiana* (Virginia pine)-dominated forests of low-elevation ridges and steep upper slopes, occurring primarily in the Appalachian provinces of the eastern United States, from central Pennsylvania, south and west to northern Georgia and northern Alabama. This community occurs on narrow ridges, steep slopes, and other exposed topographic positions, over shallow, infertile soils. This mainly evergreen forest is often of low stature, with a somewhat open to closed canopy, sparse to very dense shrub cover dominated by ericaceous species, and a sparse herb stratum. *Pinus virginiana* (Virginia pine) is the canopy dominant throughout the range of the type. In some parts of the range, other *Pinus* (pine) species may be significant canopy associates, as well as dry-site *Quercus* (oak) species (e.g., *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak)). Deciduous species may form a subcanopy or sapling stratum, particularly in areas where fire has been excluded. Common shrub dominants include *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia latifolia* (mountain laurel). Herbs vary with geography but are typical of infertile, xeric habitats. Some typical herbs in this forest are *Baptisia tinctoria* (horseflyweed), *Chimaphila maculata* (striped prince's pine), *Dichanthelium commutatum* (variable panicgrass), *Epigaea repens* (trailing arbutus), *Euphorbia corollata* (flowering spurge), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Hypoxis hirsuta* (common goldstar), *Iris verna* (dwarf violet iris), *Pityopsis graminifolia var. latifolia* (narrowleaf silkgrass), *Pteridium aquilinum var. latiusculum* (western brackenfern), and *Schizachyrium scoparium* (little bluestem).

Environmental Description: Stands of this forest occur on narrow ridges and knobs, steep upper slopes, bluff and cliff tops, and other exposed sites throughout the range of the type. The community is found primarily on south-, southeast- or southwest-facing aspects on excessively drained, shallow soils. In the Blue Ridge Escarpment region, the western margin of the Blue Ridge, and west into the Ridge and Valley and Cumberland Mountains, this xeric forest occurs on convex slopes and ridges below 850 m (2800 feet) elevation, over soils classed as Inceptisols, typically Lithic Dystrochrepts originating from sandstone, shale and other noncalcareous parent material. Occurrences in rugged parts of the western Piedmont are also likely. Its environmental situation in the western Alleghenies is not known. In the Interior Low Plateau of Kentucky, Tennessee, and Indiana, this association occurs in edaphically extreme situations, including bluff tops and narrow ridges in thin soils weathered from relatively acidic caprocks with southern and western aspects, as well as other similar slopes, over cherty limestone, siltstones, sandstones, and shales. In particular, in the Knobstone Escarpment Subsection (a few Indiana counties just north of Louisville, Kentucky), it occurs in gladelike situations on steep slopes with thin soils. Along the edges of cliff tops, there is usually a narrow zone of exposed bedrock pavement and patches of very shallow soil, but soils become progressively deeper back from the cliff edge. At least in West Virginia, portions of the stands along the cliff edge are likely to be edaphic climax communities, but farther back from the edge, they are likely to be successional following fire.
Vegetation Description: This community is a needle-leaved evergreen forest with a usually somewhat open (occasionally closed) canopy. The canopy is typically short (<20 m) with tree height and canopy cover decreasing with increasing severity of the microsite. A deciduous subcanopy may be present, especially in areas where fire has been excluded. The shrub layers can be sparse but are more often dense to very dense and are composed of tall and short shrubs, predominantly ericaceous species. Herb cover is sparse, and leaf litter often dominates the ground layer. *Pinus virginiana* (Virginia pine) is the canopy dominant throughout the range of the type. In the southern Appalachians and southern Ridge and Valley it may occur with mixes of *Pinus rigida* (pitch pine), *Pinus echinata* (shortleaf pine), or *Pinus strobus* (eastern white pine). Within its range, *Pinus pungens* (Table Mountain pine) may be present as a very minor component. Regeneration of *Pinus virginiana* (Virginia pine) is concentrated along cliff edges and tends to drop off inward from the edge. Small stems of *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Oxydendrum arboreum* (sourwood) are common in the subcanopy and sapling strata, particularly in areas where fire has been excluded, and may occur in the canopy as well. In the Southern Blue Ridge/Piedmont and Southern Blue Ridge/Ridge and Valley transition regions, *Quercus marilandica* (blackjack oak), *Quercus falcata* (southern red oak), and *Quercus stellata* (post oak) can be deciduous components. Common shrub dominants include *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Gaylussacia baccata* (black huckleberry), and *Kalmia latifolia* (mountain laurel). Other typical shrubs can include *Gaylussacia ursina* (bear huckleberry), *Kalmia latifolia* (mountain laurel), *Sassafras albidum* (sassafras), and *Vaccinium hirsutum* (hairy blueberry) (southwestern North Carolina and southeastern Tennessee only). *Smilax glauca* (cat greenbrier) and *Smilax rotundifolia* (roundleaf greenbrier) can be common vines. In the sparse herb layer, characteristic species from the Southern Blue Ridge and Southern Ridge and Valley include *Baptisia tinctoria* (horseflyweed), *Chimaphila maculata* (striped prince's pine), *Dichanthelium commutatum* (variable panicgrass), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Euphorbia corollata* (flowering spurge), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Hypoxis hirsuta*

(common goldstar), *Iris verna* (dwarf violet iris), *Pityopsis graminifolia var. latifolia* (narrowleaf silkgrass), *Pteridium aquilinum var. latiusculum* (western brackenfern), and *Schizachyrium scoparium* (little bluestem). Typical herbs from examples in the western portion of the range (Interior Low Plateau) include *Antennaria plantaginifolia* (woman's tobacco), *Antennaria solitaria* (singlehead pussytoes), *Carex albicans var. albicans* (whitetinge sedge), *Danthonia spicata* (poverty oatgrass), *Dichanthelium dichotomum* (cypress panicgrass), *Lespedeza violacea* (violet lespedeza), *Hieracium gronovii* (queendevil), *Hieracium venosum* (rattlesnakeweed), *Krigia biflora* (twoflower dwarfdandelion), *Solidago erecta* (showy goldenrod), and *Tephrosia virginiana* (Virginia tephrosia) (M. Homoya pers. comm. 1999). In some of these examples *Opuntia humifusa* (devil's-tongue), *Calamagrostis porteri ssp. insperata* (Porter's reedgrass), and *Solidago squarrosa* (stout goldenrod) may occur locally.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus* (chestnut oak)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata* (black huckleberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry)

Characteristic Species: *Comptonia peregrina* (sweet fern), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Pinus virginiana* (Virginia pine), *Pteridium aquilinum* (western brackenfern), *Sassafras albidum* (sassafras).

Other Noteworthy Species:

Species	GRank	Type	Note
Buckleya distichophylla (piratebush)	G2	plant	
Calamagrostis porteri ssp. *insperata* (Porter's reedgrass)	G4T3	plant	
Cleistes bifaria (small spreading pogonia)	-	plant	
Penstemon deamii (deam's beardtongue)	G1	plant	
Thermopsis villosa (hairy false lupine)	G3?	plant	
Vaccinium hirsutum (hairy blueberry)	G3	plant	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community occurs primarily in the Appalachian region of the United States, ranging from central Pennsylvania, south and west through the Ridge and Valley, Blue Ridge, and Cumberland Plateau to northern Georgia and Alabama, extending westward to scattered areas in the Interior Low Plateau and eastward into the upper Piedmont. It is recorded from the states of Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Pennsylvania, Indiana, Ohio, Maryland, Virginia, and West Virginia.

States/Provinces: AL, GA, IN, KY, MD, NC, OH, PA, SC, TN, VA, WV.

Federal Lands: NPS (Big South Fork, Blue Ridge Parkway, Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain?, Little River Canyon?, Mammoth Cave, New River Gorge, Obed); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Land Between the Lakes?, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont), Talladega, Talladega (Oakmulgee), Talladega (Talladega)).

CONSERVATION STATUS
Rank: G4? (11-Feb-2001).
Reasons: This xeric evergreen forest community will be maintained on sites where local soil conditions, topographic extremes, or occasional fire function to retard hardwood invasion. Infestations of southern pine beetle (*Dendroctonus frontalis*) can cause mortality of canopy trees. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 1 - Strong.
Comments: Some vegetation formerly placed (at least conceptually) in the *Pinus virginiana - Quercus (coccinea, prinus)* Forest Alliance (A.408) has been transferred here, with this association (CEGL007119) becoming more geographically inclusive. In Indiana examples, the substrate is primarily a matrix of acidic siltstone, shale, and sandstone. Rarely are cliffs formed; instead the setting is mostly very steep slopes with high hills and deep ravines. This association also includes vegetation from the transition between the Cumberland Plateau / Southern Ridge and Valley and the Upper East Gulf Coastal Plain in Alabama. Though located in the Coastal Plain, these occurrences are physiographically and floristically similar to this montane association.

Early-successional vegetation associated with old fields, old pastures, clearcuts, and burned or eroded areas and dominated by *Pinus virginiana* (Virginia pine) is classified as *Pinus virginiana* (Virginia pine) Successional Forest (CEGL002591). Appalachian xeric oak forests with similar floristics, but with a mainly deciduous canopy, are classed in *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). Appalachian shale forests and woodlands with *Pinus virginiana* (Virginia pine) occur on steep, shaly slopes and have stunted canopies and sparse herb and shrub strata, characterized by species adapted to shaly substrates. These shale communities are classed in *Pinus virginiana - Quercus (coccinea, prinus)* Forest Alliance (A.408) and *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677).
Similar Associations:
- *Pinus (rigida, echinata) - Quercus coccinea / Ilex opaca* Woodland (CEGL006115).
- *Pinus echinata* Early-Successional Forest (CEGL006327).
- *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097).
- *Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest (CEGL008500).
- *Pinus virginiana - Quercus falcata - Carya pallida* Forest (CEGL006354).
- *Pinus virginiana / Quercus marilandica* Serpentine Forest (CEGL006266).
- *Pinus virginiana* Successional Forest (CEGL002591)--is distinguished from this community by differences in land-use history; CEGL002591 exists in flat to moderately sloping land that was heavily plowed in the recent past (10-60 years), whereas this community is generally a product of less disturbed soils and more historic disturbance by fire or logging without plowing.
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271).

- *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023).

Related Concepts:

- *Pinus virginiana - (Quercus* spp.) / *Nyssa sylvatica / Gaultheria procumbens* forest (Vanderhorst 2002b) =
- *Pinus virginiana - Quercus prinus - Nyssa sylvatica* Forest (Walton et al. 1997) ?
- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) B
- Low Mountain Pine Forest (Montane Pine Subtype) (Schafale 1998b) ?
- Oligotrophic Forest (Rawinski 1992) B
- Virginia Pine - Mixed Oaks, HR (Pyne 1994) B
- Virginia Pine - Oak: 78 (Eyre 1980) B
- Virginia Pine Type (Schmalzer and DeSelm 1982) B
- Virginia Pine, BR, R&V, CUPL (Pyne 1994) B
- Virginia Pine: 79 (Eyre 1980) B
- Virginia pine forest (CAP pers. comm. 1998) ?
- Xeric Pine Forest, Pine - Heath Ridge Forest (Ambrose 1990a) B

SOURCES

Description Authors: K. D. Patterson, mod. R. White and S. C. Gawler.

References: Allard 1990, Ambrose 1990a, Barden 1977, Burns and Honkala 1990a, CAP pers. comm. 1998, Cooper 1963, Core 1966, Evans 1991, Eyre 1980, Fike 1999, Gettman 1974, Harrison 2004, Homoya pers. comm., Malter 1977, Maxwell 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson et al. 1999, Peet et al. unpubl. data 2002, Pyne 1994, Racine 1966, Rawinski 1992, Schafale 1998b, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2002b, Vanderhorst et al. 2007, Walton et al. 1997, Whittaker 1956.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL VIRGINIA PINE FOREST

SYNONYMS
NVC English Name: **Virginia Pine Successional Forest**
NVC Scientific Name: ***Pinus virginiana* Successional Forest**
NVC Identifier: **CEGL002591**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches in areas which were disturbed by agriculture or other canopy-removal disturbance. Most stands are located near existing farms, and the type probably became established on abandoned farmland. Stands occur on fine-textured soils of the Calvin and Gilpin series derived primarily from shales of the Mauch Chunk group. Some of these sites are affected by gully erosion. Most stands occur on convex landforms with southerly aspects, but a few stands occur on upper slope convex positions with northerly aspects. Slopes range from gentle to steep (mapping unit values range from 3.8 to 40 degrees, mean = 15 degrees). Elevations of mapped stands range from 401 to 740 m.
Vegetation Description: This forest is characterized by even-aged stands of *Pinus virginiana* (Virginia pine) with evidence of succession towards deciduous forest. In the two stands sampled by plots, *Pinus virginiana* (Virginia pine) appears to be dying out and deciduous species in the subcanopy and shrub layers are expected to attain dominance. Deciduous tree species in the plots include *Acer rubrum* (red maple), *Acer saccharum var. saccharum* (sugar maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), *Quercus velutina* (black oak), and *Sassafras albidum* (sassafras). Shrubs and clambering vines include *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Viburnum acerifolium* (mapleleaf viburnum), and *Viburnum prunifolium* (blackhaw). The exotic invasive *Lonicera japonica* (Japanese honeysuckle) and *Rosa multiflora* (multiflora rose) are well-established in these stands. Vascular plant species richness in the 2 sampled plots ranges from 21 to 30 taxa (mean = 25.5).
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)

Characteristic Species: *Lonicera japonica* (Japanese honeysuckle), *Prunus serotina* var. *serotina* (black cherry), *Rosa multiflora* (multiflora rose).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs in small areas in the vicinity of Chestnut Mountain and Irish Mountain in the southern third of the park.
Classification Comments: Some patches of *Pinus virginiana* (Virginia pine) (e.g., plot NERI.221) and parts of others which occur on sandstone-derived soils in the vicinity of cliffs and rock outcrops in the northern two-thirds of the park may be successional, but they are classified and mapped as *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119) due to possibly natural fire ecology and high floristic similarity and proximity to edaphically maintained patches. *Pinus virginiana* (Virginia pine) Successional

Forest (CEGL002591) is reserved for patches of clearly successional *Pinus virginiana* (Virginia pine) which occur on shale-derived soils in the southern third of the park.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.219, NERI.286.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	*Pinus virginiana* Forest Alliance (A.131)
Alliance (English name)	Virginia Pine Forest Alliance
Association	*Pinus virginiana* Successional Forest
Association (English name)	Virginia Pine Successional Forest
Ecological System(s):	Central Appalachian Dry Oak-Pine Forest (CES202.591) Northeastern Interior Dry-Mesic Oak Forest (CES202.592) Southern Appalachian Low-Elevation Pine Forest (CES202.332).

GLOBAL DESCRIPTION

Concept Summary: This community occurs in areas where canopy removal has created dry, open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana* (Virginia pine). These habitats include old fields, old pastures, clearcuts, and burned or eroded areas. This forest typically has a very dense canopy of *Pinus virginiana* (Virginia pine) and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* (pine) species (e.g., *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine)) or other early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree)). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. Stands are short-lived, generally less than 75 years.
Environmental Description: This community occurs in areas where canopy removal has created open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana* (Virginia pine). These conditions can include old fields, old pastures, clearcuts, and burned or eroded areas. In the Ridge and Valley of Tennessee, northeastern Monroe County, early successional forests with *Pinus virginiana* (Virginia pine) dominance were found on low slopes in areas that were cleared for agriculture prior to the 1970s, when Tellico Lake was created (Andreu and Tukman 1995). In the Central Appalachians, this vegetation occurs where soft shales have been farmed (primarily in valleys), resulting in stands with nothing but successional species in the understory. Soils underlying these communities are of two general types, i.e., those derived in residuum from calcareous shale and calcareous sandstone of the Middle Ordovician

and those of some other origin. Series of the former type include Dandridge (Lithic Ruptic-Alfic Eutrochrepts), Tellico (Typic Rhododults), and Steekee (Ruptic-Ultic Dystrochrepts). Other soil series that this forest type may occur on include Litz, Dewey, Alcoa, Bland, Etowah, Lobdell and Neubert. All of these soils are well-drained and range in pH from moderate acid to very strongly acidic.

Vegetation Description: This forest typically has a very dense canopy of *Pinus virginiana* (Virginia pine) and little understory vegetation. *Pinus taeda* (loblolly pine) or *Pinus echinata* (shortleaf pine) may co-occur with *Pinus virginiana* (Virginia pine) in the canopy. The canopy can also have significant admixtures of early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree)). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species; *Lonicera japonica* (Japanese honeysuckle) and *Rosa multiflora* (multiflora rose) are common. Shrub and herb strata are absent to sparse in coverage. In eastern Tennessee, the subcanopy may contain *Acer saccharum* (sugar maple) and *Cornus florida* (flowering dogwood); other associated species may include *Cercis canadensis* (eastern redbud), *Parthenocissus quinquefolia* (Virginia creeper), *Lonicera japonica* (Japanese honeysuckle), and *Microstegium vimineum* (Nepalese browntop) (Andreu and Tukman 1995). In the Central Appalachians, associates include *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine), and *Pinus rigida* (pitch pine). Some stands may have a dense ericaceous shrub stratum containing *Vaccinium* (blueberry) spp., *Gaylussacia* (huckleberry) spp., *Kalmia latifolia* (mountain laurel), and *Rhododendron* (rhododendron) spp.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus virginiana* (Virginia pine)
Tree subcanopy	Needle-leaved tree	*Juniperus virginiana* (eastern redcedar)
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood)
Tall shrub/sapling	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood)
Tall shrub/sapling	Broad-leaved evergreen tree	*Vaccinium arboreum* (farkleberry)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum* (deerberry)
Short shrub/sapling	Broad-leaved deciduous tree	*Cercis canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Oxydendrum arboreum* (sourwood), *Quercus alba* (white oak), *Sassafras albidum* (sassafras)
Herb (field)	Vine/Liana	*Lonicera japonica* (Japanese honeysuckle), *Smilax glauca* (cat greenbrier), *Toxicodendron radicans* (eastern poison ivy)

Characteristic Species: *Pinus virginiana* (Virginia pine).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This successional community is possible in the Piedmont from Pennsylvania south to Alabama and ranges west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau.
States/Provinces: AL, GA, IN, KY, MD, NC, NJ, PA, SC, TN, VA, WV.
Federal Lands: NPS (Appomattox Court House, Big South Fork, Blue Ridge Parkway?, Booker T. Washington, Cumberland Gap, Fredericksburg-Spotsylvania, Gettysburg, Great Smoky Mountains, Kings Mountain, Lincoln Birthplace, Little River Canyon?, Mammoth Cave, Natchez Trace, New River Gorge, Obed, Shenandoah, Shiloh, Thomas Stone); TVA (Tellico); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Sumter, Sumter (Mountains), Sumter (Piedmont), Uwharrie?).

CONSERVATION STATUS

Rank: GNA (ruderal) (13-Jun-2000).
Reasons: This forest represents early-successional vegetation and is thus not of conservation concern.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 1 - Strong.
Comments: Early successional *Pinus virginiana* (Virginia pine) vegetation occurring over calcareous substrates is classed in *Pinus virginiana - Juniperus virginiana var. virginiana - Ulmus alata* Forest (CEGL007121) and has species indicative of calcareous substrates.
Similar Associations:

- *Pinus echinata* Early-Successional Forest (CEGL006327)--occurs in similar environments but is dominated (>50% of canopy) by *Pinus echinata* instead of *Pinus virginiana*.
- *Pinus taeda - Liquidambar styraciflua* Semi-natural Forest (CEGL008462)--is commonly found in the same area as CEGL002591 in the Piedmont. CEGL008462 contains at least 50% *Pinus taeda* in the canopy, whereas CEGL002591 is mostly *Pinus virginiana*.
- *Pinus taeda / Liquidambar styraciflua - Acer rubrum* var. *rubrum / Vaccinium stamineum* Forest (CEGL006011)--occurs in similar environments with similar disturbance histories but is dominated by (>50% of canopy) *Pinus taeda* instead of *Pinus virginiana*.
- *Pinus virginiana - Juniperus virginiana* var. *virginiana - Ulmus alata* Forest (CEGL007121)--on more calcareous or circumneutral substrates.
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119)--can have a very similar canopy in the Piedmont and Blue Ridge ecoregions, but CEGL007119 is generally created and maintained by fire and/or logging but not heavy plowing and/or erosion. CEGL002591 generally has signs of heavy agricultural use such as sparse herbaceous or shrub layers, large percentage of invasive exotics such as *Lonicera japonica* in the herbaceous layer, old plowlines, human debris, and extremely even-aged canopy, whereas CEGL007119 generally has a more intact herbaceous/shrub layer (especially *Vaccinium pallidum*) and less signs of severe human disturbance.

Related Concepts:

- *Pinus virginiana* forest (Vanderhorst 2001b) =
- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) B
- Pine-Oak Association of the Western Shore District (Shreve et al. 1910) B
- Unclassified Old-Field Successional Forest (Fleming and Moorhead 2000) ?

- Virginia Pine - Oak: 78 (Eyre 1980) B
- Virginia Pine Type (Schmalzer and DeSelm 1982) B
- Virginia Pine, RV (Pyne 1994) B
- Virginia Pine: 79 (Eyre 1980) B
- Virginia pine successional forest (Collins and Anderson 1994) =
- Xeric Pine Forest (Ambrose 1990a) B

SOURCES

Description Authors: M. Andreu and M. Tukman, mod. K.D. Patterson and S.C. Gawler.

References: Allard 1990, Ambrose 1990a, Andreu and Tukman 1995, Collins and Anderson 1994, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Hall and Mathews 1974, Nelson 1986, Patterson et al. 1999, Pyne 1994, Schmalzer and DeSelm 1982, Schotz pers. comm., Shreve et al. 1910, Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC 1998, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUGAR MAPLE - YELLOW BUCKEYE - AMERICAN BASSWOOD FOREST

SYNONYMS

NVC English Name: **Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple / (Umbrella Magnolia) Forest**

NVC Scientific Name: ***Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala)* Forest**

NVC Identifier: **CEGL005222**

LOCAL INFORMATION

Environmental Description: This association is the predominant upland forest type on colluvial gorge slopes with cool, moist aspects and topographic positions. It occurs from lower to upper slopes on northerly aspects but is confined to lower slopes and concave positions on more southerly aspects or may be absent on the warmest aspects. It may also occur on alluvial terraces along streams and on abandoned river terraces. Slopes range from flat to very steep (mapping unit values range from 0 to 56 degrees, mean slope = 23 degrees). Elevations of mapped stands range from 250 to 979 m. It occurs on soils derived from both sandstones and shales, but its ecological amplitude, in terms of slope position and aspect, is greater on soils derived from shale. Soil chemistry data from 9 plots indicate relatively high pH (mean = 5.13) and relatively high levels of organic matter, cation-exchange capacity, and major nutrients (Ca, K, Mg, Mn, N, and P) compared to most other community types in the park. Soils are mapped primarily as loams and stony soils in the Calvin, Gilpin, and Dekalb series. Soil textures determined by hand in the field include clays, clay loams, silt loams, loams, and sandy loams. There is usually moderate to high ground cover by large rocks and high ground cover by litter. All of the stands in the park were logged at least once in the past. The predominant natural disturbance features in this community are canopy gaps caused by windfall and slope slippage. This association often borders and intergrades with the other two predominant deciduous forest types of the park, *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) and *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), both occurring on warmer, drier slope positions and aspects.

Vegetation Description: This association is a closed-canopy deciduous forest composed of a diverse mixture of tree species. Dominant species in the canopy include (in decreasing order of constancy in 32 plots) *Acer saccharum var. saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Tilia americana* (American basswood), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), *Robinia pseudoacacia* (black locust), *Ulmus rubra* (slippery elm), *Magnolia acuminata* (cucumber-tree), *Carya cordiformis* (bitternut hickory), and *Quercus rubra* (northern red oak). All of these species may also occur in the lower strata. Additional trees which occur in the canopy and subcanopy include *Betula lenta* (sweet birch), *Betula alleghaniensis var. alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Prunus serotina var. serotina* (black cherry). The most abundant shrub is *Lindera benzoin* (northern spicebush); other common shrubs include *Asimina triloba* (pawpaw), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Hydrangea arborescens* (wild hydrangea), *Smilax rotundifolia* (roundleaf greenbrier), and *Viburnum acerifolium* (mapleleaf viburnum). Vine species which occur in the canopies and shrub layers include *Aristolochia macrophylla* (pipevine), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern

poison ivy), and *Vitis aestivalis var. bicolor* (summer grape). There is typically a lush, diverse herb layer dominated by shade-tolerant, nutrient-demanding species. Common herbs include *Actaea racemosa var. racemosa* (black bugbane), *Adiantum pedatum* (northern maidenhair), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Botrychium virginianum* (rattlesnake fern), *Cardamine concatenata* (cutleaf toothwort), *Carex albursina* (white bear sedge), *Caulophyllum thalictroides* (blue cohosh), *Cryptotaenia canadensis* (Canadian honewort), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Galium aparine* (stickywilly), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Hepatica nobilis var. acuta* (sharplobe hepatica), *Hydrophyllum canadense* (bluntleaf waterleaf), *Hydrophyllum virginianum* (Shawnee salad), *Laportea canadensis* (Canadian woodnettle), *Osmorhiza claytonii* (Clayton's sweetroot), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Sedum ternatum* (woodland stonecrop), *Stellaria pubera* (star chickweed), *Thalictrum thalictroides* (rue anemone), *Tiarella cordifolia* (heartleaf foamflower), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), and species of *Viola* (violet). Vascular plant species richness in the 31 sampled plots ranges from 31 to 59 taxa (mean = 42.9).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum* var. *saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Tilia americana* (American basswood)
Herb (field)	Forb	*Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Hydrophyllum canadense* (bluntleaf waterleaf), *Laportea canadensis* (Canadian woodnettle)

Characteristic Species: *Actaea racemosa* var. *racemosa* (black bugbane), *Adiantum pedatum* (northern maidenhair), *Arisaema triphyllum* (Jack in the pulpit), *Botrychium virginianum* (rattlesnake fern), *Cardamine concatenata* (cutleaf toothwort), *Carex albursina* (white bear sedge), *Carya cordiformis* (bitternut hickory), *Caulophyllum thalictroides* (blue cohosh), *Galium aparine* (stickywilly), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Hepatica nobilis* var. *acuta* (sharplobe hepatica), *Hydrophyllum canadense* (bluntleaf waterleaf), *Hydrophyllum virginianum* (Shawnee salad), *Lindera benzoin* (northern spicebush), *Magnolia acuminata* (cucumber-tree), *Osmorhiza claytonii* (Clayton's sweetroot), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Sedum ternatum* (woodland stonecrop), *Stellaria pubera* (star chickweed), *Thalictrum thalictroides* (rue anemone), *Tiarella cordifolia* (heartleaf foamflower), *Ulmus rubra* (slippery elm), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs on gorge slopes of the main river and tributaries in all sections of the park, but patch size and aerial coverage increase from the north to south, corresponding with the transition from sandstone to shale geology.

Classification Comments: In West Virginia, the varieties of *Tilia americana* (American basswood) are sympatric and intergrade and are not very useful for circumscribing vegetation types. Another nominal tree species in the global name of this association, *Magnolia tripetala* (umbrella-tree), was absent from all plots. This species occurs in New River Gorge and is likely to occur in some stands, but it is not characteristic of this association. In New River Gorge and Gauley River Gorge, *Magnolia tripetala* (umbrella-tree) more typically occurs in forests bordering streams, including hemlock-mixed deciduous forests and the less frequently flooded floodplain forest types. In New River Gorge, *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) occurs adjacent to and intergrades with the two other upland matrix deciduous forests of the park, *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) and *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267). It may also intergrade with stands of *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest (CEGL007220).

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.4, NERI.6, NERI.9, NERI.11, NERI.30, NERI.35, NERI.36, NERI.45, NERI.46, NERI.47, NERI.64, NERI.65, NERI.66, NERI.73, NERI.74, NERI.85, NERI.111, NERI.112, NERI.120, NERI.123, NERI.233, NERI.236, NERI.244, NERI.245, NERI.255, NERI.267, NERI.268, NERI.273, NERI.277, NERI.279, NERI.293.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum Forest Alliance (A.235)
Alliance (English name)	Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple Forest Alliance
Association	Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / (Magnolia tripetala) Forest
Association (English name)	Tuliptree - Appalachian Basswood - Yellow Buckeye - Sugar Maple / (Umbrella Magnolia) Forest
Ecological System(s):	South-Central Interior Mesophytic Forest (CES202.887)

GLOBAL DESCRIPTION

Concept Summary: This mixed mesophytic forest type is found primarily in the Central Appalachians, Western Allegheny Plateau, and Cumberland Plateau ecoregions of the United States. Stands occur on cool, moist slopes and steep ravines or bottoms. The tree canopy is often tall, closed and contains a variety of tree species, including *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak). Trees indicative of the type include *Aesculus flava* (yellow buckeye) and *Tilia americana var. heterophylla* (American basswood). *Magnolia acuminata* (cucumber-tree) occurs locally. *Acer rubrum* (red maple) and *Betula lenta* (sweet birch) may be common in areas with a more recent harvest history. Frequent vines and shrubs include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush), *Staphylea trifolia* (American bladdernut), and, more locally, *Magnolia tripetala* (umbrella-tree) and *Rhododendron maximum* (great laurel). The herbaceous layer is extremely rich, including *Adiantum pedatum* (northern maidenhair), *Asarum canadense* (Canadian wildginger), *Actaea racemosa* (black bugbane), *Botrychium virginianum* (rattlesnake fern), *Caulophyllum thalictroides* (blue cohosh), *Claytonia virginica* (Virginia springbeauty), *Cryptotaenia canadensis* (Canadian honewort), *Dicentra canadensis* (squirrel corn), *Erythronium americanum* (dogtooth violet), *Geranium maculatum* (spotted geranium), *Hepatica nobilis var. acuta* (sharplobe hepatica), *Hydrophyllum canadense* (bluntleaf waterleaf), *Hydrophyllum virginianum* (Shawnee salad), *Osmorhiza* (sweetroot) spp., *Laportea canadensis* (Canadian woodnettle), *Prosartes lanuginosa* (yellow fairybells), *Sanguinaria canadensis* (bloodroot), *Sedum ternatum* (woodland stonecrop), *Tiarella cordifolia* (heartleaf foamflower), *Trillium erectum* (red trillium), *Trillium grandiflorum* (snow trillium), and many others.

Environmental Description: Stands occur on cool, moist slopes and steep ravines or bottoms, often on colluvium. It occurs from lower to upper slopes on northerly aspects but is confined to lower slopes and concave positions on more southerly aspects or may be absent on the warmest aspects. It may also occur on alluvial terraces along streams and on abandoned river terraces. Soils are derived from sandstones or shales.

Vegetation Description: The tree canopy is often tall, closed and contains a variety of tree species, including *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak). Trees indicative of the type include *Aesculus flava* (yellow buckeye) and *Tilia americana var. heterophylla* (American basswood). *Magnolia acuminata* (cucumber-tree) occurs locally, and *Carya cordiformis* (bitternut hickory) may also be present. *Acer rubrum* (red maple) and *Betula lenta* (sweet birch) may be common in areas with a more recent harvest history. Frequent vines and shrubs include *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush), *Staphylea trifolia* (American bladdernut), and more locally *Magnolia tripetala* (umbrella-tree), *Halesia tetraptera* (mountain silverbell), *Hydrangea arborescens* (wild hydrangea), and *Rhododendron maximum* (great laurel). The herbaceous layer is extremely rich and dominated by shade-tolerant, nutrient-demanding species, including *Adiantum pedatum* (northern maidenhair), *Asarum canadense* (Canadian wildginger), *Actaea racemosa* (black bugbane), *Botrychium virginianum* (rattlesnake fern), *Caulophyllum thalictroides* (blue cohosh), *Claytonia virginica* (Virginia

springbeauty), *Cryptotaenia canadensis* (Canadian honewort), *Dicentra canadensis* (squirrel corn), *Erythronium americanum* (dogtooth violet), *Geranium maculatum* (spotted geranium), *Hepatica nobilis var. acuta* (sharplobe hepatica), *Hydrophyllum canadense* (bluntleaf waterleaf), *Hydrophyllum virginianum* (Shawnee salad), *Osmorhiza* (sweetroot) spp., *Laportea canadensis* (Canadian woodnettle), *Prosartes lanuginosa* (yellow fairybells), *Sanguinaria canadensis* (bloodroot), *Sedum ternatum* (woodland stonecrop), *Tiarella cordifolia* (heartleaf foamflower), *Trillium erectum* (red trillium), *Trillium grandiflorum* (snow trillium), and many others. Vines may straggle through the canopy and shrub layers and include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), *Aristolochia macrophylla* (pipevine), and *Vitis aestivalis var. bicolor* (summer grape).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush)
Herb (field)	Forb	*Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Hydrophyllum canadense* (bluntleaf waterleaf)

Characteristic Species: *Acer saccharum* (sugar maple), *Actaea racemosa* (black bugbane), *Aesculus flava* (yellow buckeye), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Hepatica nobilis* var. *acuta* (sharplobe hepatica), *Hydrophyllum canadense* (bluntleaf waterleaf), *Laportea canadensis* (Canadian woodnettle), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Magnolia acuminata* (cucumber-tree), *Osmorhiza longistylis* (longstyle sweetroot), *Sedum ternatum* (woodland stonecrop), *Stellaria pubera* (star chickweed), *Tiarella cordifolia* (heartleaf foamflower), *Tilia americana* var. *heterophylla* (American basswood).

Other Noteworthy Species:

Species	GRank	Type	Note
Panax quinquefolius (American ginseng)	G3G4	plant	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This type is found primarily in the Central Appalachian, Western Allegheny Plateau, and Cumberland Plateau regions of the United States, ranging from southern Pennsylvania and eastern Ohio south to West Virginia and Tennessee, with outliers in Indiana.

States/Provinces: IN, KY, OH, PA, TN, WV.

Federal Lands: DOD (Camp Dawson); NPS (Cumberland Gap, Mammoth Cave, New River Gorge); USFS (Daniel Boone, Monongahela).

CONSERVATION STATUS

Rank: G4? (30-Sep-2004).

Reasons: There are still issues with the precise geographic limits of this type and its relationship to similar types in adjacent regions. It represents the typical mesic cove forest of a fairly large area of the central interior eastern United States (from southern Pennsylvania and eastern Ohio south to West Virginia and Tennessee, with outliers in Indiana). Within this range, it only occurs in protected concave topographic positions. Although relatively secure and not highly threatened

today, many stands have recovered from past episodes of timber removal and remain threatened by future timber harvests because of excellent site productivity. Much of the remaining acreage which is not formally protected is not of high quality. There are some protected stands on Federal lands (national parks, national forests) in the region. Forests of the region are vulnerable to decline from: (1) aluminum toxicity, related to acidification (from sulfates, exceeding 30 pounds per year per acre); (2) nitrogen deposition, which reduces the capacity of trees on the northern slopes to resist fungal infections; and (3) ozone deposition, which diminishes the photosynthetic capacity of trees, which in turn diminishes their roots. Invasive exotics, especially *Alliaria petiolata* (garlic mustard) (a shade-tolerant herb) and *Ailanthus altissima* (tree of heaven) (a tree which can become established in canopy gaps, mimicking the niche of *Liriodendron* (tuliptree)), pose a serious threat to the integrity of this community's flora.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: Trees indicative of the type include *Aesculus flava* (yellow buckeye) and *Tilia americana var. heterophylla* (American basswood). In Ohio, however, these are restricted to the more southern parts of Ohio, which, depending on the definition of the type, may restrict its concept. Stands strongly dominated by beech and maple go with the Beech - Maple Unglaciated Forest, *Fagus grandifolia - Acer saccharum - Liriodendron tulipifera* Unglaciated Forest (CEGL002411); by beech and white oak with the White Oak - Beech Western Allegheny Forest, *Quercus alba - Fagus grandifolia* Western Allegheny Plateau Forest (CEGL006144); and by at least 25% hemlock with the East-Central Hemlock Hardwood Forest, *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043). In Indiana this type occurs in the southeastern part of the Bluegrass Region, where it is found on calcareous substrates, though further review is needed to determine whether these Indiana stands could be placed in CEGL002411. Mike Homoya of the Indiana Heritage Program has species lists, and stand information should be compiled for review. More information is needed to distinguish these more northern (Central Appalachian) mixed mesophytic forests from similar forests in the southern Appalachians. Further division may be warranted.

Similar Associations:

- *Fagus grandifolia - Acer saccharum - Liriodendron tulipifera* Unglaciated Forest (CEGL002411).
- *Fraxinus americana - Carya ovata / Frangula caroliniana / Helianthus hirsutus* Woodland (CEGL008458)--also does not generally have high cover of either *Aesculus flava* or *Tilia americana*, and it tends to be on drier mid- to upper slopes instead of ravine areas.
- *Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana) / Actaea racemosa - Laportea canadensis* Forest (CEGL007710).
- *Liriodendron tulipifera - Tilia americana* var. *heterophylla - (Aesculus flava) / Actaea racemosa* Forest (CEGL007291).
- *Quercus alba - Fagus grandifolia* Western Allegheny Plateau Forest (CEGL006144).
- *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum - Amphicarpaea bracteata* Forest (CEGL007692)--does not have any *Aesculus flava* or *Tilia americana* in it.
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043).

Related Concepts:

- *Acer saccharum - Aesculus flava / Laportea canadensis* forest (Vanderhorst 2001b) =
- IA5d. Typic Mesophytic Forest (Allard 1990) ?
- Mixed Mesophytic Forest (Braun 1950) B

SOURCES

Description Authors: D. Faber-Langendoen, L. Sneddon, M. Pyne, mod. R. White and S. C. Gawler.

References: Allard 1990, Anderson 1982, Braun 1950, Evans 1991, Fike 1999, Midwestern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL TULIPTREE - OAK FOREST

SYNONYMS
NVC English Name: **Tuliptree - Oak species Forest**
NVC Scientific Name: ***Liriodendron tulipifera* - *Quercus* spp. Forest**
NVC Identifier: **CEGL007221**

LOCAL INFORMATION

Environmental Description: This association occurs in a variety of settings, primarily in areas that have been subject to human-caused ground and/or canopy disturbance. It occurs on abandoned farmland, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past. It is most common on plateaus on acidic soils derived from sandstones and shales of the Pottsville group. The distribution of this association is also limited by soil moisture. In previously logged areas on the plateaus which span a topographic gradient, this association occurs in water-collecting positions (lower slopes, coves), while water-shedding positions (upper slopes, ridges) are occupied by oak-dominated forests. Soils in plots were described as well-drained clay loams, but sandy loams may also be expected. Slopes range from nearly level to very steep. Elevations of plots range from 740 to 837 m. Typical adjacent forests include *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) and *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271).
Vegetation Description: This association represents successional deciduous forests strongly dominated by *Liriodendron tulipifera* (tuliptree) with *Quercus* (oak) spp. present and lacking many nutrient-demanding associates in the understories. Additional tree species in the two sampled plots include *Acer rubrum* (red maple), *Carya glabra* (pignut hickory), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), and *Robinia pseudoacacia* (black locust). Shrub layers may include saplings of the canopy species and *Acer pensylvanicum* (striped maple), *Amelanchier arborea var. arborea* (common serviceberry), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush) (in small amounts), and *Vaccinium pallidum* (Blue Ridge blueberry). Herbs with the highest constancy and/or cover in the plots include *Actaea racemosa var. racemosa* (black bugbane), *Botrychium virginianum* (rattlesnake fern), *Dichanthelium clandestinum* (deertongue), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Parthenocissus quinquefolia* (Virginia creeper), *Potentilla simplex* (common cinquefoil), *Prosartes lanuginosa* (yellow fairybells), *Scutellaria serrata* (showy skullcap), *Thelypteris noveboracensis* (New York fern), and *Uvularia perfoliata* (perfoliate bellwort). *Lycopodium digitatum* (fan clubmoss) may be abundant in some stands and may be visible on leaf-off infra-red aerial photography. Vascular plant species richness in the 2 sampled plots ranges from 27 to 54 taxa (mean = 40.5).
Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)
Herb (field)	Fern or fern ally	*Lycopodium digitatum* (fan clubmoss)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Actaea racemosa* var. *racemosa* (black bugbane), *Amelanchier arborea* var. *arborea* (common serviceberry), *Botrychium virginianum* (rattlesnake fern), *Carya glabra* (pignut hickory), *Dichanthelium clandestinum* (deertongue), *Dioscorea quaternata* (fourleaf yam), *Fagus grandifolia* (American beech), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Hamamelis virginiana* (American witchhazel), *Lycopodium digitatum* (fan clubmoss), *Medeola virginiana* (Indian cucumber), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Parthenocissus quinquefolia* (Virginia creeper), *Potentilla simplex* (common cinquefoil), *Prosartes lanuginosa* (yellow fairybells), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Robinia pseudoacacia* (black locust), *Scutellaria serrata* (showy skullcap), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Vaccinium pallidum* (Blue Ridge blueberry).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	Vanderhorst et al. 2007

Local Range: This association occurs in small to medium-sized patches scattered throughout the park primarily on the plateaus.
Classification Comments: Successional tuliptree forests in the park which include an abundance of rich-site species, most common on gorge slopes, are classified as *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest (CEGL007220). Similar successional forests at Camp Dawson in Preston County, West Virginia (Vanderhorst and Streets 2006) were also attributed to both of these associations. *Liriodendron tulipifera* (tuliptree) may also be abundant, but not dominant, in the predominant deciduous forest of the plateaus in the park, *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), probably due to disturbance from repeated logging.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.41, NERI.52.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Liriodendron tulipifera* Forest Alliance (A.236)
Alliance (English name)	Tuliptree Forest Alliance
Association	*Liriodendron tulipifera - Quercus* spp. Forest
Association (English name)	Tuliptree - Oak species Forest

Ecological System(s): Southern Coastal Plain Mesic Slope Forest (CES203.476)
Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)
East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359).

GLOBAL DESCRIPTION

Concept Summary: This broadly defined semi-natural or successional community is one of several described upland associations dominated by *Liriodendron tulipifera* (tuliptree). It ranges from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. north to the northern Piedmont of New Jersey. Species found in stands attributable to this type may include a fairly diverse and varied composition. *Acer rubrum* (red maple), *Quercus* (oak) spp., and occasionally *Liquidambar styraciflua* (sweetgum) or *Robinia pseudoacacia* (black locust) may be common in stands of this type; *Betula lenta* (sweet birch) often occurs at the northern end of the range. Examples are common across large areas of the upland landscape which have previously been disturbed. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. The oaks in these stands are frequently multi-stemmed, resulting from coppicing. Shrub composition is variable but may include *Sambucus canadensis* (common elderberry) and *Vaccinium pallidum* (Blue Ridge blueberry). Herbs are likewise variable; West Virginia samples feature *Dioscorea quaternata* (fourleaf yam), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum* (feathery false lily of the valley), *Solidago curtisii* (mountain decumbent goldenrod), *Symphyotrichum prenanthoides* (crookedstem aster), and *Geranium maculatum* (spotted geranium). This association differs from other described types in the alliance based on the lack of a significant pine component [see *Liriodendron tulipifera - Pinus taeda* Forest (CEGL007521)] and the absence of species affiliated with circumneutral conditions [see *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest (CEGL007220)]; it is later successional and more diverse than *Liriodendron tulipifera* Forest (CEGL007218) or *Liriodendron tulipifera - Robinia pseudoacacia* Forest (CEGL007219).

Environmental Description: These semi-natural upland deciduous forests are found primarily in areas which were once clearcuts, old fields, or were cleared by fire or other natural disturbances. These non-wetland forests are also found along mesic stream terraces. In previously logged areas on West Virginia plateaus which span a topographic gradient, this association occurs in water-collecting positions (lower slopes, coves), while water-shedding positions (upper slopes, ridges) are occupied by oak-dominated forests.

Vegetation Description: The canopy of this semi-natural upland association is dominated by *Liriodendron tulipifera* (tuliptree). *Quercus* (oak) species (*Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus falcata* (southern red oak), *Quercus nigra* (water oak), *Quercus velutina* (black oak)) are often present; additional associates may include *Acer rubrum* (red maple), *Carya* (hickory) spp., *Fagus grandifolia* (American beech), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), and *Robinia pseudoacacia* (black locust). *Betula lenta* (sweet birch) is a common associate at the northern range limit. Shrub layers may include saplings of the canopy species and *Acer pensylvanicum* (striped maple), *Amelanchier arborea* (common serviceberry), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush) (in small amounts), and *Vaccinium pallidum* (Blue Ridge blueberry). Herbs

vary across the range but may include *Actaea racemosa* (black bugbane), *Dichanthelium clandestinum* (deertongue), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Potentilla simplex* (common cinquefoil), *Scutellaria serrata* (showy skullcap), *Thelypteris noveboracensis* (New York fern), and *Uvularia perfoliata* (perfoliate bellwort). *Lycopodium digitatum* (fan clubmoss) may be abundant in some stands.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus florida* (flowering dogwood)
Herb (field)	Fern or fern ally	*Lycopodium digitatum* (fan clubmoss)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Actaea racemosa* (black bugbane), *Amelanchier arborea* (common serviceberry), *Carya glabra* (pignut hickory), *Dichanthelium clandestinum* (deertongue), *Fagus grandifolia* (American beech), *Galium circaezans* (licorice bedstraw), *Geranium maculatum* (spotted geranium), *Goodyera pubescens* (downy rattlesnake plantain), *Hamamelis virginiana* (American witchhazel), *Lycopodium digitatum* (fan clubmoss), *Medeola virginiana* (Indian cucumber), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Robinia pseudoacacia* (black locust), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Vaccinium pallidum* (Blue Ridge blueberry).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is known from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. and may also occur in the Upper East Gulf Coastal Plain. It ranges north to the northern Piedmont of New Jersey and adjacent Pennsylvania. It is also known from Alabama, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, West Virginia, and possibly Virginia and Delaware.

States/Provinces: AL, DE?, GA, KY, MD, NC, NJ, PA, SC, TN, VA, WV.

Federal Lands: DOD (Camp Dawson, Fort Benning); NPS (Appomattox Court House, Big South Fork, Blue Ridge Parkway, Booker T. Washington, Chickamauga-Chattanooga?, Cowpens, Cumberland Gap, Fredericksburg-Spotsylvania, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Morristown, Natchez Trace, New River Gorge, Ninety Six, Obed, Petersburg, Richmond, Shiloh, Valley Forge); USFS (Bankhead, Daniel Boone, Oconee?, Talladega, Talladega (Oakmulgee)?, Talladega (Talladega)).

CONSERVATION STATUS

Rank: GNA (ruderal) (19-Aug-2002).

Reasons: This forest represents early-successional vegetation and is thus not of conservation concern. This is a successional vegetation type composed of native species. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: Within its range, it differs from other described types based on the lack of a significant pine component [see *Liriodendron tulipifera - Pinus taeda* Forest (CEGL007521)] and the absence of species affiliated with circumneutral conditions [see *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest (CEGL007220)]; it is later successional and more diverse than *Liriodendron tulipifera* Forest (CEGL007218) and tends to be found on more stable soil substrates and less steep slopes than *Liriodendron tulipifera - Robinia pseudoacacia* Forest (CEGL007219).
Similar Associations:

- *Liriodendron tulipifera - Acer negundo* Forest (CEGL007184)--a bottomland type.
- *Liriodendron tulipifera - Robinia pseudoacacia* Forest (CEGL007219)--is generally found on steeper slopes and/or shallow soils and with a more intense history of disturbance.
- *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest (CEGL007220)--is generally found on calcareous or at least pH neutral soils.
- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* Forest (CEGL006599).
- *Prunus serotina - Sassafras albidum - (Fraxinus americana) / Juniperus virginiana* Forest (CEGL004133).

Related Concepts:

- Successional forest of low-elevation plateaus (Vanderhorst 2001a) B
- Tulip Poplar Type (Schmalzer and DeSelm 1982) B
- Yellow poplar community (Ehrenfeld 1977) =

SOURCES

Description Authors: R. E. Evans and M. Pyne, mod. L. A. Sneddon, R. White, S. C. Gawler.
References: Ehrenfeld 1977, Gallyoun et al. 1996, Keever 1973, NatureServe Ecology - Southeastern U.S. unpubl. data, Overlease 1987, Russell and Schuyler 1988, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001a, Vanderhorst and Streets 2006.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL TULIPTREE / NORTHERN SPICEBUSH FOREST

SYNONYMS
NVC English Name: Tuliptree / (Eastern Redbud) / (Northern Spicebush) Forest
NVC Scientific Name: *Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest
NVC Identifier: CEGL007220

LOCAL INFORMATION

Environmental Description: This association occurs in a variety of settings, primarily in areas that have been subject to human-caused ground and/or canopy disturbance. It occurs on abandoned farmland and townsites, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past. Small patches may occur in areas where canopy disturbance has resulted from natural causes such as windfall or landslides. It is most common on gorge slopes and alluvial terraces. Parent materials include sandstone, shale, and alluvium. The distribution of this association is limited to areas with relatively high soil fertility. Soils in plots are described as moderately well-drained to well-drained clay, silt loam, and sandy loam with pH ranging from 5.0 to 7.5. Soil chemistry analyzed in the lab from four plots indicates acidic to slightly alkaline soils (pH ranges from 5.2 to 7.5) with relatively high levels of estimated N release, S, B, Ca, Cu, K, Mg, Mn, P, and Zn. Elevations of plots range from 343 to 587 m. Slopes range from flat to very steep. Typical adjacent forests on less disturbed sites are *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222).

Vegetation Description: This association represents closed-canopy successional deciduous forests dominated by *Liriodendron tulipifera* (tuliptree) with a large component of nutrient-demanding associates. Estimated canopy height in plots ranges from 15 to 32 m. Additional tree species in the canopy and subcanopy include *Acer negundo* (box-elder), *Acer saccharum var. saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Halesia tetraptera* (mountain silverbell), *Magnolia acuminata* (cucumber-tree), *Quercus muehlenbergii* (chinquapin oak), *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), and *Ulmus rubra* (slippery elm). Shrubs include *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). Vines which may be abundant include *Aristolochia macrophylla* (pipevine), *Toxicodendron radicans* (eastern poison ivy), and *Vitis aestivalis var. bicolor* (summer grape). Herbs with the highest constancy and/or cover in plots include *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), and *Polystichum acrostichoides* (Christmas fern). Vascular plant species richness in the 5 sampled plots ranges from 24 to 51 taxa (mean = 38.6).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)

Characteristic Species: *Acer negundo* (box-elder), *Acer saccharum* var. *saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Halesia tetraptera* (mountain silverbell), *Lindera benzoin* (northern spicebush), *Magnolia acuminata* (cucumber-tree), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Robinia pseudoacacia* (black locust), *Sassafras albidum* (sassafras), *Toxicodendron radicans* (eastern poison ivy), *Ulmus rubra* (slippery elm), *Vitis aestivalis* var. *bicolor* (summer grape).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	Vanderhorst et al. 2007

Local Range: This association occurs in small to medium-sized patches scattered throughout the park primarily on gorge slopes and alluvial terraces.
Classification Comments: Successional tuliptree forests which lack many rich-site species are classified as *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221). Similar successional forests at Camp Dawson in Preston County, West Virginia (Vanderhorst and Streets 2006) were also attributed to both of these associations. Some stands in landslide chutes of upper gorge slopes (e.g., plot NERI. 237) may be natural disclimax communities.
Other Comments: Information not available.
Local Description Authors: J.P. Vanderhorst.
Plots: NERI.39, NERI.257, NERI.278, NERI.283, NERI.284.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Liriodendron tulipifera* Forest Alliance (A.236)
Alliance (English name)	Tuliptree Forest Alliance
Association	*Liriodendron tulipifera / (Cercis canadensis) / (Lindera benzoin)* Forest
Association (English name)	Tuliptree / (Eastern Redbud) / (Northern Spicebush) Forest
Ecological System(s):	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898) South-Central Interior Mesophytic Forest (CES202.887).

GLOBAL DESCRIPTION

Concept Summary: This semi-natural or successional community dominated by *Liriodendron tulipifera* (tuliptree) occurs in the Ridge and Valley of Tennessee and Virginia, the Interior Low Plateau of Kentucky, and the Central Appalachians, Piedmont and inner Coastal Plain regions of Virginia, West Virginia, and Maryland. It may also occur in similar regions of Pennsylvania and Delaware. It is distinguished from other upland communities dominated by *Liriodendron tulipifera* (tuliptree) by the presence of species associated with soils with moderately high base saturation levels (rich soils). Species found in stands attributable to this type may be fairly diverse and result in a varied composition. In addition to *Liriodendron tulipifera* (tuliptree), other canopy species may include *Liquidambar styraciflua* (sweetgum), *Acer saccharum* (sugar maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), *Magnolia acuminata* (cucumber-tree), *Ulmus rubra* (slippery elm), *Quercus imbricaria* (shingle oak), *Quercus muehlenbergii* (chinkapin oak), *Prunus serotina* (black cherry), and *Carya ovata* (shagbark hickory). Species often found in the subcanopy include *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud), *Ulmus alata* (winged elm), *Fraxinus americana* (white ash), *Morus rubra* (red mulberry), and *Cornus florida* (flowering dogwood). Shrubs include saplings of the subcanopy and canopy species, as well as *Lindera benzoin* (northern spicebush), *Symphoricarpos orbiculatus* (coralberry), *Asimina triloba* (pawpaw), *Staphylea trifolia* (American bladdernut), *Acer negundo* (box-elder), and *Juniperus virginiana var. virginiana* (eastern redcedar). Exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Lonicera japonica* (Japanese honeysuckle), are present at some sites. Herbaceous species include the exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Veronica hederifolia* (ivyleaf speedwell), as well as *Toxicodendron radicans* (eastern poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Actaea racemosa* (black bugbane), *Caulophyllum thalictroides* (blue cohosh), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum canadense* (bluntleaf waterleaf), *Adiantum pedatum* (northern maidenhair), *Polygonatum pubescens* (hairy Solomon's seal), *Verbesina alternifolia* (wingstem), *Amphicarpaea bracteata* (American hogpeanut), and *Polystichum acrostichoides* (Christmas fern).

Environmental Description: These forests are found on disturbed mesic areas underlain by rich soils with moderately high base saturation levels. It occurs on abandoned farmland and townsites, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past. Small patches may occur in areas where canopy disturbance has resulted from natural causes such as windfall or landslides. Soils may be underlain by a variety of geologic strata that weather to base-rich soils including limestone, dolomite, calcareous shale, shell deposits, metabasalts and granitic complexes. In Kentucky this association may occur on calcareous substrates in the Dripping Springs Escarpment. At Shenandoah National Park in Virginia, this community is underlain by Catoctin metabasalt or a pyroxene-bearing granitic complex. In West Virginia, parent materials include sandstone, shale, and alluvium. Soils in plots were described as moderately well-drained to well-drained clay, silt loam, and sandy loam with pH ranging from 5.0 to 7.5.

Vegetation Description: Stands are dominated by *Liriodendron tulipifera* (tuliptree) but also include various other species, including ones indicative of rich or circumneutral environments. Other species include *Liquidambar styraciflua* (sweetgum), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black

walnut), *Halesia tetraptera* (mountain silverbell), *Fraxinus americana* (white ash), *Magnolia acuminata* (cucumber-tree), *Ulmus rubra* (slippery elm), *Quercus imbricaria* (shingle oak), *Quercus muehlenbergii* (chinkapin oak), and *Carya ovata* (shagbark hickory) (NatureServe Ecology unpubl. data, VDNH unpubl. data). Species often found in the subcanopy include *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud), *Ulmus alata* (winged elm), *Morus rubra* (red mulberry), *Sassafras albidum* (sassafras), and *Cornus florida* (flowering dogwood). *Cercis canadensis* (eastern redbud) is often abundant on soils underlain by carbonate strata. Shrubs include saplings of the subcanopy and canopy species, as well as *Symphoricarpos orbiculatus* (coralberry), *Lindera benzoin* (northern spicebush), *Asimina triloba* (pawpaw), and *Juniperus virginiana var. virginiana* (eastern redcedar). *Lindera benzoin* (northern spicebush) is often abundant in occurrences of this community in the Central Appalachians, Piedmont and inner Coastal Plain regions of Virginia, West Virginia, and Maryland. Exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Lonicera japonica* (Japanese honeysuckle), are present at some sites. Vines, which may be abundant, include *Aristolochia macrophylla* (pipevine), *Toxicodendron radicans* (eastern poison ivy), and *Vitis aestivalis var. bicolor* (summer grape). Herbaceous species include the exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Veronica hederifolia* (ivyleaf speedwell), as well as *Actaea racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Asarum canadense* (Canadian wildginger), *Caulophyllum thalictroides* (blue cohosh), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum canadense* (bluntleaf waterleaf), *Osmorhiza longistylis* (longstyle sweetroot), *Adiantum pedatum* (northern maidenhair), *Polygonatum pubescens* (hairy Solomon's seal), *Polystichum acrostichoides* (Christmas fern), *Verbesina alternifolia* (wingstem), *Amphicarpaea bracteata* (American hogpeanut), and *Polystichum acrostichoides* (Christmas fern). (Andreu and Tukman 1995, NatureServe Ecology unpubl. data, WVNHP unpubl. data, VDNH unpubl. data). Examples at Fort Donelson that have been very heavily disturbed may have local dominance by *Celtis laevigata* (sugarberry) and *Juglans nigra* (black walnut).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liriodendron tulipifera* (tuliptree)

Characteristic Species: *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Carya ovata* (shagbark hickory), *Cercis canadensis* (eastern redbud), *Cryptotaenia canadensis* (Canadian honewort), *Galium triflorum* (fragrant bedstraw), *Lindera benzoin* (northern spicebush), *Osmorhiza longistylis* (longstyle sweetroot), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Toxicodendron radicans* (eastern poison ivy), *Ulmus rubra* (slippery elm).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This type occurs in the Ridge and Valley and Cumberland Plateau of Tennessee, the Interior Low Plateau of Kentucky, the Upper East Gulf Coastal Plain of Mississippi, and the Central Appalachian, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, Maryland and possibly Pennsylvania and Delaware. Its full range is unknown.
States/Provinces: DC, DE?, KY, MD, MS, PA?, TN, VA, WV.
Federal Lands: DOD (Camp Dawson); NPS (Antietam, Big South Fork, Blue Ridge Parkway, C&O Canal, Catoctin Mountain, Chickamauga-Chattanooga, Cumberland Gap, Fort Donelson, George Washington Parkway, Harpers Ferry, Lincoln Birthplace, Mammoth Cave, Natchez Trace, National Capital-East, New River Gorge, Obed, Rock Creek, Shenandoah, Thomas Stone, Vicksburg); TVA (Tellico); USFS (Cherokee?).

CONSERVATION STATUS

Rank: GNA (ruderal) (28-Oct-2003).
Reasons: This forest represents early-successional vegetation and is thus not of conservation concern. It is composed largely of native species, though exotics may be locally abundant. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: This type was originally described from the work of Andreu and Tukman (1995) but was later modified to emphasize stands with moderately high base saturation levels. It is apparently a widespread successional forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast.
Similar Associations:

- *Liriodendron tulipifera* - *Pinus taeda* Forest (CEGL007521)--supports a significant pine component.
- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221)--lacks species affiliated with circumneutral conditions.
- *Liriodendron tulipifera* Forest (CEGL007218)--is less diverse and earlier successional.

Related Concepts:

- *Liriodendron tulipifera / Lindera benzoin* Forest (Lea 2000) F
- Oak-Hickory Association of the Western Shore District (Shreve et al. 1910) B
- Successional forest of low-elevation plateaus (Vanderhorst 2001a) B
- Tulip Poplar Type (Schmalzer and DeSelm 1982) B

SOURCES

Description Authors: R. E. Evans, mod. M. Pyne, J. Teague, C. W. Nordman, R. White, S. C. Gawler.
References: Andreu and Tukman 1995, Hall and Mathews 1974, Lea 2000, Lea 2003, Martin 1989, NatureServe Ecology - Southeastern U.S. unpubl. data, Schmalzer and DeSelm 1982, Shreve et al. 1910, Southeastern Ecology Working Group n.d., TDNH unpubl. data, VDNH unpubl. data, Vanderhorst 2001a, Vanderhorst and Streets 2006, WVNHP unpubl. data b.

COMMON NAME (PARK-SPECIFIC): CHINQUAPIN OAK - BLACK MAPLE FOREST

SYNONYMS

NVC English Name:	**Chinquapin Oak - (White Oak, Northern Red Oak) - Bitternut Hickory / Smooth Blackhaw Forest**
NVC Scientific Name:	***Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest**
NVC Identifier:	**CEGL004793**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches on lower to middle gorge slopes eroded from calcareous geologic formations. Although accurate geology maps for the park are lacking, these rocks are probably calcareous shales or limestones of the Bluestone and/or Hinton formations of the Mauch Chunk group. There is exposed bedrock in the one plot sampled. Aspects of mapped stands range from southeast to southwest, and slopes range from 22 to 39 degrees (mean = 31 degrees). Elevations of mapped stands range from 363 to 465 m. Soil chemistry analyzed from the one plot sampled indicates high pH (6.8) and high levels of total cation-exchange capacity, calcium (4180 ppm), potassium (121 ppm), and magnesium (424 ppm) compared to most other soils in the park. Although almost all forests in the park were logged in the past, one small patch of this community exhibits old-growth characteristics (large live and dead standing trees, abundant windfall and coarse woody debris, tip-up mounds). Mapped stands of this association border stands of *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) upslope and *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) downslope.

Vegetation Description: This association is a tall, closed-canopy deciduous forest dominated by tree species which are restricted to soils with high levels of calcium. The canopy and subcanopy of the one sampled plot include (in order of decreasing cover) *Acer nigrum* (black maple), *Quercus muehlenbergii* (chinquapin oak), *Fraxinus americana* (white ash), *Aesculus flava* (yellow buckeye), and *Carya cordiformis* (bitternut hickory). The shrub layers include *Asimina triloba* (pawpaw), *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Lindera benzoin* (northern spicebush), and saplings of the shade-tolerant canopy species. Herbs with 1% cover or less include *Ageratina altissima* (white snakeroot), *Asarum canadense* (Canadian wildginger), *Diarrhena americana* (American beakgrain), *Microstegium vimineum* (Nepalese browntop), *Pilea pumila var. pumila* (Canadian clearweed), *Polygonum virginianum* (jumpseed), and *Verbesina alternifolia* (wingstem). Additional herbs include *Amphicarpaea bracteata* (American hogpeanut), *Brachyelytrum erectum* (bearded shorthusk), *Carex albursina* (white bear sedge), *Carex laxiflora* (broad looseflower sedge), *Cryptotaenia canadensis* (Canadian honewort), *Elymus hystrix* (eastern bottlebrush grass), *Eurybia divaricata* (white wood aster), *Galium triflorum* (fragrant bedstraw), *Geum canadense var. canadense* (white avens), *Muhlenbergia tenuiflora* (slender muhly), *Polystichum acrostichoides* (Christmas fern), and *Sedum ternatum* (woodland stonecrop). Vascular plant species richness in the 1 sampled plot is 31.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer nigrum* (black maple), *Quercus muehlenbergii* (chinquapin oak)
Herb (field)	Forb	*Ageratina altissima* (white snakeroot), *Asarum canadense* (Canadian wildginger)

Characteristic Species: *Acer nigrum* (black maple), *Aesculus flava* (yellow buckeye), *Ageratina altissima* (white snakeroot), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Brachyelytrum erectum* (bearded shorthusk), *Carex albursina* (white bear sedge), *Carex laxiflora* (broad looseflower sedge), *Carya cordiformis* (bitternut hickory), *Cryptotaenia canadensis* (Canadian honewort), *Diarrhena americana* (American beakgrain), *Elymus hystrix* (eastern bottlebrush grass), *Eurybia divaricata* (white wood aster), *Fraxinus americana* (white ash), *Galium triflorum* (fragrant bedstraw), *Geum canadense* var. *canadense* (white avens), *Lindera benzoin* (northern spicebush), *Microstegium vimineum* (Nepalese browntop), *Muhlenbergia tenuiflora* (slender muhly), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonum virginianum* (jumpseed), *Polystichum acrostichoides* (Christmas fern), *Quercus muehlenbergii* (chinkapin oak), *Verbesina alternifolia* (wingstem).

Other Noteworthy Species:

Species	GRank	Type	Note
Monarda fistulosa ssp. 1 (smoke hole bergamot)	G5T1	plant	= ssp. *brevis*

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This community occurs in small, linear patches on lower to middle slopes of the New River Gorge in the middle section of the park between Terry and Thurmond. Additional unmapped patches within and outside this range are possible but are unlikely to occur in the northern third of the park due to the lack of calcareous geologic strata.

Classification Comments: The chinquapin oak - black maple forest at New River Gorge National River is rare, occurs in very small patches, and was sampled by just one plot. However, several plots of similar vegetation were sampled in 2003-2005 from Bluestone National Scenic River. At Bluestsone and other observed stands at New River, *Acer saccharum* (sugar maple) is an abundant canopy species, but the stands are usually dominated by species of *Quercus* (oak). In an analysis of calcareous forests from throughout eastern West Virginia, the New River plot clustered with plots from Shannondale Springs Wildlife Management Area in Jefferson County. These forests appear to represent the more mesic end of *Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest (CEGL004793) or the dry end of *Acer (nigrum, saccharum) - Tilia americana / Asimina triloba / Jeffersonia diphylla - Caulophyllum thalictroides* Forest (CEGL008412).

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.354.

New River Gorge National River Inventory Notes: Additional plots from New River Gorge would provide a better local description for this community.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Quercus muehlenbergii - (Acer saccharum)* Forest Alliance (A.1912)
Alliance (English name)	Chinquapin Oak - (Sugar Maple) Forest Alliance
Association	*Quercus muehlenbergii - Quercus (alba, rubra) - Carya cordiformis / Viburnum prunifolium* Forest
Association (English name)	Chinquapin Oak - (White Oak, Northern Red Oak) - Bitternut Hickory / Smooth Blackhaw Forest
Ecological System(s):	Southern Appalachian Oak Forest (CES202.886) Central Appalachian Alkaline Glade and Woodland (CES202.602).

GLOBAL DESCRIPTION

Concept Summary: These are rich forests of moderately steep slopes in the Ridge and Valley province over various limestone and dolomitic formations. They are dominated by a mixture of *Quercus muehlenbergii* (chinkapin oak), other oaks (particularly *Quercus alba* (white oak) and *Quercus rubra* (northern red oak)), and several hickories (*Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), and *Carya ovalis* (red hickory)). *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Tilia americana* (American basswood), and *Juglans nigra* (black walnut) may also be present in the canopy. Disturbed stands may have a higher proportion of *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), and other early-successional species in the overstory. The relatively open subcanopy may contain *Acer saccharum* (sugar maple) and *Juniperus virginiana var. virginiana* (eastern redcedar), as well as smaller individuals of *Fraxinus americana* (white ash) and *Carya* (hickory) spp. *Viburnum prunifolium* (blackhaw), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), and *Asimina triloba* (pawpaw) are present as tall shrubs or small trees. Low shrubs include *Rhus aromatica var. aromatica* (fragrant sumac), *Dirca palustris* (eastern leatherwood), *Staphylea trifolia* (American bladdernut), *Toxicodendron radicans* (eastern poison ivy), and small individuals of *Aesculus flava* (yellow buckeye). Herbs present include *Ageratina altissima* (white snakeroot), *Bromus pubescens* (hairy woodland brome), *Brachyelytrum erectum* (bearded shorthusk), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Hexastylis arifolia var. ruthii* (Ruth's littlebrownjug), *Collinsonia canadensis* (richweed), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Hydrophyllum virginianum* (Shawnee salad), *Sanicula odorata* (clustered blacksnakeroot), *Geranium maculatum* (spotted geranium), *Euphorbia mercurialina* (mercury spurge), *Sanguinaria canadensis* (bloodroot), *Maianthemum racemosum* (feathery false lily of the valley), *Thaspium barbinode* (hairyjoint meadowparsnip), *Viola pubescens* (downy yellow violet), *Prenanthes* (rattlesnakeroot) sp., and *Polystichum acrostichoides* (Christmas fern). Some small patches of *Arundinaria gigantea* (giant cane) are also present in stands at the southern end of the range. Although *Acer saccharum* (sugar maple) is present in some stands, this type appears to reach maximal development in Ridge and Valley

landscapes where *Acer saccharum* (sugar maple) is absent or infrequent. This association has been observed on The Nature Conservancy's Powell River Preserve and in Cumberland Gap National Historical Park, both in Claiborne County, Tennessee, as well as in a number of Virginia sites in the Ridge and Valley province. Quantitative data from northwestern Virginia, eastern West Virginia, and western Maryland have been analyzed for the National Park Service.
Environmental Description: This type is strongly associated with carbonate rock substrates and calcareous soils of the Ridge and Valley province. A few rare, disjunct Piedmont stands also occur in the northern Virginia Triassic (Culpeper) Basin in association with bluffs of calcareous siltstone. Examples of this community in Tennessee and southwestern Virginia occur on gentle to steep, south- to east-facing slopes underlain by limestone. Sites are submesic, with locally shallow soils over flat-lying limestones. Plot-sampled stands in Virginia, West Virginia, and Maryland were located on gentle to steep slopes with variable aspects. Underlying bedrock in all but one case was limestone or dolomite. Middle and upper slope topographic positions were prevalent. Most sites had been disturbed in the past by cutting, clearing, and/or grazing. Surface substrate at sampling sites was not very rocky (mean cover of bedrock and loose rocks = 6%), had an average of 17% bare mineral soil, and was mostly covered by leaf litter and other organic matter. Soil samples collected from plots were nearly circumneutral (mean pH = 6.6) with very high calcium (mean = 3374 ppm) and magnesium (mean = 408 ppm) content, as well as nearly complete (97%) total base saturation. Habitats were subjectively assessed as submesic to mesic.
Vegetation Description: Stands are dominated by a mixture of *Quercus muehlenbergii* (chinkapin oak), other oaks (particularly *Quercus alba* (white oak) and *Quercus rubra* (northern red oak)), and several hickories (*Carya cordiformis* (bitternut hickory), *Carya glabra* (pignut hickory), and *Carya ovalis* (red hickory)). *Fraxinus americana* (white ash), *Liriodendron tulipifera* (tuliptree), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Tilia americana* (American basswood), and *Juglans nigra* (black walnut) may also be present in the canopy. Disturbed stands may have a higher proportion of *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), and other early-successional species in the overstory. The relatively open subcanopy may contain *Acer saccharum* (sugar maple) and *Juniperus virginiana var. virginiana* (eastern redcedar), as well as smaller individuals of *Fraxinus americana* (white ash) and *Carya* (hickory) spp. *Viburnum prunifolium* (blackhaw), *Cercis canadensis var. canadensis* (eastern redbud), *Cornus florida* (flowering dogwood), *Ulmus rubra* (slippery elm), and *Asimina triloba* (pawpaw) are present as tall shrubs or small trees. Low shrubs include *Rhus aromatica var. aromatica* (fragrant sumac), *Dirca palustris* (eastern leatherwood), *Staphylea trifolia* (American bladdernut), *Toxicodendron radicans* (eastern poison ivy), and small individuals of *Aesculus flava* (yellow buckeye). Herbs present include *Ageratina altissima* (white snakeroot), *Bromus pubescens* (hairy woodland brome), *Brachyelytrum erectum* (bearded shorthusk), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Hexastylis arifolia var. ruthii* (Ruth's littlebrownjug), *Collinsonia canadensis* (richweed), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Hydrophyllum virginianum* (Shawnee salad), *Sanicula odorata* (clustered blacksnakeroot), *Geranium maculatum* (spotted geranium), *Euphorbia mercurialina* (mercury spurge), *Sanguinaria canadensis* (bloodroot), *Maianthemum racemosum* (feathery false lily of the valley), *Thaspium barbinode* (hairyjoint meadowparsnip), *Viola pubescens* (downy yellow violet), *Prenanthes* (rattlesnakeroot) sp., and *Polystichum acrostichoides* (Christmas fern). Some small patches of *Arundinaria gigantea* (giant cane) are also present in stands at the southern end of the range. Additional species characteristic of plot samples at the northern end of the range are *Festuca subverticillata* (nodding fescue), *Viola*

sororia (common blue violet), *Cardamine concatenata* (cutleaf toothwort), *Geum canadense* (white avens), *Arisaema triphyllum* (Jack in the pulpit), *Actaea racemosa* (black bugbane), *Dicentra cucullaria* (dutchman's breeches), *Claytonia virginica* (Virginia springbeauty), *Polygonum virginianum* (jumpseed), *Corydalis flavula* (yellow fumewort), *Eurybia divaricata* (white wood aster), *Podophyllum peltatum* (mayapple), and *Viola striata* (striped cream violet). Several species that are more typical of basic mesic forests (e.g., *Asarum canadense* (Canadian wildginger), *Jeffersonia diphylla* (twinleaf), *Hybanthus concolor* (eastern greenviolet), and *Dicentra canadensis* (squirrel corn)) occasionally exhibit strong patch-dominance in this community, although none of these species occurs with high constancy. In Lee County, VA, *Hydrastis canadensis* (goldenseal) frequently forms large clones in this forest. Additional, relatively inconstant herbs that occasionally cover >1% of an individual stand include *Sanicula odorata* (clustered blacksnakeroot), *Bromus pubescens* (hairy woodland brome), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Sanguinaria canadensis* (bloodroot), *Galium concinnum* (shining bedstraw), *Hepatica nobilis var. obtusa* (roundlobe hepatica), *Polymnia canadensis* (whiteflower leafcup), *Stellaria pubera* (star chickweed), and *Carex jamesii* (James' sedge). Many additional herbs occur at low cover and constancy. Although *Acer saccharum* (sugar maple) is present in some stands, this type appears to reach maximal development in Ridge and Valley landscapes where *Acer saccharum* (sugar maple) is absent or infrequent.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus muehlenbergii* (chinkapin oak)

Characteristic Species: *Bromus pubescens* (hairy woodland brome), *Cercis canadensis* (eastern redbud), *Quercus muehlenbergii* (chinkapin oak).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is found in the Ridge and Valley of Tennessee, Virginia, West Virginia, and Maryland, with small disjunct occurrences in the northern Virginia Triassic (Culpeper) Basin.

States/Provinces: MD, TN, VA, WV.

Federal Lands: NPS (Antietam, Big South Fork, C&O Canal, Cumberland Gap, Harpers Ferry, Manassas, New River Gorge).

CONSERVATION STATUS

Rank: G3G4 (1-Oct-2006).

Reasons: This association is potentially widespread across the Ridge and Valley province of four states. However, this region has a long and extensive history of settlement and agriculture. As a result, few high-quality occurrences of this community exist, and most contemporary stands have been impacted by multiple disturbances, including clearing, cutting, and grazing. Moreover, the fertile soils occupied by this community are particularly prone to invasion by aggressive introduced weeds, whose abundance degrades the quality of many existing stands.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 3 - Weak.

Comments: Information not available.

Similar Associations:

- *Acer saccharum - Quercus muehlenbergii / Cercis canadensis* Forest (CEGL006017)--clearly related but more xeric and without oak dominance.

Related Concepts:

- IA6j. Interior Calcareous Oak-Hickory Forest (Allard 1990) ?

SOURCES

Description Authors: M. Pyne and R. White, mod. G. P. Fleming.

References: Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): OAK / ERICAD FOREST

SYNONYMS

NVC English Name:	**(Chestnut Oak, Scarlet Oak) / Mountain Laurel / (Galax, Wintergreen) Forest**
NVC Scientific Name:	***Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest**
NVC Identifier:	**CEGL006271**

LOCAL INFORMATION

Environmental Description: This association occurs in small to large patches on warm, dry aspects and topographic positions. It is most abundant on southerly aspects in the northern two-thirds of the park on upper gorge slopes, on ridges and spurs, and in convex positions on the plateaus. Soils are mostly derived from sandstones of the Pottsville group and are mapped mostly in the Dekalb and Gilpin series. Soils are usually shallow, rocky, dry, acidic sandy loams with low fertility; soil chemistry analyzed from 11 plots indicates relatively low pH (mean = 4.3) and low levels of several nutrients (Ca, Cu, K, Mg, Mn, Zn) compared to most other community types in the park. Slopes range from level to very steep (mean slope of mapped stands = 20 degrees). Elevations of mapped stands range from 302 to 926 m. Almost all forests in the park, including this association, have been logged in the past. There is abundant evidence of past fires in this community, and the vegetation may be fire-adapted, although information on natural fire regimes is lacking. Stands of this association are typically adjacent to or surrounded by the less xeric, oak-dominated matrix forest types of the park, *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) and *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268), or they may be adjacent to or surround the more xeric, small patch *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119).

Vegetation Description: This association is a deciduous forest dominated by oaks over a shrub layer dominated by evergreen and/or deciduous species in the Ericaceae (heath family). Dominant canopy trees include (in decreasing order of constancy in 23 sampled plots) *Quercus prinus* (chestnut oak), *Quercus velutina* (black oak), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), and *Quercus alba* (white oak). Additional canopy species which may have significant cover in some stands include *Magnolia acuminata* (cucumber-tree) and *Magnolia fraseri* (mountain magnolia). The conifer *Pinus virginiana* (Virginia pine) may occur as scattered individuals. Additional tree species with high cover in the subcanopy include *Castanea dentata* (American chestnut) (as root sprouts), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), and *Sassafras albidum* (sassafras). Important species in the shrub layers, in addition to saplings of the tree species, include *Kalmia latifolia* (mountain laurel), *Gaylussacia baccata* (black huckleberry), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), and *Viburnum acerifolium* (mapleleaf viburnum). Additional heaths which occur in some stands include *Rhododendron calendulaceum* (flame azalea), *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron maximum* (great laurel), and *Vaccinium stamineum* (deerberry). The herb layer is usually sparse and has low diversity but commonly includes *Danthonia spicata* (poverty oatgrass), *Dioscorea quaternata* (fourleaf yam), *Gaultheria procumbens* (eastern teaberry), *Hieracium venosum* (rattlesnakeweed), *Houstonia longifolia* (longleaf summer bluet),

Lysimachia quadrifolia (whorled yellow loosestrife), and *Potentilla simplex* (common cinquefoil). The global nominal species *Galax urceolata* (beetleweed) was found in two plots. Mosses include *Dicranum fulvum* (dicranum moss), *Dicranum scoparium* (dicranum moss), and *Leucobryum glaucum* (leucobryum moss). Macrolichens on rocks include *Lasallia papulosa* (blistered naval lichen) and *Umbilicaria mammulata* (navel lichen). Vascular plant species richness in the 23 sampled plots ranges from 15 to 47 taxa (mean = 26.9).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Quercus prinus* (chestnut oak), *Quercus velutina* (black oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)

Characteristic Species: *Acer rubrum* (red maple), *Castanea dentata* (American chestnut), *Danthonia spicata* (poverty oatgrass), *Dioscorea quaternata* (fourleaf yam), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Hieracium venosum* (rattlesnakeweed), *Houstonia longifolia* (longleaf summer bluet), *Leucobryum glaucum* (leucobryum moss), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Magnolia acuminata* (cucumber-tree), *Magnolia fraseri* (mountain magnolia), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Pinus virginiana* (Virginia pine), *Potentilla simplex* (common cinquefoil), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus rubra* (northern red oak), *Rhododendron calendulaceum* (flame azalea), *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron maximum* (great laurel), *Sassafras albidum* (sassafras), *Smilax glauca* (cat greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), *Viburnum acerifolium* (mapleleaf viburnum).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs mostly in the northern two-thirds of the park in areas with sandstone geology, however, a few stands were mapped in the southern third of the park on shale.

Classification Comments: Forests which may have an oak component with shrub layers strongly dominated by *Rhododendron maximum* (great laurel) are classified as *Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest, a local segregate of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543). Oak-hemlock forests with shrub layers including a large component of *Rhododendron catawbiense* (Catawba rosebay) are classified as *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest (CEGL008524).

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.32, NERI.42, NERI.53, NERI.115, NERI.119, NERI.201, NERI.220, NERI.223, NERI.225, NERI.235, NERI.240, NERI.256, NERI.247, NERI.249, NERI.253, NERI.259, NERI.260, NERI.261, NERI.263, NERI.274, NERI.294, NERI.320, NERI.322.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Quercus prinus - (Quercus coccinea, Quercus velutina)* Forest Alliance (A.248)
Alliance (English name)	Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
Association	*Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest
Association (English name)	(Chestnut Oak, Scarlet Oak) / Mountain Laurel / (Galax, Wintergreen) Forest
Ecological System(s):	Southern Appalachian Oak Forest (CES202.886).

GLOBAL DESCRIPTION

Concept Summary: This community includes xeric ridgetop and exposed slope forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont, north into the Central Appalachians, and north and west into the Ridge and Valley. This community occurs over shallow soils, primarily on south- to west-facing slopes and ridgetops. Soils are rocky, infertile, dry, acidic sandy loams typically derived from sandstone. The community includes forests with canopies strongly dominated by *Quercus prinus* (chestnut oak) and/or *Quercus coccinea* (scarlet oak), with lesser amounts of *Quercus velutina* (black oak), *Quercus rubra* (northern red oak), *Quercus falcata* (southern red oak), *Oxydendrum arboreum* (sourwood), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple), occurring over a typically dense shrub stratum dominated by ericaceous species. The shrub layer may vary between evergreen and deciduous dominance. Typical shrub species include *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia ursina* (bear huckleberry), *Gaylussacia baccata* (black huckleberry), and (in the more southern portions of the range) *Leucothoe recurva* (redtwig doghobble). *Castanea dentata* (American chestnut) may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* (trailing arbutus) and *Gaultheria procumbens* (eastern teaberry). Other common species include *Chamaelirium luteum* (fairywand), *Chimaphila maculata* (striped prince's pine), *Galax urceolata* (beetleweed), *Magnolia fraseri* (mountain magnolia), *Sassafras albidum* (sassafras), *Symplocos tinctoria* (common sweetleaf), *Smilax rotundifolia* (roundleaf greenbrier), and *Smilax glauca* (cat greenbrier). This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acidic soils.

Environmental Description: This community occurs on upper slopes, ridges and spurs, usually convex, primarily on south- to west-facing slopes and ridgetops. This community includes xeric ridgetop forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians, and west into the Ridge and Valley. Soils are rocky, infertile, dry, acidic sandy loams typically derived from sandstone. Slopes range from level to very steep. Sites range up to 915 m (3000 feet).

Vegetation Description: Stands of this association are forests with canopies strongly dominated by *Quercus prinus* (chestnut oak) and *Quercus coccinea* (scarlet oak) alone or in mixture. *Quercus velutina* (black oak) is an important associate in some stands. Other trees, usually in lesser amounts, include *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Oxydendrum arboreum* (sourwood), *Nyssa sylvatica* (blackgum), *Pinus virginiana* (Virginia pine), and *Acer rubrum* (red maple). *Magnolia acuminata* (cucumber-tree) and *Magnolia fraseri* (mountain magnolia) are present in some areas. The trees grow over a typically dense shrub stratum dominated by ericaceous species, which may vary between evergreen and deciduous dominance. Typical shrub species include *Kalmia latifolia* (mountain laurel), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia ursina* (bear huckleberry), and *Gaylussacia baccata* (black huckleberry). Some areas may feature *Rhododendron maximum* (great laurel), *Rhododendron calendulaceum* (flame azalea), *Rhododendron catawbiense* (Catawba rosebay), and *Leucothoe recurva* (redtwig doghobble). *Castanea dentata* (American chestnut) may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* (trailing arbutus) and *Gaultheria procumbens* (eastern teaberry). Other common species include *Chamaelirium luteum* (fairywand), *Chimaphila maculata* (striped prince's pine), *Galax urceolata* (beetleweed), *Danthonia spicata* (poverty oatgrass), *Dioscorea quaternata* (fourleaf yam), *Hieracium venosum* (rattlesnakeweed), *Houstonia longifolia* (longleaf summer bluet), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Symplocos tinctoria* (common sweetleaf), and *Potentilla simplex* (common cinquefoil). Mosses include *Dicranum fulvum* (dicranum moss), *Dicranum scoparium* (dicranum moss), and *Leucobryum glaucum* (leucobryum moss). Macrolichens on rocks include *Lasallia papulosa* (blistered naval lichen) and *Umbilicaria mammulata* (navel lichen). This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acid soils. In the Great Smoky Mountains *Acer rubrum* (red maple) is often dominant or codominant in these forests, presumably on former American Chestnut (*Castanea dentata* (American chestnut)) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* (pitch pine) forests and woodlands, *Quercus falcata* (southern red oak) may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum* (Blue Ridge blueberry).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), *Quercus velutina* (black oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum* (deerberry)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)
Herb (field)	Dwarf-shrub	*Epigaea repens* (trailing arbutus), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry)

Characteristic Species: *Acer rubrum* (red maple), *Castanea dentata* (American chestnut), *Galax urceolata* (beetleweed), *Gaylussacia baccata* (black huckleberry), *Hieracium venosum* (rattlesnakeweed), *Kalmia latifolia* (mountain laurel), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Quercus coccinea* (scarlet oak), *Quercus prinus* (chestnut oak), *Quercus*

velutina (black oak), *Rhododendron periclymenoides* (pink azalea), *Sassafras albidum* (sassafras), *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry).

Other Noteworthy Species:

Species	GRank	Type	Note
Monotropsis odorata (sweet pinesap)	G3	plant	
Smilax biltmoreana (Biltmore's carrionflower)	-	plant	
Thermopsis fraxinifolia (ash-leaved bush-pea)	G3?	plant	
Thermopsis mollis (Allegheny Mountain goldenbanner)	G3G4	plant	
Vaccinium hirsutum (hairy blueberry)	G3	plant	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: The center of distribution for this community is the Southern Blue Ridge of southwestern Virginia, western North Carolina, eastern Tennessee, northeastern Georgia and northwestern South Carolina. It ranges south and east into the upper Piedmont and north into the Central Appalachians, and could possibly extend west into the Ridge and Valley and the Cumberlands of Kentucky.

States/Provinces: GA, KY, NC, SC, TN, VA:S5, WV.

Federal Lands: NPS (Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)?).

CONSERVATION STATUS

Rank: G5 (31-Dec-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 1 - Strong.

Comments: In the Great Smoky Mountains *Acer rubrum* (red maple) is often dominant or codominant in these forests, presumably on former American chestnut (*Castanea dentata* (American chestnut)) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* (pitch pine) forests and woodlands, *Quercus falcata* (southern red oak) may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum* (Blue Ridge blueberry). A similar association defined for the southern Cumberland Plateau, *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431), occurs over sandstone or other geologies not as acid as the Blue Ridge type and lacks species indicative of the Blue Ridge association, such as *Kalmia latifolia* (mountain laurel), *Gaylussacia ursina* (bear huckleberry), *Gaylussacia baccata* (black huckleberry), and *Gaultheria procumbens* (eastern teaberry).

Similar Associations:

- *Acer rubrum* var. *rubrum - Betula (alleghaniensis, lenta) - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Forest (CEGL008558).
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119).

- *Quercus alba - Quercus (coccinea, velutina, prinus) / Gaylussacia baccata* Forest (CEGL008521).
- *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum* Forest (CEGL008431)--defined for the southern Cumberland Plateau and western fringe of the southern Blue Ridge, with more diverse shrubs.
- *Quercus prinus - (Quercus coccinea, Quercus rubra) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299).
- *Quercus prinus - Carya* spp. - *Quercus velutina / Vaccinium arboreum / Iris verna* var. *smalliana* Forest (CEGL007261)--defined for the lower Piedmont of Alabama and has Coastal Plain affinities.
- *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)--broadly defined type for the Appalachian Plateau and Interior Low Plateau.
- *Quercus prinus - Quercus (rubra, velutina) / Vaccinium angustifolium* Forest (CEGL006282)--defined for the Northern Piedmont, Central Appalachians; occurs on granite monadnocks.
- *Quercus prinus - Quercus alba / Oxydendrum arboreum / Vitis rotundifolia* Forest (CEGL006281).
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286)--is more mesic and has a higher component of *Rhododendron maximum* and relatively little *Kalmia latifolia*.

Related Concepts:

- *Quercus alba - Quercus velutina - (Quercus prinus) / Vaccinium pallidum -(Kalmia latifolia)* forest (Vanderhorst 2001b) =
- *Quercus montana - Quercus coccinea / Vaccinium pallidum* Forest (Fleming and Moorhead 2000) ?
- *Quercus montana / Kalmia latifolia / Vaccinium pallidum* Association, *pro parte* (Rawinski et al. 1996) ?
- *Quercus prinus - Quercus coccinea / Kalmia latifolia / Vaccinium pallidum* Forest (Fleming and Coulling 2001) ?
- Chestnut Oak Forest (Dry Heath Subtype) (Schafale 1998b) ?
- Chestnut Oak Forests (McLeod 1988) ?
- Chestnut Oak type (Golden 1974) ?
- Chestnut Oak, BR, CUPL (Pyne 1994) ?
- Chestnut Oak-Chestnut Heath (Whittaker 1956) ?
- Chestnut Oak: 44 (Eyre 1980) B
- Chestnut oak-scarlet oak/ericad forest: (matrix) xeric, S- & SW-facing slopes (CAP pers. comm. 1998) ?
- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) B

SOURCES

Description Authors: K.D. Patterson, mod. R. White and S.C. Gawler.

References: Allard 1990, CAP pers. comm. 1998, Evans 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Golden 1974, Major et al. 1999, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data 2002, Pyne 1994, Rawinski et al. 1996, Schafale 1998b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data, VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007, Whittaker 1956.

COMMON NAME (PARK-SPECIFIC): EASTERN HEMLOCK - CHESTNUT OAK / CATAWBA RHODODENDRON FOREST

SYNONYMS

NVC English Name: **Chestnut Oak / Catawba Rhododendron - Mountain Laurel Forest**

NVC Scientific Name: ***Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest**

NVC Identifier: **CEGL008524**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches and linear zones confined to cool aspects of cliff tops, ridge spurs, and upper gorge slopes on sandstones of the Pottsville group. Stands are often centered on rock outcrops and cliffs, and there is usually high ground cover by rock. Soil chemistry analyzed from 2 plots indicates low pH (mean = 4.29), cation-exchange capacity, and estimated nitrogen release, and low levels of most nutrients (Ca, Cu, Fe, K, Mg, Mn, P, Zn) compared to most other communities in the park. Elevations of mapped stands range from 334 to 841 m. Slopes range from nearly level to very steep (mapping unit values range from 0.4 to 48 degrees, mean = 30 degrees). On ridge spurs with contrasting aspects, this association often occurs on the cool northerly aspect with *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119) occurring on the warm southerly aspect. This association is also often adjacent to *Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest (a local segregate of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)) which occurs in less exposed positions (e.g., below the cliff or away from the cliff edge).

Vegetation Description: This association is typically a mixed evergreen - deciduous forest with an evergreen shrub layer. Dominant tree species in the canopy include *Tsuga canadensis* (eastern hemlock), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), and *Betula alleghaniensis var. alleghaniensis* (yellow birch). Additional tree species with high constancy in the subcanopy include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Castanea dentata* (American chestnut) (from root sprouts), and *Oxydendrum arboreum* (sourwood). There is a well-developed evergreen shrub layer with *Rhododendron catawbiense* (Catawba rosebay) dominant or codominant with *Rhododendron maximum* (great laurel). Additional shrubs include *Acer pensylvanicum* (striped maple), *Gaylussacia baccata* (black huckleberry), *Hamamelis virginiana* (American witchhazel), *Kalmia latifolia* (mountain laurel), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), and *Viburnum acerifolium* (mapleleaf viburnum). The herb layer has low diversity and cover but commonly includes *Aralia nudicaulis* (wild sarsaparilla), *Cypripedium acaule* (moccasin flower), *Gaultheria procumbens* (eastern teaberry), and *Polypodium virginianum* (rock polypody). The bryophyte layer may have significant cover by *Leucobryum glaucum* (leucobryum moss). Lichens collected from this community include *Cladonia caroliniana* (Carolina cup lichen), *Flavoparmelia baltimorensis*, and *Umbilicaria mammulata* (navel lichen). Vascular plant species richness in the 4 sampled plots ranges from 14 to 33 taxa (mean = 23.5).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron catawbiense* (Catawba rosebay), *Rhododendron maximum* (great laurel)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Aralia nudicaulis* (wild sarsaparilla), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Cypripedium acaule* (moccasin flower), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Hamamelis virginiana* (American witchhazel), *Kalmia latifolia* (mountain laurel), *Leucobryum glaucum* (leucobryum moss), *Polypodium virginianum* (rock polypody), *Rhododendron maximum* (great laurel), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association occurs on the upper slopes of the New River Gorge and gorges of its tributaries from Glade Creek north in areas underlain by Pottsville sandstone. The distribution of this association at New River Gorge coincides with the area of highest abundance of *Rhododendron catawbiense* (Catawba rosebay).

Classification Comments: The distribution of this association at New River Gorge coincides with the area of highest abundance of *Rhododendron catawbiense* (Catawba rosebay). *Rhododendron maximum* (great laurel) is a much more common species in the New River Gorge and may also be abundant in this association, contrasting with the association's original description from Virginia. Although *Tsuga canadensis* (eastern hemlock) is prominent in this association at New River Gorge (another contrast to Virginia stands), similar vegetation dominated by *Quercus prinus* (chestnut oak) (and sometimes lacking *Tsuga canadensis* (eastern hemlock)) over an evergreen shrub layer including *Rhododendron catawbiense* (Catawba rosebay) has been observed at Gauley River National Recreation Area and will be compared with this association as part of the vegetation mapping project for that park (est. completion 2009). Deciduous forests with a tall-shrub layer dominated by *Rhododendron maximum* (great laurel) at New River Gorge National River are currently classified as *Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest (a local segregate of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)).

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.14, NERI.234, NERI.252, NERI.290.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Quercus prinus - (Quercus coccinea, Quercus velutina)* Forest Alliance (A.248)
Alliance (English name)	Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
Association	*Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest
Association (English name)	Chestnut Oak / Catawba Rhododendron - Mountain Laurel Forest
Ecological System(s):	Central Appalachian Dry Oak-Pine Forest (CES202.591).

GLOBAL DESCRIPTION

Concept Summary: The documented range of this community is confined to the northern Virginia Blue Ridge and scattered locations in the Ridge and Valley province of west-central and southwestern Virginia and adjacent areas of West Virginia. In addition, there are a few local outliers on sheltered, north-facing bluffs along the James River in the western Piedmont. Piedmont occurrences are confined to steep, sheltered bluffs subtending the James River at <200 m (650 feet) elevation. In the mountains, stands are generally associated with strongly convex, upper slopes and spur crests at elevations from 800 m to over 975 m (2700-3200 feet). Stands have north or northwest aspects. The vegetation is an exceptionally species-poor, open to closed-canopy forest of often stunted (<10 m tall), gnarled trees over a dense, evergreen tall-shrub layer. *Quercus prinus* (chestnut oak) is the sole canopy dominant, with occasional associates of *Betula lenta* (sweet birch), *Tsuga canadensis* (eastern hemlock), *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), and *Pinus strobus* (eastern white pine). *Rhododendron catawbiense* (Catawba rosebay) and *Kalmia latifolia* (mountain laurel) dominate the shrub layer. *Pieris floribunda* (mountain fetterbush) is reported to be a characteristic shrub of this community. Additional shrubs present at low cover include *Hamamelis virginiana* (American witchhazel), *Ilex montana* (mountain holly), and *Amelanchier arborea* (common serviceberry). Deciduous ericads such as *Gaylussacia baccata* (black huckleberry) and *Vaccinium pallidum* (Blue Ridge blueberry) are often present but rarely contribute more than 10% cover. Herbs and subshrubs are exceedingly sparse in the densely shaded, forest-floor environment.

Environmental Description: In the typical mountains range of this type, stands are generally associated with strongly convex, upper slopes, cliff tops, and spur crests at elevations from 305 to over 975 m (1000-3200 feet). All plot-sampled stands have north or northwest aspects and, with a few exceptions, slopes >20 degrees. Piedmont occurrences of this vegetation type are confined to steep, sheltered bluffs subtending the James River at <200 m (650 feet) elevation. Site moisture potential appears to be in the subxeric to submesic range. Surface cover of rocks varies from low to high, and soils have thick, poorly decomposed duff layers. Soils are extremely acidic (mean pH = 4.1) and infertile, with low levels of most nutrients (Ca, Cu, Fe, K, Mg, Mn, P, Zn).

Vegetation Description: The vegetation is an exceptionally species-poor, open- to closed-canopy forest of often stunted (<10 m tall), gnarled trees over a dense, evergreen tall-shrub layer. *Quercus prinus* (chestnut oak) is the canopy dominant, with occasional associates of *Tsuga canadensis* (eastern hemlock), *Betula lenta* (sweet birch), *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), *Betula alleghaniensis* (yellow birch), and *Pinus strobus* (eastern white pine). *Rhododendron catawbiense* (Catawba rosebay) and *Kalmia latifolia* (mountain laurel), each with mean cover of 25-50% in plots, dominate the shrub layer; *Rhododendron maximum* (great laurel) may be locally important. Additional shrubs present at low cover include *Acer pensylvanicum* (striped maple), *Gaylussacia baccata* (black huckleberry), *Hamamelis virginiana* (American witchhazel), *Ilex montana* (mountain holly), *Amelanchier arborea* (common serviceberry), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), and *Viburnum acerifolium* (mapleleaf viburnum). Although not documented in plots, *Pieris floribunda* (mountain fetterbush) is reported to be a characteristic shrub of this community in the Thunder Ridge - Apple Orchard Mountain area of Virginia's Bedford and Botetourt counties (Rawinski et al. 1996). Herbs and subshrubs are exceedingly sparse in the densely shaded forest floor environment, but the evergreen species *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), and *Goodyera pubescens* (downy rattlesnake plantain) are sometimes present at low cover. Occasional herbs include *Aralia nudicaulis* (wild sarsaparilla), *Cypripedium acaule* (moccasin flower), and *Polypodium virginianum* (rock polypody). The bryophyte layer may have significant cover by *Leucobryum glaucum* (leucobryum moss). Lichens collected from this community include *Cladonia caroliniana* (Carolina cup lichen), *Flavoparmelia baltimorensis*, and *Umbilicaria mammulata* (navel lichen). Vascular plant species richness of Virginia plot-sampled stands ranged from 9 to 16 taxa per 400 square meters (mean = 12); in the four WV sampled plots it ranged from 14 to 33 taxa (mean = 23.5).
Most Abundant Species: Information not available.
Characteristic Species: *Aralia nudicaulis* (wild sarsaparilla), *Cypripedium acaule* (moccasin flower), *Gaultheria procumbens* (eastern teaberry), *Hamamelis virginiana* (American witchhazel), *Kalmia latifolia* (mountain laurel), *Quercus prinus* (chestnut oak), *Rhododendron catawbiense* (Catawba rosebay), *Tsuga canadensis* (eastern hemlock).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: The documented range of this community is confined to the northern Virginia Blue Ridge and scattered locations in the Ridge and Valley province of west-central and southwestern Virginia and adjacent areas of West Virginia. In addition, there are a few local outliers on sheltered, north-facing bluffs along the James River in the western Piedmont (Appomattox and Buckingham counties).
States/Provinces: VA:S3?, WV.
Federal Lands: NPS (Blue Ridge Parkway, New River Gorge); USFS (George Washington, Jefferson).

CONSERVATION STATUS
Rank: G3? (25-Feb-2004).
Reasons: The geographic distribution of this community and the extent to which it occurs throughout the northern Blue Ridge and Ridge and Valley are somewhat uncertain and need further investigation. This appears to be a somewhat geographically restricted, mostly small-patch vegetation type of oligotrophic, north-facing habitats.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 2 - Moderate.
Comments: The geographic distribution of this community and the extent to which it recurs throughout the Northern Blue Ridge and Ridge and Valley are somewhat uncertain and need further investigation. Although documented by plot data only on the Blue Ridge of Virginia and at New River Gorge in West Virginia, similar vegetation is reported to be frequent on xeric, rocky upper slopes and summits throughout the west-central and southwestern Virginia Ridge and Valley region (T.F. Wieboldt pers. comm.). These putative Ridge and Valley occurrences sometimes contain mixtures of *Rhododendron catawbiense* (Catawba rosebay) and *Rhododendron maximum* (great laurel). For the most part, however, this community appears to reach optimal development in geographic areas (i.e., the Northern Blue Ridge) and drier habitats where *Rhododendron maximum* (great laurel) is spotty or absent. In WV, *Rhododendron maximum* (great laurel) is a much more common species in the New River Gorge and may also be abundant in this association, contrasting with the original description from Virginia. Although *Tsuga canadensis* (eastern hemlock) is prominent in this association at New River Gorge (another contrast to Virginia stands), similar vegetation dominated by *Quercus prinus* (chestnut oak) (and sometimes lacking *Tsuga canadensis* (eastern hemlock)) over an evergreen shrub layer including *Rhododendron catawbiense* (Catawba rosebay) has been observed at Gauley River National Recreation Area and will be compared with this association as part of the vegetation mapping project for that park (est. completion 2009).

This association (CEGL008524) is not likely to be found in the Southern Blue Ridge, where *Rhododendron catawbiense* (Catawba rosebay) is more restricted to high elevations and exposed habitats, above the elevational limits of *Quercus prinus* (chestnut oak) (Newell 1997, A.S. Weakley pers. comm.). Although stands of this type can be rather difficult to plot-sample, the collection of additional quantitative data from well developed occurrences would be desirable. This community type is similar to and sometimes co-occurs with *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139) on the Northern Blue Ridge. The degree to which periodic fires have influenced the structure and composition of this community type needs investigation.
Similar Associations:
- *Fagus grandifolia - Quercus alba / Kalmia latifolia - (Symplocos tinctoria, Rhododendron catawbiense) / Galax urceolata* Forest (CEGL004539).
- *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139).

Related Concepts:

- *Quercus montana - Pinus strobus / Kalmia latifolia / Gaylussacia baccata* Forest (Coulling and Rawinski 1999) ?
- *Quercus montana / Kalmia latifolia / Vaccinium pallidum* Association: *Rhododendron catawbiense / Galax urceolata* Subassociation (Rawinski et al. 1996) ?
- *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest (Fleming and Coulling 2001) =
- *Quercus rubra - Tsuga canadensis / Rhododendron catawbiense* Association, *pro parte* (Rawinski et al. 1996) ?
- Chestnut Oak: 44 (Eyre 1980) B

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. S.C. Gawler.

References: Coulling and Rawinski 1999, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Fleming et al. 2004, Newell 1997, Rawinski et al. 1996, Vanderhorst et al. 2007, Wieboldt pers. comm.

COMMON NAME (PARK-SPECIFIC): OAK - HICKORY - SUGAR MAPLE FOREST

SYNONYMS

NVC English Name:	**Chestnut Oak - Shagbark Hickory - Northern Red Oak / Sugar Maple Forest**
NVC Scientific Name:	***Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest**
NVC Identifier:	**CEGL007268**

LOCAL INFORMATION

Environmental Description: This association is the predominant upland forest type on colluvial gorge slopes with relatively warm, dry aspects, and it also occurs locally on plateaus. It commonly occurs as a matrix forest on lower to upper positions on southerly facing gorge slopes but can also occur in small to large patches on ridge spurs and convex upper slopes on more northerly aspects. On the plateau in the vicinity of Backus Mountain, this association occurs on gentle northerly facing slopes. Stands occur both on sandstones of the Pottsville group and on shales of the Mauch Chunk group. Elevations of mapped stands range from 249 to 985 m. Slopes range from flat to very steep (mapping unit values range from 0 to 51 degrees, mean = 25 degrees). Soils are mostly well-drained sandy to clay loams mapped in the Calvin, Dekalb, and Gilpin series. Soil chemistry analyzed from 10 plots indicates extremely acidic to slightly acidic soils (mean pH = 4.92) with intermediate levels of most nutrients and somewhat higher levels of some nutrients (K, Mg, Mn, P) compared to other community types in the park. On a moisture-fertility gradient, this association is intermediate between, and often borders, the more mesic *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) and more xeric *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267). Although almost all forests in the park were logged in the past, one small patch of this community exhibits old-growth characteristics (large live and dead standing trees, abundant windfall and coarse woody debris, and tip mounds). There is abundant evidence of past fires in this community, but information on its natural fire regime is lacking; fire suppression or lack of ignition sources may be responsible for the abundance of *Acer saccharum var. saccharum* (sugar maple) in this type and for the current predominance of this association on the landscape.

Vegetation Description: This association is a closed-canopy deciduous forest dominated by species of *Quercus* (oak) with an abundance of *Acer saccharum var. saccharum* (sugar maple) in the canopy and/or shrub layers. The most important tree species in the canopy include (in decreasing order of constancy in plots) *Quercus rubra* (northern red oak), *Quercus prinus* (chestnut oak), *Acer saccharum var. saccharum* (sugar maple), *Quercus alba* (white oak), *Fraxinus americana* (white ash), *Carya ovata* (shagbark hickory), *Quercus velutina* (black oak), *Liriodendron tulipifera* (tuliptree), and *Carya glabra* (pignut hickory). The subcanopy is often strongly dominated by *Acer saccharum var. saccharum* (sugar maple). Vines which may occur in the understory or reach into the canopy include *Aristolochia macrophylla* (pipevine), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis aestivalis var. bicolor* (summer grape). Common tall shrubs or short trees include *Cercis canadensis* (eastern redbud), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), and *Ostrya virginiana var. virginiana* (hophornbeam). The shrub layers have an abundance of tree saplings of *Acer saccharum var. saccharum* (sugar

maple) and *Fraxinus americana* (white ash) and somewhat lesser amounts of *Carya* (hickory) spp. and *Quercus* (oak) spp. The most common shrubs are *Viburnum acerifolium* (mapleleaf viburnum) and *Smilax rotundifolia* (roundleaf greenbrier). Common herbs include *Actaea racemosa var. racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carex albursina* (white bear sedge), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Sanicula canadensis* (Canadian blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Solidago caesia* (wreath goldenrod), and species of *Viola* (violet). Vascular plant species richness in the 26 sampled plots ranges from 27 to 54 taxa (mean = 42).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum* var. *saccharum* (sugar maple)
Tree canopy	Broad-leaved deciduous tree	*Carya ovata* (shagbark hickory), *Fraxinus americana* (white ash), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer saccharum* var. *saccharum* (sugar maple)

Characteristic Species: *Acer saccharum* var. *saccharum* (sugar maple), *Actaea racemosa* var. *racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Carex albursina* (white bear sedge), *Carya glabra* (pignut hickory), *Cercis canadensis* (eastern redbud), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Liriodendron tulipifera* (tuliptree), *Ostrya virginiana* var. *virginiana* (hophornbeam), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Quercus velutina* (black oak), *Sanicula canadensis* (Canadian blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Smilax rotundifolia* (roundleaf greenbrier), *Solidago caesia* (wreath goldenrod), *Toxicodendron radicans* (eastern poison ivy), *Viburnum acerifolium* (mapleleaf viburnum), *Vitis aestivalis* var. *bicolor* (summer grape).

Other Noteworthy Species:

Species	GRank	Type	Note
Monarda fistulosa ssp. 1 (Smokehole bergamot)	G5T1	plant	= *Monarda fistulosa* ssp. *brevis* (unpubl.); globally rare and state-rare (S1)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association is one of the predominant community types on gorge slopes throughout the park and is locally common on the plateau in the vicinity of Backus Mountain.
Classification Comments: This association is floristically and environmentally intermediate between *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) and *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) and may also represent an intermediate successional stage. Classification and mapping boundaries between these three matrix forest types are often difficult to establish.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.7, NERI.8, NERI.10, NERI.13, NERI.18, NERI.19, NERI.27, NERI.31, NERI.37, NERI.48, NERI.70, NERI.86, NERI.224, NERI.232, NERI.238, NERI.241, NERI.242, NERI.243, NERI.248, NERI.256, NERI.280, NERI.285, NERI.310, NERI.315, NERI.321, NERI.351.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Quercus prinus - Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
Alliance (English name)	Chestnut Oak - (White Oak, Southern Red Oak, Northern Red Oak, Black Oak) Forest Alliance
Association	*Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest
Association (English name)	Chestnut Oak - Shagbark Hickory - Northern Red Oak / Sugar Maple Forest
Ecological System(s):	Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359) Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898).

GLOBAL DESCRIPTION

Concept Summary: These dry-mesic forests of the Ridge and Valley and adjacent sedimentary ecoregions (Cumberlands, Interior Low Plateau) occur near the tops of calcareous ridges, gorge slopes, spurs, and knobs with northerly aspects. Elevations range from 250 to 1000 m (800-3250 feet). Soils are very well-drained, acidic to circumneutral, and derived from sandstone and shales. The canopy is dominated by *Quercus prinus* (chestnut oak) with other oaks and hickories, typically with *Acer saccharum* (sugar maple) as a canopy associate and/or a subcanopy dominant. Some examples are strongly dominated by *Quercus prinus* (chestnut oak). Other

examples with more diverse canopies include *Quercus rubra* (northern red oak), *Carya ovata* (shagbark hickory), *Carya glabra* (pignut hickory), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Quercus velutina* (black oak). The canopy is generally closed (greater than 75% cover). The subcanopy may be dominated by *Acer saccharum* (sugar maple) in some examples due to fire suppression. Other subcanopy species may include *Carya ovata* (shagbark hickory), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus muehlenbergii* (chinkapin oak), *Aesculus flava* (yellow buckeye), and *Juniperus virginiana* (eastern redcedar). The subcanopy is relatively sparse with cover less than 25%. The shrub and herbaceous layers are sparse with small stems of canopy and subcanopy species along with herbaceous species such as *Actaea racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carex albursina* (white bear sedge), *Campanulastrum americanum* (American bellflower), *Chimaphila maculata* (striped prince's pine), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Sanicula canadensis* (Canadian blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Solidago caesia* (wreath goldenrod), and species of *Viola* (violet).

Environmental Description: In the Ridge and Valley of Tennessee, these forests occur near the tops of calcareous ridges and knobs with northerly aspects that range from 250 to 1000 m (800-3250 feet), on very well-drained, gravelly, sandy soils (Andreu and Tukman 1995). The sites are characterized by very well-drained, gravely, sandy soils and exposed topographical positions. On the Tellico Pilot Project study site many of these communities were found on the following soil series: Dandridge, Tellico, and Steekee. The Tellico series is an Ultisol while the others are Inceptisols; all can be described as well- to excessively well-drained soils. The Tellico and Steekee soils are strongly acid or very strongly acid. The Dandridge soils are slightly acid neutral or mildly alkaline. At New River Gorge in West Virginia, this association is the predominant upland forest type on lower to upper colluvial gorge slopes with relatively warm, dry aspects, and it also occurs in smaller patches on plateaus, ridge spurs and convex upper slopes, often north-facing. Stands occur both on sandstones of the Pottsville group and on shales of the Mauch Chunk group. Elevations of mapped stands range from 249 to 985 m. Slopes range from flat to very steep (0 to 51 degrees, mean = 25 degrees). Soils are mostly well-drained sandy to clay loams mapped in the Calvin, Dekalb, and Gilpin series. Soil chemistry analyzed from 10 plots indicates extremely acidic to slightly acidic soils (mean pH = 4.92) with intermediate levels of most nutrients and somewhat higher levels of some nutrients (K, Mg, Mn, P) compared to other community types nearby.

Vegetation Description: This association is a closed-canopy deciduous forest dominated by species of *Quercus* (oak), often with *Carya* (hickory) spp., and often with an abundance of *Acer saccharum* (sugar maple) in the canopy and/or shrub layers. *Quercus prinus* (chestnut oak) is the most typical canopy dominant; other dominants can include *Quercus rubra* (northern red oak), *Acer saccharum* (sugar maple), *Quercus alba* (white oak), *Fraxinus americana* (white ash), and *Carya ovata* (shagbark hickory). Other canopy associates include *Carya glabra* (pignut hickory), *Quercus velutina* (black oak), and *Liriodendron tulipifera* (tuliptree). Subcanopy species that may be present are *Carya ovata* (shagbark hickory), *Carya glabra* (pignut hickory), *Quercus rubra* (northern red oak), *Quercus muehlenbergii* (chinkapin oak), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), and *Juniperus virginiana* (eastern redcedar). The subcanopy may be dominated by *Acer saccharum* (sugar maple) in some examples due to fire

suppression. The subcanopy is typically relatively sparse with less than 25% cover. Vines, which may occur in the understory or reach into the canopy, include *Aristolochia macrophylla* (pipevine), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis aestivalis var. bicolor* (summer grape). Common tall shrubs or short trees include *Cercis canadensis* (eastern redbud), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), and *Ostrya virginiana* (hophornbeam). The shrub and herbaceous layers are sparse with small stems of canopy and subcanopy species along with herbaceous species. The most common shrubs are *Viburnum acerifolium* (mapleleaf viburnum) and *Smilax rotundifolia* (roundleaf greenbrier). Common herbs include *Actaea racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carex albursina* (white bear sedge), *Campanulastrum americanum* (American bellflower), *Chimaphila maculata* (striped prince's pine), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Sanicula canadensis* (Canadian blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Solidago caesia* (wreath goldenrod), and species of *Viola* (violet). Vascular plant species richness in 26 West Virginia sampled plots (New River) ranged from 27 to 54 taxa (mean = 42).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple), *Carya glabra* (pignut hickory)
Tree canopy	Broad-leaved deciduous tree	*Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple)
Shrub/sapling (tall & short)	Vine/Liana	*Smilax rotundifolia* (roundleaf greenbrier)
Short shrub/sapling	Broad-leaved deciduous tree	*Quercus prinus* (chestnut oak)
Herb (field)	Fern or fern ally	*Pleopeltis polypodioides* ssp. *polypodioides* (resurrection fern)

Characteristic Species: *Actaea racemosa* (black bugbane), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carex albursina* (white bear sedge), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Geranium maculatum* (spotted geranium), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Prosartes lanuginosa* (yellow fairybells), *Quercus rubra* (northern red oak), *Sanicula canadensis* (Canadian blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Solidago caesia* (wreath goldenrod), *Viburnum acerifolium* (mapleleaf viburnum).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: These dry-mesic forests are found in the Ridge and Valley and adjacent sedimentary ecoregions (Cumberlands, Interior Low Plateau) of the southeastern United States, ranging from Kentucky and Tennessee to West Virginia and perhaps Virginia.

States/Provinces: AL, KY?, TN, VA?, WV.
Federal Lands: DOE (Oak Ridge); NPS (New River Gorge, Russell Cave); TVA (Tellico); USFS (Cherokee?).

CONSERVATION STATUS

Rank: G4? (9-Oct-2001).
Reasons: This community is believed to be relatively common and secure, although good mature examples of large size may be uncommon. Additional information is needed relative to its distribution and relation to other similar communities. The rank was formerly G3G5, and changing it to G4? (which is equivalent) makes it clear that this is not to be considered a rare community type.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: Two variants of this association (14 stands sampled; 19 stands sampled) were described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeast Monroe County). This may be similar to vegetation reported from limestone in the Ridge and Valley of Virginia.
Similar Associations:

- *Quercus prinus - Quercus rubra - Carya (ovata, glabra) - Pinus virginiana* Forest (CEGL007269).
- *Quercus prinus - Quercus* spp. / *Vaccinium arboreum - (Kalmia latifolia, Styrax grandifolius)* Forest (CEGL007700).

Related Concepts:

- *Quercus prinus - Quercus rubra - (Quercus alba) - Liriodendron tulipifera - Acer rubrum / Parthenocissus quinquefolia* forest (Vanderhorst 2001b) B
- Chestnut Oak Forest (Oberholster 1993) B
- Chestnut Oak, RV (Pyne 1994) B
- Chestnut Oak: 44 (Eyre 1980) B
- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) ?

SOURCES

Description Authors: M. Andreu and M. Tukman, mod. S. C. Gawler.
References: Allard 1990, Andreu and Tukman 1995, Evans 1991, Eyre 1980, Oberholster 1993, Pyne 1994, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): OAK - HICKORY FOREST

SYNONYMS

NVC English Name:	**Chestnut Oak - (Northern Red Oak) - Hickory species / Sourwood - Flowering Dogwood Forest**
NVC Scientific Name:	***Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest**
NVC Identifier:	**CEGL007267**

LOCAL INFORMATION

Environmental Description: This association is the predominant upland forest of the plateaus and relatively warm, dry aspects of middle to upper gorge slopes. It occurs on both sandstones of the Pottsville group and on shales of the Mauch Chunk group, but it is most abundant on the former. Soils are mostly sandy loams mapped in the Dekalb, Calvin, and Gilpin series, but textures determined by hand in the field also include loams and clay loams. Soil chemistry analyzed from 9 plots indicates very strongly acidic soils (mean pH = 4.59) with relatively low levels of most nutrients compared to average values across all types in the park. Slopes range from level to very steep, but this association generally occurs on relatively gentle terrain (mapping unit slope values range from 0 to 54 degrees, mean = 13.4 degrees). Elevations of mapped stands range from 335 to 998 m. All forests in the park have been logged in the past, and this association was probably especially heavily logged due to its occurrence in relatively level, accessible landscape positions. Large areas of this forest type were destroyed by strip mining on the plateaus. Evidence of past fires is abundant in this type, but its natural fire regime is not known. Forest seeps (*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest (CEGL007853)) often occur in low-gradient drainage bottoms imbedded within stands of this association. More xeric positions (southerly slopes and convex landforms) adjacent to stands of this association often grade to *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271).

Vegetation Description: This association is a closed-canopy deciduous forest dominated by *Quercus* (oak) spp. with some species of *Carya* (hickory) usually present. Canopy species with high cover include (in decreasing order of constancy in plots) *Acer rubrum* (red maple), *Quercus prinus* (chestnut oak), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree), *Quercus velutina* (black oak), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), and *Carya ovata* (shagbark hickory). Abundance of *Acer rubrum* (red maple) and *Liriodendron tulipifera* (tuliptree) is probably due to repeated logging of these forests. Additional common tree species in the subcanopy and shrub layers include *Acer pensylvanicum* (striped maple), *Castanea dentata* (American chestnut), *Cornus florida* (flowering dogwood), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), and *Sassafras albidum* (sassafras), Common shrubs include *Sambucus nigra ssp. canadensis* (common elderberry), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry), and *Viburnum acerifolium* (mapleleaf viburnum). Cover by herbs is typically moderate, and herb diversity can be relatively high. Herbs with high constancy include *Ageratina altissima* (white snakeroot), *Conopholis americana* (American cancer-root), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Medeola*

virginiana (Indian cucumber), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Solidago caesia* (wreath goldenrod), *Thelypteris noveboracensis* (New York fern), *Toxicodendron radicans* (eastern poison ivy), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), and species of *Viola* (violet). Vascular plant species richness in the 25 sampled plots ranges from 28 to 65 taxa (mean = 41.8).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Ageratina altissima* (white snakeroot), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Castanea dentata* (American chestnut), *Conopholis americana* (American cancer-root), *Cornus florida* (flowering dogwood), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Liriodendron tulipifera* (tuliptree), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), *Medeola virginiana* (Indian cucumber), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Sambucus nigra* ssp. *canadensis* (common elderberry), *Sassafras albidum* (sassafras), *Smilax rotundifolia* (roundleaf greenbrier), *Solidago caesia* (wreath goldenrod), *Thelypteris noveboracensis* (New York fern), *Toxicodendron radicans* (eastern poison ivy), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), *Vaccinium pallidum* (Blue Ridge blueberry), *Viburnum acerifolium* (mapleleaf viburnum).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs on middle to upper gorge slopes and on the plateaus throughout the park but is most common in areas underlain by sandstone. In the southern quarter of the park, it is mostly confined to the highest elevations.

Classification Comments: This association is floristically intermediate between *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) and the more xeric *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271), and some stands are difficult to distinguish. It lacks the abundance of *Acer saccharum* (sugar maple) of the former and the abundance of ericaceous shrubs of the latter and has higher abundance of *Liriodendron tulipifera* (tuliptree) than either.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst

Plots: NERI.12, NERI.28, NERI.29, NERI.51, NERI.101, NERI.104, NERI.116, NERI.117, NERI.118, NERI.125, NERI.132, NERI.134, NERI.213, NERI.214, NERI.215, NERI.239, NERI.254, NERI.258, NERI.265, NERI.266, NERI.275, NERI.276, NERI.281, NERI.316, NERI.323.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
Alliance (English name)	Chestnut Oak - Northern Red Oak Forest Alliance
Association	*Quercus prinus* - *(Quercus rubra)* - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest
Association (English name)	Chestnut Oak - (Northern Red Oak) - Hickory species / Sourwood - Flowering Dogwood Forest
Ecological System(s):	Southern Appalachian Oak Forest (CES202.886).

GLOBAL DESCRIPTION

Concept Summary: This community is known from low to intermediate elevations of the Southern Blue Ridge escarpment, the Great Smoky Mountains, Piedmont transition areas, into the Southern Ridge and Valley, and in the Cumberlands in southern West Virginia. It occurs on relatively exposed landforms below 1000 m (3280 feet) elevation (365-1000 m [1200-3280 feet]), on nearly level to steep, convex, middle to upper slopes, ridges, and plateaus, with mostly northern to southwestern aspects. Canopies are dominated by *Quercus prinus* (chestnut oak), with *Acer rubrum* (red maple) often codominating. Other species that can have significant canopy coverage include *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), *Carya ovata* (shagbark hickory), *Liriodendron tulipifera* (tuliptree), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), and *Quercus rubra* (northern red oak). Abundance of *Acer rubrum* (red maple) and *Liriodendron tulipifera* (tuliptree) appears to be related to logging history. *Cornus florida* (flowering dogwood) is characteristic and may be dominant in the subcanopy. *Oxydendrum arboreum* (sourwood) is also common. The shrub stratum is sparse, with no clear dominant. Some typical shrub species include *Vaccinium pallidum* (Blue Ridge blueberry), *Kalmia latifolia* (mountain laurel), *Magnolia fraseri* (mountain magnolia), and *Sassafras albidum* (sassafras). Common vines are *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Vitis aestivalis* (summer grape), *Vitis rotundifolia* (muscadine), and *Vitis vulpina* (frost grape). Herb cover is sparse, but diversity and species composition vary among occurrences. Some of the more typical species include *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dichanthelium* (rosette grass) spp., *Ageratina altissima* (white snakeroot), *Dioscorea quaternata* (fourleaf yam), *Galium latifolium* (purple bedstraw), *Galium circaezans* (licorice bedstraw), *Galium latifolium* (purple bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Houstonia purpurea* (Venus' pride), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum ssp. racemosum* (feathery

false lily of the valley), *Polystichum acrostichoides* (Christmas fern), *Prenanthes* (rattlesnakeroot) spp., *Thalictrum thalictroides* (rue anemone), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), *Uvularia sessilifolia* (sessileleaf bellwort), and *Viola* (violet) spp.

Environmental Description: This community is known from low to intermediate elevations, on relatively exposed landforms from 300 to 1000 m (1000-3250 feet) elevation. Slopes are moderately steep to steep where it occurs on convex, middle to upper slopes, grading to gentle, on ridges and plateaus; aspects are mostly northern to southwestern. Soils are developed over sandstones and, less commonly, shales and are strongly acidic, relatively nutrient-poor and sandy to loamy in texture.

Vegetation Description: The canopies of stands of this type are dominated by *Quercus prinus* (chestnut oak), with *Acer rubrum* (red maple) often codominating. Other species that can have significant canopy coverage include *Carya glabra* (pignut hickory), *Carya alba* (mockernut hickory), *Carya ovata* (shagbark hickory), *Liriodendron tulipifera* (tuliptree), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Quercus alba* (white oak), and *Quercus rubra* (northern red oak). Abundance of *Acer rubrum* (red maple) and *Liriodendron tulipifera* (tuliptree) appears to be related to logging history. *Cornus florida* (flowering dogwood) is characteristic and may be dominant in the subcanopy. Additional canopy and subcanopy species can include *Nyssa sylvatica* (blackgum), *Magnolia fraseri* (mountain magnolia), *Halesia tetraptera var. monticola* (mountain silverbell), and *Oxydendrum arboreum* (sourwood). The shrub stratum is sparse, with no clear dominant. Some typical shrub species include *Vaccinium pallidum* (Blue Ridge blueberry), *Kalmia latifolia* (mountain laurel), *Magnolia fraseri* (mountain magnolia), *Sassafras albidum* (sassafras), *Viburnum acerifolium* (mapleleaf viburnum), and (at least in the central and southern portions of the type's range) *Gaylussacia ursina* (bear huckleberry), *Hydrangea arborescens* (wild hydrangea), and *Hydrangea radiata* (silverleaf hydrangea). Common vines are *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), *Vitis aestivalis* (summer grape), *Vitis rotundifolia* (muscadine), and *Vitis vulpina* (frost grape). Herb cover is sparse to moderate; diversity and species composition vary among occurrences. Some of the more typical species include *Ageratina altissima* (white snakeroot), *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Dichanthelium* (rosette grass) spp. (e.g., *Dichanthelium boscii* (Bosc's panicgrass), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium dichotomum* (cypress panicgrass)), *Dioscorea quaternata* (fourleaf yam), *Galium circaezans* (licorice bedstraw), *Galium latifolium* (purple bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Houstonia purpurea* (Venus' pride), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Polystichum acrostichoides* (Christmas fern), *Prenanthes* (rattlesnakeroot) spp., *Solidago caesia* (wreath goldenrod), *Thalictrum thalictroides* (rue anemone), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort), *Uvularia sessilifolia* (sessileleaf bellwort), and *Viola* (violet) spp. (e.g., *Viola blanda* (sweet white violet), *Viola hastata* (halberdleaf yellow violet), *Viola X palmata* (early blue violet), *Viola tripartita* (threepart violet)).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus velutina* (black oak)
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak)
Tree subcanopy	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer rubrum* (red maple), *Ageratina altissima* (white snakeroot), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Carya ovata* (shagbark hickory), *Castanea dentata* (American chestnut), *Cornus florida* (flowering dogwood), *Dioscorea quaternata* (fourleaf yam), *Eurybia divaricata* (white wood aster), *Galium circaezans* (licorice bedstraw), *Goodyera pubescens* (downy rattlesnake plantain), *Liriodendron tulipifera* (tuliptree), *Maianthemum racemosum* (feathery false lily of the valley), *Medeola virginiana* (Indian cucumber), *Nyssa sylvatica* (blackgum), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Solidago caesia* (wreath goldenrod), *Thelypteris noveboracensis* (New York fern), *Toxicodendron radicans* (eastern poison ivy), *Uvularia perfoliata* (perfoliate bellwort), *Uvularia puberula* (mountain bellwort).

Other Noteworthy Species:

Species	GRank	Type	Note
Ageratina altissima var. *roanensis* (white snakeroot)	G5T3T4	plant	
Carex lucorum var. *austrolucorum* (Blue Ridge sedge)	-	plant	
Monotropsis odorata (sweet pinesap)	G3	plant	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community occurs in the Southern Blue Ridge, the Great Smoky Mountains, and Piedmont transition areas of western North Carolina, eastern Tennessee, northwestern South Carolina, and northeastern Georgia. It extends north into the Cumberlands area in southern West Virginia and the border between Virginia, Kentucky, and Tennessee. It extends marginally into the southwestern edge of the Virginia Blue Ridge.

States/Provinces: GA, KY, NC, SC, TN, VA, WV.

Federal Lands: NPS (Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)).

CONSERVATION STATUS

Rank: G4G5 (15-Aug-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: This forest lacks the dense ericaceous shrub layer typical of other *Quercus prinus* (chestnut oak)-dominated forests in the Blue Ridge escarpment region and commonly has diverse herbaceous composition. It is distinguished from similar forests in the Ridge and Valley by lacking *Acer saccharum* (sugar maple) and from Piedmont forests by the lack of *Quercus falcata* (southern red oak) and *Quercus stellata* (post oak), and by the presence of species more typical of the southern Appalachians (*Magnolia fraseri* (mountain magnolia), *Halesia tetraptera* (mountain silverbell), and *Castanea dentata* (American chestnut)). This association was originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. The North Carolina Piedmont examples of this association are only montane transition areas, such as the Sauratown Mountains and Hanging Rock. It may become more widespread in the Piedmont of Virginia. In West Virginia, this association is floristically intermediate between *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) and the more xeric *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271), and some stands are difficult to distinguish. It lacks the abundance of *Acer saccharum* (sugar maple) of the former and the abundance of ericaceous shrubs of the latter and has higher abundance of *Liriodendron tulipifera* (tuliptree) than either.

Similar Associations:

- *Acer rubrum* var. *rubrum - Betula (alleghaniensis, lenta) - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Forest (CEGL008558).
- *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina)* Forest (CEGL007230)--occurs at higher elevations and has a stronger white oak component.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057).
- *Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest (CEGL006286).

Related Concepts:

- *Quercus prinus - Quercus rubra - (Quercus alba) - Liriodendron tulipifera - Acer rubrum / Parthenocissus quinquefolia* forest (Vanderhorst 2001b) B
- Chestnut Oak Forest (Herb Subtype) (Schafale 1998b) ?
- IA6h. Montane Oak - Hickory Forest (Allard 1990) B
- Oak - Chestnut - Hickory Forest (Ambrose 1990a) B

SOURCES

Description Authors: K. D. Patterson, mod. T. Govus, R. White, S. C. Gawler.

References: Allard 1990, Ambrose 1990a, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data 2002, Schafale 1998b, Schafale and Weakley 1990, Simon pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL BLACK LOCUST WOODLAND

SYNONYMS
NVC English Name: **Black Locust Forest**
NVC Scientific Name: ***Robinia pseudoacacia* Forest**
NVC Identifier: **CEGL007279**

LOCAL INFORMATION

Environmental Description: This association is a successional forest or woodland on sites which have been abandoned following clearing and ground disturbance by human activities. It is found on abandoned farmlands and on old mine sites. Soil chemistry analyzed from one plot indicates very highly acidic soil (pH = 4.3) with relatively low levels of nutrients compared to the averages of all types in the park. Slopes range from gentle to somewhat steep (mapping unit values range from 2 to 21 degrees, mean = 19 degrees). Elevations of mapped stands range from 669 to 839 m.

Vegetation Description: This association is a successional deciduous woodland or forest dominated by *Robinia pseudoacacia* (black locust). Additional canopy trees in the plots include *Acer rubrum* (red maple), *Malus pumila* (paradise apple), *Nyssa sylvatica* (blackgum), and *Prunus serotina var. serotina* (black cherry). The subcanopy includes *Cornus florida* (flowering dogwood), *Rhus glabra* (smooth sumac), and *Sassafras albidum* (sassafras). The shrub layers are dominated by the invasive exotics *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata var. parvifolia* (autumn olive). The herb layer may have high diversity including native and exotic species. Abundant herbs in the plots include *Ageratina altissima* (white snakeroot), *Dactylis glomerata ssp. glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), *Dichanthelium clandestinum* (deertongue), *Lespedeza cuneata* (Chinese lespedeza), *Lolium pratense* (meadow ryegrass), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila var. pumila* (Canadian clearweed), *Polygonum scandens* (climbing false buckwheat), *Potentilla canadensis var. canadensis* (dwarf cinquefoil), *Solidago canadensis* (Canada goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Stellaria media* (common chickweed), and *Verbesina occidentalis* (yellow crownbeard). Stands with closed canopies and those in different landscape positions are likely to have contrasting floristic composition. Vascular plant species richness in the 2 sampled plot ranges from 22 to 56 taxa (mean = 39).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Robinia pseudoacacia* (black locust)

Characteristic Species: *Acer rubrum* (red maple), *Ageratina altissima* (white snakeroot), *Dactylis glomerata* ssp. *glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), *Dichanthelium clandestinum* (deertongue), *Elaeagnus umbellata* var. *parvifolia* (autumn olive), *Lespedeza cuneata* (Chinese lespedeza), *Lolium pratense* (meadow ryegrass), *Malus pumila* (paradise apple), *Nyssa sylvatica* (blackgum), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonum scandens* (climbing false buckwheat), *Potentilla canadensis* var. *canadensis* (dwarf cinquefoil), *Prunus serotina* var. *serotina* (black cherry), *Rhus glabra* (smooth sumac), *Rosa multiflora* (multiflora rose), *Solidago canadensis* (Canada goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Stellaria media* (common chickweed), *Verbesina occidentalis* (yellow crownbeard).

Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA			[not crosswalked]	

Local Range: The single mapped stand occurs on Highland Mountain in the middle section of the park. Additional small patches are known or are likely to occur on abandoned farmland and strip mines and in other disturbed areas throughout the park.
Classification Comments: Information not available.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.272, NERI.289.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	*Robinia pseudoacacia* Forest Alliance (A.256)
Alliance (English name)	Black Locust Forest Alliance
Association	*Robinia pseudoacacia* Forest
Association (English name)	Black Locust Forest
Ecological System(s):	Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898) Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269) Central Appalachian Dry Oak-Pine Forest (CES202.591).

GLOBAL DESCRIPTION

Concept Summary: This black locust semi-natural forest is found locally throughout the eastern United States. Stands often establish on old fields abandoned after agricultural cropping or pasturing or around old homesites. In some areas it occurs on post-agricultural floodplain terraces. The vegetation is dominated by *Robinia pseudoacacia* (black locust). Associated woody species vary from site to site and include *Prunus serotina* (black cherry), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), and in some areas *Acer platanoides* (Norway maple). Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans* (eastern poison ivy). The invasive non-native *Rosa multiflora* (multiflora rose) may be present as a shrub. Non-native species such as *Alliaria petiolata* (garlic mustard), *Chelidonium majus* (celandine), *Glechoma hederacea* (ground ivy), and *Convallaria majalis* (European lily of the valley) can characterize the herb layer.
Environmental Description: This type often establishes on old fields abandoned after agricultural cropping or pasturing or around old home sites. Soils are variable and may be highly acidic, especially where established on old mine sites.
Vegetation Description: The vegetation is dominated by *Robinia pseudoacacia* (black locust) forming a partial to nearly complete canopy. Associated woody species vary from site to site and include *Prunus serotina* (black cherry), *Ulmus americana* (American elm), *Ulmus rubra*

(slippery elm), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and in some areas *Acer platanoides* (Norway maple). *Cornus florida* (flowering dogwood) may be present in the subcanopy. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans* (eastern poison ivy). The invasive species *Rosa multiflora* (multiflora rose) and *Elaeagnus umbellata* (autumn olive) are typically the most common shrubs. Non-native species such as *Alliaria petiolata* (garlic mustard), *Chelidonium majus* (celandine), *Glechoma hederacea* (ground ivy), *Dactylis glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), and *Convallaria majalis* (European lily of the valley) can characterize the herb layer, which may have a native component as well, for example with *Ageratina altissima* (white snakeroot), *Dichanthelium clandestinum* (deertongue), *Parthenocissus quinquefolia* (Virginia creeper), *Pilea pumila* (Canadian clearweed), *Solidago canadensis* (Canada goldenrod), and *Solidago rugosa* (wrinkleleaf goldenrod).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Robinia pseudoacacia* (black locust)

Characteristic Species: *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Rosa multiflora* (multiflora rose).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This black locust semi-natural forest is found locally throughout the eastern United States. Its distribution is not completely known because many states have not developed lists of semi-natural types in their states.

States/Provinces: AR, DE, IA, KY, MA, MS, NC, NJ, OK, PA, TN, VA, VT, WV.

Federal Lands: DOD (Camp Dawson); NPS (Blue Ridge Parkway, Buffalo River?, Cape Cod, George Washington Birthplace, Marsh-Billings-Rockefeller, Minute Man, Morristown, New River Gorge, Shenandoah, Vicksburg); USFS (George Washington, Jefferson, Nantahala, Ouachita, Ouachita (Mountains), Ozark, Pisgah).

CONSERVATION STATUS

Rank: GNA (ruderal) (24-Oct-2002).

Reasons: Although *Robinia pseudoacacia* (black locust) is a native species found in the Central Appalachians and Ozark Mountains, it does not typically become a dominant species in these natural habitats (Elias 1980). It is now widespread in the eastern U.S. in disturbed habitats. This forest represents early-successional vegetation and is thus not of conservation concern and does not receive a conservation status rank.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: Information not available.

Similar Associations:

- *Prunus serotina - Liriodendron tulipifera - Acer rubrum - Fraxinus americana* Forest (CEGL006599)--can have *Robinia* as an important canopy component but is not dominated by it as is this type.
- *Prunus serotina - Sassafras albidum - (Fraxinus americana) / Juniperus virginiana* Forest (CEGL004133).

- *Robinia pseudoacacia - Celtis occidentalis - (Fraxinus americana, Liriodendron tulipifera)* Forest (CEGL007281).

Related Concepts:

- *Juglans nigra - Robinia pseudoacacia / Lonicera japonica / Verbesina alternifolia* Association (Rawinski et al. 1996) ?
- Successional black locust disturbed forests (CAP pers. comm. 1998) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. S. C. Gawler.

References: Baalman 1965, CAP pers. comm. 1998, Ehrenfeld 1977, Elias 1980, Fleming and Coulling 2001, Gaertner 1955, Hoagland 2000, INAI unpubl. data, McDonald 1938, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUCCESSIONAL BOX-ELDER FOREST

SYNONYMS
NVC English Name: **Box-elder Forest**
NVC Scientific Name: ***Acer negundo* Forest**
NVC Identifier: **CEGL005033**

LOCAL INFORMATION

Environmental Description: This association occurs on floodplains, terraces, and lower gorge slopes along the New River in areas cleared in the past by humans. Occurrences are mostly on higher floodplain terraces with less rocky soils which were used for agriculture or habitation. Soil textures in the two sampled plots are sand. Slopes range from nearly level to somewhat steep (mapping unit values range from 0.3 to 19 degrees, mean = 7 degrees). Elevations of mapped stands range from 307 to 384 m. Stands of this association are typically small patches which are imbedded in or adjacent to less disturbed floodplain forest *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) or upland mixed mesophytic forest *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222).
Vegetation Description: This association is a successional forest or woodland dominated by *Acer negundo* (box-elder). Additional tree species in the two sampled plots include *Acer saccharinum* (silver maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), and *Ulmus americana* (American elm). *Lindera benzoin* (northern spicebush) is dominant in the shrub layer. The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (smallspike false nettle), *Carex grayi* (Gray's sedge), *Glechoma hederacea* (ground ivy), *Lysimachia nummularia* (creeping jenny), *Mertensia virginica* (Virginia bluebells), *Prunella vulgaris* (common selfheal), and *Verbesina alternifolia* (wingstem). Vascular plant species richness in the 2 sampled plots ranges from 23 to 26 (mean = 24.5).
Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer negundo* (box-elder)

Characteristic Species: *Acer saccharinum* (silver maple), *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (smallspike false nettle), *Carex grayi* (Gray's sedge), *Glechoma hederacea* (ground ivy), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), *Lysimachia nummularia* (creeping jenny), *Mertensia virginica* (Virginia bluebells), *Prunella vulgaris* (common selfheal), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), *Verbesina alternifolia* (wingstem).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association is found along or near the New River.
Classification Comments: This association is a semi-natural successional community of disturbed sites at New River Gorge National River and other West Virginia sites.
Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.
Plots: NERI.2, NERI.69.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	*Acer negundo* Temporarily Flooded Forest Alliance (A.278)
Alliance (English name)	Box-elder Temporarily Flooded Forest Alliance
Association	*Acer negundo* Forest
Association (English name)	Box-elder Forest
Ecological System(s):	Central Appalachian River Floodplain (CES202.608) East Gulf Coastal Plain Large River Floodplain Forest (CES203.489) Mississippi River Riparian Forest (CES203.190) South-Central Interior Large Floodplain (CES202.705) Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)

GLOBAL DESCRIPTION

Concept Summary: This semi-open to closed-canopy forest is found on floodplains in the southern, eastern, and midwestern United States. Stands occur on large rivers in the active floodplain and on sandbars, and may form farther from the riverfront following disturbance. Occurrences are mostly on higher floodplain terraces with less rocky soils which were used for agriculture or habitation. They are typically temporarily flooded in the spring. These early-successional forests are dominated by *Acer negundo* (box-elder). Other characteristic species include *Platanus occidentalis* (Sycamore), *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Liquidambar styraciflua* (sweetgum), *Acer saccharinum* (silver maple), *Ulmus alata* (winged elm), *Ulmus rubra* (slippery elm), *Carpinus caroliniana* (American hornbeam), *Morus rubra* (red mulberry), and *Populus deltoides* (eastern cottonwood). The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy.

Environmental Description: Stands occur on large rivers in the active floodplain and on sandbars, and may form farther from the riverfront following disturbance. Occurrences are mostly on higher floodplain terraces with less rocky soils which were used for agriculture or habitation. They are typically temporarily flooded in the spring and have sandy soils. In Kentucky, these forests may also occur in old fields.

Vegetation Description: These early-successional forests (sometimes woodlands) are dominated by *Acer negundo* (box-elder). Other characteristic species include *Platanus occidentalis* (Sycamore), *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Liquidambar styraciflua* (sweetgum), *Acer saccharinum* (silver maple), *Ulmus alata* (winged elm), *Ulmus rubra* (slippery elm), *Carpinus caroliniana* (American hornbeam), *Morus rubra* (red mulberry), and *Populus deltoides*

(eastern cottonwood). The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. *Lindera benzoin* (northern spicebush) may be dominant in the shrub layer. The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (smallspike false nettle), *Carex grayi* (Gray's sedge), *Glechoma hederacea* (ground ivy), *Lysimachia nummularia* (creeping jenny), *Mertensia virginica* (Virginia bluebells), *Prunella vulgaris* (common selfheal), and *Verbesina alternifolia* (wingstem). The range, dynamics, and variability of this type are complicated by the "weedy" nature of *Acer negundo* (box-elder), e.g., in Kentucky, *Acer negundo* (box-elder) may be dominant in old fields, with *Dichanthelium clandestinum* (deertongue) and *Carex* (sedge) spp. in the ground layer. Elsewhere in the Midwest, logged and grazed stands of *Fraxinus pennsylvanica* (green ash) and *Ulmus americana* (American elm) may be dominated by *Acer negundo* (box-elder).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer negundo* (box-elder)

Characteristic Species: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ageratina altissima* (white snakeroot), *Boehmeria cylindrica* (smallspike false nettle), *Carex grayi* (Gray's sedge), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Mertensia virginica* (Virginia bluebells), *Platanus occidentalis* (Sycamore), *Prunella vulgaris* (common selfheal), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), *Verbesina alternifolia* (wingstem).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This *Acer negundo* (box-elder) floodplain forest is found sporadically on floodplains in the southern, eastern, and midwestern United States, ranging from Maryland west to Iowa (and possibly southeastern South Dakota), south to Louisiana and possibly Texas, and east to Georgia. It occurs in the Piedmont region in Pennsylvania and in the Coastal Plain and Piedmont regions in New Jersey and Delaware.

States/Provinces: AL, AR, DE, GA, IA, KY, LA, MD, MO, MS, NJ, OK, PA, SC, SD?, TN, TX?, VA, WV.

Federal Lands: NPS (Chickamauga-Chattanooga, Mammoth Cave, Natchez Trace, New River Gorge, Ozark, Shiloh, Vicksburg); USFS (Daniel Boone, St. Francis); USFWS (Little River).

CONSERVATION STATUS

Rank: G4G5 (28-Mar-2003).

Reasons: As currently defined, this is a broad-ranging community type. However, the range, dynamics, and variability of this type are complicated by the "weedy" nature of *Acer negundo* (box-elder). More information may be needed to clarify the extent to which this type represents purely natural vegetation. Some stands may develop following disturbance of other natural bottomland communities.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: The range, dynamics, and variability of this type is complicated by the 'weedy' nature of *Acer negundo* (box-elder). For example, disturbed stands in the *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286) often become dominated by *Acer negundo* (box-elder). And in the upper Midwest *Acer negundo* (box-elder)-dominated stands are treated as part of the *Fraxinus pennsylvanica - (Ulmus americana) / Symphoricarpos occidentalis* Forest (CEGL002088). Thus, some consistency is needed in the application of this type across its range. In Arkansas, these forests can be pure *Acer negundo* (box-elder) or have *Acer rubrum* (red maple) and *Platanus occidentalis* (Sycamore) as associates (T. Foti pers. comm. 1999). Composition is variable. This type occurs along the Arkansas River in Arkansas (D. Zollner pers. comm. 1999). In Missouri, stands would probably be combined with *Betula nigra - Platanus occidentalis* Forest (CEGL002086) (M. Leahy pers. comm. 1999). In Kentucky, this may be found at the Licking River impoundment (Cave Run Lake). Narrower floodplains of smaller rivers and streams are not included in this association but are treated instead under *Acer negundo - (Platanus occidentalis, Populus deltoides)* Forest (CEGL004690).

Similar Associations:

- *Acer negundo - (Platanus occidentalis, Populus deltoides)* Forest (CEGL004690).
- *Betula nigra - Platanus occidentalis* Forest (CEGL002086).
- *Fraxinus pennsylvanica - (Ulmus americana) / Symphoricarpos occidentalis* Forest (CEGL002088).
- *Fraxinus pennsylvanica - Ulmus americana - (Acer negundo, Tilia americana)* Northern Forest (CEGL002089).
- *Fraxinus pennsylvanica - Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014).

Related Concepts:

- *Acer negundo* riparian woodland (Vanderhorst 2001b) =

SOURCES

Description Authors: mod. E. Largay and S. C. Gawler.

References: Blair 1938, Campbell pers. comm., Fleming et al. 2001, Foti pers. comm., Harrison 2004, Hoagland 2000, INAI unpubl. data, Leahy pers. comm., Patterson and DeSelm 1989, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Zollner pers. comm.

COMMON NAME (PARK-SPECIFIC): SILVER MAPLE FLOODPLAIN FOREST

SYNONYMS
NVC English Name: **Silver Maple - American Elm Forest**
NVC Scientific Name: ***Acer saccharinum* - *Ulmus americana* Forest**
NVC Identifier: **CEGL002586**

LOCAL INFORMATION

Environmental Description: This association occurs in very small linear patches on floodplains along the New River. Observed patches occur on sandy levees imbedded within other more common floodplain forest and woodland associations (i.e., *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) and *Platanus occidentalis - (Betula nigra, Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725)). It appears to be favored by deposition of deep sandy sediments by low-energy flood waters. Soil chemistry analyzed from one plot indicates slightly acidic soil (pH = 6.1) with relatively high levels of Mg, Mn, and Zn, low to average levels of other nutrients, and low organic matter. There may be heavy accumulations of flotsam including driftwood and garbage. Lines of *Acer saccharinum* (silver maple) along low-gradient reaches of the river in developed areas (e.g., Cunard, Dun Glen) provide evidence that this association may have been somewhat more abundant in the past and that its habitat was favored for human use. Slopes range from gentle to moderate (mapping unit values range from 2 to 11 degrees, mean = 10 degrees). Elevations of mapped stands range from 319 to 343 m.
Vegetation Description: This association is a floodplain forest dominated by *Acer saccharinum* (silver maple). The canopy in the one sampled plot is about 30 m tall with 80% cover. Additional trees in the plot include *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (sycamore), and *Halesia tetraptera* (mountain silverbell). The subcanopy of some stands may include *Acer negundo* (box-elder). In the plot there is about 35% cover in the tall-shrub layer dominated by *Lindera benzoin* (northern spicebush) and 15% cover in the short-shrub layer dominated by *Toxicodendron radicans* (eastern poison ivy). Understory vegetation can be lush, dominated by tall herbs, or may be sparse, with high exposure of bare sand. In the plot there is 60% cover in the herb layer, with high cover by *Boehmeria cylindrica* (smallspike false nettle), *Chasmanthium latifolium* (Indian woodoats), *Cryptotaenia canadensis* (Canadian honewort), *Elymus virginicus var. virginicus* (Virginia wildrye), *Glechoma hederacea* (ground ivy), *Helianthus* (sunflower) sp., *Impatiens capensis* (jewelweed), *Menispermum canadense* (common moonseed), *Microstegium vimineum* (Nepalese browntop), *Monarda clinopodia* (white bergamot), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata var. laciniata* (cutleaf coneflower), and *Verbesina alternifolia* (wingstem). Vascular plant species richness in the 1 sampled plot is 48.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum* (silver maple)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin* (northern spicebush)
Short shrub/sapling	Vine/Liana	*Toxicodendron radicans* (eastern poison ivy)
Herb (field)	Forb	*Verbesina alternifolia* (wingstem)

Characteristic Species: *Acer negundo* (box-elder), *Boehmeria cylindrica* (smallspike false nettle), *Chasmanthium latifolium* (Indian woodoats), *Cryptotaenia canadensis* (Canadian

honewort), *Elymus virginicus* var. *virginicus* (Virginia wildrye), *Fraxinus pennsylvanica* (green ash), *Glechoma hederacea* (ground ivy), *Halesia tetraptera* (mountain silverbell), *Impatiens capensis* (jewelweed), *Menispermum canadense* (common moonseed), *Microstegium vimineum* (Nepalese browntop), *Monarda clinopodia* (white bergamot), *Platanus occidentalis* (sycamore), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* var. *laciniata* (cutleaf coneflower).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: Four mapped stands occur in the middle section of the park downstream from Terry and upstream from Thurmond. Additional small patches are most likely to occur along slow reaches of river in the southern two-thirds of the park.
Classification Comments: This association is not well-developed in the park, and its classification here is based on extrapolation of the type which occurs as the predominant floodplain forest type farther downstream along the Ohio River (Walton et al. 1996). It is favored by larger, lower gradient rivers which deposit finer sediments than is common along the New River within the park.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.305.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	*Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
Alliance (English name)	Silver Maple Temporarily Flooded Forest Alliance
Association	*Acer saccharinum* - *Ulmus americana* Forest
Association (English name)	Silver Maple - American Elm Forest
Ecological System(s):	Laurentian-Acadian Floodplain Forest (CES201.587)
	Central Appalachian River Floodplain (CES202.608)
	Mississippi River Riparian Forest (CES203.190)
	North-Central Interior Floodplain (CES202.694)
	South-Central Interior Large Floodplain (CES202.705).

GLOBAL DESCRIPTION

Concept Summary: This silver maple - elm - cottonwood forest community is found throughout the midwestern United States and parts of the eastern United States. Stands occur on large, regularly flooded floodplains. The canopy cover is more-or-less closed and dominated by *Acer saccharinum* (silver maple). Codominants may include *Platanus occidentalis* (Sycamore), *Betula nigra* (river birch), and rarely *Acer saccharum* (sugar maple). Associated species may include *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Acer negundo* (box-elder), *Salix nigra* (black willow), *Celtis occidentalis* (common hackberry), *Carya cordiformis*

(bitternut hickory), *Juglans nigra* (black walnut), and *Fraxinus pennsylvanica* (green ash). The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus canadensis* (common elderberry), *Rubus occidentalis* (black raspberry), or *Lindera benzoin* (northern spicebush). Woody and herbaceous vines can be prominent, including among the woody vines *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis riparia* (riverbank grape). Herbaceous vine species include *Apios americana* (groundnut), *Amphicarpaea bracteata* (American hogpeanut), and *Echinocystis lobata* (wild cucumber). Herbaceous grasses, forbs, and ferns dominate the ground layer, including *Symphyotrichum lateriflorum* (calico aster), *Boehmeria cylindrica* (smallspike false nettle), *Erythronium americanum* (dogtooth violet), *Solidago gigantea* (giant goldenrod), *Cinna arundinacea* (sweet woodreed), *Leersia virginica* (whitegrass), *Elymus virginicus* (Virginia wildrye), *Impatiens pallida* (pale touch-me-not), *Laportea canadensis* (Canadian woodnettle), *Matteuccia struthiopteris* (ostrich fern), *Onoclea sensibilis* (sensitive fern), *Pilea pumila* (Canadian clearweed), *Urtica dioica* (stinging nettle), and others. A variety of exotics may be present, including *Lysimachia* (yellow loosestrife) spp., *Microstegium vimineum* (Nepalese browntop), *Polygonum cuspidatum* (Japanese knotweed), *Rosa multiflora* (multiflora rose), and *Lonicera japonica* (Japanese honeysuckle).

Environmental Description: This community occurs on temporarily flooded soils along major rivers and smaller perennial streams. Soils may be well-drained and sandy, more loamy on infrequently flooded bottomlands and levees, or deep silts on stabilized sites along larger rivers. It appears to be favored by deposition of deep sandy sediments by low-energy floodwaters. The community may form small linear patches among other floodplain associations or be locally extensive. The structure and composition of the type is influenced by the flooding regime. Floods leave river-deposited debris on the forest floor, ice scars on trees, and abandoned channels that retain water at or above the level of the main river channel.

Vegetation Description: The canopy cover is more-or-less closed and dominated by *Acer saccharinum* (silver maple). Codominants may include *Platanus occidentalis* (Sycamore), *Betula nigra* (river birch), and rarely *Acer saccharum* (sugar maple). Associated species may include *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Acer negundo* (box-elder), *Salix nigra* (black willow), *Celtis occidentalis* (common hackberry), *Carya cordiformis* (bitternut hickory), *Juglans nigra* (black walnut), *Fraxinus pennsylvanica* (green ash), and occasionally *Halesia tetraptera* (mountain silverbell). The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus canadensis* (common elderberry), *Rubus occidentalis* (black raspberry), or *Lindera benzoin* (northern spicebush). Woody and herbaceous vines can be prominent, including among the woody vines *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis riparia* (riverbank grape). Herbaceous vine species include *Apios americana* (groundnut), *Amphicarpaea bracteata* (American hogpeanut), and *Echinocystis lobata* (wild cucumber). Grasses, forbs, and ferns dominate the ground layer, including various combinations of *Symphyotrichum lateriflorum* (calico aster), *Boehmeria cylindrica* (smallspike false nettle), *Chasmanthium latifolium* (Indian woodoats), *Cryptotaenia canadensis* (Canadian honewort), *Erythronium americanum* (dogtooth violet), *Solidago gigantea* (giant goldenrod), *Cinna arundinacea* (sweet woodreed), *Leersia virginica* (whitegrass), *Elymus virginicus* (Virginia wildrye), *Helianthus* (sunflower) sp., *Impatiens capensis* (jewelweed), *Impatiens pallida* (pale touch-me-not), *Laportea canadensis* (Canadian woodnettle), *Matteuccia struthiopteris* (ostrich fern), *Menispermum canadense* (common moonseed), *Onoclea sensibilis* (sensitive fern), *Pilea pumila* (Canadian clearweed),

Polygonum virginianum (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Verbesina alternifolia* (wingstem), *Urtica dioica* (stinging nettle), and others. A variety of exotics may be present, including *Lysimachia* (yellow loosestrife) spp., *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), *Polygonum cuspidatum* (Japanese knotweed), *Rosa multiflora* (multiflora rose), and *Lonicera japonica* (Japanese honeysuckle).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum* (silver maple)
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy)
Herb (field)	Graminoid	*Leersia virginica* (whitegrass)

Characteristic Species: *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Alliaria petiolata* (garlic mustard), *Conium maculatum* (poison hemlock), *Elymus virginicus* (Virginia wildrye), *Glechoma hederacea* (ground ivy), *Humulus japonicus* (Japanese hop), *Populus deltoides* (eastern cottonwood), *Urtica dioica* ssp. *gracilis* (California nettle).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is found throughout the midwestern United States and in the mid-Atlantic region of the eastern United States, ranging from Delaware, New Jersey, and Pennsylvania west to Minnesota, and south to Arkansas.

States/Provinces: AR, DE, IA:SU, IL, IN, KY, MI, MN, MO, NJ, NY, OH, ON, PA, TN, WI:S3, WV.

Federal Lands: NPS (Delaware Water Gap, Effigy Mounds, New River Gorge, Upper Delaware); USFS (Ozark?); USFWS (Erie).

CONSERVATION STATUS

Rank: G4? (3-Oct-1996).

Reasons: There has been significant conversion of stands to agriculture, hydrologic modifications due to river dams, etc., and siltation caused by modified flooding regimes.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: This type includes stands where *Acer saccharinum* (silver maple) represents the majority of trees (>50% cover or basal area?). This type is most clearly expressed on larger rivers. To some degree this type is more northern, separable from the more southern type *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Forest (CEGL002431), but this distinction is not yet well resolved. In the southern parts of its range, this type may overlap with *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334), but that type is generally a higher terrace, small stream type. Compare this type with SAF cover type 62 (Eyre 1980). In Minnesota stands with less than either 50% cottonwood or silver maple and not in northwestern Minnesota tend to occur here (i.e., a mixed floodplain forest), as do silver maple stands with a supercanopy of cottonwoods. In southwestern Minnesota, stands with only some swamp white oak go here. If swamp white oak is dominant the stands probably belong with either an association in the *Quercus palustris - (Quercus bicolor)* Seasonally Flooded Forest

Alliance (A.329), or *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* (woodreed) spp. Forest (CEGL002098), at least in the Midwest. *Fraxinus pennsylvanica* (green ash) is a typical codominant in this type. In Wisconsin, this type may better be named *Acer saccharinum - Fraxinus pennsylvanica - Betula nigra* Forest (E. Epstein pers. comm. 1999).

Similar Associations:

- *Acer (rubrum, saccharinum) - Fraxinus* spp. - *Ulmus americana* Forest (CEGL005038)--grades into this community in backwater swamps.
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147)--is somewhat more northern, lacking *Platanus* and *Betula nigra*.
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Forest (CEGL006217)
- *Acer saccharinum - Betula nigra / Cephalanthus occidentalis* Forest (CEGL007810)
- *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Forest (CEGL002431)--is more southern.
- *Acer saccharinum* Temporarily Flooded Forest [Placeholder] (CEGL007304)
- *Fagus grandifolia - Quercus* spp. - *Acer rubrum - Juglans nigra* Forest (CEGL005014)--in the eastern part of its range on the mesic side.
- *Fraxinus pennsylvanica - Ulmus americana - (Acer negundo, Tilia americana)* Northern Forest (CEGL002089)--in the western part of its range on the mesic side.
- *Fraxinus pennsylvanica - Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014)
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334)--may overlap in southern parts of the range of CEGL002586.
- *Populus deltoides - Salix nigra* Forest (CEGL002018)--grades into this community on the wetter side.
- *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* spp. Forest (CEGL002098)

Related Concepts:

- Silver Maple - American Elm: 62 (Eyre 1980) B
- Silver maple-American elm-cottonwood floodplain forest (CAP pers. comm. 1998) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. L. A. Sneddon, E. Largay, S. C. Gawler.

References: Anderson 1996, CAP pers. comm. 1998, Eyre 1980, Fike 1999, INAI unpubl. data, MNNHP 1993, Midwestern Ecology Working Group n.d., Perles et al. 2007, Podniesinski and Wagner 2002, TDNH unpubl. data, Vanderhorst et al. 2007, WNHIP unpubl. data, WPC and TNC 2002, Walton et al. 1996.

COMMON NAME (PARK-SPECIFIC): OAK - TULIPTREE / MOUNTAIN SILVERBELL FLOODPLAIN FOREST

SYNONYMS

NVC English Name: **(White Oak, Northern Red Oak, Black Oak) / Mountain Silverbell Forest**

NVC Scientific Name: ***Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest**

NVC Identifier: **CEGL006462**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches on the highest positions of river floodplains which are infrequently flooded and possibly on alluvial terraces which are no longer flooded. The largest patches occur on large point bars which have developed along inside bends of large meanders, but patches may also occur along straight reaches of river. Evidence of flooding includes fluvial topography, accumulations of rocks on the upstream side of tree bases, and some flotsam. Low frequency and low energy of flooding is evidenced by the development of litter layers and organic-enriched soil horizons. Soils are well-drained sands and sandy loams; soil moisture regime may be somewhat dry. Soil chemistry analyzed from three plots indicates slightly acidic soils (mean pH = 5.8) and relatively high levels of some nutrients (Ca, Mg, Zn) compared to soils of most upland forests in the park. Slopes range from level to steep (mapping unit values range from 0 to 35 degrees, mean = 8 degrees). Elevations of mapped stands range from 267 to 390 m. Stands of this association are usually adjacent to or surrounded by other floodplain forest and woodland associations (i.e., *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) and *Platanus occidentalis - (Betula nigra, Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725)) which occur in more frequently flooded positions.

Vegetation Description: This association is a closed-canopy deciduous floodplain forest dominated by tree species more typical of uplands. Many of the stands are composed of very large-diameter, tall trees. Dominant trees in the canopy include *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), and *Acer saccharum var. saccharum* (sugar maple). Additional trees which may occur in the canopy and subcanopy include *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), and *Nyssa sylvatica* (blackgum). The small tree *Halesia tetraptera* (mountain silverbell) is usually dominant in a well-developed tall-shrub layer and may extend into the tree subcanopy. Additional shrubs include *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), and *Lindera benzoin* (northern spicebush). Characteristic herbs include *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Cynoglossum virginianum var. virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hydrastis canadensis* (goldenseal), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), *Packera aurea* (golden ragwort), and *Parthenocissus quinquefolia* (Virginia creeper). Vascular plant species richness in the 4 sampled plots ranges from 16 to 27 (mean = 32).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum* var. *saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Halesia tetraptera* (mountain silverbell)

Characteristic Species: *Acer rubrum* (red maple), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carpinus caroliniana* ssp. *virginiana* (American hornbeam), *Carya ovata* (shagbark hickory), *Cynoglossum virginianum* var. *virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass), *Dirca palustris* (eastern leatherwood), *Fagus grandifolia* (American beech), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Hydrastis canadensis* (goldenseal), *Lindera benzoin* (northern spicebush), *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), *Nyssa sylvatica* (blackgum), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper).

Other Noteworthy Species:

Species	GRank	Type	Note
Maianthemum stellatum (starry false lily of the vally)	-	plant	state-rare (S2)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association occurs in small patches scattered along the New River from Sandstone Falls downstream.

Classification Comments: This association has canopy composition similar to *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), but it is differentiated by its occurrence on floodplains and by the abundance of *Halesia tetraptera* (mountain silverbell) and other mesophytic species in the understory. Similar oak-dominated floodplain forests have been observed at Gauley River National Recreation Area and Bluestone National Scenic River, and the concept of this association may need to be broadened when data from those parks are incorporated into the IVC.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.107, NERI.356, NERI.362, NERI.363.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)

Alliance	*Acer saccharum - Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
Alliance (English name)	Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance
Association	*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest
Association (English name)	(White Oak, Northern Red Oak, Black Oak) / Mountain Silverbell Forest
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This association is a closed-canopy deciduous floodplain forest on the highest positions of river floodplains. These alluvial terraces are infrequently flooded and some are possibly no longer flooded. Low frequency and low energy of flooding is evidenced by the development of litter layers and organic-enriched soil horizons. Soils are well-drained sands and sandy loams, and soil moisture regime may be somewhat dry. The soils are slightly acidic and have relatively high cation levels. Slopes range from level to steep. The canopy is frequently composed of very large-diameter, tall trees, with species more typical of uplands. Dominant trees in the canopy include *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), and *Acer saccharum* (sugar maple). Additional trees which may occur in the canopy and subcanopy include *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), and *Nyssa sylvatica* (blackgum). The small tree *Halesia tetraptera* (mountain silverbell) is usually dominant in a well-developed tall-shrub layer and may extend into the tree subcanopy. Additional shrubs include *Carpinus caroliniana* (American hornbeam), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), and *Lindera benzoin* (northern spicebush). Characteristic herbs include *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Cynoglossum virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hydrastis canadensis* (goldenseal), *Maianthemum racemosum* (feathery false lily of the valley), *Packera aurea* (golden ragwort), and *Parthenocissus quinquefolia* (Virginia creeper).

Environmental Description: This association occurs in small patches on the highest positions of river floodplains which are infrequently flooded and possibly on alluvial terraces which are no longer flooded. The largest patches occur on large point bars which have developed along inside bends of large meanders. Evidence of flooding includes fluvial topography, accumulations of rocks on the upstream side of tree bases, and some flotsam. Low frequency and low energy of flooding is evidenced by the development of litter layers and organic-enriched soil horizons. Soils are well-drained sands and sandy loams, and soil moisture regime may be somewhat dry. Soil chemistry analyzed from three plots indicates slightly acidic soils (mean pH = 5.8) and relatively high levels of some nutrients (Ca, Mg, Zn) compared to soils of most upland forests in the area. Slopes range from level to steep. Elevations of mapped stands range from 267 to 390 m.

Vegetation Description: This association is a closed-canopy deciduous floodplain forest dominated by tree species more typical of uplands. Many of the stands are composed of very large-diameter, tall trees. Dominant trees in the canopy include *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Quercus alba* (white oak), *Liriodendron tulipifera* (tuliptree), and *Acer saccharum* (sugar maple). Additional trees which may occur in the canopy and subcanopy include *Acer rubrum* (red maple), *Carya ovata* (shagbark hickory), *Fagus grandifolia*

(American beech), *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), and *Nyssa sylvatica* (blackgum). The small tree *Halesia tetraptera* (mountain silverbell) is usually dominant in a well-developed tall-shrub layer and may extend into the tree subcanopy. Additional shrubs include *Carpinus caroliniana* (American hornbeam), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), and *Lindera benzoin* (northern spicebush). Characteristic herbs include *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Cynoglossum virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Hydrastis canadensis* (goldenseal), *Maianthemum racemosum* (feathery false lily of the valley), *Packera aurea* (golden ragwort), and *Parthenocissus quinquefolia* (Virginia creeper). Vascular plant species richness in the 4 sampled plots ranges from 16 to 27 (mean = 32).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Halesia tetraptera* (mountain silverbell)

Characteristic Species: *Acer rubrum* (red maple), *Ageratina altissima* (white snakeroot), *Arisaema triphyllum* (Jack in the pulpit), *Carpinus caroliniana* (American hornbeam), *Carya ovata* (shagbark hickory), *Cynoglossum virginianum* (wild comfrey), *Dichanthelium boscii* (Bosc's panicgrass), *Dirca palustris* (eastern leatherwood), *Fagus grandifolia* (American beech), *Galium circaezans* (licorice bedstraw), *Galium triflorum* (fragrant bedstraw), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Hydrastis canadensis* (goldenseal), *Lindera benzoin* (northern spicebush), *Magnolia acuminata* (cucumber-tree), *Magnolia tripetala* (umbrella-tree), *Maianthemum racemosum* (feathery false lily of the valley), *Nyssa sylvatica* (blackgum), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is currently known only from West Virginia along the New River and believed to occur along the Gauley and Bluestone rivers.

States/Provinces: WV.

Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: GNR (5-Jun-2006).

Reasons: More information is needed to determine a global rank. This association is likely to have been reduced from its original extent by clearing for agriculture or houses.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: This association has canopy composition similar to *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), but it is differentiated by its occurrence on floodplains and by the abundance of *Halesia tetraptera* (mountain silverbell) and other mesophytic species in the understory. Similar oak-dominated floodplain forests have been observed at Gauley River National Recreation Area and Bluestone National Scenic River, and the concept of this association may need to be broadened when data from those parks are incorporated into the NVC.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES

Description Authors: J. P. Vanderhorst.
References: Eastern Ecology Working Group n.d., Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SYCAMORE - ASH FLOODPLAIN FOREST

SYNONYMS

NVC English Name: **Sycamore - Green Ash / American Hornbeam / Wingstem Forest**

NVC Scientific Name: ***Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest**

NVC Identifier: **CEGL006458**

LOCAL INFORMATION

Environmental Description: This association occurs in small to medium-sized patches (<0.1-13 ha) on floodplains of the New River. The best developed stands occur on the wider floodplains which are associated with point bars along the inside bends of large river meanders. It also occurs on alluvial fans at the mouths of tributaries, and at knickpoints created by rapids and waterfalls. These positions are temporarily inundated by low- to medium-energy floods which may occur at any time of year but are more frequent in the winter and spring. Flooding frequency varies by relative elevation but is likely to occur at least annually throughout most of this community. Evidence of flooding includes fluvial microtopography, flotsam piles, and lack of thick litter layers and organic soil horizons. Substrates are alluvium, including boulders, cobbles, gravel, and sand. Soils in plots are described as well-drained, slightly acidic to neutral sand and sandy loam. Soil chemistry analyzed from 5 plots indicates slightly acidic soils (mean pH = 5.92) with relatively low levels of organic matter, S, Al, K, and P, and relatively high levels of Ca, Cu, Mg, and Zn. Slopes range from level to steep (mapping unit values range from 0 to 35 degrees, mean = 8 degrees). Elevations of mapped stands range from 259 to 418 m. Adjacent communities include *Platanus occidentalis - (Betula nigra, Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725), which occurs closer to the rivershore in positions subject to higher energy flooding, and *Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest (CEGL006462), which occurs on higher floodplain terraces which are infrequently flooded.

Vegetation Description: This association represents closed-canopy deciduous floodplain forests along the New River. The tree canopy is usually tall (20-35 m) with cover in plots ranging from 40 to 80% dominated by *Platanus occidentalis* (sycamore), *Fraxinus pennsylvanica* (green ash), and *Liriodendron tulipifera* (tuliptree). Additional important trees in the canopy include *Betula nigra* (river birch), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Subcanopy cover ranges from 10 to 80% and may include canopy species and *Acer saccharum var. saccharum* (sugar maple), *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Halesia tetraptera* (mountain silverbell), *Sassafras albidum* (sassafras), and *Zanthoxylum americanum* (common pricklyash). Cover in the tall-shrub layer of plots ranges from 10 to 80%; cover in the short-shrub layer ranges from 10 to 50%. Additional species in the shrub layers not included in the canopy include *Asimina triloba* (pawpaw), *Campsis radicans* (trumpet creeper), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush), *Toxicodendron radicans* (eastern poison ivy), and *Viburnum recognitum* (southern arrowwood). Cover in the diverse herb layer of plots ranges from 20 to 90%. Herbs with highest constancy and/or cover in plots include *Ageratina altissima* (white snakeroot), *Allium cernuum* var. *cernuum* (nodding onion), *Amphicarpaea bracteata*

(American hogpeanut), *Arabis laevigata* (smooth rockcress), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Boehmeria cylindrica* (smallspike false nettle), *Brachyelytrum erectum* (bearded shorthusk), *Cardamine impatiens* (narrowleaf bittercress), *Chasmanthium latifolium* (Indian woodoats), *Cinna arundinacea* (sweet woodreed), *Cryptotaenia canadensis* (Canadian honewort), *Dichanthelium clandestinum* (deertongue), *Dioscorea villosa* (wild yam), *Elymus hystrix* (eastern bottlebrush grass), *Elymus virginicus* (Virginia wildrye), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Galium aparine* (stickywilly), *Iris cristata* (dwarf crested iris), *Laportea canadensis* (Canadian woodnettle), *Lysimachia ciliata* (fringed loosestrife), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper), *Phlox paniculata* (fall phlox), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum virginianum* (jumpseed), *Polystichum acrostichoides* (Christmas fern), *Rudbeckia laciniata* var. *laciniata* (cutleaf coneflower), *Sanicula odorata* (clustered blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Silene stellata* (widowsfrill), *Silphium perfoliatum var. connatum* (cup plant), *Solidago flexicaulis* (zigzag goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), *Tradescantia virginiana* (Virginia spiderwort), *Verbesina alternifolia* (wingstem), *Verbesina occidentalis* (yellow crownbeard), *Viola striata* (striped cream violet), *Zizia aptera* (meadow zizia), *Zizia aurea* (golden zizia), and *Zizia trifoliata* (meadow alexanders). Exotic plant species which invade this community include *Alliaria petiolata* (garlic mustard), *Glechoma hederacea* (ground ivy), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), *Polygonum cuspidatum* (Japanese knotweed), *Prunella vulgaris* (common selfheal), and *Rosa multiflora* (multiflora rose). Vascular plant species richness in the 16 sampled plots ranges from 26 to 70 (mean = 53.2).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (sycamore)
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana* ssp. *virginiana* (American hornbeam)

Characteristic Species: *Acer saccharum* (sugar maple), *Ageratina altissima* (white snakeroot), *Allium cernuum* var. *cernuum*, *Amphicarpaea bracteata* (American hogpeanut), *Arabis laevigata* (smooth rockcress), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Betula nigra* (river birch), *Boehmeria cylindrica* (smallspike false nettle), *Brachyelytrum erectum* (bearded shorthusk), *Campsis radicans* (trumpet creeper), *Cardamine impatiens* (narrowleaf bittercress), *Cercis canadensis* (eastern redbud), *Chasmanthium latifolium* (Indian woodoats), *Chionanthus virginicus* (white fringetree), *Cinna arundinacea* (sweet woodreed), *Cornus florida* (flowering dogwood), *Cryptotaenia canadensis* (Canadian honewort), *Dichanthelium clandestinum* (deertongue), *Dioscorea villosa* (wild yam), *Dirca palustris* (eastern leatherwood), *Elymus hystrix* (eastern bottlebrush grass), *Elymus virginicus* var. *virginicus* (Virginia wildrye), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Fraxinus americana* (white ash), *Galium aparine* (stickywilly), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Iris cristata* (dwarf crested iris), *Juglans nigra* (black walnut), *Laportea canadensis* (Canadian woodnettle), *Lindera benzoin* (northern spicebush), *Lysimachia ciliata* (fringed

loosestrife), *Maianthemum racemosum* ssp. *racemosum* (feathery false lily of the valley), *Nyssa sylvatica* (blackgum), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper), *Phlox paniculata* (fall phlox), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum virginianum* (jumpseed), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Rudbeckia laciniata* (cutleaf coneflower), *Sanicula odorata* (clustered blacksnakeroot), *Sassafras albidum* (sassafras), *Sedum ternatum* (woodland stonecrop), *Silene stellata* (widowsfrill), *Solidago flexicaulis* (zigzag goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), *Toxicodendron radicans* (eastern poison ivy), *Tradescantia virginiana* (Virginia spiderwort), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Verbesina alternifolia* (wingstem), *Verbesina occidentalis* (yellow crownbeard), *Viburnum recognitum* (southern arrowwood), *Viola striata* (striped cream violet), *Zanthoxylum americanum* (common pricklyash), *Zizia aptera* (meadow zizia), *Zizia aurea* (golden zizia), *Zizia trifoliata* (meadow alexanders).

Other Noteworthy Species:

Species	GRank	Type	Note
Cardamine flagellifera (Blue Ridge bittercress)	G3	plant	state-rare (S1S2)
Silphium perfoliatum var. *connatum* (cup plant)	G5T3?	plant	state-rare (S1)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association occurs in patches along the New River throughout its length in the park.

Classification Comments: Spatially and compositionally, this association is intermediate to *Platanus occidentalis - (Betula nigra*, *Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725), which is usually a woodland and occurs in lower positions subject to more frequent, higher energy flooding, and *Quercus (alba*, *rubra*, *velutina) / Halesia tetraptera* Forest (CEGL006462), which occurs in higher positions subject to less frequent, lower energy floods. Suiter (1995) considered the floodplain forests along the New River to be part of the mesic upland forest.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.3, NERI.5, NERI.54, NERI.79, NERI.127, NERI.129, NERI.130, NERI.140, NERI.141, NERI.141, NERI.269, NERI.270, NERI.307, NERI.324, NERI.327, NERI.355, NERI.361.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Platanus occidentalis - (Liquidambar styraciflua, Liriodendron tulipifera) Temporarily Flooded Forest Alliance (A.289)

Alliance (English name)	Sycamore - (Sweetgum, Tuliptree) Temporarily Flooded Forest Alliance
Association	*Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest
Association (English name)	Sycamore - Green Ash / American Hornbeam / Wingstem Forest
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This association is currently only known and described from New River Gorge, West Virginia. It occurs in small to medium-sized patches (<0.1-13 ha) on floodplains of the New River. The best developed stands occur on the wider floodplains which are associated with point bars along the inside bends of large river meanders. It also occurs on alluvial fans at the mouths of tributaries, and at knickpoints created by rapids and waterfalls. These positions are temporarily inundated by low- to medium-energy floods which may occur at any time of year but are more frequent in the winter and spring. Substrates are alluvium, including boulders, cobbles, gravel, and sand. Soils are well-drained, slightly acidic to neutral sand and sandy loam. Elevations of mapped stands range from 259 to 418 m. This association represents closed-canopy deciduous floodplain forests along the New River. The tree canopy is dominated by *Platanus occidentalis* (Sycamore), *Fraxinus pennsylvanica* (green ash), and *Liriodendron tulipifera* (tuliptree). Additional important trees in the canopy include *Betula nigra* (river birch), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). The subcanopy includes canopy species and *Acer saccharum* (sugar maple), *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Halesia tetraptera* (mountain silverbell), *Sassafras albidum* (sassafras) and *Zanthoxylum americanum* (common pricklyash). Species in the shrub layers not included in the canopy include *Asimina triloba* (pawpaw), *Campsis radicans* (trumpet creeper), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush), *Toxicodendron radicans* (eastern poison ivy), and *Viburnum recognitum* (southern arrowwood). Cover in the diverse herb layer ranges from 20 to 90%.

Environmental Description: This association occurs in small to medium-sized patches (<0.1-13 ha) on floodplains of the New River. The best developed stands occur on the wider floodplains which are associated with point bars along the inside bends of large river meanders. It also occurs on alluvial fans at the mouths of tributaries, and at knickpoints created by rapids and waterfalls. These positions are temporarily inundated by low- to medium-energy floods which may occur at any time of year but are more frequent in the winter and spring. Substrates are alluvium, including boulders, cobbles, gravel, and sand. Soils in plots are described as well-drained, slightly acidic to neutral sand and sandy loam. Soil chemistry analyzed from 5 plots at New River Gorge indicates slightly acidic soils (mean pH = 5.92) with relatively low levels of organic matter, S, Al, K, and P, and relatively high levels of Ca, Cu, Mg, and Zn. Slopes range from level to steep (mapping unit values range from 0 to 35 degrees, mean = 8 degrees). Elevations of mapped stands range from 259 to 418 m.

Vegetation Description: This association represents closed-canopy deciduous floodplain forests along the New River. The tree canopy is usually tall (20-35 m) with cover in plots ranging from 40 to 80% dominated by *Platanus occidentalis* (American sycamore), *Fraxinus pennsylvanica* (green ash), and *Liriodendron tulipifera* (tuliptree). Additional important trees in

the canopy include *Betula nigra* (river birch), *Fraxinus americana* (white ash), *Juglans nigra* (black walnut), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Subcanopy cover ranges from 10 to 80% and may include canopy species and *Acer saccharum* (sugar maple), *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Cornus florida* (flowering dogwood), *Halesia tetraptera* (mountain silverbell), *Sassafras albidum* (sassafras) and *Zanthoxylum americanum* (common pricklyash). Cover in the tall-shrub layer of plots ranges from 10 to 80%, and cover in the short-shrub layers ranges from 10 to 50%. Additional species in the shrub layers not included in the canopy include *Asimina triloba* (pawpaw), *Campsis radicans* (trumpet creeper), *Dirca palustris* (eastern leatherwood), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (northern spicebush), *Toxicodendron radicans* (eastern poison ivy), and *Viburnum recognitum* (southern arrowwood). Cover in the diverse herb layer of plots ranges from 20 to 90%. Herbs with highest constancy and/or cover in plots include *Ageratina altissima* (white snakeroot), *Allium cernuum* (nodding onion), *Amphicarpaea bracteata* (American hogpeanut), *Arabis laevigata* (smooth rockcress), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Boehmeria cylindrica* (smallspike false nettle), *Brachyelytrum erectum* (bearded shorthusk), *Cardamine impatiens* (narrowleaf bittercress), *Chasmanthium latifolium* (Indian woodoats), *Cinna arundinacea* (sweet woodreed), *Cryptotaenia canadensis* (Canadian honewort), *Dichanthelium clandestinum* (deertongue), *Dioscorea villosa* (wild yam), *Elymus hystrix* (eastern bottlebrush grass), *Elymus virginicus* (Virginia wildrye), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Galium aparine* (stickywilly), *Iris cristata* (dwarf crested iris), *Laportea canadensis* (Canadian woodnettle), *Lysimachia ciliata* (fringed loosestrife), *Maianthemum racemosum* (feathery false lily of the valley), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper), *Phlox paniculata* (fall phlox), *Pilea pumila* (Canadian clearweed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum virginianum* (jumpseed), *Polystichum acrostichoides* (Christmas fern), *Rudbeckia laciniata* (cutleaf coneflower), *Sanicula odorata* (clustered blacksnakeroot), *Sedum ternatum* (woodland stonecrop), *Silene stellata* (widowsfrill), *Silphium perfoliatum var. connatum* (cup plant), *Solidago flexicaulis* (zigzag goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), *Tradescantia virginiana* (Virginia spiderwort), *Verbesina alternifolia* (wingstem), *Verbesina occidentalis* (yellow crownbeard), *Viola striata* (striped cream violet), *Zizia aptera* (meadow zizia), *Zizia aurea* (golden zizia), and *Zizia trifoliata* (meadow alexanders). Exotic plant species which invade this community include *Alliaria petiolata* (garlic mustard), *Glechoma hederacea* (ground ivy), *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Nepalese browntop), *Polygonum cuspidatum* (Japanese knotweed), *Prunella vulgaris* (common selfheal), and *Rosa multiflora* (multiflora rose). Vascular plant species richness in the 16 sampled plots ranges from 26 to 70 (mean = 53.2).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (Sycamore)
Tree subcanopy	Broad-leaved deciduous tree	*Carpinus caroliniana* ssp. *virginiana* (American hornbeam)

Characteristic Species: *Ageratina altissima* (white snakeroot), *Allium cernuum* (nodding onion), *Amphicarpaea bracteata* (American hogpeanut), *Arabis laevigata* (smooth rockcress), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asimina triloba* (pawpaw), *Betula nigra* (river birch), *Boehmeria cylindrica* (smallspike false nettle), *Brachyelytrum erectum* (bearded shorthusk), *Campsis radicans* (trumpet creeper), *Cardamine impatiens* (narrowleaf bittercress), *Cercis canadensis* (eastern redbud), *Chasmanthium latifolium* (Indian woodoats), *Chionanthus virginicus* (white fringetree), *Cinna arundinacea* (sweet woodreed), *Cornus florida* (flowering dogwood), *Cryptotaenia canadensis* (Canadian honewort), *Dichanthelium clandestinum* (deertongue), *Dioscorea villosa* (wild yam), *Dirca palustris* (eastern leatherwood), *Elymus hystrix* (eastern bottlebrush grass), *Elymus virginicus* (Virginia wildrye), *Eurybia divaricata* (white wood aster), *Festuca subverticillata* (nodding fescue), *Fraxinus americana* (white ash), *Galium aparine* (stickywilly), *Halesia tetraptera* (mountain silverbell), *Hamamelis virginiana* (American witchhazel), *Iris cristata* (dwarf crested iris), *Juglans nigra* (black walnut), *Laportea canadensis* (Canadian woodnettle), *Lindera benzoin* (northern spicebush), *Lysimachia ciliata* (fringed loosestrife), *Maianthemum racemosum* (feathery false lily of the valley), *Nyssa sylvatica* (blackgum), *Packera aurea* (golden ragwort), *Parthenocissus quinquefolia* (Virginia creeper), *Phlox paniculata* (fall phlox), *Pilea pumila* (Canadian clearweed), *Polygonatum biflorum* (smooth Solomon's seal), *Polygonum virginianum* (jumpseed), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Robinia pseudoacacia* (black locust), *Rudbeckia laciniata* (cutleaf coneflower), *Sanicula odorata* (clustered blacksnakeroot), *Sassafras albidum* (sassafras), *Sedum ternatum* (woodland stonecrop), *Silene stellata* (widowsfrill), *Solidago flexicaulis* (zigzag goldenrod), *Symphyotrichum cordifolium* (common blue wood aster), *Toxicodendron radicans* (eastern poison ivy), *Tradescantia virginiana* (Virginia spiderwort), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Verbesina alternifolia* (wingstem), *Verbesina occidentalis* (yellow crownbeard), *Viburnum recognitum* (southern arrowwood), *Viola striata* (striped cream violet), *Zanthoxylum americanum* (common pricklyash), *Zizia aptera* (meadow zizia), *Zizia aurea* (golden zizia), *Zizia trifoliata* (meadow alexanders).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION
Range: This association is currently documented from the New River in West Virginia but is presumably wider ranging.
States/Provinces: WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS
Rank: GNR (2-Aug-2006).
Reasons: Information not available.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 3 - Weak.
Comments: Information not available.

Similar Associations:

- *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Forest (CEGL004073)--occurs on richer floodplains in the central Appalachians, usually on calcareous substrates.
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334)--occurs on richer floodplains in the southern Appalachians, Cumberlands, and adjacent regions, usually on calcareous substrates.
- *Platanus occidentalis - Liquidambar styraciflua / Carpinus caroliniana - Asimina triloba* Forest (CEGL007340)--has Coastal Plain affinity.

Related Concepts:

- *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana* riparian forest (Vanderhorst 2001b) =
- mesic upland forest (Suiter 1995) B

SOURCES

Description Authors: J. P. Vanderhorst.

References: Eastern Ecology Working Group n.d., Suiter 1995, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): FOREST SEEP

SYNONYMS

NVC English Name:	**Red Maple - Blackgum / Common Winterberry - Black Highbush Blueberry / Cinnamon Fern Forest**
NVC Scientific Name:	***Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest**
NVC Identifier:	**CEGL007853**

LOCAL INFORMATION

Environmental Description: This wetland association occurs in small, often linear patches in seepy low-gradient drainages on the plateaus. Sites are underlain by sandstone of the Pottsville group. Substrates are poorly drained mineral soils with numerous hydric indicators, including saturated horizons, low chroma, gley, and mottles. Soil textures determined by hand in plots include clays, clay loams, sandy loams, sand, and muck. Soil chemistry analyzed from four plots indicates very strongly acidic soils (mean pH = 4.53) with high levels of Al and relatively low levels of other nutrients (Ca, Mn, Mg, Zn). There are often small pools of standing water or small flowing streams in this community. Trees are mostly rooted on the upland edges or on elevated hummocks. Windfall and tip mounds are common. Patches of this community are mostly shaded by overhanging trees, but sunny spots may be created by canopy gaps, and larger patches may have small open centers. These seepage wetlands are not effected by flooding caused by beaver activities. Slopes range from level to somewhat steep (mapping unit values range from 0 to 26 degrees, mean = 7 degrees). Elevations of mapped stands range from 505 to 905 m. This association usually occurs in small patches embedded in the matrix forest of the plateaus, *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267).

Vegetation Description: This association is a deciduous forest which generally has a closed canopy formed by overhanging trees. Tree species with highest cover and constancy include *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), and *Betula lenta* (sweet birch). Like the tree strata, the shrub strata are composed primarily of shrubs and saplings which are characteristic of the surrounding upland forests, but wetland shrubs such as *Alnus serrulata* (smooth alder) and *Ilex verticillata* (common winterberry) may occur. The thorny vines *Smilax rotundifolia* (roundleaf greenbrier) and *Rubus hispidus* (bristly dewberry) are common. The herb layer has relatively high cover and diversity and includes a combination of wetland indicator species and upland species. The fern *Thelypteris noveboracensis* (New York fern) often forms dense swards. Additional herbs with high constancy in the plots include *Athyrium filix-femina* (common ladyfern), *Carex debilis var. rudgei* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Dioscorea quaternata* (fourleaf yam), *Juncus effusus* (common rush), *Lycopus uniflorus var. uniflorus* (northern bugleweed), *Medeola virginiana* (Indian cucumber), *Osmunda cinnamomea* (cinnamon fern), *Oxypolis rigidior* (stiff cowbane), *Platanthera clavellata* (small green wood orchid), *Polystichum acrostichoides* (Christmas fern), *Potentilla simplex* (common cinquefoil), *Viola cucullata* (marsh blue violet), and *Viola hastata* (halberdleaf yellow violet). Additional wetland indicator herbs in some stands include *Callitriche heterophylla ssp. heterophylla* (twoheaded water-starwort), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex prasina* (drooping sedge), *Chelone glabra* (white

turtlehead), *Cinna arundinacea* (sweet woodreed), *Eleocharis tenuis* (slender spikerush), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), and *Scirpus atrovirens* (green bulrush). Vascular plant species richness in the 12 sampled plots ranges from 35 to 47 (mean = 40.7). The bryophyte layer may also be diverse; species of mosses and liverworts identified from plots include *Atrichum undulatum* (undulate atrichum moss), *Aulacomnium palustre* (aulacomnium moss), *Bryhnia novae-angliae* (New England bryhnia moss), *Callicladium haldanianum* (callicladium moss), *Campylium radicale* (campylium moss), *Dicranum scoparium* (dicranum moss), *Hypnum imponens* (hypnum moss), *Jungermannia gracillima*, *Leucobryum albidum* (leucobryum moss), *Mnium hornum* (horn calcareous moss), *Pellia epiphylla*, *Plagiomnium ciliare* (plagiomnium moss), *Platygyrium repens* (platygyrium moss), *Steerecleus serrulatus* (steerecleus moss), and *Thuidium delicatulum* (delicate thuidium moss).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak)
Herb (field)	Fern or fern ally	*Thelypteris noveboracensis* (New York fern)

Characteristic Species: *Alnus serrulata* (smooth alder), *Athyrium filix-femina* (common ladyfern), *Aulacomnium palustre* (aulacomnium moss), *Bryhnia novae-angliae* (New England bryhnia moss), *Callicladium haldanianum* (callicladium moss), *Callitriche heterophylla* ssp. *heterophylla* (twoheaded water-starwort), *Campylium radicale* (campylium moss), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex debilis* var. *rudgei* (white edge sedge), *Carex folliculata* (northern long sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Carex prasina* (drooping sedge), *Chelone glabra* (white turtlehead), *Cinna arundinacea* (sweet woodreed), *Dioscorea quaternata* (fourleaf yam), *Eleocharis tenuis* (slender spikerush), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Ilex verticillata* (common winterberry), *Juncus effusus* (common rush), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Medeola virginiana* (Indian cucumber), *Mnium hornum* (horn calcareous moss), *Osmunda cinnamomea* (cinnamon fern), *Oxypolis rigidior* (stiff cowbane), *Pellia epiphylla*, *Plagiomnium ciliare* (plagiomnium moss), *Platanthera clavellata* (small green wood orchid), *Polystichum acrostichoides* (Christmas fern), *Potentilla simplex* (common cinquefoil), *Scirpus atrovirens* (green bulrush), *Viola cucullata* (marsh blue violet), *Viola hastata* (halberdleaf yellow violet).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs on the plateaus in areas underlain by Pottsville sandstones. It is most common in the middle section of the park in the vicinities of Kate's Branch, Backus Mountain, and Highland Mountain.

Classification Comments: This is a well-defined and easily recognized community in the park, but it differs from the global description by lacking a well-developed shrub layer and some species which do not occur in West Virginia (*Vaccinium fuscatum* (black highbush blueberry), *Gaylussacia frondosa* (blue huckleberry), *Helonias bullata* (swamppink)) or which do not occur

in this community (*Pinus rigida* (pitch pine), *Rhododendron catawbiense* (Catawba rosebay), *Toxicodendron vernix* (poison sumac), *Parnassia asarifolia* (kidneyleaf grass of Parnassus)). West Virginia ecologists refer to this community as a "fern gully" due to high cover by *Thelypteris noveboracensis* (New York fern) and *Osmunda cinnamomea* (cinnamon fern). In a regional wetland analysis (Byers et al. 2007), plots of this association from New River Gorge did not cluster closely with forest seeps from higher elevations in the Allegheny Mountains of West Virginia which are attributed to *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132), *Chrysosplenium americanum* (American golden saxifrage) Herbaceous Vegetation (CEGL006193), or *Caltha palustris - Impatiens capensis - Viola cucullata* Herbaceous Vegetation (CEGL006258).
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.22, NERI.23, NERI.26, NERI.43, NERI.49, NERI.136, NERI.138, NERI.211, NERI.250, NERI.262, NERI.264, NERI.271.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Saturated cold-deciduous forest (I.B.2.N.g.)
Alliance	*Acer rubrum - Nyssa sylvatica* Saturated Forest Alliance (A.348)
Alliance (English name)	Red Maple - Blackgum Saturated Forest Alliance
Association	*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest
Association (English name)	Red Maple - Blackgum / Common Winterberry - Black Highbush Blueberry / Cinnamon Fern Forest
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609).

GLOBAL DESCRIPTION

Concept Summary: This community occurs on groundwater-saturated flats and low slopes along streams in the Ridge and Valley, northern Blue Ridge, and western Piedmont at elevations of 200-900 m (700-2900 feet). The canopy is usually closed and consists of *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Liriodendron tulipifera* (tuliptree). *Pinus rigida* (pitch pine) is a frequent overstory associate in some Ridge and Valley and Blue Ridge stands, although its numbers have been recently reduced by southern pine beetle outbreaks. Other tree species, especially at higher elevations, include *Quercus alba* (white oak), *Magnolia acuminata* (cucumber-tree), *Betula lenta* (sweet birch), and *Pinus strobus* (eastern white pine). The shrub stratum may be well-developed and includes *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Kalmia latifolia* (mountain laurel), *Alnus serrulata* (smooth alder), *Viburnum nudum var. cassinoides* (withe-rod), *Viburnum dentatum* (southern arrowwood), *Smilax* (greenbrier) spp., and, less consistently, *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), *Gaylussacia frondosa* (blue huckleberry), *Gaylussacia baccata* (black huckleberry), *Menziesia pilosa* (minniebush), *Vaccinium fuscatum* (black highbush blueberry), *Chionanthus virginicus* (white fringetree), *Viburnum nudum var.*

nudum (possumhaw), *Rhododendron viscosum* (swamp azalea), and *Toxicodendron vernix* (poison sumac). *Rubus hispidus* (bristly dewberry) is an abundant creeping vine in many stands. Typical herbaceous plants are *Osmunda cinnamomea* (cinnamon fern), *Carex gynandra* (nodding sedge), *Thelypteris noveboracensis* (New York fern), *Medeola virginiana* (Indian cucumber), *Lycopodium obscurum* (rare clubmoss), *Osmunda regalis var. spectabilis* (royal fern), *Symplocarpus foetidus* (skunk cabbage), *Veratrum viride* (green false hellebore), and *Viola cucullata* (marsh blue violet).

Environmental Description: This community occurs on groundwater-saturated flats along low- to middle-elevation streams and headwaters seeps in areas underlain by acidic sedimentary and metamorphic rocks. It is a small-patch type that is particularly frequent and well-developed in the large alluvial fans along the western foot of the northern Blue Ridge and in small-stream valleys and low-gradient plateau drainages of the Ridge and Valley province. Outliers occur throughout the western Piedmont, particularly in districts underlain by acidic metasedimentary rocks. Habitats are usually more-or-less narrow and elongate, with hummock-and-hollow microtopography. Substrates are poorly drained mineral soils with numerous hydric indicators, including saturated horizons, low chroma, gley, and mottles. Local areas of organic muck sometimes accumulate in depressions. The ground surface is slightly sloping, and drainage is usually via small, intricately braided channels with interspersed hummocks. Moss mats, predominantly of *Sphagnum* (sphagnum) spp., are usually abundant and provide a rooting medium for herbaceous species. Soils collected from plot samples are very strongly acidic with moderately low to very low base status. Patches of this community are mostly shaded by overhanging trees, but sunny spots may be created by canopy gaps, and larger patches may have small open centers.

Vegetation Description: This forest association has an open to closed canopy of *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Liriodendron tulipifera* (tuliptree). *Quercus alba* (white oak) is an important associate in some areas. *Pinus rigida* (pitch pine) is a frequent overstory associate in some Ridge and Valley and Blue Ridge stands, although its numbers have been recently reduced by southern pine beetle outbreaks. Minor tree species, especially at the higher elevations, include *Magnolia acuminata* (cucumber-tree), *Betula lenta* (sweet birch), and *Pinus strobus* (eastern white pine). A single, anomalous stand in Augusta County, Virginia, contains an abundance of the disjunct Coastal Plain tree *Magnolia virginiana* (sweetbay) (Carr 1939). *Amelanchier arborea* (common serviceberry) is usually common in the understory, along with reproduction of *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum). The shrub stratum is often well-developed and includes *Ilex verticillata* (common winterberry), *Kalmia latifolia* (mountain laurel), *Alnus serrulata* (hazel alder), *Viburnum dentatum* (southern arrowwood), *Photinia pyrifolia* (red chokeberry), *Vaccinium corymbosum* (highbush blueberry), and *Smilax* (greenbrier) spp. Less frequent, but locally important, shrubs include *Vaccinium fuscatum* (black highbush blueberry), *Toxicodendron vernix* (poison sumac), *Viburnum nudum var. nudum* (possumhaw), *Viburnum nudum var. cassinoides* (withe-rod), *Menziesia pilosa* (minniebush), *Carpinus caroliniana* (American hornbeam), *Chionanthus virginicus* (white fringetree), *Lindera benzoin* (northern spicebush), *Gaylussacia frondosa* (blue huckleberry), *Rhododendron catawbiense* (Catawba rosebay), *Rhododendron periclymenoides*, and *Rhododendron viscosum* (swamp azalea). *Rubus hispidus* (bristly dewberry) is an abundant creeping vine in many stands; *Smilax rotundifolia* may also be present. The most characteristic herbaceous plants are *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Platanthera clavellata* (small green wood orchid), *Chelone glabra* (white

turtlehead), *Rubus hispidus* (bristly dewberry), *Viola cucullata* (marsh blue violet), *Carex gynandra* (nodding sedge), *Carex lurida* (shallow sedge), *Carex atlantica* (prickly bog sedge), *Carex debilis*, *Oxypolis rigidior* (stiff cowbane), *Thelypteris noveboracensis* (New York fern), *Athyrium filix-femina* (common ladyfern), *Dioscorea quaternata* (fourleaf yam), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Medeola virginiana* (Indian cucumber), *Polystichum acrostichoides* (Christmas fern), *Potentilla simplex* (common cinquefoil), and *Viola hastata* (halberdleaf yellow violet). Where shrubs are sparse, as in most of the West Virginia occurrences, fern cover is typically extensive. Less frequent but typical herbs include *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Carex intumescens* (greater bladder sedge), *Carex leptalea* (bristlystalked sedge), *Symplocarpus foetidus* (skunk cabbage), *Veratrum viride* (green false hellebore), *Maianthemum canadense* (Canada mayflower), *Lycopodium obscurum* (rare clubmoss), and *Dryopteris cristata* (crested woodfern). Many additional herbaceous species, including several more typical of uplands, occur at low constancy and cover. The bryophyte layer may also be diverse; species of mosses and liverworts identified from plots include *Atrichum undulatum* (undulate atrichum moss), *Aulacomnium palustre* (aulacomnium moss), *Bryhnia novae-angliae* (New England bryhnia moss), *Callicladium haldanianum* (callicladium moss), *Campylium radicale* (campylium moss), *Dicranum scoparium* (dicranum moss), *Hypnum imponens* (hypnum moss), *Jungermannia gracillima*, *Leucobryum albidum* (leucobryum moss), *Mnium hornum* (horn calcareous moss), *Pellia epiphylla*, *Plagiomnium ciliare* (plagiomnium moss), *Platygyrium repens* (platygyrium moss), *Steerecleus serrulatus* (steerecleus moss), and *Thuidium delicatulum* (delicate thuidium moss). Mean vascular plant species richness of 29 plot-sampled stands in Virginia and West Virginia is 48 taxa per 400 square meters.

The recognition of segregate associations, subassociations, or variants may be warranted following additional assessment, ideally based on wider geographic sampling. Lower elevation sites are characterized by *Amianthium muscitoxicum* (flypoison), *Brachyelytrum erectum* (bearded shorthusk), *Carex debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Cypripedium acaule* (moccasin flower), *Gaylussacia frondosa* (blue huckleberry), *Lindera benzoin* (northern spicebush), *Platanthera ciliaris* (yellow fringed orchid), *Platanthera clavellata* (small green wood orchid), *Uvularia sessilifolia* (sessileleaf bellwort), *Viburnum nudum var. nudum* (possumhaw), and *Viola X primulifolia* (primroseleaf violet). Middle-elevation sites are characterized by *Oclemena acuminata* (whorled wood aster), *Betula lenta* (sweet birch), *Magnolia acuminata* (cucumber-tree), *Pinus strobus* (eastern white pine), *Rhododendron catawbiense* (Catawba rosebay), and *Rhododendron viscosum* (swamp azalea). A single site (Magnolia Swamp), possibly with boggier or more organic soils, is characterized by *Magnolia virginiana* (sweetbay), *Arethusa bulbosa* (dragon's mouth), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), *Parthenocissus quinquefolia* (Virginia creeper), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Woodwardia areolata* (netted chainfern).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak)
Herb (field)	Fern or fern ally	*Thelypteris noveboracensis* (New York fern)

Characteristic Species: *Acer rubrum* (red maple), *Alnus serrulata* (smooth alder), *Aulacomnium palustre* (aulacomnium moss), *Bryhnia novae-angliae* (New England bryhnia moss), *Callicladium haldanianum* (callicladium moss), *Campylium radicale* (campylium moss), *Carex baileyi* (Bailey's sedge), *Carex debilis* (white edge sedge), *Carex folliculata* (northern long sedge), *Carex intumescens* (greater bladder sedge), *Carex prasina* (drooping sedge), *Chelone glabra* (white turtlehead), *Cinna arundinacea* (sweet woodreed), *Dichanthelium dichotomum* (cypress panicgrass), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Heteromeles arbutifolia* (toyon), *Ilex verticillata* (common winterberry), *Juncus effusus* (common rush), *Liriodendron tulipifera* (tuliptree), *Lycopus uniflorus* (northern bugleweed), *Mnium hornum* (horn calcareous moss), *Nyssa sylvatica* (blackgum), *Osmunda cinnamomea* (cinnamon fern), *Oxypolis rigidior* (stiff cowbane), *Pellia epiphylla*, *Plagiomnium ciliare* (plagiomnium moss), *Platanthera clavellata* (small green wood orchid), *Rubus hispidus* (bristly dewberry), *Thelypteris noveboracensis* (New York fern), *Vaccinium fuscatum* (black highbush blueberry), *Viola cucullata* (marsh blue violet).

Other Noteworthy Species:

Species	GRank	Type	Note
Eriocaulon decangulare (tenangle pipewort)	-	plant	VA S2
Helonias bullata (swamppink)	G3	plant	

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: The probable range of this community type encompasses the Central Appalachian region of Pennsylvania, Maryland, and Virginia, and the Cumberland Mountains in West Virginia. In Virginia it is scattered throughout the mountains and, more locally, the western Piedmont (Allard and Leonard 1943).

States/Provinces: MD, PA?, VA:S3?, WV.

Federal Lands: NPS (Blue Ridge Parkway, Catoctin Mountain, New River Gorge, Shenandoah); USFS (George Washington).

CONSERVATION STATUS

Rank: G3G4 (1-Oct-2001).

Reasons: This association has a narrow geographic range and is further limited by its requirement for special, localized wetlands. The type is confined to groundwater-saturated, nutrient-poor habitats that are large enough to support forest vegetation.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: Examples occur near the Maple Flats pond complex (Augusta County, Virginia). This community is also known from Massanutten Mountain (Lee District, George Washington National Forest), elsewhere along the foot of the Blue Ridge (north of Maple Flats), a site on the

northern Blue Ridge in Loudoun County, Virginia (owned by The Appalachian Trail Club), and in the Bull Run Mountains of Virginia, an isolated Piedmont foothill in Fauquier and Prince William counties, Virginia; occurrences in the latter two areas do not have *Pinus rigida* (pitch pine) (or much of it) but are otherwise very similar (Fleming 1998). Quantitative analysis of a 1300-plot regional dataset for the National Capital Region Parks Vegetation Mapping Project Phase I indicate that a portion of Gould and Berdine's (1998) "circumneutral" seepage swamp community from Catoctin Mountain, Maryland, also corresponds to this type. It has also been sampled in West Virginia, where occurrences generally lack a dense shrub layer and are characterized by heavy fern cover.

There are unresolved issues regarding conceptual overlap between this type and *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132). The latter type is a broadly defined community type that encompasses both seepage wetlands and poorly drained depressions. The community classified and described here for Virginia is limited conceptually to flow-through, groundwater-seepage wetlands. Communities with similar *Acer - Nyssa* canopies but occurring in saturated to seasonally flooded depression wetlands without apparent seepage inputs have been documented in Virginia but are not treated due to insufficient data. Nevertheless, they appear to warrant segregation from the seepage wetland communities because of their hydrologic regime, distinctly different herbaceous composition, and much lower species richness.

This type is currently under-represented by plot data, but observations suggest that it is relatively consistent in its composition and environmental affiliations. However, community characterization and nomenclature are subject to change pending further data collection and analysis, ideally based on wider geographic sampling. The recognition of segregate associations, subassociations, or variants may also be warranted following additional assessment. This type is similar in many respects to, and intergrades with, Montane Basic Seepage Swamps that are situated on calcareous soils derived from metabasalt (greenstone) and carbonate rock substrates [see *Acer rubrum - Fraxinus americana - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides* Forest (CEGL008416)]. These environmentally disparate swamps share a surprising number of prominent species including *Acer rubrum* (red maple), *Symplocarpus foetidus* (skunk cabbage), *Veratrum viride* (green false hellebore), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Carex leptalea* (bristlystalked sedge), etc. Acidic seepage swamps, however, have lower species richness and mostly lack distinctly base-loving species such as *Fraxinus americana* (white ash), *Fraxinus nigra* (black ash), *Caltha palustris* (yellow marsh marigold), *Carex bromoides* (bromelike sedge), *Saxifraga pensylvanica* (eastern swamp saxifrage), etc. *Sphagnum* (sphagnum) mosses, as well as many vascular plants that characterize Acidic Seepage Swamps, are absent or unimportant in the calcareous swamps. Examples include *Pinus rigida* (pitch pine), *Nyssa sylvatica* (blackgum), *Viburnum nudum* (possumhaw), *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Platanthera ciliaris* (yellow fringed orchid), *Platanthera clavellata* (small green wood orchid), *Rubus hispidus* (bristly dewberry), *Lycopodium obscurum* (rare clubmoss), *Carex debilis* (white edge sedge), and *Carex folliculata* (northern long sedge) (Fleming and Van Alstine 1999).

Formerly a common canopy tree of this community type in certain localities (e.g., Maple Flats, Augusta County), *Pinus rigida* (pitch pine) has been nearly eliminated from many stands by a recent outbreak of southern pine beetles (*Dendroctonus frontalis*).

Similar Associations:

- *Acer rubrum - Fraxinus americana - Fraxinus nigra - Liriodendron tulipifera / Carex bromoides - Caltha palustris* Forest (CEGL008416).
- *Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum* var. *nudum / Osmunda cinnamomea - Woodwardia areolata* Forest (CEGL006238).
- *Acer rubrum - Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132).

Related Concepts:

- *Acer rubrum - Fraxinus pennsylvanica - Betula (alleghaniensis, lenta) / Ilex verticillata / Symplocarpus foetidus* Forest (Gould and Berdine 1998) I
- *Acer rubrum - Liriodendron tulipifera / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea - Symplocarpus foetidus* Forest (Fleming 2002a) =
- *Acer rubrum - Nyssa sylvatica - Pinus rigida / Ilex verticillata / Osmunda cinnamomea* community (Fleming and Van Alstine 1999) ?
- *Acer rubrum - Nyssa sylvatica / Vaccinium fuscatum - Ilex verticillata / Osmunda cinnamomea* Forest (Fleming and Coulling 2001) ?
- *Acer rubrum / Thelypteris noveboracensis* forest seep (Vanderhorst 2001b) =

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. S. C. Gawler.

References: Allard and Leonard 1943, Byers et al. 2007, Carr 1939, Fleming 1998, Fleming 2002a, Fleming and Coulling 2001, Fleming and Van Alstine 1999, Fleming et al. 2001, Fleming pers. comm., Gould and Berdine 1998, Southeastern Ecology Working Group n.d., VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): YELLOW BIRCH COLD COVE FOREST

SYNONYMS

NVC English Name:	**Yellow Birch - (Eastern Hemlock) / Great Laurel / (Mountain Doghobble) Forest**
NVC Scientific Name:	***Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest**
NVC Identifier:	**CEGL007861**

LOCAL INFORMATION

Environmental Description: This association is an upland forest type which occurs on steep, rocky lower slopes along creeks in the bottoms of deep side canyons of the New River Gorge. These positions, which have low solar exposure and may be subject to cold-air inversions, support vegetation similar to types normally found at higher elevations (Grafton and McGraw 1976). Early leaf drop compared to surrounding deciduous forests is apparent on fall aerial photography. The bottom edge of stands may be subject to high-energy flooding. Soils are typically shallow and rocky. Soil chemistry analyzed from two plots indicates strongly acidic soils (mean pH = 4.85) with relatively low levels of most nutrients. Slopes range from nearly level to very steep (mapping unit values range from 0.3 to 45 degrees, mean = 16 degrees). Elevations of mapped stands range from 319 to 750 m. Adjacent forest types upslope include *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) on cooler aspects and *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) on warmer aspects. Adjacent creek bottoms often support patches of *Carex torta* (twisted sedge) Herbaceous Vegetation (CEGL004103).

Vegetation Description: This association is a deciduous or mixed deciduous-evergreen forest dominated by *Betula alleghaniensis var. alleghaniensis* (yellow birch). Additional trees with high constancy and cover in plots include *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Tilia americana* (American basswood), and *Tsuga canadensis* (eastern hemlock). There is usually a dense tall-shrub layer dominated by *Rhododendron maximum* (great laurel). Additional shrubs include *Acer spicatum* (mountain maple), *Hamamelis virginiana* (American witchhazel), *Hydrangea arborescens* (wild hydrangea), and *Ribes cynosbati* (eastern prickly gooseberry). There is typically moderate cover and diversity in the herb layer, dominated by ferns, but the only constant species in plots is *Polystichum acrostichoides* (Christmas fern). Additional species occurring in the herb layer of two or more plots include *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asplenium rhizophyllum* (walking fern), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Galium triflorum* (fragrant bedstraw), *Hexastylis virginica* (Virginia heartleaf), *Hydrophyllum virginianum* (Shawnee salad), *Mitchella repens* (partridgeberry), *Parthenocissus quinquefolia* (Virginia creeper), *Polygonatum pubescens* (hairy Solomon's seal), *Sedum ternatum* (woodland stonecrop), *Symphyotrichum prenanthoides* (crookedstem aster), *Tiarella cordifolia* (heartleaf foamflower), and *Uvularia puberula* (mountain bellwort). The Appalachian endemic *Cymophyllus fraserianus* (Fraser's cymophyllus) is abundant in at least one stand. Vascular plant species richness in the 6 sampled plots ranges from 18 to 40 taxa (mean = 29.2). The bryophyte

layer can be well-developed and diverse; mosses and liverworts collected from one plot include *Anomodon attenuatus* (anomodon moss), *Aulacomnium heterostichum* (aulacomnium moss), *Bryhnia graminicolor* (bryhnia moss), *Bryoandersonia illecebra* (bryoandersonia moss), *Campylium chrysophyllum* (goldenleaf campylium moss), *Hypnum curvifolium* (curveleaf hypnum moss), *Hypnum imponens* (hypnum moss), *Loeskeobryum brevirostre* (loeskeobryum moss), *Mnium stellare* (stellar calcareous moss), *Plagiothecium denticulatum* (toothed plagiothecium moss), *Platyhypnidium riparioides*, and *Thuidium delicatulum* (delicate thuidium moss).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis* var. *alleghaniensis* (yellow birch)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum* (great laurel)

Characteristic Species: *Acer spicatum* (mountain maple), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asplenium rhizophyllum* (walking fern), *Betula lenta* (sweet birch), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Galium triflorum* (fragrant bedstraw), *Hamamelis virginiana* (American witchhazel), *Hexastylis virginica* (Virginia heartleaf), *Hydrangea arborescens* (wild hydrangea), *Hydrophyllum virginianum* (Shawnee salad), *Liriodendron tulipifera* (tuliptree), *Mitchella repens* (partridgeberry), *Parthenocissus quinquefolia* (Virginia creeper), *Polygonatum pubescens* (hairy Solomon's seal), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Ribes cynosbati* (eastern prickly gooseberry), *Sedum ternatum* (woodland stonecrop), *Symphyotrichum prenanthoides* (crookedstem aster), *Tiarella cordifolia* (heartleaf foamflower), *Tilia americana* (American basswood), *Tsuga canadensis* (eastern hemlock), *Uvularia puberula* (mountain bellwort).

Other Noteworthy Species:

Species	GRank	Type	Note
Cymophyllus fraserianus (Fraser's cymophyllus)	-	plant	state-rare (S3)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs in the canyon bottoms of Glade Creek, Pinch Creek, Mann's Creek, Fire Creek, and Ephraim Creek.

Classification Comments: The low-elevation habitat of this association at New River Gorge contrasts with the high elevations cited in the global description of this type. However, it is confined to inverted topographic positions with cold microclimates and includes some mixed mesophytic species (e.g., *Tilia americana* (American basswood)) cited in the global description. It is also similar to *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206) which occurs abundantly in the high Allegheny Mountains in West Virginia but lacks *Prunus serotina var. serotina* (black cherry) and is probably more diverse than that type. Similar stands dominated by *Betula alleghaniensis var. alleghaniensis* (yellow birch) over *Rhododendron maximum* (great laurel) have been observed along streams in Panther State Forest in the extreme southern West Virginia landscapes, such as New River Gorge, where *Betula alleghaniensis var. alleghaniensis* (yellow birch) is otherwise uncommon.

Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.15, NERI.40, NERI.72, NERI.122, NERI.312, NERI.314.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a.)
Alliance	*Tsuga canadensis - Betula alleghaniensis* Forest Alliance (A.412)
Alliance (English name)	Eastern Hemlock - Yellow Birch Forest Alliance
Association	*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest
Association (English name)	Yellow Birch - (Eastern Hemlock) / Great Laurel / (Mountain Doghobble) Forest
Ecological System(s):	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Southern Appalachian Northern Hardwood Forest (CES202.029).

GLOBAL DESCRIPTION

Concept Summary: This association occurs in the Great Smoky Mountains and high mountain areas of southern Virginia, and at lower elevations in protected mountain settings in West Virginia. This community is found on steep, mostly north-facing slopes, and on slopes and flats along and above streams. These forests occur on midslope or toeslope positions, protected by higher landforms. The elevations of samples range from as low as 320 m in West Virginia (1040 feet) to around 1350 m (4400 feet), but the community can probably occur as high as 1524 m (5000 feet) or until *Picea rubens* (red spruce) begins to dominate. Sites are rocky, often with many large boulders and talus. Soils are stony with heavy litter layers. This forest is affected by occasional disturbance by ice, wind, and landslides. This mixed forest type has an open to closed canopy dominated by *Betula alleghaniensis* (yellow birch) and/or *Tsuga canadensis* (eastern hemlock), although either of these species may be locally dominant at a small scale. Other minor canopy and subcanopy species may include *Aesculus flava* (yellow buckeye), *Halesia tetraptera var. monticola* (mountain silverbell), *Picea rubens* (red spruce), *Prunus pensylvanica* (pin cherry), *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree) (at lower elevations), and *Tilia americana var. heterophylla* (American basswood). The tall-shrub stratum is over 2 m in height, very dense (50-100% coverage) and dominated by *Rhododendron maximum* (great laurel). Other minor shrubs can include *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), *Hamamelis virginiana* (American witchhazel), *Hydrangea arborescens* (wild hydrangea), *Ilex montana* (mountain holly), *Kalmia latifolia* (mountain laurel), *Rubus allegheniensis* (Allegheny blackberry), *Sambucus racemosa* (red elderberry), *Ribes cynosbati* (eastern prickly gooseberry), and *Vaccinium erythrocarpum* (southern mountain cranberry). Additional shrubs include *Acer pensylvanicum* (striped maple), *Ilex montana* (mountain holly), *Kalmia latifolia* (mountain laurel), *Rubus allegheniensis* (Allegheny blackberry), *Sambucus racemosa* (red elderberry), *Vaccinium erythrocarpum*

(southern mountain cranberry). The ground layer is dominated by leaf litter, fallen trees, and rocks. Herbaceous cover is sparse to moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Some of the more characteristic species include *Dryopteris intermedia* (intermediate woodfern), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Tiarella cordifolia* (heartleaf foamflower), *Oxalis montana* (mountain woodsorrel), *Polypodium appalachianum* (Appalachian polypody), and *Smilax rotundifolia* (roundleaf greenbrier). The bryophyte layer can be well-developed and diverse. This association grades into forests dominated by *Picea rubens* (red spruce) or *Tsuga canadensis* (eastern hemlock) at higher elevations.

Environmental Description: This community occurs on steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams. It typically occupies mid- to lower slope and valley-bottom topographic positions that are well-protected by higher landforms. These sites have low solar exposure and may be subject to cold-air inversions. Elevations (of plot-sampled stands) range from 320-750 m (1040-2400 feet) at New River Gorge in West Virginia, to 915-1450 m (3000-4800 feet) in the Virginia mountains, and to 1030-1350 m (3400-4400 feet) in the Great Smoky Mountains. Lower elevation stands may intergrade with *Betula lenta* (sweet birch)-dominated forest types. Sites are often rocky, with many large boulders and stones. Soils, weathered from sandstone, acidic shale, or metamorphic igneous rocks, have dense, root-rich duff layers. Samples collected from plots are highly acidic (mean pH = 3.7 to 4.8) with low base status and moderately high organic matter content (mean = 20%). On stream-bottom sites, local areas of seepage are not uncommon, and habitats may be somewhat transitional to a saturated hydrologic regime. Sites occupied by this forest are affected by occasional ice, wind, and landslide disturbances.

Vegetation Description: This mixed forest community has an open to closed canopy codominated by *Betula alleghaniensis* (yellow birch) and/or *Tsuga canadensis* (eastern hemlock), although either of these species may be solely dominant over small areas. Minor canopy and subcanopy species may include *Aesculus flava* (yellow buckeye), *Picea rubens* (red spruce), *Prunus pensylvanica* (pin cherry), *Betula lenta* (sweet birch), *Magnolia acuminata* (cucumber-tree), *Magnolia fraseri* (mountain magnolia), *Fagus grandifolia* (American beech), *Quercus rubra* (northern red oak), *Liriodendron tulipifera* (tuliptree) (at lower elevations), and *Tilia americana var. heterophylla* (American basswood). *Picea rubens* (red spruce) is present in a majority of Virginia sites and is a codominant canopy tree in several. The community has a very dense (50-100% cover), evergreen tall-shrub stratum (>2 m tall) dominated by *Rhododendron maximum* (great laurel). In the Great Smoky Mountains, a dense low-shrub stratum dominated by *Leucothoe fontanesiana* (highland doghobble) is typical, but this species is absent from Virginia and West Virginia examples of the type. Additional shrubs include *Acer spicatum* (mountain maple), *Hamamelis virginiana* (American witchhazel), *Hydrangea arborescens* (wild hydrangea), *Acer pensylvanicum* (striped maple), *Ilex montana* (mountain holly), *Kalmia latifolia* (mountain laurel), *Rubus allegheniensis* (Allegheny blackberry), *Sambucus racemosa* (red elderberry), *Vaccinium erythrocarpum* (southern mountain cranberry), and *Ribes cynosbati* (eastern prickly gooseberry). Herbaceous cover is sparse to occasionally moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Some of the more characteristic species include *Dryopteris intermedia* (intermediate woodfern), *Polystichum acrostichoides* (Christmas fern), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Tiarella cordifolia* (heartleaf foamflower), *Oxalis montana* (mountain woodsorrel), *Botrychium oneidense* (bluntlobe grapefern), *Viola rotundifolia* (roundleaf yellow

violet), and *Polypodium appalachianum* (Appalachian polypody). Additional herbaceous species found in this community include *Arisaema dracontium* (green dragon), *Arisaema triphyllum* (Jack in the pulpit), *Aristolochia macrophylla* (pipevine), *Asarum canadense* (Canadian wildginger), *Asplenium rhizophyllum* (walking fern), *Oclemena acuminata* (whorled wood aster), *Eurybia divaricata* (white wood aster), *Circaea alpina* (small enchanter's nightshade), *Dryopteris carthusiana* (spinulose woodfern), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Goodyera pubescens* (downy rattlesnake plantain), *Goodyera repens* (lesser rattlesnake plantain), *Galium triflorum* (fragrant bedstraw), *Hexastylis virginica* (Virginia heartleaf), *Hydrophyllum virginianum* (Shawnee salad), *Huperzia lucidula* (shining clubmoss), *Laportea canadensis* (Canadian woodnettle), *Maianthemum canadense* (Canada mayflower), *Monotropa uniflora* (Indianpipe), *Polygonatum pubescens* (hairy Solomon's seal), *Prenanthes altissima* (tall rattlesnakeroot), *Symphyotrichum prenanthoides* (crookedstem aster), *Uvularia puberula* (mountain bellwort), *Viola blanda* (sweet white violet), and *Viola rotundifolia* (roundleaf yellow violet). Vascular plant species richness of plot-sampled stands ranges from 10 to 40 taxa per 400 square meters (mean = 26). The bryophyte layer can be well-developed and diverse; mosses and liverworts collected from one West Virginia plot include *Anomodon attenuatus* (anomodon moss), *Aulacomnium heterostichum* (aulacomnium moss), *Bryhnia graminicolor* (bryhnia moss), *Bryoandersonia illecebra* (bryoandersonia moss), *Campylium chrysophyllum* (goldenleaf campylium moss), *Hypnum curvifolium* (curveleaf hypnum moss), *Hypnum imponens* (hypnum moss), *Loeskeobryum brevirostre* (loeskeobryum moss), *Mnium stellare* (stellar calcareous moss), *Plagiothecium denticulatum* (toothed plagiothecium moss), *Platyhypnidium riparoides*, and *Thuidium delicatulum* (delicate thuidium moss).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula alleghaniensis* (yellow birch)
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum* (great laurel)
Herb (field)	Fern or fern ally	*Dryopteris intermedia* (intermediate woodfern)

Characteristic Species: *Betula alleghaniensis* (yellow birch), *Betula lenta* (sweet birch), *Botrychium oneidense* (bluntlobe grapefern), *Leucothoe fontanesiana* (highland doghobble), *Magnolia fraseri* (mountain magnolia), *Mitchella repens* (partridgeberry), *Oxalis montana* (mountain woodsorrel), *Picea rubens* (red spruce), *Polypodium appalachianum* (Appalachian polypody), *Polystichum acrostichoides* (Christmas fern), *Prunus pensylvanica* (pin cherry), *Rhododendron maximum* (great laurel), *Ribes cynosbati* (eastern prickly gooseberry), *Tiarella cordifolia* (heartleaf foamflower), *Tsuga canadensis* (eastern hemlock), *Viola rotundifolia* (roundleaf yellow violet).

Other Noteworthy Species:

Species	GRank	Type	Note
Catharus guttatus (hermit thrush)	-	animal	
Dendroica magnolia (magnolia warbler)	-	animal	
Prenanthes roanensis (Roan Mountain rattlesnakeroot)	G3	plant	
Regulus satrapa (golden-crowned kinglet)	-	animal	
Sitta canadensis (red-breasted nuthatch)	-	animal	
Troglodytes troglodytes (winter wren)	-	animal	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community has been documented in the Great Smoky Mountains of North Carolina and Tennessee; in the Mount Rogers - Whitetop Mountain area of the Virginia Blue Ridge (Grayson, Smyth and Washington counties); on Salt Pond Mountain in the Ridge and Valley of west-central Virginia (Giles County); and on Allegheny Mountain in Highland County, Virginia and adjacent Pocahontas County, West Virginia. Most likely, this vegetation type is locally distributed throughout higher elevations of the Southern and Central Appalachians.

States/Provinces: NC, TN, VA:S3, WV.

Federal Lands: NPS (Blue Ridge Parkway, Great Smoky Mountains, New River Gorge); USFS (Cherokee, George Washington, Jefferson).

CONSERVATION STATUS

Rank: G3G4Q (28-Jan-1999).

Reasons: This community type is naturally uncommon within its range due to specific requirements for protected, mesic sites at high elevations. Most remaining examples of this community have been affected by past logging and are currently threatened with the loss of their *Tsuga canadensis* (eastern hemlock) component due to ongoing or potential infestations by the exotic pest hemlock woolly adelgid (*Adelges tsugae*). This community type has a restricted but locally extensive distribution in the highest mountains of southwestern and west-central Virginia. This association was originally described from Great Smoky Mountains National Park. It needs to be compared with other associations in this alliance to determine its taxonomy, range, and conservation status.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: This association was originally described from Great Smoky Mountains National Park. It should be compared with and distinguished from other associations in this alliance, such as *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006109), *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206), and *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543), as well as other vegetation in the Southern Blue Ridge.

The relationship between this community and CEGL006206 is unclear and needs resolution. Although CEGL006206 is alleged to be the characteristic acidic cove forest of the Allegheny Mountains and higher Ridge and Valley sites, Virginia stands do not have *Prunus serotina* (black cherry) as a prominent component and clearly have much affinity to the Great Smoky Mountains

stands that originally formed the basis of the type described here. However, information concerning the environments, composition, and distribution of CEGL006206 is sparse. At present, the distinction between the two types seems dubious, but more information and analysis is needed.

Forests of high-elevation coves at Salt Pond Mountain in Giles County (e.g., War Spur Branch), where *Picea rubens* (red spruce) is codominant with or subordinate to *Tsuga canadensis* (eastern hemlock) and *Betula alleghaniensis* (yellow birch), are tentatively placed here. Some of these stands, however, may be better classified as wetlands and require additional investigation.

Similar Associations:

- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543).
- *Picea rubens / Acer rubrum / Maianthemum canadense - (Lycopodium clavatum, Lycopodium dendroideum)* Forest (CEGL008501).
- *Tsuga canadensis - Betula alleghaniensis - Acer saccharum / Dryopteris intermedia* Forest (CEGL006109).
- *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206).
- *Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693).

Related Concepts:

- *Betula alleghaniensis - Tsuga canadensis - (Picea rubens) / Rhododendron maximum* Forest (Fleming and Coulling 2001) ?
- *Betula alleghaniensis / Oxalis montana* Association: *Betula alleghaniensis / Rhododendron maximum* Variant (Fleming and Moorhead 1996) ?
- *Betula alleghaniensis / Rhododendron maximum* forest (Vanderhorst 2001b) =
- Hemlock - Yellow Birch: 24 (Eyre 1980) B
- Red Spruce Community: Hemlock - Spruce Subtype (Adams and Stephenson 1991) ?

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. S. C. Gawler.

References: Adams and Stephenson 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Grafton and McGraw 1976, Livingston and Mitchell 1976, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell 1997, Newell et al. 1997, Peet et al. unpubl. data 2002, Southeastern Ecology Working Group n.d., TDNH unpubl. data, VDNH 2003, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): DECIDUOUS TREE / GREAT LAUREL FOREST

SYNONYMS

NVC English Name: **Sweet Birch - Tuliptree - Red Maple / Great Laurel Forest**

NVC Scientific Name: ***Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest**

NVC Identifier: **CELT007543 (Local subtype of CEGL007543)**

LOCAL INFORMATION

Environmental Description: This association occurs in small to large patches (<0.1-32 ha) in protected positions on plateaus and upper gorge slopes. It is most common on northerly aspects and concave landforms. Underlying geologic strata of most stands are sandstones of the Pottsville group, but some smaller stands also occur on shales of the Mauch Chunk group. Sites are often rocky, with high cover by bedrock and/or rocky colluvium. Soils from plots are described as well-drained, very strongly acidic, sandy loams. Slopes range from level to very steep (mapping unit values range from 0 to 51 degrees, mean = 21 degrees). Elevations of mapped stands range from 293 to 859 m. Adjacent associations include *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222), *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268), *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), and *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543).

Vegetation Description: This association is a closed-canopy deciduous forest with a dense tall-shrub layer dominated by the evergreen *Rhododendron maximum* (great laurel). Dominant trees with highest constancy in the canopy include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), and *Quercus rubra* (northern red oak). The conifer *Tsuga canadensis* (eastern hemlock) may occur in the canopy and shrub layers but is often absent and is not dominant. Additional tree species in the canopy and subcanopy include *Magnolia acuminata* (cucumber-tree), *Magnolia fraseri* (mountain magnolia), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), and *Quercus prinus* (chestnut oak). Cover in the tall-shrub layer of plots ranges from 20 to 90%, strongly dominated by *Rhododendron maximum* (great laurel). Additional shrubs include *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), *Hamamelis virginiana* (American witchhazel), and *Kalmia latifolia* (mountain laurel). Cover and diversity in the herb layer is low due to heavy shading by the evergreen shrub layer and acidic soils. Common herbs include *Mitchella repens* (partridgeberry), *Monotropa uniflora* (Indianpipe), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Uvularia puberula* (mountain bellwort), and *Viola* (violet) spp. Cover by bryophytes is typically low; mosses observed in plots include *Hypnum imponens* (hypnum moss) and *Thuidium delicatulum* (delicate thuidium moss). Vascular plant species richness in the 6 sampled plots ranges from 13 to 25 (mean = 17.2).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum* (great laurel)

Characteristic Species: *Acer pensylvanicum* (striped maple), *Acer spicatum* (mountain maple), *Hamamelis virginiana* (American witchhazel), *Hypnum imponens* (hypnum moss), *Magnolia acuminata* (cucumber-tree), *Magnolia fraseri* (mountain magnolia), *Mitchella repens* (partridgeberry), *Monotropa uniflora* (Indianpipe), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Prunus serotina* var. *serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Tsuga canadensis* (eastern hemlock), *Uvularia puberula* (mountain bellwort).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association occurs in small to large patches throughout the park but is most common in areas underlain by the Pottsville Formation in the northern three-quarters of the park.

Classification Comments: This community fits within the current concept of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543), but *Tsuga canadensis* (eastern hemlock) is not a dominant species and is often lacking from large areas. The global description states: "The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees." Stands lacking *Tsuga canadensis* (eastern hemlock) may be mid-successional and may be colonized by the shade-tolerant conifer as they age. This trend, however, is likely to be curtailed by the infestation of *Tsuga canadensis* (eastern hemlock) by an insect pest, the hemlock woolly adelgid, which has been recently identified in the park. Similar deciduous forests with thick cover by *Rhododendron maximum* (great laurel) are common throughout the Allegheny Mountains and Cumberland Mountains (the coal fields) of West Virginia. Recognition of this community as an association distinct from the typical CEGL007543 is supported by its occurrence in large areas over a broad geographic range, by straightforward classification and aerial delineation of stands, and by possibly distinct animal, especially bird and invertebrate, assemblages. It is treated as distinct from CEGL007543 for purposes of vegetation classification and mapping for the park. See description for Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest for local and global information about CEGL007543.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.81, NERI.114, NERI.364, NERI.365, NERI.366, NERI.367.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a.)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A.413)
Alliance (English name)	Eastern Hemlock - Tuliptree Forest Alliance
Association	*Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest
Association (English name)	Sweet Birch - Tuliptree - Red Maple / Great Laurel Forest
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: Information not available. See description for Eastern Hemlock - Sweet Birch - Tuliptree / Great Laurel Forest for local and global information about CEGL007543.
Environmental Description: Information not available.
Vegetation Description: Information not available.
Most Abundant Species: Information not available.
Characteristic Species: Information not available.
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: Information not available.
States/Provinces: WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: GNR (8-Dec-2006).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Nonstandard.
Confidence: Information not available.
Comments: Information not available.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES

Description Authors: Information not available.
References: Eastern Ecology Working Group n.d., Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): EASTERN HEMLOCK - SWEET BIRCH - TULIPTREE / GREAT LAUREL FOREST

SYNONYMS
NVC English Name: **Tuliptree - Sweet Birch - Eastern Hemlock / Great Laurel Forest**
NVC Scientific Name: ***Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest**
NVC Identifier: **CEGL007543**

LOCAL INFORMATION

Environmental Description: This upland forest association occurs in small to large patches in mesic, acidic habitats. It occurs along creeks in ravines and in other concave positions on plateaus and protected gorge slopes with cool aspects. Most stands are in areas underlain by sandstones of the Pottsville group, but some stands in the southern part of the park occur on shales of the Mauch Chunk group. Soils are usually well-drained, and soil textures determined by hand in plots include sandy loam, silt loam, loam, clay loam, and clay. Soil chemistry analyzed from three plots indicates very strongly acidic soils (mean pH = 4.3) with relatively high levels of Al and S and low levels of other nutrients (Ca, K, Mg, Mn, P, and Zn). Slopes range from level to very steep (mapping unit values range from 0 to 47 degrees, mean = 18 degrees). Elevations of mapped stands range from 262 to 888 m. Adjacent matrix forests are typically *Quercus prinus - (Quercus rubra) - Carya* spp. / *Oxydendrum arboreum - Cornus florida* Forest (CEGL007267) on the plateaus and *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222) and *Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum* Forest (CEGL007268) on gorge slopes. Survival of the dominant tree in this association, *Tsuga canadensis* (eastern hemlock), is currently threatened by an exotic insect pest, the hemlock woolly adelgid (*Adelges tsugae*). This insect has been recently detected in the park and has decimated hemlock stands elsewhere in West Virginia in recent years.

Vegetation Description: This association is a mixed evergreen-deciduous forest with *Tsuga canadensis* (eastern hemlock) occurring as a dominant or codominant in the canopy and/or subcanopy. Codominant deciduous trees include *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), and *Quercus rubra* (northern red oak). Additional tree species with significant cover in some plots include *Acer saccharum var. saccharum* (sugar maple), *Magnolia fraseri* (mountain magnolia), *Magnolia tripetala* (umbrella-tree), *Nyssa sylvatica* (blackgum), *Prunus serotina var. serotina* (black cherry), and *Quercus alba* (white oak). Wood (1999) reported *Quercus prinus* (chestnut oak) as an important tree species in some drier hemlock stands in the park. Typically, there is a dense tall-shrub layer dominated by the evergreen *Rhododendron maximum* (great laurel), but this species may be lacking from stands on drier sites (Wood 1999). The herb layer is usually sparse, especially where shrub cover is heavy. Herbs with highest constancy in the plots include *Dioscorea quaternata* (fourleaf yam), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Gaultheria procumbens* (eastern teaberry), *Mitchella repens* (partridgeberry), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), and *Thelypteris noveboracensis* (New York fern). Vascular plant species richness in the 11 sampled plots ranges from 8 to 40 taxa (mean = 28.5).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Rhododendron maximum* (great laurel)

Characteristic Species: *Acer saccharum* var. *saccharum* (sugar maple), *Dioscorea quaternata* (fourleaf yam), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Gaultheria procumbens* (eastern teaberry), *Magnolia fraseri* (mountain magnolia), *Magnolia tripetala* (umbrella-tree), *Mitchella repens* (partridgeberry), *Nyssa sylvatica* (blackgum), *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrostichoides* (Christmas fern), *Prunus serotina* var. *serotina* (black cherry), *Quercus alba* (white oak), *Thelypteris noveboracensis* (New York fern).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: Stands of this association occur on the plateaus and gorge slopes across most of the park but are absent from the southernmost section (upstream from Brooks Island).

Classification Comments: This association differs from *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861), which is confined to a few deep side canyons in the New River Gorge National River, by usually lacking *Betula alleghaniensis* (yellow birch) and by constancy of *Tsuga canadensis* (eastern hemlock). Forests occurring in drier topographic positions with *Tsuga canadensis* (eastern hemlock) codominant with *Quercus prinus* (chestnut oak) and which have *Rhododendron catawbiense* (Catawba rosebay) in the shrub layers are classified as *Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest (CEGL008524). Deciduous forests with shrub layers dominated by *Rhododendron maximum* (great laurel) without significant amounts of *Betula alleghaniensis* (yellow birch) or *Tsuga canadensis* (eastern hemlock) are classified and mapped as *Betula lenta - Liriodendron tulipifera - Acer rubrum / Rhododendron maximum* Forest [CELT007543, a local segregate of *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543)]. Wood (1999) reported baseline data from permanent plots established in selected hemlock stands across a moisture gradient in the park. Drier stands differed somewhat by presence of *Quercus prinus* (chestnut oak) and absence of *Liriodendron tulipifera* (tuliptree) in the canopy and by absence or lower cover of *Rhododendron maximum* (great laurel) in the shrub layer.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.71, NERI.82, NERI.93, NERI.103, NERI.108, NERI.110, NERI.131, NERI.133, NERI.251, NERI.282, NERI.298.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a.)
Alliance	*Tsuga canadensis - Liriodendron tulipifera* Forest Alliance (A.413)
Alliance (English name)	Eastern Hemlock - Tuliptree Forest Alliance
Association	*Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest
Association (English name)	Tuliptree - Sweet Birch - Eastern Hemlock / Great Laurel Forest
Ecological System(s):	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Southern and Central Appalachian Cove Forest (CES202.373).

GLOBAL DESCRIPTION

Concept Summary: This association includes hemlock-hardwood forests and acidic cove forests of lower to intermediate elevations in the Southern Blue Ridge, upper Piedmont, and adjacent areas, ranging from southwestern Virginia and West Virginia, south and west to northwestern Georgia. The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees in mesic, acidic environments. These communities occur at low to middle elevations (260-1060 m [850-3500 feet]) in the mountains and foothills, generally in coves, gorges or sheltered slopes, over acidic soils. The canopy is usually dominated by *Liriodendron tulipifera* (tuliptree) or *Betula lenta* (sweet birch) mixed with *Tsuga canadensis* (eastern hemlock), but substantial portions may be comprised mainly of *Tsuga canadensis* (eastern hemlock) and the occasional *Acer rubrum* (red maple), while other sites may have little or no *Tsuga* (Hemlock) in the canopy. Other deciduous species more typical of "rich" coves may occur as scattered individuals, including *Tilia americana var. heterophylla* (American basswood), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Fagus grandifolia* (American beech). Other canopy/subcanopy species often include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Magnolia fraseri* (mountain magnolia), and *Pinus strobus* (eastern white pine). *Rhododendron maximum* (great laurel) is usually dominant in the shrub stratum, often forming impenetrable thickets. South of Virginia, woody associates may also include *Ilex opaca var. opaca* (American holly), *Calycanthus floridus* (eastern sweetshrub), *Halesia tetraptera var. tetraptera* (mountain silverbell), and *Leucothoe fontanesiana* (highland doghobble). Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Typical herbs include *Polystichum acrostichoides* (Christmas fern), *Dryopteris intermedia* (intermediate woodfern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Goodyera pubescens* (downy rattlesnake plantain), *Mitchella repens* (partridgeberry), *Thelypteris noveboracensis* (New York fern), *Galax urceolata* (beetleweed), *Viola rotundifolia* (roundleaf yellow violet), and *Tiarella cordifolia* (heartleaf foamflower).

Environmental Description: This association is typically found at lower to intermediate elevations (260-1060 m [850-3500 feet]) in the southern Appalachians and adjacent foothills. Habitats are mesic and located on gentle to steep, lower slopes along creeks in ravines, in coves

or gorges, and in concave positions on protected slopes with cool aspects and acidic soils. In situations where midslopes are in protected north-facing positions, this community can range very high up straight or even convex slopes. The type often occurs in linear patches along stream bottoms and in steep ravines in complexes with rich cove communities. Although frequently associated with streams, it is not a wetland. Soils collected from plots are extremely acidic (mean pH = 4.0) and infertile, with high iron and aluminum levels and very low total base saturation. They are usually well-drained sandy loam, silt loam, loam, clay loam, or clay.

Vegetation Description: This association encompasses hemlock-hardwood forests and acidic cove forests with canopies dominated by mixtures of *Tsuga canadensis* (eastern hemlock), *Liriodendron tulipifera* (tuliptree), *Betula lenta* (sweet birch), *Quercus rubra* (northern red oak), and *Acer rubrum* (red maple). The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees. Presumably because of past logging, *Tsuga canadensis* (eastern hemlock) is absent or confined to the understory in some stands, which have mixed canopies of *Liriodendron tulipifera* (tuliptree), *Betula lenta* (sweet birch), *Acer rubrum* (red maple), *Magnolia acuminata* (cucumber-tree), *Quercus rubra* (northern red oak), and/or *Nyssa sylvatica* (blackgum). Other deciduous species more typical of fertile coves, including *Tilia americana var. heterophylla* (American basswood), *Acer saccharum* (sugar maple), *Fraxinus americana* (white ash), and *Fagus grandifolia* (American beech), may occur as scattered individuals. Minor overstory and understory species include *Quercus alba* (white oak), *Quercus prinus* (chestnut oak), *Magnolia fraseri* (mountain magnolia), *Magnolia tripetala* (umbrella-tree), and *Pinus strobus* (eastern white pine). *Rhododendron maximum* (great laurel) is scattered to dominant in the shrub stratum often forming nearly impenetrable colonies. *Kalmia latifolia* (mountain laurel) is also a typical, but less abundant, shrub. In the southern portion of this type's range, *Ilex opaca* (American holly), *Calycanthus floridus* (eastern sweetshrub), *Halesia tetraptera* (mountain silverbell), and *Leucothoe fontanesiana* (highland doghobble) may be common; these are lacking in Virginia and West Virginia occurrences, where *Hamamelis virginiana* (American witchhazel) and *Acer pensylvanicum* (striped maple) may be minor associates. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Frequent low-cover species of this layer include *Arisaema triphyllum* (Jack in the pulpit), *Chimaphila maculata* (striped prince's pine), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Eurybia divaricata* (white wood aster), *Galax urceolata* (beetleweed), *Gaultheria procumbens* (eastern teaberry), *Goodyera pubescens* (downy rattlesnake plantain), *Hexastylis* (heartleaf) spp., *Luzula echinata* (hedgehog woodrush), *Monotropa uniflora* (Indianpipe), *Medeola virginiana* (Indian cucumber), *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Tiarella cordifolia* (heartleaf foamflower), and *Waldsteinia fragarioides* (Appalachian barren strawberry). The spectacular sedge *Cymophyllus fraserianus* (Fraser's cymophyllus) is often associated with this forest.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Tsuga canadensis* (eastern hemlock)
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Liriodendron tulipifera* (tuliptree)
Tall shrub/sapling	Broad-leaved evergreen tree	*Rhododendron maximum* (great laurel)

Characteristic Species: *Acer rubrum* (red maple), *Betula lenta* (sweet birch), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Galax urceolata* (beetleweed), *Leucothoe fontanesiana* (highland doghobble), *Liriodendron tulipifera* (tuliptree), *Luzula echinata* (hedgehog woodrush), *Mitchella repens* (partridgeberry), *Polystichum acrostichoides* (Christmas fern), *Quercus rubra* (northern red oak), *Rhododendron maximum* (great laurel), *Thelypteris noveboracensis* (New York fern), *Tiarella cordifolia* (heartleaf foamflower), *Tsuga canadensis* (eastern hemlock), *Waldsteinia fragarioides* (Appalachian barren strawberry).

Other Noteworthy Species:

Species	GRank	Type	Note
Ageratina altissima var. *roanensis* (white snakeroot)	G5T3T4	plant	
Betula uber (virginia roundleaf birch)	G1Q	plant	
Botrychium jenmanii (alabama grapefern)	G3G4	plant	
Diervilla rivularis (mountain bush honeysuckle)	G3	plant	
Hexastylis contracta (southern heartleaf)	G3	plant	
Hexastylis naniflora (dwarfflower heartleaf)	G3	plant	
Hexastylis rhombiformis (french broad heartleaf)	G2	plant	
Isotria medeoloides (small whorled pogonia)	G2	plant	
Malaxis bayardii (bayard's malaxis)	G1G2	plant	
Monotropsis odorata (sweet pinesap)	G3	plant	
Shortia galacifolia var. *brevistyla* (northern shortia)	G2T2	plant	
Shortia galacifolia var. *galacifolia* (southern shortia)	G2T2	plant	
Trillium persistens (persistent trillium)	G1	plant	
Trillium pusillum var. 1 (interior least trillium)	G3T2Q	plant	
Waldsteinia lobata (lobed barren-strawberry)	G2	plant	

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community occurs in the Southern Blue Ridge and peripherally in the upper Piedmont, ranging from southwestern Virginia, south and west to northwestern Georgia.

States/Provinces: GA, NC, SC, TN, VA:S5, WV.

Federal Lands: NPS (Blue Ridge Parkway, Carl Sandburg Home, Great Smoky Mountains, New River Gorge, Obed); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)).

CONSERVATION STATUS

Rank: G5 (27-Sep-2004).

Reasons: Within its range, this community type occurs extensively in suitable mesic habitats. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis* (eastern hemlock).

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 1 - Strong.

Comments: Deciduous trees more typical of "rich" coves, such as *Aesculus flava* (yellow buckeye), *Tilia americana var. heterophylla* (American basswood), and *Acer saccharum* (sugar

maple), are present in this forest only as minor components, if at all. Likewise, rich-site herbs, such as *Actaea racemosa* (black bugbane), *Caulophyllum thalictroides* (blue cohosh), *Actaea pachypoda* (white baneberry), and *Adiantum pedatum* (northern maidenhair), are absent or nearly so. This forest is distinguished from "northern hardwood forests" by the lack of or near absence of *Fagus grandifolia* (American beech), *Betula alleghaniensis* (yellow birch), *Aesculus flava* (yellow buckeye), and the presence of low-elevation species, such as *Betula lenta* (sweet birch) and *Liriodendron tulipifera* (tuliptree), and generally by a more depauperate herb layer. An interesting example from the Piedmont/Blue Ridge transition of Georgia (Cedar Creek Canyon, Chattahoochee National Forest) has high coverage of *Rhododendron minus* (piedmont rhododendron) and other foothills/Piedmont species such as *Liquidambar styraciflua* (sweetgum) and *Aesculus sylvatica* (painted buckeye).

This community type is grossly under-represented by plot data considering its extensive distribution in southwestern Virginia. In the 900-1060 m (3000-3500 feet) elevation range, the type becomes transitional to *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861), which lacks lower-elevation species such as *Liriodendron tulipifera* (tuliptree) and *Galax urceolata* (beetleweed), and contains many species characteristic of higher elevations and northern latitudes.

Similar vegetation has been observed in coves of the Cumberland Mountains of southwestern Virginia (e.g., Clinch Ranger District: Dark Hollow, Roaring Branch, Pick Breeches and Flannery Ridges,) but comprehensive data are needed to determine whether these stands are part of this forest types or transitional to *Tsuga canadensis - (Fagus grandifolia, Tilia americana var. heterophylla) / Magnolia tripetala* Forest (CEGL008407). The latter unit apparently has an extensive distribution in the Cumberland Plateau of Kentucky and Tennessee, the Southern Ridge and Valley of Tennessee, and the Central Appalachians of West Virginia and southwestern Pennsylvania.

Similar Associations:

- *Acer rubrum* var. *rubrum - Betula (alleghaniensis, lenta) - Magnolia fraseri / (Rhododendron maximum, Kalmia latifolia)* Forest (CEGL008558).
- *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / (Leucothoe fontanesiana)* Forest (CEGL007861).
- *Tsuga canadensis - (Fagus grandifolia, Tilia americana* var. *heterophylla) / Magnolia tripetala* Forest (CEGL008407).
- *Tsuga canadensis - (Pinus strobus)* Temporarily Flooded Forest (CEGL007143).
- *Tsuga canadensis - Fagus grandifolia - Acer saccharum / (Hamamelis virginiana, Kalmia latifolia)* Forest (CEGL005043).
- *Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693).

Related Concepts:

- *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (Fleming and Coulling 2001) ?
- *Tsuga canadensis - Betula lenta / Rhododendron maximum* forest (Vanderhorst 2001b) =
- Acidic Cove Forest (Typic Subtype) (Schafale 1998b) ?
- Cove Forest (Patterson et al. 1994) B
- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) B

- Mixed Mesophytic Coves (Gettman 1974) ?
- Sweet Birch - Hemlock Type (Schmalzer and DeSelm 1982) =
- Type 5 (Newell and Peet 1995) ?
- Yellow-Poplar - Eastern Hemlock: 58 (Eyre 1980) B

SOURCES

Description Authors: K. D. Patterson, mod. G. Fleming and P. Coulling, mod. T. Govus and S. C. Gawler.

References: Allard 1990, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Fleming et al. 2004, Gettman 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Patterson 1994, Patterson et al. 1994, Peet et al. unpubl. data 2002, Schafale 1998b, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Wood 1999.

COMMON NAME (PARK-SPECIFIC): CLIFF TOP PITCH PINE WOODLAND

SYNONYMS

NVC English Name: **Pitch Pine - Scarlet Oak / Northern Lowbush Blueberry Woodland**

NVC Scientific Name: ***Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland**

NVC Identifier: **CEGL006557**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches on narrow spits above sandstone cliffs and on shoulder slopes of side canyons to the New River. These positions have high solar exposure and are hot and dry. Sites are underlain by acidic sandstone of the New River Formation in the Pottsville group. Soils are extremely shallow and rapidly drained, often consisting of just a few centimeters of needles and duff over bedrock. Textures of mineral soils where they occur are sand or sandy loam. Slopes range from nearly level to steep (mapping unit values range from 0.6 to 38 degrees, mean = 37 degrees). Elevations of mapped stands range from 630 to 737 m. Evidence of past fires was observed in plots, and this association is likely to be fire-adapted. Patches on less severe sites may be successional following fire, but in cliff edge positions, this association is probably an edaphic climax. Adjacent deciduous forests in somewhat less xeric positions are *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271).

Vegetation Description: This association is a mixed evergreen-deciduous woodland with a short (5-15 m) open canopy dominated by *Pinus rigida* (pitch pine). Deciduous trees with high constancy include *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), and *Oxydendrum arboreum* (sourwood). Additional conifers which occur in lesser amounts in some patches include *Pinus strobus* (eastern white pine), *Pinus virginiana* (Virginia pine), and *Tsuga canadensis* (eastern hemlock). There is a well-developed shrub layer dominated by species in the Ericaceae (heath family), including *Kalmia latifolia* (mountain laurel), *Vaccinium pallidum* (Blue Ridge blueberry), *Gaylussacia baccata* (black huckleberry), *Rhododendron maximum* (great laurel), and *Rhododendron catawbiense* (Catawba rosebay). *Smilax rotundifolia* (roundleaf greenbrier) is also common in the shrub layer. The dwarf-shrubs *Epigaea repens* (trailing arbutus) and *Gaultheria procumbens* (eastern teaberry) have high constancy. Herb cover and diversity are low, consisting of drought- and acid-tolerant species such as *Andropogon virginicus var. virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), and *Pteridium aquilinum* (western brackenfern). Vascular plant species richness in the 4 sampled plots ranges from 19 to 25 taxa (mean = 22.5). Characteristic nonvascular species include the moss *Leucobryum glaucum* (leucobryum moss) and reindeer lichens (*Cladonia* (cup lichen) spp.).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus rigida* (pitch pine)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)

Characteristic Species: *Acer rubrum* (red maple), *Andropogon virginicus* var. *virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Leucobryum glaucum* (leucobryum moss), *Nyssa sylvatica* (blackgum), *Oxydendrum arboreum* (sourwood), *Pteridium aquilinum* (western brackenfern), *Quercus coccinea* (scarlet oak), *Rhododendron catawbiense* (Catawba rhododendron), *Rhododendron maximum* (great laurel), *Smilax rotundifolia* (roundleaf greenbrier), *Vaccinium pallidum* (Blue Ridge blueberry).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association is restricted to small areas on the upper gorge slopes of Mann's Creek and Fire Creek in the northern section of the park.
Classification Comments: This community at New River Gorge lacks the global nominal shrub species *Vaccinium angustifolium* (lowbush blueberry), which, in West Virginia, is mostly confined to higher elevations. Additional species listed in the global description which are lacking here include *Betula populifolia* (gray birch), *Comptonia peregrina* (sweet fern), *Vaccinium corymbosum* (highbush blueberry), and *Quercus ilicifolia* (bear oak). This community at New River Gorge may be more similar to *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097), but *Pinus pungens* (Table Mountain pine) is not known from the park. *Clethra acuminata* (mountain sweetpepperbush) was identified in the tall-shrub layer of one plot (NERI.113) sampled in 1998, but the habitat seems inappropriate for this species, which typically occurs along streams. It is possible that this shrub was misidentified and could really be *Leucothoe recurva* (redtwig doghobble), which is also known from southern West Virginia and is tracked as a state-rare species. *Leucothoe recurva* (redtwig doghobble) is a southern species which is listed as a dominant shrub in the global description for this type. Similar communities at New River Gorge which are dominated by *Pinus virginiana* (Virginia pine) are classified as *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119).
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.113, NERI.216, NERI.217, NERI.218.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	*Pinus rigida* Woodland Alliance (A.524)
Alliance (English name)	Pitch Pine Woodland Alliance
Association	*Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland

Association (English name) Pitch Pine - Scarlet Oak / Northern Lowbush Blueberry Woodland
Ecological System(s): Central Appalachian Dry Oak-Pine Forest (CES202.591).

GLOBAL DESCRIPTION

Concept Summary: This open oak-pine woodland community occurs on well-drained, nutrient-poor shallow soils on dry ridges and bedrock ledges in the Central Appalachians. Soils are dry, sandy, and acidic. *Pinus rigida* (pitch pine) contributes between 25 and 75% relative cover. *Pinus pungens* (Table Mountain pine) or *Pinus resinosa* (red pine) may also occur on some sites. Hardwood associates include *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Betula lenta* (sweet birch), *Betula populifolia* (gray birch), and *Acer rubrum* (red maple). The shrub layer may be entirely composed of low shrubs, including *Vaccinium corymbosum* (highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Comptonia peregrina* (sweet fern), and *Gaylussacia baccata* (black huckleberry), or may have an additional layer of taller shrubs such as *Kalmia latifolia* (mountain laurel), *Vaccinium corymbosum* (highbush blueberry), and *Quercus ilicifolia* (bear oak). Herbaceous species include *Pteridium aquilinum* (western brackenfern), *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Melampyrum lineare* (narrowleaf cowwheat), *Carex pensylvanica* (Pennsylvania sedge), *Carex communis* (fibrousroot sedge), *Oryzopsis* (ricegrass) spp., and *Aralia nudicaulis* (wild sarsaparilla). Lichens, such as *Cladonia* (cup lichen) spp. and *Cladina* (reindeer lichen) spp., are abundant in some areas.

Environmental Description: This open oak-pine woodland community occurs on nutrient-poor shallow soils on exposed, dry ridges and bedrock ledges. Soils are extremely shallow and rapidly drained, often consisting of a just a few centimeters of needles and duff over bedrock. Textures of mineral soils where they occur are sand or sandy loams. Slopes range from nearly level to steep.

Vegetation Description: This mixed woodland has a short (5-15 m) open canopy. *Pinus rigida* (pitch pine) contributes between 25 and 75% relative cover. *Pinus pungens* (Table Mountain pine), *Pinus virginiana* (Virginia pine), or *Pinus resinosa* (red pine) may also occur on some sites. Hardwood associates include *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak), *Quercus velutina* (black oak), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Betula lenta* (sweet birch), *Betula populifolia* (gray birch), *Nyssa sylvatica* (blackgum), and *Acer rubrum* (red maple). In the southern portion of the range, *Oxydendrum arboreum* (sourwood) may be an associate. The shrub layer may be entirely composed of low shrubs, including *Vaccinium corymbosum* (highbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Comptonia peregrina* (sweet fern), and *Gaylussacia baccata* (black huckleberry), or may have an additional layer of taller shrubs such as *Kalmia latifolia* (mountain laurel), *Vaccinium corymbosum* (highbush blueberry), and *Quercus ilicifolia* (bear oak). *Rhododendron catawbiense* (Catawba rosebay) may be present in the southern portion of the range. The herb layer includes *Pteridium aquilinum* (western brackenfern), *Deschampsia flexuosa* (wavy hairgrass), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Melampyrum lineare* (narrowleaf cowwheat), *Carex pensylvanica* (Pennsylvania sedge), *Carex communis* (fibrousroot sedge), *Oryzopsis* (ricegrass) spp., and *Aralia nudicaulis* (wild sarsaparilla). *Leucobryum glaucum* (leucobryum moss) is a common moss. Lichens, such as *Cladonia* (cup lichen) spp. and *Cladina* (reindeer lichen) spp., are abundant in some areas.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus rigida* (pitch pine)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Gaylussacia baccata* (black huckleberry), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium pallidum* (Blue Ridge blueberry)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia* (mountain laurel)

Characteristic Species: *Acer rubrum* (red maple), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Gaylussacia baccata* (black huckleberry), *Leucobryum glaucum* (leucobryum moss), *Pteridium aquilinum* (western brackenfern), *Quercus coccinea* (scarlet oak).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is centered in the Central Appalachians ecoregion from Pennsylvania to West Virginia.
States/Provinces: PA, WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: GNR (8-Jul-1999).
Reasons: Better rangewide information is needed to determine the conservation rank for this type.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: This community at New River Gorge lacks the global nominal shrub species for this association, *Vaccinium angustifolium* (lowbush blueberry), which, in West Virginia, is mostly confined to higher elevations. Additional species listed in the global description which are lacking here include *Betula populifolia* (gray birch), *Comptonia peregrina* (sweet fern), *Vaccinium corymbosum* (highbush blueberry), and *Quercus ilicifolia* (bear oak). This community at New River Gorge may be more similar to *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097), but *Pinus pungens* (Table Mountain pine) is not known from the park.
Similar Associations: Information not available.
Related Concepts:

- *Pinus rigida - Quercus coccinea / Gaultheria procumbens / Epigaea repens* woodland (Vanderhorst 2002b) =
- *Pinus rigida - Quercus coccinea / Gaylussacia baccata* woodland (Vanderhorst 2001b) =

SOURCES

Description Authors: E. Largay after Fike (1999), mod. S. C. Gawler.
References: Eastern Ecology Working Group n.d., Fike 1999, Vanderhorst 2001b, Vanderhorst 2002b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): EASTERN RED-CEDAR - VIRGINIA PINE FLATROCK WOODLAND

SYNONYMS

NVC English Name: **Eastern Red-cedar - Virginia Pine - Post Oak / Running Serviceberry / Poverty Oatgrass - Two-flower Melicgrass Woodland**

NVC Scientific Name: ***Juniperus virginiana* var. *virginiana* - *Pinus virginiana* - *Quercus stellata* / *Amelanchier stolonifera* / *Danthonia spicata* - *Melica mutica* Woodland**

NVC Identifier: **CEGL008449**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches along the New River on flat bedrock of Stony Gap sandstone of the Hinton Formation (Mauch Chunk group). These exposures, which occur beside the river at two major waterfalls, are rarely flooded but are hypothesized to have been subjected to catastrophic floods in the past. The natural flooding regime of the New River was altered by construction of Bluestone Dam in 1949. Some areas of this association are still subject to flooding, but maximum flows and energy have been reduced since the dam was built. Soils are shallow, rapidly drained sands and sandy loams over bedrock. Soils are extremely acidic (pH = 3.9) with high organic matter content and low levels of major nutrients (Mitchem 2004). Soil moisture regime is relatively xeric. Slopes range from level to moderate (mapping unit values range from 0 to 13 degrees, mean = 4 degrees). Elevations of mapped stands range from 379 to 402 m. Although it is similar to other types which have fire ecologies, fire was probably not an important part of the natural disturbance regime of this association. Despite this, in 2002 a controlled burn was conducted in this community at Camp Brookside with the objective of maintaining conifer dominance (Gellerstedt and Johnson 2005). Fires have also occurred at Sandstone Falls where they were related to unregulated camping and other forms of recreation. This community continues to be subject to trampling by recreational visitors.

Vegetation Description: Although this association is currently known only within the boundaries of New River Gorge National River, and thus the park vegetation is the same as the global vegetation, additional information is presented here which is not covered in the global description. The exotic *Rubus phoenicolasius* (wine raspberry) was found in the shrub layer of one plot at Sandstone Falls in 1999 and has since become abundant in this community at Camp Brookside, apparently in positive response to the controlled burn conducted in 2002. Vascular plant species richness in the 5 sampled plots ranges from 19 to 53 (mean = 36.4). Rare plants tracked by West Virginia Natural Heritage Program which have been documented in this community by past surveys include *Aristida purpurascens var. purpurascens* (arrowfeather threeawn), *Carex woodii* (pretty sedge), *Commelina erecta var. angustifolia* (whitemouth dayflower), *Coreopsis pubescens var. robusta* (star tickseed) (in ecotone with mowed field), *Galactia volubilis* (downy milkpea), *Hypericum virgatum* (coppery St. Johnswort), *Melica mutica* (twoflower melicgrass), and *Piptochaetium avenaceum* (blackseed speargrass) Additional details on the composition, structure, and dynamics of the vegetation at Camp Brookside are provided in Mitchem and Johnson (2001) and Mitchem (2004).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Juniperus virginiana* var. *virginiana* (eastern redcedar), *Pinus virginiana* (Virginia pine)

Characteristic Species: *Amelanchier stolonifera* (running serviceberry), *Andropogon virginicus* var. *virginicus* (broomsedge bluestem), *Celtis occidentalis* (common hackberry), *Cercis canadensis* (eastern redbud), *Chionanthus virginicus* (white fringetree), *Cladina subtenuis* (reindeer lichen), *Cladonia furcata* (cup lichen), *Cladonia grayi* (Gray's cup lichen), *Cladonia robbinsii* (Robbins' cup lichen), *Cladonia strepsilis* (cup lichen), *Danthonia spicata* (poverty oatgrass), *Dicranum condensatum* (condensed dicranum moss), *Dicranum scoparium* (dicranum moss), *Fraxinus americana* (white ash), *Grimmia pilifera* (grimmia dry rock moss), *Hedwigia ciliata* (ciliate hedwigia moss), *Hypericum gentianoides* (orangegrass), *Hypnum imponens* (hypnum moss), *Isopterygium tenerum* (isopterygium moss), *Krigia virginica* (Virginia dwarfdandelion), *Leersia virginica* (whitegrass), *Leucobryum glaucum* (leucobryum moss), *Melica mutica* (twoflower melicgrass), *Parmotrema hypotropum*, *Piptochaetium avenaceum* (blackseed speargrass), *Plagiomnium ciliare* (plagiomnium moss), *Polytrichum juniperinum* (juniper polytrichum moss), *Punctelia rudecta*, *Quercus stellata* (post oak), *Rhus copallinum* var. *latifolia* (winged sumac), *Rosa carolina* var. *carolina* (Carolina rose), *Thuidium delicatulum* (delicate thuidium moss), *Ulmus americana* (American elm), *Viburnum prunifolium* (blackhaw).

Other Noteworthy Species:

Species	GRank	Type	Note
Aristida purpurascens var. *purpurascens* (arrowfeather threeawn)	-	plant	state-rate (S1)
Carex woodii (pretty sedge)	-	plant	state-rare (S1)
Commelina erecta var. *angustifolia* (whitemouth dayflower)	-	plant	state-rare (S2)
Coreopsis pubescens var. *robusta* (star tickseed)	-	plant	state-rare (S2)
Galactia volubilis (downy milkpea)	-	plant	state-rare (S1)
Hypericum virgatum (coppery St. Johnswort)	-	plant	state-rare (S1)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association is confined to two sites, Sandstone Falls and Camp Brookside (Brooks Falls) in the southern section of the park.

Classification Comments: This community was described by Rouse and McDonald (1986) as a part of the "Appalachian river flatrock" community, by McDonald and Trianosky (1995) as sub-mesic Virginia pine woodland, and by Suiter (1995) and Suiter and Evans (1999) as *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland. It is similar to associations in the *Juniperus virginiana-Quercus (stellata, velutina, marilandica)* Forest Alliance (A.383), but differs by its history of flooding as opposed to fire disturbance and by its floristic composition. McDonald and Trianosky (1995) identified communities described from other eastern states which are superficially similar to the community described here, but their ecology is related to fire and/or edaphic regimes rather than flooding. They suggested this community may be most similar to xeric *Pinus virginiana* (Virginia pine) woodlands in the vicinity of Great Falls on the Potomac River in Maryland. The community at Great Falls has been described as *Pinus*

virginiana - Carya glabra - Quercus (rubra, stellata) / Chasmanthium latifolium (Thomson et al.1999) and *Pinus virginiana - Quercus stellata / Vaccinium pallidum / Helianthus divaricatus* Forest (Lea 2000). In a previous report (Vanderhorst 2001b), this association was divided into a woodland type and a sparsely vegetated type, however, floristic similarities, small size of openings, and constant co-occurrence of these physiognomic expressions support recognition of just one woodland association in the IVC. Two separate community types within this association at Camp Brookside were also recognized and described by Mitchem (2004).
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.17, NERI.20, NERI.24, NERI.25, NERI.77.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
Alliance	*Juniperus virginiana* Woodland Alliance (A.545)
Alliance (English name)	Eastern Red-cedar Woodland Alliance
Association	*Juniperus virginiana* var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland
Association (English name)	Eastern Red-cedar - Virginia Pine - Post Oak / Running Serviceberry / Poverty Oatgrass - Two-flower Melicgrass Woodland
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This woodland occupies areas of flat sandstone bedrock along the New River in West Virginia. It has an open to nearly closed canopy dominated by a mixture of evergreen conifer and deciduous tree species over a diverse understory of shrubs and herbs often with heavy ground cover by mosses and lichens. The open canopy is dominated by about equal amounts of *Juniperus virginiana var. virginiana* (eastern redcedar) and *Pinus virginiana* (Virginia pine). Associated deciduous tree species include *Quercus stellata* (post oak), *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and *Cercis canadensis* (eastern redbud). The dense shrub layer includes *Amelanchier stolonifera* (running serviceberry), *Rhus copallinum* (flameleaf sumac), *Rosa carolina* (Carolina rose), and *Viburnum prunifolium* (blackhaw). Vines include *Toxicodendron radicans* (eastern poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis aestivalis* (summer grape). The exotics *Ligustrum vulgare* (European privet), *Rubus phoenicolasius* (wine raspberry), *Lonicera japonica* (Japanese honeysuckle), and *Rosa multiflora* (multiflora rose) may also be present. The herbaceous layer has high representation of grasses; species include *Andropogon virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), *Leersia virginica*

(whitegrass), *Melica mutica* (twoflower melicgrass), and *Piptochaetium avenaceum* (blackseed speargrass). The fern ally *Selaginella rupestris* (northern selaginella) may also contribute significant ground cover. Cover by mosses and lichens is variable and may approach 90%.
Environmental Description: This community occupies areas of flat sandstone bedrock along the New River Gorge National River (Camp Brookside and Sandstone Falls), West Virginia. These areas are above the normal river floodplain but are hypothesized to have been impacted by catastrophic floods in the late 1800s resulting in establishment of primary successional species on the scoured bedrock (McDonald and Trianosky 1995). The soils are shallow with considerable areas of exposed rock. Soils are extremely acidic (pH = 3.9) with high organic matter content and low levels of major nutrients (Mitchem 2004). Soil moisture regime is relatively xeric. Slopes range from level to moderate (mapping unit values range from 0 to 13 degrees, mean = 4 degrees). Elevations of mapped stands range from 379 to 402 m.
Vegetation Description: This woodland has an open to nearly closed canopy (40-75% total cover) dominated by a mixture of evergreen conifer and deciduous tree species over a diverse understory of shrubs and herbs often with heavy ground cover by mosses and lichens. The open canopy is dominated by about equal amounts of *Juniperus virginiana var. virginiana* (eastern redcedar) and *Pinus virginiana* (Virginia pine). Associated deciduous tree species occurring in lesser amounts include *Quercus stellata* (post oak), *Fraxinus americana* (white ash), *Celtis occidentalis* (common hackberry), *Chionanthus virginicus* (white fringetree), *Ulmus americana* (American elm), *Gleditsia triacanthos* (honeylocust), *Ostrya virginiana* (hophornbeam), and *Cercis canadensis* (eastern redbud). In addition to saplings of tree species, the dense shrub layer (60% total cover) layer includes *Amelanchier stolonifera* (running serviceberry), *Rhus copallinum* (flameleaf sumac), *Rosa carolina* (Carolina rose), and *Viburnum prunifolium* (blackhaw). The exotics *Ligustrum vulgare* (European privet) and *Rosa multiflora* (multiflora rose) may also be present. Vines (5% total cover) include *Toxicodendron radicans* (eastern poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis aestivalis* (summer grape). The invasive exotics *Lonicera japonica* (Japanese honeysuckle) and *Rubus phoenicolasius* (wine raspberry) may invade this stratum as well. The herbaceous layer (20-40% cover) has high representation of grasses compared to most woodland communities in this region; species include *Andropogon virginicus* (broomsedge bluestem), *Danthonia spicata* (poverty oatgrass), *Leersia virginica* (whitegrass), *Melica mutica* (twoflower melicgrass), and *Piptochaetium avenaceum* (blackseed speargrass). Unusually high cover by the small fern *Asplenium platyneuron* (ebony spleenwort) has been noted in examples of this community; in addition, the fern ally *Selaginella rupestris* (northern selaginella) may contribute significant ground cover (Suiter 1995). Additional characteristic species in the herb layer include *Hypericum gentianoides* (orangegrass), *Krigia virginica* (Virginia dwarfdandelion), *Lespedeza virginica* (slender lespedeza), *Potentilla simplex* (common cinquefoil), *Salvia lyrata* (lyreleaf sage), *Symphyotrichum patens* (late purple aster), and *Toxicodendron radicans* (eastern poison ivy). Vascular plant species richness in the 5 sampled plots at New River Gorge ranges from 19 to 53 (mean = 36.4). Cover by mosses and lichens is variable, though typically high, approaching 90%. Mosses identified in plots include *Dicranum condensatum* (condensed dicranum moss), *Dicranum scoparium* (dicranum moss), *Grimmia pilifera* (grimmia dry rock moss), *Hedwigia ciliata* (ciliate hedwigia moss), *Hypnum imponens* (hypnum moss), *Isopterygium tenerum* (isopterygium moss), *Leucobryum glaucum* (leucobryum moss), *Plagiomnium ciliare* (plagiomnium moss), *Polytrichum juniperinum* (juniper polytrichum moss), and *Thuidium delicatulum* (delicate thuidium moss). Lichens in the plots include *Cladonia furcata* (cup lichen),

Cladonia grayi (Gray's cup lichen), *Cladonia robbinsii* (Robbins' cup lichen), *Cladonia strepsilis* (cup lichen), *Cladina subtenuis* (reindeer lichen), *Parmotrema hypotropum*, and *Punctelia rudecta*.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Juniperus virginiana* (eastern redcedar), *Pinus virginiana* (Virginia pine)

Characteristic Species: *Amelanchier stolonifera* (running serviceberry), *Andropogon virginicus* (broomsedge bluestem), *Celtis occidentalis* (common hackberry), *Chionanthus virginicus* (white fringetree), *Danthonia spicata* (poverty oatgrass), *Dicranum condensatum* (condensed dicranum moss), *Dicranum scoparium* (dicranum moss), *Fraxinus americana* (white ash), *Grimmia pilifera* (grimmia dry rock moss), *Hypericum gentianoides* (orangegrass), *Krigia virginica* (Virginia dwarfdandelion), *Leersia virginica* (whitegrass), *Leucobryum glaucum* (leucobryum moss), *Melica mutica* (twoflower melicgrass), *Piptochaetium avenaceum* (blackseed speargrass), *Polytrichum juniperinum* (juniper polytrichum moss), *Quercus stellata* (post oak), *Rhus copallinum* (flameleaf sumac), *Rosa carolina* (Carolina rose), *Ulmus americana* (American elm), *Viburnum prunifolium* (blackhaw).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community is currently restricted to the New River Gorge of West Virginia; more information is needed.

States/Provinces: MD?, WV.

Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: G2? (25-Aug-2000).

Reasons: This community hosts several rare plant species and is itself a rare element of biodiversity. Unfortunately, its long-term persistence is uncertain due to altered flooding regime since building of Bluestone Dam in 1949. Succession of this community towards deciduous woodland has been very slow, probably due to shallow, droughty soils. Occurrences of this community are in extremely rocky areas which are protected and not vulnerable to resource extraction, conversion, or development. Currently stands of this association are probably most threatened by encroachment of exotic weeds such as *Lonicera japonica* (Japanese honeysuckle) and *Rosa multiflora* (multiflora rose).

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 3 - Weak.

Comments: This community was described by Rouse and McDonald (1986) as a part of the "Appalachian river flatrock" community, by McDonald and Trianosky (1995) as sub-mesic Virginia pine woodland, and by Suiter (1995) and Suiter and Evans (1999) as *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland. It is similar to associations in the *Juniperus virginiana - Quercus (stellata, velutina, marilandica)* Forest Alliance (A.383), but differs by its history of flooding, as opposed to fire disturbance, and by its floristic composition. McDonald and Trianosky (1995) identified communities described from other eastern states which are superficially similar to the community described here, but their ecology is related to fire and/or

edaphic regimes rather than flooding. They suggested this community may be most similar to xeric *Pinus virginiana* (Virginia pine) woodlands in the vicinity of Great Falls on the Potomac River in Maryland. The community at Great Falls has been described as *Pinus virginiana - Carya glabra - Quercus (rubra, stellata) / Chasmanthium latifolium* (Thomson et al. 1999) and *Pinus virginiana - Quercus stellata / Vaccinium pallidum / Helianthus divaricatus* Forest (Lea 2000). In a previous report (Vanderhorst 2001b), this association was divided into a woodland type and a sparsely vegetated type, however, floristic similarities, small size of openings, and constant co-occurrence of these physiognomic expressions support recognition of just one woodland association. Two separate community types within this association at Camp Brookside were also recognized and described by Mitchem (2004).

Similar Associations: Information not available.

Related Concepts:

- *Juniperus virginiana - Pinus virginiana - Quercus stellata / Asplenium platyneuron* woodland (Vanderhorst 2001b) =
- *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland (Suiter and Evans 1999) =
- *Pinus virginiana - Juniperus virginiana - Quercus stellata* woodland (Suiter 1995) =
- Appalachian river flatrock (Rouse and McDonald 1986) B
- sub-mesic Virginia pine woodland (McDonald and Trianosky 1995) =

SOURCES

Description Authors: M. Pyne after Vanderhorst (2000), mod. S. C. Gawler.

References: Eastern Ecology Working Group n.d., Gellerstedt and Johnson 2005, Lea 2000, McDonald and Trianosky 1995, Mitchem 2004, Mitchem and Johnson 2001, Rouse and McDonald 1986, Suiter 1995, Suiter and Evans 1999, Thomson et al. 1999, Vanderhorst 2000a, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst pers. comm.

COMMON NAME (PARK-SPECIFIC): SYCAMORE - RIVER BIRCH RIVERSCOUR WOODLAND

SYNONYMS

NVC English Name: **Sycamore - (River Birch, Willow species) Temporarily Flooded Woodland**

NVC Scientific Name: ***Platanus occidentalis* - (*Betula nigra, Salix* spp.) Temporarily Flooded Woodland**

NVC Identifier: **CEGL003725**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches and more often in relatively continuous linear zones along the shores of the New River in positions that are subject to frequent high-energy flooding. These floods damage and remove trees, maintaining an open canopy. The alluvial substrate is composed of boulders and cobbles with gravel and sand accumulations but no soil development. These coarse-textured substrates are potentially well-drained, but fluvial topography and proximity to the water table often results in a mixture of well-drained and poorly drained microsites, including areas of standing water, within the community. Soil (sandy alluvium) chemistry analyzed from four plots indicates relatively high pH (mean = 6.73), low levels of macronutrients (N, P, K) and organic matter, and high levels of several micronutrients (Ca, Cu, Fe, Mg, Mn, Zn). Slopes range from level to steep (mapping unit values range from 0 to 35 degrees, mean = 9 degrees). Elevations of mapped stands range from 252 to 408 m. Ecologically and spatially this association is intermediate between *Andropogon gerardii* - *Panicum virgatum* - *Baptisia australis* Herbaceous Vegetation (CEGL006283), which occurs on sites which are more severely impacted by flooding, and *Platanus occidentalis* - *Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), which occurs on sites less severely impacted by floods. *Salix nigra* - *Betula nigra / Schoenoplectus (pungens, tabernaemontani)* Wooded Herbaceous Vegetation (CEGL006463) occurs in similar riverside positions along lower energy reaches, often just downstream from rapids.

Vegetation Description: This association is a deciduous woodland or open forest typically codominated by *Platanus occidentalis* (Sycamore) and *Betula nigra* (river birch). One atypical stand has a canopy codominated by *Pinus virginiana* (Virginia pine). Additional important trees include *Acer saccharinum* (silver maple), *Catalpa speciosa* (northern catalpa), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). The usually short, open canopy is composed mostly of flood-battered trees. The tallest trees are often the younger ones which have not yet been subjected to damage by severe floods. Common shrubs include *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Chionanthus virginicus* (white fringetree), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). There is often a large component of woody vines in the short-shrub layer, including *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis rupestris* (sand grape). The herb layer is composed of a mixture of warm-season grasses and forbs adapted to frequent flooding and high light exposure. Characteristic herbs include *Andropogon gerardii* (big bluestem), *Apocynum cannabinum*

(Indianhemp), *Baptisia australis* (blue wild indigo), *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eupatorium fistulosum* (trumpetweed), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Lysimachia ciliata* (fringed loosestrife), *Panicum virgatum* (switchgrass), *Solidago juncea var. juncea* (early goldenrod), *Tripsacum dactyloides* (eastern gamagrass), and *Viola cucullata* (marsh blue violet). Rare plants tracked by West Virginia Natural Heritage Program which have been documented in this community in vegetation plots or by past surveys include *Baptisia australis* (blue wild indigo), *Carex emoryi* (Emory's sedge), *Coreopsis pubescens var. robusta* (star tickseed), *Solidago simplex var. racemosa* (Rand's goldenrod), and *Vitis rupestris* (sand grape). Vascular plant species richness in the 14 sampled plots ranges from 20 to 59 (mean = 38.7). The bryophyte layer is usually poorly developed. Crustose lichens may occur on large rocks.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula nigra* (river birch), *Platanus occidentalis* (Sycamore)

Characteristic Species: *Acer saccharinum* (silver maple), *Alnus serrulata* (smooth alder), *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Campsis radicans* (trumpet creeper), *Catalpa speciosa* (northern catalpa), *Cephalanthus occidentalis* (common buttonbush), *Chasmanthium latifolium* (Indian woodoats), *Chionanthus virginicus* (white fringetree), *Cornus amomum* (silky dogwood), *Dichanthelium clandestinum* (deertongue), *Diospyros virginiana* (common persimmon), *Eupatorium coelestinum* (blue mistflower), *Eupatorium fistulosum* (trumpetweed), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Hypericum prolificum* (shrubby St. Johnswort), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Lysimachia ciliata* (fringed loosestrife), *Panicum virgatum* (switchgrass), *Robinia pseudoacacia* (black locust), *Salix caroliniana* (coastal plain willow), *Salix nigra* (black willow), *Solidago juncea* var. *juncea* (early goldenrod), *Toxicodendron radicans* (eastern poison ivy), *Tripsacum dactyloides* (eastern gamagrass), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Viola cucullata* (marsh blue violet), *Vitis rupestris* (sand grape).

Other Noteworthy Species:

Species	GRank	Type	Note
Baptisia australis (blue wild indigo)	-	plant	state-rare (S3)
Carex emoryi (Emory's sedge)	-	plant	state-rare (S2)
Coreopsis pubescens var. *robusta* (star tickseed)	-	plant	state-rare (S2)
Solidago simplex var. *racemosa* (Rand's goldenro	G5T3?	plant	state-rare (S1)
Vitis rupestris (sand grape)	G3	plant	state-rare (S1)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	*Platanus occidentalis* - (Betula nigra, Salix spp.) Temporarily Flooded Woodland [Provisional]	Vanderhorst 2001b

Local Range: This association occurs in patches scattered along the New River throughout its length in the park.

Classification Comments: Within the park this association is ecologically and floristically intermediate between *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (CEGL006283), which is more open and occurs on sites which are more severely impacted by flooding, and *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), which has a more closed canopy, usually lacking *Betula nigra* (river birch), and occurs on sites less severely impacted by flooding. It is also similar to *Salix nigra - Betula nigra / Schoenoplectus (pungens, tabernaemontani)* Wooded Herbaceous Vegetation (CEGL006463), which occurs on finer textured alluvium in riverside positions along lower energy reaches. Similar vegetation was described from the New River Gorge by Suiter (1995) as the *Platanus occidentalis - Betula nigra* forest. Recent classification studies in the National Park Service National Capitol Region have shown this association to be distinct from similar vegetation in the Potomac drainage. Its relationship to riverscour woodlands along the Bluestone and Gauley rivers has not yet been analyzed.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.56, NERI.80, NERI.92, NERI.105, NERI.126, NERI.128, NERI.207, NERI.208, NERI.209, NERI.318, NERI.352, NERI.357, NERI.358, NERI.359.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Deciduous woodland (II.B.)
Physiognomic Group	Cold-deciduous woodland (II.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
Formation	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
Alliance	*Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
Alliance (English name)	Sycamore - (River Birch, Willow species) Temporarily Flooded Woodland Alliance
Association	*Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland
Association (English name)	Sycamore - (River Birch, Willow species) Temporarily Flooded Woodland
Ecological System(s):	Cumberland Riverscour (CES202.036).

GLOBAL DESCRIPTION

Concept Summary: These woodlands occur along high-energy Appalachian rivershores, such as the New River in West Virginia. They maintain an open canopy due to mechanical disturbance (flooding and scouring). The coarse-textured substrates are potentially well-drained, but fluvial topography and proximity to the water table often result in a mixture of well-drained and poorly drained microsites. The usually short, open canopy is composed mostly of flood-battered trees, typically codominated by *Platanus occidentalis* (Sycamore) and *Betula nigra* (river birch). The tallest trees are often the younger ones which have not yet been subjected to damage by severe floods. Additional important trees include *Acer saccharinum* (silver maple), *Catalpa speciosa* (northern catalpa), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Robinia pseudoacacia* (black

locust), *Salix nigra* (black willow), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Common shrubs include *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Chionanthus virginicus* (white fringetree), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). There is often a large component of woody vines, including *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis rupestris* (sand grape). The herb layer is composed of a mixture of warm-season grasses and forbs adapted to frequent flooding and high light exposure. Characteristic herbs include *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eupatorium fistulosum* (trumpetweed), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Lysimachia ciliata* (fringed loosestrife), *Panicum virgatum* (switchgrass), *Solidago juncea* (early goldenrod), *Tripsacum dactyloides* (eastern gamagrass), and *Viola cucullata* (marsh blue violet).

Environmental Description: These woodlands occur along high-energy Appalachian rivershores, such as the New River in West Virginia. They maintain an open canopy due to mechanical disturbance (flooding and scouring). This association occurs as relatively continuous linear zones (sometimes in small patches) along the shores of the New River in positions that are subject to frequent high-energy flooding. These floods damage and remove trees, maintaining an open canopy. The sandy alluvium substrate is composed of boulders and cobbles with gravel and sand accumulations but no soil development. These coarse-textured substrates are potentially well-drained, but fluvial topography and proximity to the water table often result in a mixture of well-drained and poorly drained microsites, including areas of standing water, within the community. Soil chemistry analyzed from four plots indicates relatively high pH (mean = 6.73), low levels of macronutrients (N, P, K) and organic matter, and high levels of several micronutrients (Ca, Cu, Fe, Mg, Mn, Zn). Slopes range from level to steep but are generally gentle. Known elevations range from 250 to 400 m (810-1350 feet).

Vegetation Description: This association is a deciduous woodland or open forest typically codominated by *Platanus occidentalis* (Sycamore) and *Betula nigra* (river birch). One atypical stand has a canopy codominated by *Pinus virginiana* (Virginia pine). Additional important trees include *Acer saccharinum* (silver maple), *Catalpa speciosa* (northern catalpa), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). The usually short, open canopy is composed mostly of flood-battered trees. The tallest trees are often the younger ones which have not yet been subjected to damage by severe floods. Common shrubs include *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Chionanthus virginicus* (white fringetree), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). There is often a large component of woody vines in the short-shrub layer, including *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis rupestris* (sand grape). The herb layer is composed of a mixture of warm-season grasses and forbs adapted to frequent flooding and high light exposure. Characteristic herbs include *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eupatorium fistulosum* (trumpetweed), *Justicia americana* (American water-willow), *Lobelia*

cardinalis (cardinalflower), *Lysimachia ciliata* (fringed loosestrife), *Panicum virgatum* (switchgrass), *Solidago juncea* (early goldenrod), *Tripsacum dactyloides* (eastern gamagrass), and *Viola cucullata* (marsh blue violet). Rare plants tracked by West Virginia Natural Heritage Program which occur in this community include *Baptisia australis* (blue wild indigo), *Carex emoryi* (Emory's sedge), *Coreopsis pubescens var. robusta* (star tickseed), *Solidago simplex var. racemosa* (Rand's goldenrod), and *Vitis rupestris* (sand grape). Vascular plant species richness in the 14 sampled plots ranged from 20 to 59 (mean = 38.7). The bryophyte layer is usually poorly developed; crustose lichens may occur on large rocks.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Betula nigra* (river birch), *Platanus occidentalis* (Sycamore)

Characteristic Species: *Acer saccharinum* (silver maple), *Alnus serrulata* (smooth alder), *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Campsis radicans* (trumpet creeper), *Catalpa speciosa* (northern catalpa), *Cephalanthus occidentalis* (common buttonbush), *Chasmanthium latifolium* (Indian woodoats), *Chionanthus virginicus* (white fringetree), *Cornus amomum* (silky dogwood), *Dichanthelium clandestinum* (deertongue), *Diospyros virginiana* (common persimmon), *Eupatorium coelestinum* (blue mistflower), *Eupatorium fistulosum* (trumpetweed), *Hypericum prolificum* (shrubby St. Johnswort), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Lysimachia ciliata* (fringed loosestrife), *Panicum virgatum* (switchgrass), *Robinia pseudoacacia* (black locust), *Salix caroliniana* (coastal plain willow), *Salix nigra* (black willow), *Solidago juncea* (early goldenrod), *Toxicodendron radicans* (eastern poison ivy), *Tripsacum dactyloides* (eastern gamagrass), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Viola cucullata* (marsh blue violet), *Vitis rupestris* (sand grape).

Other Noteworthy Species:

Species	GRank	Type	Note
Baptisia australis (blue wild indigo)	-	plant	WV state-rare
Carex emoryi (Emory's sedge)	-	plant	WV state-rare
Coreopsis pubescens var. *robusta* (star tickseed)	-	plant	WV state-rare
Solidago simplex var. *racemosa* (Rand's goldenrod)	G5T3?	plant	WV state-rare
Vitis rupestris (sand grape)	G3	plant	WV state-rare

USFWS Wetland System: Riverine.

DISTRIBUTION

Range: This type is being reserved for vegetation of high-energy Appalachian rivers, such as the New River in West Virginia. Its range may include Virginia as well.
States/Provinces: VA, WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: GNR (1-Dec-1997).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.

Comments: Along the New River, this association is ecologically and floristically intermediate between *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (CEGL006283), which is more open and occurs on sites which are more severely impacted by flooding, and *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), which has a more closed canopy, usually lacking *Betula nigra* (river birch), and occurs on sites less severely impacted by flooding. It is also similar to *Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation (CEGL006463), which occurs on finer textured alluvium in riverside positions along lower energy reaches. Similar vegetation was described from the New River Gorge by Suiter (1995) as *Platanus occidentalis - Betula nigra* forest. Recent classification studies in the National Park Service National Capitol Region have shown this association to be distinct from similar vegetation in the Potomac drainage, which is being placed in *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Woodland (CEGL003896). Its relationship to riverscour woodlands along the Bluestone and Gauley rivers has not yet been analyzed.

Similar Associations:

- *Betula nigra - Platanus occidentalis* Forest (CEGL002086)--with a more-or-less closed canopy.
- *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Woodland (CEGL003896).
- *Quercus bicolor - Fraxinus pennsylvanica - (Platanus occidentalis) / Chasmanthium latifolium - Dichanthelium clandestinum - Zizia aurea* Woodland (CEGL006218).
- *Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463)--occurs in similar riverside positions along lower energy reaches, often just downstream from rapids.

Related Concepts:

- *Platanus occidentalis - Betula nigra / Cornus amomum* riparian woodland (Vanderhorst 2001b) =
- *Platanus occidentalis - Betula nigra* forest (Suiter 1995) ?

SOURCES

Description Authors: M. Pyne, mod. S. C. Gawler.

References: Fleming et al. 2001, Mitchem 2004, Southeastern Ecology Working Group n.d., Suiter 1995, Vanderhorst 2000b, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst pers. comm.

COMMON NAME (PARK-SPECIFIC): KUDZU PATCH

SYNONYMS
NVC English Name: **Kudzu Vine-Shrubland**
NVC Scientific Name: ***Pueraria montana* var. *lobata* Vine-Shrubland**
NVC Identifier: **CEGL003882**

LOCAL INFORMATION

Environmental Description: This association occurs on disturbed sites, including abandoned townsites and mine lands and on landslides. Apparently, *Pueraria montana var. lobata* (kudzu) was introduced to stabilize these sites (Remo 1999). In West Virginia, *Pueraria montana var. lobata* (kudzu) may be limited in its ability to spread due to its relatively cold climate. Recently, efforts have been made by the National Park Service to eradicate *Pueraria montana var. lobata* (kudzu) from these sites. Slopes range from moderate to steep (mapping unit values range from 12 to 36 degrees, mean = 24 degrees). Elevations of mapped stands range from 290 to 481 m.
Vegetation Description: This association is a near monoculture of the vine *Pueraria montana var. lobata* (kudzu).
Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Vine/Liana	*Pueraria montana* var. *lobata* (kudzu)

Characteristic Species: Information not available.
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association occurs in the town of Thurmond and on gorge slopes in the northern section of the park.
Classification Comments: Information not available.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: No plots were sampled.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	*Pueraria montana* Vine-Shrubland Alliance (A.904)
Alliance (English name)	Kudzu Vine-Shrubland Alliance
Association	*Pueraria montana* var. *lobata* Vine-Shrubland
Association (English name)	Kudzu Vine-Shrubland
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This vine-dominated vegetation is dominated by *Pueraria montana var. lobata* (kudzu), a fast-growing vine native to Asia. The species was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. It was subsequently widely used for erosion control in the southeastern United States. This association occupies a variety of sites throughout most physiographic provinces in the Southeast, ranging in size from less than a hectare to 5-10 hectares or more. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu. This association is also known to occur north to central Kentucky, Virginia, and Maryland, and as far west as eastern Texas and Oklahoma.

Environmental Description: The association occupies a variety of sites throughout most physiographic provinces in the southeastern U.S., with examples ranging in size from less than one hectare to 5-10 hectares or more. It occurs on disturbed sites, including abandoned town sites and mine lands and on landslides. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. In West Virginia, *Pueraria montana var. lobata* (kudzu) may be limited in its ability to spread due to relatively cold climate.

Vegetation Description: This vine-dominated vegetation is dominated by *Pueraria montana var. lobata* (kudzu), a fast-growing vine native to Asia.

Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Vine/Liana	*Pueraria montana* var. *lobata* (kudzu)

Characteristic Species: *Pueraria montana* var. *lobata* (kudzu).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This vegetation is known to occur in the southeastern United States from central Kentucky, Virginia, and Maryland, south through Tennessee, North Carolina, South Carolina, Georgia, and Alabama to Florida and west through Mississippi and Louisiana to eastern Texas, Arkansas, and Oklahoma (Edwards 1982).

States/Provinces: AL, AR, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV.

Federal Lands: DOD (Fort Benning); NPS (Chickamauga-Chattanooga?, Cumberland Gap, Natchez Trace, New River Gorge, Vicksburg); TVA (Tellico); USFS (Bankhead, Cherokee, Daniel Boone, George Washington, Jefferson, Oconee?, Ouachita, Ouachita (Coastal Plain), Ouachita (Mountains), Ozark, Talladega, Talladega (Oakmulgee), Talladega (Talladega)).

CONSERVATION STATUS

Rank: GNA (invasive) (24-May-2000).

Reasons: This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority. *Pueraria montana var. lobata* (kudzu), native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: *Pueraria montana var. lobata* (kudzu), native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.
Similar Associations:
- *Wisteria sinensis* Vine-Shrubland (CEGL008568).

Related Concepts:
- Kudzu thicket (CAP pers. comm. 1998) ?

SOURCES

Description Authors: A. S. Weakley, mod. S. C. Gawler.
References: CAP pers. comm. 1998, Edwards 1982, Fleming and Coulling 2001, Hoagland 1998b, Hoagland 2000, Remo 1999, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SMOOTH ALDER SHRUB WETLAND

SYNONYMS
NVC English Name: **Smooth Alder Saturated Southern Shrubland**
NVC Scientific Name: ***Alnus serrulata* Saturated Southern Shrubland**
NVC Identifier: **CEGL003912**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches in wetlands which are influenced by beaver activity. Hydrology of some sites may also be influenced by roads and other human construction. These sites occur on floodplains along low-gradient streams on the plateaus. Underlying geological formations are sandstones of the Pottsville group. Soils are saturated or semipermanently flooded with textures in plots described as muck. There is standing water in parts of this community at most times of the year. Soil chemistry analyzed from one plot indicates very strongly acidic soils (pH = 4.4) with relatively high levels of organic matter, estimated N release, S, Fe, Mg, Na, and P, and average or below average levels of other nutrients. Slopes range from level to moderate but are typically gentle (mapping unit values range from 0 to 16 degrees, mean = 6 degrees). Elevations of mapped stands (beaver-influenced wetland mapping unit, which includes this type) range from 528 to 801 m. This association occurs in patchy mosaics with other wetland associations, including *Hypericum densiflorum* (bushy St. Johnswort) Shrubland (CEGL006464), *Leersia oryzoides* - *Callitriche heterophylla* Herbaceous Vegetation (CEGL006461), and *Sparganium americanum* - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510).
Vegetation Description: This association is a tall-shrub swamp dominated by *Alnus serrulata* (smooth alder). Cover by *Alnus serrulata* (smooth alder) in plots averages 40% in the tall-shrub layer (1-4 m tall) and 15% in the short-shrub layer (<1 m tall). Additional shrubs with less cover include *Hypericum densiflorum* (bushy St. Johnswort), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Viburnum recognitum* (southern arrowwood). There is usually high cover in the herb layer dominated by wetland indicators; species with highest cover in plots include *Bidens vulgata* (big devils beggartick), *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Carex seorsa* (weak stellate sedge), *Eleocharis tenuis* (slender spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), and *Sparganium americanum* (American bur-reed). Vascular plant species richness in the 2 sampled plots ranges from 22 to 33 (mean = 27.5). The peatmoss *Sphagnum quinquefarium* (sphagnum) was collected from one plot.
Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Alnus serrulata* (smooth alder)

Characteristic Species: *Bidens vulgata* (big devils beggartick), *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Carex seorsa* (weak stellate sedge), *Eleocharis tenuis* (slender spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Glyceria striata* (fowl mannagrass), *Hypericum densiflorum* (bushy St. Johnswort), *Hypericum*

mutilum (dwarf St. Johnswort), *Juncus effusus* (common rush), *Kalmia latifolia* (mountain laurel), *Leersia oryzoides* (rice cutgrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Rhododendron maximum* (great laurel), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed), *Sphagnum quinquefarium* (sphagnum), *Viburnum recognitum* (southern arrowwood).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: Beaver-influenced wetlands are scattered on plateaus from Kate's Branch north, and it is likely that this association occurs in at least small patches across this same range. However, plots have only been sampled from Kate's Branch wetland, and it is possible that this association is confined to this one site.

Classification Comments: In a previous report (Vanderhorst 2001b), this association was combined with *Hypericum densiflorum* (bushy St. Johnswort) Shrubland (CEGL006464) based on data from Kate's Branch wetland due to the close proximity of patches dominated by *Alnus serrulata* (smooth alder) and *Hypericum densiflorum* (bushy St. Johnswort) and co-occurrence of both species in patches dominated by either. However, elsewhere in the park and elsewhere in West Virginia, either species can dominate stands where the other is lacking. For this reason, we recognize two associations and distinguish between the two using relative cover of the two dominant shrubs. Shrub swamps in West Virginia dominated by *Alnus serrulata* (smooth alder) have also been described from wetlands along the Meadow River (Putnam 1995) and the Ohio River (Walton et al. 1996). High-elevation (>730 m) alder swamps in West Virginia are dominated by *Alnus incana ssp. rugosa* (speckled alder).

Other Comments: Information not available.

Local Description Authors: J.P. Vanderhorst.

Plots: NERI.87, NERI.303.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Saturated cold-deciduous shrubland (III.B.2.N.g.)
Alliance	*Alnus serrulata* Saturated Shrubland Alliance (A.1014)
Alliance (English name)	Smooth Alder Saturated Shrubland Alliance
Association	*Alnus serrulata* Saturated Southern Shrubland
Association (English name)	Smooth Alder Saturated Southern Shrubland
Ecological System(s):	East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
	East Gulf Coastal Plain Depression Pondshore (CES203.558)
	Interior Low Plateau Seepage Fen (CES202.346)
	South-Central Interior Small Stream and Riparian (CES202.706)

GLOBAL DESCRIPTION

Concept Summary: This broadly defined type represents saturated vegetation dominated by *Alnus serrulata* (smooth alder) from several coastal and interior ecoregions of the southeastern United States. It may be subdivided as more information becomes available. Saturated vegetation dominated by *Alnus serrulata* (smooth alder) at Fort Benning, Georgia (East Gulf Coastal Plain - Upper East Gulf Coastal Plain transition region), on the upper ends of beaver ponds, is placed here, at least until another specific association is developed if necessary. These are shrub-dominated inclusions in a *Nyssa biflora* (swamp tupelo) saturated forest.

Environmental Description: This association occurs in small patches in wetlands which are influenced by beaver activity. They may occur as shrub-dominated inclusions in various types of saturated forest. Hydrology of some sites may also be influenced by roads and other human construction. These sites occur on floodplains along low-gradient streams. Soils are saturated or semipermanently flooded with textures described as muck. There is standing water at most times of the year. Soil chemistry analyzed from one plot indicates very strongly acidic soils (pH = 4.4) with relatively high levels of organic matter, estimated N release, S, Fe, Mg, Na, and P, and average or below average levels of other nutrients. Slopes range from level to moderate but are typically gentle. Documented elevations range from near sea level to 415 m (1350 feet).

Vegetation Description: This association accommodates saturated stands of *Alnus serrulata* (smooth alder) in a variety of ecoregions and environmental situations. In West Virginia, cover by *Alnus serrulata* (smooth alder) averages 40% in the tall-shrub layer and 15% in the short-shrub layer. Additional shrubs with less cover include *Hypericum densiflorum* (bushy St. Johnswort), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Viburnum recognitum* (southern arrowwood). There is usually high cover in the herb layer dominated by wetland indicators; species with highest cover in plots include *Bidens vulgata* (big devils beggartick), *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Carex seorsa* (weak stellate sedge), *Eleocharis tenuis* (slender spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), and *Sparganium americanum* (American bur-reed).

Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Alnus serrulata* (smooth alder)

Characteristic Species: *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Carex seorsa* (weak stellate sedge), *Eleocharis tenuis* (slender spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association occurs in several coastal and interior ecoregions of the southeastern United States from Alabama and Georgia north to West Virginia.
States/Provinces: AL, GA, KY, NC, SC, TN, WV.
Federal Lands: DOD (Fort Benning); NPS (Cumberland Gap, Kings Mountain, New River Gorge); USFS (Daniel Boone, Talladega, Talladega (Oakmulgee), Talladega (Talladega), Tuskegee?).

CONSERVATION STATUS

Rank: G4 (15-Oct-2002).
Reasons: This is a wide-ranging association that occurs in a variety of ecoregions and environmental situations.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: This association accommodates saturated stands of *Alnus serrulata* (smooth alder) in a variety of ecoregions and environmental situations. Additional types may be developed if necessary as more information becomes available. In the Western Highland Rim of Tennessee, small-scale saturated areas dominated by *Alnus serrulata* (smooth alder) may form at the margins of seepage areas otherwise dominated by herbaceous plants, classified as *Carex lurida - Carex leptalea - Parnassia grandifolia - Juncus brachycephalus - (Xyris tennesseensis)* Herbaceous Vegetation (CEGL004161). Saturated vegetation dominated by *Alnus serrulata* (smooth alder) at Fort Benning, Georgia (East Gulf Coastal Plain - Upper East Gulf Coastal Plain transition region), on the upper ends of beaver ponds which are inclusions in a *Nyssa biflora* (swamp tupelo) saturated forest apparently belong here, at least until a specific association is developed, if necessary. In West Virginia, Vanderhorst (2001b) combined this association with *Hypericum densiflorum / Rubus hispidus* Shrubland (CEGL006464) based on data from Kate's Branch wetland due to the close proximity of patches dominated by *Alnus serrulata* (smooth alder) and *Hypericum densiflorum* (bushy St. Johnswort) and co-occurrence of both species in patches dominated by either. However, elsewhere in West Virginia, either species can dominate stands where the other is lacking. For this reason, we recognize two associations and distinguish between the two using relative cover of the two dominant shrubs. Shrub swamps in West Virginia dominated by *Alnus serrulata* (smooth alder) have also been described from wetlands along the Meadow River (Putnam 1995) and the Ohio River (Walton et al. 1996). High-elevation (>730 m) alder swamps in West Virginia are dominated by *Alnus incana ssp. rugosa* (speckled alder).
Similar Associations:

- *(Carex interior, Carex lurida) - Carex leptalea - Parnassia grandifolia - Rhynchospora capillacea* Herbaceous Vegetation (CEGL002404).
- *Hypericum densiflorum / Rubus hispidus* Shrubland (CEGL006464).
- *Juncus effusus - Chelone glabra - Scirpus* spp. Southern Blue Ridge Beaver Pond Herbaceous Vegetation (CEGL008433)--can intergrade with *Alnus*-dominated stands.

Related Concepts:

- *Alnus serrulata - Hypericum densiflorum* shrub wetland (Vanderhorst 2001b) B
- IIC1e. Interior Basin Shrub Swamps (Allard 1990) ?
- IIE1a. Southern Appalachian Bog Complex (Allard 1990) B

SOURCES

Description Authors: Southeast Ecology Group, mod. S. C. Gawler.

References: Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Putnam 1995, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007, Walton et al. 1996, Zollner pers. comm.

COMMON NAME (PARK-SPECIFIC): BUSHY ST. JOHN'S-WORT SHRUB WETLAND

SYNONYMS
NVC English Name: **Bushy St. John's-wort / Bristly Dewberry Shrubland**
NVC Scientific Name: ***Hypericum densiflorum / Rubus hispidus* Shrubland**
NVC Identifier: **CEGL006464**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches in wetlands which are influenced by beaver activity. Hydrology of some sites may also be influenced by roads and other human construction. These sites occur on floodplains along low-gradient streams on the plateaus. Underlying geological formations are sandstones of the Pottsville group. There may be standing water at any time of year. Soils in plots were described as poorly drained sandy or clay loams with hydric indicators, including low chroma horizons, oxidized root channels, and high water tables. Soil chemistry analyzed from three plots indicates strongly acidic soils (mean pH = 4.87) with relatively high levels of Fe and Na and low levels of other nutrients. Slopes range from level to moderate but are typically gentle (mapping unit values range from 0 to 16 degrees, mean = 6 degrees). Elevations of mapped stands (beaver-influenced wetland mapping unit, which includes this type) range from 528 to 801 m. This association occurs in patchy mosaics with other wetland associations, including *Alnus serrulata* (smooth alder) Saturated Southern Shrubland (CEGL003912), *Leersia oryzoides* - *Callitriche heterophylla* Herbaceous Vegetation (CEGL006461), and *Sparganium americanum* - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510).

Vegetation Description: This association is a shrub swamp dominated by *Hypericum densiflorum* (bushy St. Johnswort). Cover by *Hypericum densiflorum* (bushy St. Johnswort) in plots ranges from 5 to 60% in the tall-shrub layer (1-2 m tall) and from 5 to 30% cover in the short-shrub layer (<1 m tall). Additional shrub species with less cover in plots include *Alnus serrulata* (smooth alder), *Ilex verticillata* (common winterberry), *Rhododendron periclymenoides* (pink azalea), and *Kalmia latifolia* (mountain laurel). The low-growing trailing vine *Rubus hispidus* (bristly dewberry) has high constancy and cover in the plots. There is usually high cover in the herb layer dominated by wetland indicator species; species with highest cover and/or constancy in the plots include *Bidens vulgata* (big devils beggartick), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex vulpinoidea* (fox sedge), *Dichanthelium dichotomum ssp. microcarpon* (roundseed panicgrass), *Galium asprellum* (rough bedstraw), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus var. uniflorus* (northern bugleweed), *Schoenoplectus pungens var. pungens* (common threesquare), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed), *Thelypteris noveboracensis* (New York fern), *Typha latifolia* (broadleaf cattail), and *Viola X primulifolia* (primroseleaf violet). Vascular plant species richness in the 4 sampled plots ranges from 23 to 32 (mean = 26.0).

Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hypericum densiflorum* (bushy St. Johnswort)
Short shrub/sapling	Vine/Liana	*Rubus hispidus* (bristly dewberry)

Characteristic Species: *Alnus serrulata* (smooth alder), *Bidens vulgata* (big devils beggartick), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex vulpinoidea* (fox sedge), *Dichanthelium dichotomum* (cypress panicgrass), *Galium asprellum* (rough bedstraw), *Ilex verticillata* (common winterberry), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Kalmia latifolia* (mountain laurel), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Rhododendron periclymenoides* (pink azalea), *Rubus hispidus* (bristly dewberry), *Schoenoplectus pungens* var. *pungens* (common threesquare), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed), *Thelypteris noveboracensis* (New York fern), *Typha latifolia* (broadleaf cattail), *Viola* x *primulifolia* (primroseleaf violet).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	S3	=	1	*Hypericum* densiflorum / Juncus effusus / Sphagnum spp. short shrub peatland	Byers et al. 2007

Local Range: Beaver-influenced wetlands are scattered on plateaus from Kate's Branch north, and it is likely that this association occurs in at least small patches across this same range. However, plots have only been sampled from Kate's Branch wetland, and it is possible that this association is confined to this one site.
Classification Comments: In a previous report (Vanderhorst 2001b), this association was combined with *Alnus serrulata* (smooth alder) Saturated Southern Shrubland (CEGL003912) based on data from Kate's Branch wetland due to the close proximity of patches dominated by *Alnus serrulata* (smooth alder) and *Hypericum densiflorum* (bushy St. Johnswort) and co-occurrence of both species in patches dominated by either. However, elsewhere in the park and elsewhere in West Virginia, either species can dominate stands where the other is lacking. For this reason, we recognize two associations and distinguish between the two using relative cover of the two dominant shrubs. Shrub swamps dominated by *Hypericum densiflorum* (bushy St. Johnswort) have also been described from the Allegheny Mountains of West Virginia where they occur in beaver-influenced wetlands, along stream margins, and on abandoned pastureland (Fortney 1975, Walbridge 1982, Walbridge and Lang 1982).
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.16, NERI.296, NERI.300, NERI.301.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Saturated cold-deciduous shrubland (III.B.2.N.g.)
Alliance	*Alnus serrulata* Saturated Shrubland Alliance (A.1014)
Alliance (English name)	Smooth Alder Saturated Shrubland Alliance

Association *Hypericum densiflorum / Rubus hispidus* Shrubland
Association (English name) Bushy St. John's-wort / Bristly Dewberry Shrubland
Ecological System(s): High Allegheny Wetland (CES202.069).

GLOBAL DESCRIPTION

Concept Summary: This shrub swamp occurs in naturally or anthropogenically disturbed headwater wetlands in the Central Appalachians, Cumberlands, and perhaps adjacent ecoregions. It is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* (sphagnum) spp. Shrub associates include *Viburnum nudum var. cassinoides* (withe-rod), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing trailing vine *Rubus hispidus* (bristly dewberry) is characteristic in the ground layer. The herbaceous stratum is well-developed with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda cinnamomea var. cinnamomea* (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia var. scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). *Sphagnum* (sphagnum) spp. and *Polytrichum commune* (polytrichum moss) are the dominant bryophytes, averaging around 50% cover.

Environmental Description: This successional shrub peatland occurs on saturated, temporarily flooded, and semipermanently flooded soils in headwater basins of the Allegheny Mountain region, New River Gorge National River, Meadow River wetlands, and probably elsewhere in the region, at elevations from 700-1200 m. It is a small-patch type that occupies very gently sloping (0- to 2-degree slopes) land in beaver-influenced wetlands, drying oxbows, and on former pastureland or disturbed ground. It is fed primarily by seepage flow and rainfall, and it may occasionally receive low-energy flooding from meandering headwater streams. Microtopography may or may not include hummock-and-hollow development, depending on the amount of decaying woody debris and peat formation. Bedrock is highly variable and may consist of sandstone, shale, limestone, or Quaternary alluvium. Soils are variable, including poorly drained peat, clay loam, silt loam, or sandy loam. Hydric soil indicators include Histosols, sandy redox, stripped matrix, depleted matrix, redox depressions, and alluvial depleted matrix. Depth of organic soil varies from 0-40 cm (n=9). Soil pH averages 4.2 (n=6). Pore water pH ranges from 4.1-6.3, with an average of 4.5, and electrical conductivity of pore water averages 49 (n=10). Soil chemistry is characterized by high Cu, Fe, Na; moderate Al, B, H, K; and low organic matter, Ca, ENR, Mg, Mn, P, S, TEC, Zn (n=6). The unvegetated surface is predominantly litter, with an average of 4% downed wood, 10% standing water, and occasional patches of bare soil (Byers et al. 2007).

Vegetation Description: This shrub swamp is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* (sphagnum) spp. Cover by *Hypericum densiflorum* (bushy St. Johnswort) in plots ranges from 5 to 80% in the tall-shrub layer and from 5 to 80% cover in the short-shrub layer. Additional shrub species with relatively high constancy but less cover include *Viburnum nudum var. cassinoides* (withe-rod), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing trailing vine *Rubus hispidus* (bristly dewberry) has high constancy and cover in the plots. The herbaceous stratum averages 65% cover with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda*

cinnamomea var. cinnamomea (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia var. scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). Locally abundant herbaceous species include *Carex intumescens* (greater bladder sedge) and *Onoclea sensibilis* (sensitive fern). Nonvascular plants average 50% cover and are typically dominated by *Sphagnum recurvum* (recurved sphagnum), *Sphagnum affine* (sphagnum), other *Sphagnum* (sphagnum) spp., and *Polytrichum commune* (polytrichum moss). Indicator species that help to distinguish this community from others within the shrubland physiognomy in West Virginia include *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush), and *Scirpus cyperinus* (woolgrass). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters, with most of the diversity in the herbaceous stratum (Byers et al. 2007).

Most Abundant Species:

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Hypericum densiflorum* (bushy St. Johnswort)
Herb (field)	Vine/Liana	*Rubus hispidus* (bristly dewberry)

Characteristic Species: *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: Currently this association is documented only from West Virginia, but it may be more widely distributed in the Central Appalachians and adjacent ecoregions.

States/Provinces: WV:S3.

Federal Lands: NPS (New River Gorge); USFS (Monongahela); USFWS (Canaan Valley).

CONSERVATION STATUS

Rank: GNR (6-Jun-2006).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: This description is based on 31 West Virginia plots, classified as part of a 2006 analysis of palustrine plots statewide. The type clusters and ordinates very loosely, indicating its broad ecological amplitude and successional status. It has been sampled across a fairly wide range of environments in West Virginia. Indicator species that help to distinguish this community from other West Virginia shrublands include *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush), and *Scirpus cyperinus* (woolgrass).

Similar Associations:

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912).

Related Concepts:

- *Hypericum densiflorum* low shrub community (Walbridge 1982) F
- *Hypericum densiflorum* thicket community (Fortney 1975) =
- *Sphagnum recurvum* - *Polytrichum commune* - *Hypericum densiflorum* hummock hollow community (Walbridge 1982) F

SOURCES

Description Authors: E. Byers, mod. S. C. Gawler.

References: Byers et al. 2007, Eastern Ecology Working Group n.d., Fortney 1975, Vanderhorst 2001b, Vanderhorst et al. 2007, Walbridge 1982, Walbridge and Lang 1982.

COMMON NAME (PARK-SPECIFIC): OLD FIELD

SYNONYMS
NVC English Name: **(Tall Fescue, Meadow Fescue) Herbaceous Vegetation**
NVC Scientific Name: ***Lolium (arundinaceum, pratense)* Herbaceous Vegetation**
NVC Identifier: **CEGL004048**

LOCAL INFORMATION

Environmental Description: This association occurs in areas which have been cleared in the past, including abandoned farmlands, strip mines, and other areas disturbed by human activities. Herbaceous physiognomy of most occurrences is no longer actively maintained by human management but represents early-successional semi-natural vegetation. Some occurrences may be occasionally mowed or be subject to occasional or light grazing by livestock. The dominant grasses and legumes are usually of exotic origin and may have been planted or may have colonized the site. The five sampled plots occur on a variety of landforms on shales of the Mauch Chunk group and on sandstones of the Pottsville group. Soils in the plots were described as well-drained or moderately well-drained clay, silt loam, and clay loam, but soil characteristics across the range of the type are likely to be highly variable depending on topographic position and underlying geology. Elevations of the sampled plots range from 418 to 718 m.
Vegetation Description: This association represents early-successional herbaceous and herb-shrub vegetation dominated by or having a large component of exotic grasses and legumes. The five sampled plots represent a range of physiognomy related to successional stages. In one stand which is periodically mowed by NPS to maintain the appearance of an historic farmstead, woody encroachment is restricted to low cover by *Toxicodendron radicans* (eastern poison ivy) and species of *Rubus* (blackberry), both of which become more abundant in older stands. The woody component increases in cover, height, and species diversity as stands age. Shrub cover in the plots ranges from 0 to 10%; species in the shrub layers include *Crataegus crus-galli* (cockspur hawthorn), *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Rosa multiflora* (multiflora rose), *Robinia pseudoacacia* (black locust), *Cornus florida* (flowering dogwood), *Elaeagnus umbellata var. parvifolia* (autumn olive), *Sambucus nigra ssp. canadensis* (common elderberry), and *Sassafras albidum* (sassafras). Additional woody species in the herb layer of plots include *Acer negundo* (box-elder), *Acer rubrum* (red maple), *Ilex opaca var. opaca* (American holly), *Liriodendron tulipifera* (tuliptree), *Prunus serotina var. serotina* (black cherry), *Smilax glauca* (cat greenbrier), and species of *Vitis* (grape). The dominant exotic grasses include *Agrostis gigantea* (redtop), *Dactylis glomerata ssp. glomerata* (orchardgrass), *Holcus lanatus* (common velvetgrass), *Lolium pratense* (meadow ryegrass), *Phleum pratense* (timothy), and *Poa pratensis ssp. pratensis* (Kentucky bluegrass). Exotic legumes include *Lespedeza cuneata* (Chinese lespedeza), *Trifolium campestre* (field clover), *Trifolium hybridum* (alsike clover), *Trifolium pratense* (red clover), and *Trifolium repens* (white clover). Exotic herbs with high constancy include *Achillea millefolium var. occidentalis* (western yarrow), *Calystegia sepium* (hedge false bindweed), *Daucus carota* (Queen Anne's lace), *Leucanthemum vulgare* (oxeye daisy), *Oxalis stricta* (common yellow oxalis), and *Plantago lanceolata* (narrowleaf plantain). Common native herbs include *Apocynum cannabinum* (Indianhemp), *Desmodium canescens* (hoary ticktrefoil), *Dichanthelium clandestinum* (deertongue), *Erigeron annuus* (eastern daisy fleabane), *Fragaria virginiana ssp. virginiana* (Virginia strawberry), *Packera anonyma* (Small's ragwort), *Potentilla simplex* (common cinquefoil), *Solanum carolinense var.*

carolinense (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), and *Verbesina occidentalis* (yellow crownbeard). Vascular plant species richness in the 6 sampled plots ranges from 28 to 44 (mean = 35.8).

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Agrostis gigantea* (redtop), *Dactylis glomerata* ssp. *glomerata* (orchardgrass), *Holcus lanatus* (common velvetgrass), *Lolium pratense* (meadow ryegrass), *Phleum pratense* (timothy), *Poa pratensis* ssp. *pratensis* (Kentucky bluegrass)

Characteristic Species: *Achillea millefolium* var. *occidentalis* (western yarrow), *Apocynum cannabinum* (Indianhemp), *Calystegia sepium* (hedge false bindweed), *Daucus carota* (Queen Anne's lace), *Desmodium canescens* (hoary ticktrefoil), *Dichanthelium clandestinum* (deertongue), *Erigeron annuus* (eastern daisy fleabane), *Fragaria virginiana* ssp. *virginiana* (Virginia strawberry), *Lespedeza cuneata* (Chinese lespedeza), *Leucanthemum vulgare* (oxeye daisy), *Oxalis stricta* (common yellow oxalis), *Plantago lanceolata* (narrowleaf plantain), *Potentilla simplex* (common cinquefoil), *Solanum carolinense* var. *carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Toxicodendron radicans* (eastern poison ivy), *Trifolium campestre* (field clover), *Trifolium hybridum* (alsike clover), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Verbesina occidentalis* (yellow crownbeard).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNA	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs on old farmland, strip mines, and other disturbed areas throughout the park.

Classification Comments: Information not available.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.58, NERI.59, NERI.60, NERI,106, NERI.109, NERI.287.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	*Lolium (arundinaceum, pratense)* Herbaceous Alliance (A.1213)
Alliance (English name)	(Tall Fescue, Meadow Ryegrass) Herbaceous Alliance
Association	*Lolium (arundinaceum, pratense)* Herbaceous Vegetation
Association (English name)	(Tall Fescue, Meadow Fescue) Herbaceous Vegetation
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. The dominant species in this type are the European "tall or meadow fescues" of uncertain and controversial generic placement. Several other exotic grasses (*Agrostis gigantea* (redtop), *Dactylis glomerata* (orchardgrass), *Holcus lanatus* (common velvetgrass), *Phleum pratense* (timothy), and *Poa pratensis* (Kentucky bluegrass), for example) are common associates. These communities are sometimes nearly monospecific but can also be very diverse and contain many native as well as exotic species of grasses, sedges, and forbs. Exotic forbs include the legumes *Lespedeza cuneata* (Chinese lespedeza), *Trifolium campestre* (field clover), *Trifolium hybridum* (alsike clover), *Trifolium pratense* (red clover), and *Trifolium repens* (white clover), as well as *Achillea millefolium* (common yarrow), *Calystegia sepium* (hedge false bindweed), *Daucus carota* (Queen Anne's lace), *Leucanthemum vulgare* (oxeye daisy), *Oxalis stricta* (common yellow oxalis), and *Plantago lanceolata* (narrowleaf plantain). Common native herbs include *Apocynum cannabinum* (Indianhemp), *Desmodium canescens* (hoary ticktrefoil), *Dichanthelium clandestinum* (deertongue), *Erigeron annuus* (eastern daisy fleabane), *Fragaria virginiana* (Virginia strawberry), *Potentilla simplex* (common cinquefoil), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), and *Verbesina occidentalis* (yellow crownbeard). This vegetation is currently defined for the central and southern Appalachians, Ozarks, Ouachita Mountains, and parts of the Piedmont and Interior Low Plateau, but it is possible throughout much of the eastern United States and southern Canada.

Environmental Description: This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. It occurs in areas which have been cleared in the past, including abandoned farmlands, strip mines, and other areas disturbed by human activities.

Vegetation Description: This association represents early-successional herbaceous and herb-shrub vegetation dominated by or having a large component of exotic grasses and legumes. The dominant species in this association are the European "tall or meadow fescues" (*Lolium* (Ryegrass) spp.). These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs. Woody encroachment is restricted to low cover by *Toxicodendron radicans* (eastern poison ivy) and species of *Rubus* (blackberry), both of which become more abundant in older stands. Scattered individuals of various shrubs may be present, including *Crataegus crus-galli* (cockspur hawthorn), *Fraxinus pennsylvanica* (green ash), *Fraxinus americana* (white ash), *Rosa multiflora* (multiflora rose), *Robinia pseudoacacia* (black locust), *Cornus florida* (flowering dogwood), *Elaeagnus umbellata* (autumn olive), *Sambucus canadensis* (common elderberry), and *Sassafras albidum* (sassafras). In the Central Appalachians and northern Cumberlands, the dominant exotic grasses include *Agrostis gigantea* (redtop), *Dactylis glomerata* (orchardgrass), *Holcus lanatus* (common velvetgrass), *Lolium pratense* (meadow ryegrass), *Phleum pratense* (timothy), and *Poa pratensis* (Kentucky bluegrass). Exotic forbs include the legumes *Lespedeza cuneata* (Chinese lespedeza), *Trifolium campestre* (field clover), *Trifolium hybridum* (alsike clover), *Trifolium pratense* (red clover), and *Trifolium repens* (white clover), as well as *Achillea millefolium* (common yarrow), *Calystegia sepium* (hedge false bindweed), *Daucus carota* (Queen Anne's lace), *Leucanthemum vulgare* (oxeye daisy), *Oxalis stricta* (common yellow oxalis), and *Plantago lanceolata* (narrowleaf plantain). Common native herbs include *Apocynum cannabinum* (Indianhemp), *Desmodium canescens* (hoary ticktrefoil), *Dichanthelium clandestinum* (deertongue), *Erigeron*

annuus (eastern daisy fleabane), *Fragaria virginiana* (Virginia strawberry), *Potentilla simplex* (common cinquefoil), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), and *Verbesina occidentalis* (yellow crownbeard). In the Black Belt region of Alabama and Mississippi, it is commonly found in mixture with *Paspalum dilatatum* (dallisgrass) (Bransby n.d.), and the exotic *Bromus tectorum* (cheatgrass) may be present in stands.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Agrostis gigantea* (redtop), *Phleum pratense* (timothy)

Characteristic Species: *Achillea millefolium* (common yarrow), *Apocynum cannabinum* (Indianhemp), *Calystegia sepium* (hedge false bindweed), *Dactylis glomerata* (orchardgrass), *Daucus carota* (Queen Anne's lace), *Desmodium canescens* (hoary ticktrefoil), *Dichanthelium clandestinum* (deertongue), *Erigeron annuus* (eastern daisy fleabane), *Fragaria virginiana* (Virginia strawberry), *Holcus lanatus* (common velvetgrass), *Lespedeza cuneata* (Chinese lespedeza), *Leucanthemum vulgare* (oxeye daisy), *Oxalis stricta* (common yellow oxalis), *Plantago lanceolata* (narrowleaf plantain), *Poa pratensis* (Kentucky bluegrass), *Potentilla simplex* (common cinquefoil), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Trifolium hybridum* (alsike clover), *Trifolium pratense* (red clover), *Trifolium repens* (white clover).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is currently documented from the southern half of the Central Appalachians through the Gulf Coastal Plain and west to the Ozarks and Ouachitas. It is possible throughout much of the eastern United States.

States/Provinces: AL, AR, GA, KY, MD, MO, MS, NC, OK, SC, TN, VA, WV.

Federal Lands: NPS (Big South Fork, Blue Ridge Parkway, Buffalo River, Carl Sandburg Home, Chickamauga-Chattanooga, Cowpens, Cumberland Gap, Fort Donelson, Great Smoky Mountains, Guilford Courthouse, Kings Mountain, Lincoln Birthplace, Mammoth Cave, Natchez Trace, New River Gorge, Ninety Six, Obed, Russell Cave, Shiloh, Stones River, Thomas Stone, Vicksburg); USFS (Cherokee, Ouachita, Ouachita (Coastal Plain)?, Ouachita (Mountains), Ozark).

CONSERVATION STATUS

Rank: GNA (invasive) (5-Jan-2000).

Reasons: This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: *Lolium pratense* (meadow ryegrass) and *Lolium arundinaceum* (tall fescue) are two closely related species which were traditionally treated as *Festuca pratensis* and *Festuca arundinacea*, and could alternately be treated as *Schedonorus pratensis* and *Schedonorus arundinaceus*. Conversion to Kartesz (1999) standard has necessitated the shift to the *Lolium* (Ryegrass) names from *Festuca* (fescue).

Similar Associations:

- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Herbaceous Vegetation (CEGL006107).
- *Schizachyrium scoparium* - *Solidago* spp. Herbaceous Vegetation (CEGL006333).

Related Concepts:

- *Festuca pratensis* - *(Holcus lanatus)* - *Solidago canadensis* herbaceous vegetation (Vanderhorst 2001b) =
- Cleared Areas (Schmalzer and DeSelm 1982) B

SOURCES

Description Authors: A. S. Weakley, mod. S. C. Gawler.

References: Bransby n.d., Heath et al. 1973, Hoagland 2000, Kartesz 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): RIVERSCOUR PRAIRIE

SYNONYMS

NVC English Name:	**Big Bluestem - Switchgrass - Tall Blue Wild Indigo Herbaceous Vegetation**
NVC Scientific Name:	***Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation**
NVC Identifier:	**CEGL006283**

LOCAL INFORMATION

Environmental Description: This association occurs along the shores of the New River in positions that are subject to frequent high-energy flooding, usually within the active channel shelf along rapids. These positions are prone to dramatic restructuring by large floods, and patches of this association may be ephemeral. Floods maintain herbaceous physiognomy by damaging and removing woody vegetation. Substrates can include bedrock, boulders, and cobble, with gravel and sand accumulations but no soil development. These coarse-textured substrates are potentially well-drained, but fluvial topography and a high water table often result in a mixture of well-drained and poorly drained microsites. Occurrences on flat bedrock often develop scoured-out potholes which hold flood and rain water; vegetation is confined to cracks and sediment accumulations. Soil (sand) chemistry analyzed from one plot indicates very slight acidity (pH = 6.4) with relatively low levels of organic matter and relatively high levels of Ca, Mg, Mn, and Zn. Slopes range from nearly level to somewhat steep but are typically gentle (mapping unit values range from 0.3 to 24 degrees, mean = 7 degrees). Elevations of mapped stands range from 288 to 397 m. Adjacent positions with somewhat less severe flooding regime are usually occupied by *Platanus occidentalis - (Betula nigra*, *Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725).

Vegetation Description: This association represents herbaceous or herb-shrub vegetation dominated by tall, warm-season grasses. There may be low cover (10% or less in plots) by trees, which are usually short and flood-battered, including *Betula nigra* (river birch), *Chionanthus virginicus* (white fringetree), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (Sycamore), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Cover in the shrub layers of plots ranges from 15 to 20%, which includes short individuals of the tree species and shrub species, including *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). Low-growing vines with high cover and/or constancy include *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis rupestris* (sand grape). Cover in the herb layer of plots ranges from 20 to 80%. Dominant grasses include *Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), and *Sorghastrum nutans* (Indiangrass). Additional herbs with high cover and/or constancy include *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Chasmanthium latifolium* (Indian woodoats), *Coreopsis tripteris* (tall tickseed), *Cyperus strigosus* (strawcolored flatsedge), *Eupatorium fistulosum* (trumpetweed), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Ludwigia alternifolia* (seedbox), *Potentilla simplex* (common cinquefoil), *Rhynchospora capitellata* (brownish beaksedge), *Solidago juncea var. juncea* (early goldenrod), *Symphyotrichum laeve* (smooth blue aster), *Viola cucullata* (marsh blue violet), and

Zizia trifoliata (meadow alexanders). State-rare plants tracked by West Virginia Natural Heritage Program which have been documented in this community in vegetation plots or by past surveys include *Aristida purpurascens var. purpurascens* (arrowfeather threeawn), *Baptisia australis* (blue wild indigo), *Carex suberecta* (prairie straw sedge), *Eleocharis compressa* (flatstem spikerush), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Pycnanthemum torrei* (Torrey's mountainmint), *Rhynchospora recognita* (globe beaksedge), and *Vitis rupestris* (sand grape). Vascular plant species richness in the 7 sampled plots ranges from 23 to 66 (mean = 43.1). There may be low cover of mosses and lichens on rocks.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Baptisia australis* (blue wild indigo)
Herb (field)	Graminoid	*Andropogon gerardii* (big bluestem), *Panicum virgatum* (switchgrass), *Sorghastrum nutans* (Indiangrass)

Characteristic Species: *Alnus serrulata* (smooth alder), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Betula nigra* (river birch), *Campsis radicans* (trumpet creeper), *Cephalanthus occidentalis* (common buttonbush), *Chasmanthium latifolium* (Indian woodoats), *Chionanthus virginicus* (white fringetree), *Coreopsis tripteris* (tall tickseed), *Cornus amomum* (silky dogwood), *Cyperus strigosus* (strawcolored flatsedge), *Diospyros virginiana* (common persimmon), *Eupatorium fistulosum* (trumpetweed), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Hypericum prolificum* (shrubby St. Johnswort), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Ludwigia alternifolia* (seedbox), *Panicum virgatum* (switchgrass), *Platanus occidentalis* (sycamore), *Potentilla simplex* (common cinquefoil), *Rhynchospora capitellata* (brownish beaksedge), *Salix caroliniana* (coastal plain willow), *Solidago juncea* var. *juncea* (early goldenrod), *Sorghastrum nutans* (Indiangrass), *Symphyotrichum laeve* (smooth blue aster), *Toxicodendron radicans* (eastern poison ivy), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Viola cucullata* (marsh blue violet), *Vitis rupestris* (sand grape), *Zizia trifoliata* (meadow alexanders).

Other Noteworthy Species:

Species	GRank	Type	Note
Aristida purpurascens (arrowfeather threeawn)	-	plant	state-rare (S1)
Baptisia australis (blue wild indigo)	-	plant	state-rare (S3)
Carex suberecta (prairie straw sedge)	-	plant	state-rare (S1)
Eleocharis compressa (flatstem spikerush)	-	plant	state-rare (S2)
Helianthus occidentalis ssp. *occidentalis* (fewleaf sunflower)	-	plant	state-rare (S2)
Pycnanthemum torrei (Torrey's mountainmint)	G2	plant	state-rare (S1)
Rhynchospora recognita (globe beaksedge)	-	plant	state-rare (S2)
Vitis rupestris (sand grape)	G3	plant	state-rare (S1)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: In the park, this association occurs in a few small patches along the New River from Camp Brookside downstream to Keeney's Creek Rapids. Nearby, outside the park, it is found downstream along the New River at Cotton Hill and upstream along the Greenbrier River.

Classification Comments: Riverside prairies within the park are characterized by high cover and constancy of the nominal species *Andropogon gerardii* (big bluestem) and *Baptisia australis* (blue wild indigo). Similar communities have been observed along the Greenbrier River which empties into the New River upstream from the park and which may be one source of the high levels of Ca found in substrates of this and other riparian communities in the park. Riverscour prairies along other West Virginia rivers, including the Cheat (Vanderhorst 2001a, Vanderhorst and Streets 2006), Tygart Valley, Gauley, Bluestone, Shenandoah (Vanderhorst 2000b), and Potomac, usually lack *Baptisia australis* (blue wild indigo). Prairies along the Tygart Valley and Gauley rivers share a number of species which distinguish them from this association (e.g., *Osmunda regalis* (royal fern), *Packera paupercula* (balsam groundsel), *Solidago simplex* (Mt. Albert goldenrod), *Ilex verticillata* (common winterberry)), but this vegetation has not yet been described in the IVC.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.84, NERI.102, NERI.124, NERI.202, NERI.203, NERI.317, NERI.360.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	*Andropogon gerardii - (Sorghastrum nutans)* Temporarily Flooded Herbaceous Alliance (A.1337)
Alliance (English name)	Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance
Association	*Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation
Association (English name)	Big Bluestem - Switchgrass - Tall Blue Wild Indigo Herbaceous Vegetation
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609) Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This community is found in the east-central United States along high-gradient sections of major rivers, such as in gorges and along the fall-line. It usually occupies rocky areas within the active channel shelf at an intermediate level above the low-water level and the bank-full level. Flood scouring and ice floods are powerful and ecologically important abrasive forces that shape the physiognomy and composition of this association. Soils are rapidly drained Psamments. Often, soil material is restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. This community is characterized by a luxuriant growth of the robust grasses *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Panicum virgatum* (switchgrass), and *Spartina pectinata* (prairie cordgrass) which resembles prairie vegetation. *Tripsacum dactyloides* (eastern gamagrass) may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis* (blue

wild indigo), *Allium cernuum* (nodding onion), *Aristida purpurascens* (arrowfeather threeawn), *Bidens frondosa* (devil's beggartick), *Chasmanthium latifolium* (Indian woodoats), *Clematis viorna* (vasevine), *Eleocharis compressa* (flatstem spikerush), *Conoclinium coelestinum* (blue mistflower), *Eupatorium serotinum* (lateflowering thoroughwort), *Lespedeza violacea* (violet lespedeza), *Packera aurea* (golden ragwort), *Physostegia virginiana* (obedient plant), *Pycnanthemum virginianum* (Virginia mountainmint), *Solidago rupestris* (rock goldenrod), *Teucrium canadense* (Canada germander), *Veronicastrum virginicum* (Culver's root), *Zizia trifoliata* (meadow alexanders), and *Zizia aurea* (golden zizia). Scattered and flood-battered shrubs and tree saplings often occur.

Environmental Description: Stands occur along high-gradient sections of major rivers, such as in gorges and along the fall-line. They occupy rocky areas within the active channel shelf subject to frequent high-energy flooding, at an intermediate level above the low-water level and the bank-full level. These positions are prone to dramatic restructuring by large floods and patches of this association may be ephemeral. Flood scouring and ice floods are powerful and ecologically important abrasive forces that shape the physiognomy and composition of this association. Soils are rapidly drained Psamments, usually with neutral to high pH. These coarse-textured substrates are potentially well-drained, but fluvial topography and a high water table often result in a mixture of well-drained and poorly drained microsites. Occurrences on flat bedrock often develop scoured out potholes which hold flood and rain water, and vegetation is confined to cracks and sediment accumulations. Soil material is restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. However, along the Greenbrier and New rivers in West Virginia, stands of this type occupy cobble bars rather than stabilized outcrops and boulder deposits.

Vegetation Description: This community is characterized by a luxuriant growth of the robust grasses *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Panicum virgatum* (switchgrass), and *Spartina pectinata* (prairie cordgrass), which resembles prairie vegetation. *Tripsacum dactyloides* (eastern gamagrass) may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis* (blue wild indigo), *Allium cernuum* (nodding onion), *Aristida purpurascens* (arrowfeather threeawn), *Bidens frondosa* (devil's beggartick), *Chasmanthium latifolium* (Indian woodoats), *Clematis viorna* (vasevine), *Eleocharis compressa* (flatstem spikerush), *Conoclinium coelestinum* (blue mistflower), *Eupatorium serotinum* (lateflowering thoroughwort), *Lespedeza violacea* (violet lespedeza), *Packera aurea* (golden ragwort), *Physostegia virginiana* (obedient plant), *Pycnanthemum virginianum* (Virginia mountainmint), *Solidago rupestris* (rock goldenrod), *Teucrium canadense* (Canada germander), *Veronicastrum virginicum* (Culver's root), *Zizia trifoliata* (meadow alexanders), and *Zizia aurea* (golden zizia). Additional herbs with high cover and/or constancy in some areas include *Apocynum cannabinum* (Indianhemp), *Coreopsis tripteris* (tall tickseed), *Cyperus strigosus* (strawcolored flatsedge), *Eupatorium fistulosum* (trumpetweed), *Helianthus occidentalis ssp. occidentalis* (fewleaf sunflower), *Justicia americana* (American water-willow), *Lobelia cardinalis* (cardinalflower), *Ludwigia alternifolia* (seedbox), *Potentilla simplex* (common cinquefoil), *Pycnanthemum torrei* (Torrey's mountainmint), *Rhynchospora capitellata* (brownish beaksedge), *Rhynchospora recognita* (globe beaksedge), *Solidago juncea* (early goldenrod), *Symphyotrichum laeve* (smooth blue aster), and *Viola cucullata* (marsh blue violet). There may be low cover (≤ by trees, which are usually short and flood-battered, including *Betula nigra* (river birch), *Chionanthus virginicus* (white fringetree), *Diospyros virginiana* (common persimmon), *Fraxinus americana* (white ash),

Fraxinus pennsylvanica (green ash), *Platanus occidentalis* (Sycamore), *Ulmus americana* (American elm), and *Ulmus rubra* (slippery elm). Cover in the shrub layer is likewise low and includes short individuals of the tree and shrub species, including *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Cornus amomum* (silky dogwood), *Hypericum prolificum* (shrubby St. Johnswort), and *Salix caroliniana* (coastal plain willow). Low-growing vines include *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), and *Vitis rupestris* (sand grape). In the Potomac River drainage, *Solidago simplex var. racemosa* (Rand's goldenrod), *Helianthus occidentalis* (fewleaf sunflower), *Cerastium arvense var. velutinum* (field chickweed), and *Ceanothus herbaceus* (Jersey tea) are noteworthy components (Lea 2000). In the James River drainage, *Orbexilum pedunculatum var. psoralioides* (Sampson's snakeroot), *Silphium trifoliatum* (whorled rosinweed), *Solidago speciosa* (showy goldenrod), and *Vicia americana* (American vetch) are associated. Vascular plant species richness of sampled plots (Virginia and West Virginia sample sets) averages 43-56 taxa per 100 square meters.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass)

Characteristic Species: *Andropogon gerardii* (big bluestem), *Apocynum cannabinum* (Indianhemp), *Baptisia australis* (blue wild indigo), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Desmodium glabellum* (Dillenius' ticktrefoil), *Lespedeza violacea* (violet lespedeza), *Packera aurea* (golden ragwort), *Panicum virgatum* (switchgrass), *Physostegia virginiana* (obedient plant), *Sorghastrum nutans* (Indiangrass), *Spartina pectinata* (prairie cordgrass).

Other Noteworthy Species:

Species	GRank	Type	Note
Vicia americana (American vetch)	-	plant	VA S1S2

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is found in the east-central United States, from Pennsylvania, Maryland, West Virginia, and Virginia, and possibly Ohio.

States/Provinces: MD, OH, PA, VA:S1, WV.

Federal Lands: NPS (C&O Canal, New River Gorge); USFS (Jefferson).

CONSERVATION STATUS

Rank: G2G3 (14-Dec-1998).

Reasons: There are probably fewer than 100 occurrences of this community rangewide, depending on how an occurrence is defined. It is known from Maryland, the District of Columbia, and Virginia along the Potomac River, from the James River, Shenandoah River, and various tributaries in Virginia, and from scattered patches along about 50 miles along the Greenbrier River in West Virginia. It is also reported from the Delaware River in Pennsylvania and may also occur in Ohio. This community is threatened by invasion of exotic weeds, especially *Sorghum halepense* (Johnsongrass), *Centaurea biebersteinii* (spotted knapweed), and *Lythrum salicaria* (purple loosestrife).

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: The distinctions between this community type and *Salix* (willow) spp. / *Andropogon gerardii - Sorghastrum nutans* Gravel Wash Herbaceous Vegetation (CEGL005175) and *(Salix caroliniana, Rhododendron arborescens) - Andropogon gerardii - Baptisia australis - (Solidago simplex var. randii)* Herbaceous Vegetation (CEGL008471) seem quite artificial and further study should be undertaken to determine whether these merely represent geographic subtypes of a single association. In the Central Appalachian region, the type is found predominantly on Western Allegheny Mountains (M221Be + M221Bd, Gauley M221Ca dammed).

Similar Associations:

- *(Salix caroliniana, Rhododendron arborescens) - Andropogon gerardii - Baptisia australis - (Solidago simplex* var. *randii)* Herbaceous Vegetation (CEGL008471).
- *Andropogon gerardii - Phlox subulata - Solidago simplex* var. *racemosa - Packera paupercula* Herbaceous Vegetation (CEGL004284)--sparse vegetation of less frequently flooded, xeric rock outcrops.
- *Panicum virgatum - Andropogon gerardii* Gravel Wash Herbaceous Vegetation (CEGL006477)--on gravel and cobble depositional bars along lower-gradient rivershores.
- *Salix* spp. / *Andropogon gerardii - Sorghastrum nutans* Gravel Wash Herbaceous Vegetation (CEGL005175).

Related Concepts:

- *Andropogon gerardii - Baptisia australis* riparian herbaceous vegetation (Vanderhorst 2001b) =
- *Andropogon gerardii - Panicum virgatum - Rhus radicans - Baptisia australis* Association (Rawinski et al. 1996) =
- *Cornus amomum / Andropogon gerardii - Panicum virgatum - Baptisia australis* Shrub Herbaceous Vegetation (Fleming and Coulling 2001) =
- *Fraxinus pennsylvanica / Andropogon gerardii - Panicum virgatum - Baptisia australis* Wooded Herbaceous Vegetation (Lea 2000) =
- Riverwash Grasslands (*Baptisia australis - Lespedeza violacea - Chasmanthium latifolium* Herbaceous Vegetation) (Grossman et al. 1994) ?
- Willow - Indian grass riverine shrubland (Perles et al. 2004) B

SOURCES

Description Authors: L. A. Sneddon, mod. G. Fleming and P. Coulling, mod. S. C. Gawler.

References: Eastern Ecology Working Group n.d., Fike 1999, Fleming and Coulling 2001, Fleming et al. 2001, Grossman et al. 1994, Harrison 2004, Lea 2000, Perles et al. 2004, Rawinski 1988, Rawinski et al. 1996, TDNH unpubl. data, VDNH 2003, Vanderhorst 2000b, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): TWISTED SEDGE ROCKY CREEKBED

SYNONYMS
NVC English Name: **Twisted Sedge Herbaceous Vegetation**
NVC Scientific Name: ***Carex torta* Herbaceous Vegetation**
NVC Identifier: **CEGL004103**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches within the channel shelves of large, high-gradient tributaries of the New River. These positions are subject to frequent high-energy floods which can occur at any time of year. The rooting zone of the nominal species *Carex torta* (twisted sedge) is typically semipermanently saturated and temporarily flooded. Substrates consist of boulders, cobbles, gravel, and sand. The community is usually partially shaded by overhanging trees. Elevations of sampled plots range from 398 to 541 m. This community is most abundant on tributaries which support stands of *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861) along their banks.
Vegetation Description: This association represents herbaceous vegetation strongly dominated by *Carex torta* (twisted sedge). It is usually partially shaded by overhanging trees. The three plots in the park were placed to sample a broader community than the more strictly herbaceous type concept of the global description and thus include a mixture of woody and herbaceous species, including both upland and wetland indicators. However, wetland and flood-adapted species are emphasized in this description. The most abundant canopy tree species in plots are *Betula alleghaniensis var. alleghaniensis* (yellow birch) and *Platanus occidentalis* (sycamore). Shrubs which occur on the edges of the community include *Alnus serrulata* (smooth alder), *Cornus amomum* (silky dogwood), *Rhododendron arborescens* (smooth azalea), and *Rhododendron maximum* (great laurel). Cover by *Carex torta* (twisted sedge) in the plots ranges from 5 to 10% consisting of dense monospecific patches. Additional characteristic herbs which occur in lesser amounts include *Eupatorium fistulosum* (trumpetweed), *Helenium autumnale var. autumnale* (common sneezeweed), *Houstonia caerulea* (azure bluet), *Hypericum mutilum* (dwarf St. Johnswort), *Lobelia cardinalis* (cardinalflower), *Prunella vulgaris* (common selfheal), *Solidago canadensis* (Canada goldenrod), *Symphyotrichum prenanthoides* (crookedstem aster), *Trautvetteria caroliniensis var. caroliniensis* (Carolina bugbane), and *Viola cucullata* (marsh blue violet). Vascular plant species richness in the 3 sampled plots ranges from 32 to 48 (mean = 38.3). The moss *Climacium americanum* (American climacium moss) has 10% cover in one plot.
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta* (twisted sedge)

Characteristic Species: *Alnus serrulata* (smooth alder), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Climacium americanum* (American climacium moss), *Cornus amomum* (silky dogwood), *Eupatorium fistulosum* (trumpetweed), *Helenium autumnale* var. *autumnale* (common sneezeweed), *Houstonia caerulea* (azure bluet), *Hypericum mutilum* (dwarf St. Johnswort), *Lobelia cardinalis* (cardinalflower), *Platanus occidentalis* (sycamore), *Prunella vulgaris* (common selfheal), *Rhododendron arborescens* (smooth azalea), *Rhododendron maximum* (great laurel), *Solidago canadensis* (Canada goldenrod), *Symphyotrichum*

prenanthoides (crookedstem aster), *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Viola cucullata* (marsh blue violet).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	S3	=	1	*Carex torta* riverscour prairie	Byers et al. 2007

Local Range: This association was sampled along Glade Creek and Mann's Creek but may also occur in small patches along other large tributaries in the park.
Classification Comments: The three plots in the park were placed to sample a broader community than the strictly herbaceous type concept of the global description and thus include a mixture of woody and herbaceous species, including both upland and wetland indicators.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.38, NERI.311, NERI.313.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	*Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
Alliance (English name)	Twisted Sedge Temporarily Flooded Herbaceous Alliance
Association	*Carex torta* Herbaceous Vegetation
Association (English name)	Twisted Sedge Herbaceous Vegetation
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609)
	Cumberland Riverscour (CES202.036)
	Central Appalachian River Floodplain (CES202.608)
	South-Central Interior Large Floodplain (CES202.705)
	South-Central Interior Small Stream and Riparian (CES202.706)

GLOBAL DESCRIPTION

Concept Summary: This association accommodates herbaceous alluvial wetlands in which *Carex torta* (twisted sedge) is a dominant or characteristic species. It occupies sand, gravel, and rock bars along small rivers and streams in valleys and gorges in the Southern Appalachians, ranging west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. This association is characterized by light-requiring, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* (twisted sedge) often forms dense, extensive colonies. Associated species vary with geography but can include *Polygonum sagittatum* (arrowleaf tearthumb), *Dichanthelium clandestinum* (deertongue), *Solidago rugosa ssp. aspera* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Equisetum arvense* (field horsetail), *Onoclea sensibilis* (sensitive fern), *Vernonia noveboracensis* (New York ironweed), *Lycopus virginicus* (Virginia water horehound), *Lobelia cardinalis* (cardinalflower), *Symphyotrichum dumosum* (rice button aster),

Lycopus virginicus (Virginia water horehound), *Osmunda regalis* (royal fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eupatorium fistulosum* (trumpetweed), *Solidago patula* (roundleaf goldenrod), *Boehmeria cylindrica* (smallspike false nettle), *Amphicarpaea bracteata* (American hogpeanut), *Acalypha rhomboidea* (Virginia threeseed mercury), *Hypericum mutilum* (dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), and *Symphyotrichum lateriflorum* (calico aster). Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (Sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (smooth alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy may include *Platanus occidentalis* (Sycamore), *Betula alleghaniensis var. alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and other weedy exotics.

Environmental Description: This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Flooding duration is probably similar to that documented along Passage Creek in Shenandoah County, Virginia, by Hupp (1982). In that drainage, the channel shelf was inundated approximately 15% of the time. Elevations in West Virginia range from 390-1200 m. Soils are moderately to poorly drained sand with pH averaging 6.5 (n=5). Organic soils are not present. Soil chemistry is characterized by high Cu, Mn; moderate B, Ca, Mg; and low Al, ENR, Fe, H, K, Na, P, S, TEC, Zn, and organic matter (n=3).

Vegetation Description: Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* (twisted sedge) is usually the dominant species and typically forms dense, extensive colonies. Associated species vary with geography. *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod), and *Dichanthelium clandestinum* (deertongue) are typical; others include *Acalypha rhomboidea* (Virginia threeseed mercury), *Amphicarpaea bracteata* (American hogpeanut), *Boehmeria cylindrica* (smallspike false nettle), *Equisetum arvense* (field horsetail), *Eupatorium fistulosum* (trumpetweed), *Euthamia graminifolia var. graminifolia* (flat-top goldentop), *Juncus effusus* (common rush), *Hypericum mutilum* (dwarf St. Johnswort), *Hypericum perforatum* (common St. Johnswort), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Prunella vulgaris* (common selfheal), *Solidago patula* (roundleaf goldenrod), *Symphyotrichum dumosum* (rice button aster), *Symphyotrichum lateriflorum* (calico aster), *Symphyotrichum prenanthoides* (crookedstem aster), *Thalictrum* (meadow-rue) spp., *Trautvetteria caroliniensis var. caroliniensis* (Carolina bugbane), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). Cover by nonvascular plants is insignificant. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (Sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (smooth alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy with an average cover of 20% may include *Platanus occidentalis* (Sycamore), *Betula alleghaniensis var. alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Sparse

overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and other weedy exotics. Mean species richness of vascular plants in six West Virginia plots was 36 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex torta* (twisted sedge)

Characteristic Species: *Carex torta* (twisted sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont.

States/Provinces: AL, DE:S1?, GA, KY, MD, NC, PA, SC, TN, VA:S2?, WV:S3.

Federal Lands: NPS (Blue Ridge Parkway?, C&O Canal, Catoctin Mountain, Great Smoky Mountains, New River Gorge, Prince William); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)).

CONSERVATION STATUS

Rank: G3G4 (21-Jan-2000).

Reasons: This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. Although this community has a moderately large geographic range, it is uncommon within its range and occurrences are small. This community is more common than the number of documented occurrences would suggest, since it is often overlooked in inventories.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: Information not available.

Similar Associations:

- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation (CEGL006536).

Related Concepts:

- *Carex torta* Association (Fleming and Moorhead 1996) ?
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001) ?
- *Carex torta* riparian herbaceous vegetation (Vanderhorst 2001b) =
- *Carex torta* riverscour prairie (Byers et al. 2007) =
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B
- Riverine Upper and Lower Perennial Beach/Bar, Cobble/Gravel, Seasonally Flooded (R2and3BB1C) (Cowardin et al. 1979) ?

- Riverine Upper and Lower Perennial Beach/Bar, Sand, Seasonally Flooded (R2and3BB2C) (Cowardin et al. 1979) ?
- Rocky Bar and Shore (Twisted Sedge Subtype) (Schafale 1998b) ?
- Sedge - spotted joe pye weed riverine herbaceous vegetation (Perles et al. 2004) =
- Torturous sedge gravel rivershore (CAP pers. comm. 1998) ?

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. G. Fleming and S. C. Gawler.

References: Allard 1990, Bowman 2000, Byers et al. 2007, CAP pers. comm. 1998, Cowardin et al. 1979, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Fleming et al. 2004, Hupp 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, Palmer-Ball et al. 1988, Peet et al. unpubl. data 2002, Perles et al. 2004, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Schafale pers. comm., Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): RICE CUTGRASS MARSH

SYNONYMS
NVC English Name: **Rice Cutgrass - Broadleaf Arrowhead Herbaceous Vegetation**
NVC Scientific Name: ***Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation**
NVC Identifier: **CEGL006461**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches in wetlands influenced by beaver activity. It is an early-successional wetland type and patches may be ephemeral, but it is likely to be present on the landscape as long as a beaver -influenced disturbance regime persists. It may also develop on wetland sites disturbed by human activities. The one plot-sampled stand occurs in the bottom of an abandoned beaver pond. Soil was described as moist clay with mottling in the A horizon. Slopes range from level to moderate but are typically gentle (beaver-influenced wetland mapping unit values range from 0 to 16 degrees, mean = 6 degrees). Elevations of mapped stands of the beaver-influenced wetland mapping unit, which includes this association, range from 528 to 801 m. This community is likely to occur in patchy mosaics with other wetland associations, including *Alnus serrulata* (smooth alder) Saturated Southern Shrubland (CEGL003912), *Hypericum densiflorum* (bushy St. Johnswort) Shrubland (CEGL006464), and *Sparganium americanum* - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510).
Vegetation Description: This association represents herbaceous vegetation strongly dominated by *Leersia oryzoides* (rice cutgrass). Herbaceous cover in the one sampled stand was estimated at 100%, with 75% cover by *Leersia oryzoides* (rice cutgrass). Additional herbs in the plot include *Callitriche heterophylla ssp. heterophylla* (twoheaded water-starwort), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex debilis var. rudgei* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia virginica* (whitegrass), *Lycopus uniflorus var. uniflorus* (northern bugleweed), *Sparganium* (bur-reed) sp., and *Thelypteris noveboracensis* (New York fern). Vascular plant species richness in the 1 sampled plot is 19.
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Leersia oryzoides* (rice cutgrass)

Characteristic Species: *Callitriche heterophylla* ssp. *heterophylla* (twoheaded water-starwort), *Carex baileyi* (Bailey's sedge), *Carex crinita* (fringed sedge), *Carex debilis* var. *rudgei* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia virginica* (whitegrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Thelypteris noveboracensis* (New York fern).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	S3	=	1	Leersia oryzoides - Sagittaria latifolia marsh	Byers et al. 2007

Local Range: Beaver-influenced wetlands are scattered on plateaus from Kate's Branch north, and it is likely that this association occurs in at least small patches across this same range.

However, this type has only been sampled or observed at one site along Poll's Branch, and it is possible that this association is confined to this one site.
Classification Comments: Herbaceous wetland vegetation dominated by *Leersia oryzoides* (rice cutgrass) is well-documented in West Virginia from wetlands along the Meadow River (Putnam 1995), Ohio River (Walton et al. 1996), and Tygart Valley River (Grafton and Eye 1982), and from high-elevation wetlands in the Alleghany Mountains (Walbridge 1982, Walbridge and Lang 1982, Byers et al. 2007).
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.44.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
Alliance (English name)	Rice Cutgrass - Fowl Mannagrass Seasonally Flooded Herbaceous Alliance
Association	*Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation
Association (English name)	Rice Cutgrass - Broadleaf Arrowhead Herbaceous Vegetation
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

GLOBAL DESCRIPTION

Concept Summary: This community occupies wet alluvial bottomlands and beaver ponds in the Central Appalachians and adjacent ecoregions. Parent materials are alluvium derived mainly from acidic sandstones and shales. Surface soils are poorly drained, acidic clay loams. This small-patch wetland community is dominated by grasses and forbs, with scattered trees and shrubs. The dominant grasses are *Leersia oryzoides* (rice cutgrass) and *Phalaris arundinacea* (reed canarygrass) with *Leersia* (cutgrass) strongly dominant at most sites. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover, except at higher elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional characteristic herbs include *Boehmeria cylindrica* (smallspike false nettle), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex baileyi* (Bailey's sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Eupatorium fistulosum* (trumpetweed), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lobelia siphilitica* (great blue lobelia), *Ludwigia palustris* (marsh seedbox), *Lycopus uniflorus* (northern bugleweed), *Lycopus virginicus* (Virginia water horehound), *Lysimachia terrestris* (earth loosestrife), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus atrovirens* (green bulrush), and *Typha latifolia* (broadleaf cattail). Areas with longer standing water may have aquatic species, including *Callitriche heterophylla* (twoheaded water-starwort) and *Sparganium* (bur-reed) spp. Scattered

small trees include *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), and *Fraxinus pennsylvanica* (green ash). The exotic shrub *Rosa multiflora* (multiflora rose) is sometimes invasive in this community. *Cornus amomum* (silky dogwood) is a characteristic native shrub.

Environmental Description: This community occupies wet alluvial bottomlands, beaver ponds, and disturbed flats in the Central Appalachians and adjacent ecoregions. Parent materials at documented sites are alluvium derived mainly from acidic sandstones and shales. Surface soils described from sampled plots are somewhat to very poorly drained clay, clay loam, muck, sandy clay, sandy loam, or silty clay. Hydric soil indicators include Histosols, histic epipedon, depleted matrix, and redox depressions. Soil pH averages 4.0 (n=2). The unvegetated surface is predominantly litter, with small amounts of downed wood and standing water, and frequent patches of bare soil. Elevations of documented stands range up to 1300 m.

Vegetation Description: This small-patch wetland community is dominated by grasses and forbs, with scattered trees and shrubs. The dominant grasses are *Leersia oryzoides* (rice cutgrass) and *Phalaris arundinacea* (reed canarygrass). Both of these are native species, however, introduction of Eurasian ecotypes and cultivars of *Phalaris arundinacea* (reed canarygrass) and subsequent hybridization with native stock have been blamed for the current invasive capacity of this species. *Leersia* (cutgrass) is strongly dominant at most sites. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover but drops out at the highest elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional characteristic herbs include *Boehmeria cylindrica* (smallspike false nettle), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex baileyi* (Bailey's sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Eupatorium fistulosum* (trumpetweed), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lobelia siphilitica* (great blue lobelia), *Ludwigia palustris* (marsh seedbox), *Lycopus uniflorus* (northern bugleweed), *Lycopus virginicus* (Virginia water horehound), *Lysimachia terrestris* (earth loosestrife), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus atrovirens* (green bulrush), and *Typha latifolia* (broadleaf cattail). Cover by nonvascular plants is generally insignificant. Scattered small trees include *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), and *Fraxinus pennsylvanica* (green ash). The exotic shrub *Rosa multiflora* (multiflora rose) may be invasive in this community. *Cornus amomum* (silky dogwood) and *Cephalanthus occidentalis* (common buttonbush) are characteristic native shrubs. Areas with longer standing water may have aquatic species, including *Callitriche heterophylla* (twoheaded water-starwort) and *Sparganium* (bur-reed) spp. Mean species richness of vascular plants in 19 WV plots was 16 taxa per 400 square meters.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Sagittaria latifolia* (broadleaf arrowhead)
Herb (field)	Graminoid	*Phalaris arundinacea* (reed canarygrass)

Characteristic Species: *Cephalanthus occidentalis* (common buttonbush), *Cornus amomum* (silky dogwood), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is currently documented from several areas in West Virginia; it is likely in other parts of the Central Appalachians from Pennsylvania to Virginia.
States/Provinces: MD, PA, VA, WV:S3.
Federal Lands: DOD (Camp Dawson); NPS (New River Gorge); USFS (Monongahela); USFWS (Canaan Valley).

CONSERVATION STATUS

Rank: GNR (5-Jun-2006).
Reasons: Need more complete information on range and occurrences before ranking.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: This association is based on 19 plots and anecdotal data from West Virginia, but it is likely wider ranging.
Similar Associations:

- *Leersia oryzoides* - *Boehmeria cylindrica* - *Ranunculus flabellaris* Herbaceous Vegetation (CEGL006903)--sinkhole ponds in New Jersey.

Related Concepts:

- *Leersia oryzoides* - *Phalaris arundinacea* - *Juncus effusus* herbaceous wetland (Vanderhorst and Streets 2006) =
- *Leersia oryzoides* community (Walbridge 1982) F
- *Leersia oryzoides* herbaceous wetland (Vanderhorst 2001b) =
- Herbaceous wetland (Vanderhorst 2001a) ?
- Rice cutgrass marsh (Putnam 1995) =

SOURCES

Description Authors: S. C. Gawler.
References: Byers et al. 2007, Eastern Ecology Working Group n.d., Grafton and Eye 1982, Putnam 1995, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007, Walbridge 1982, Walbridge and Lang 1982, Walton et al. 1996.

COMMON NAME (PARK-SPECIFIC): BULRUSH - AMERICAN BUR-REED MARSH

SYNONYMS

NVC English Name: **American Bur-reed - (Simple-stem Bur-reed) - Bog Willowherb Herbaceous Vegetation**

NVC Scientific Name: ***Sparganium americanum* - *(Sparganium erectum* ssp. *stoloniferum)* - *Epilobium leptophyllum* Herbaceous Vegetation**

NVC Identifier: **CEGL004510**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches in wetlands influenced by beaver activity. It is an early-successional wetland type and patches may be ephemeral, but it is likely to be present on the landscape as long as a beaver-influenced disturbance regime persists. This community occurs in the most poorly drained areas of these wetlands, and there is usually standing water and/or saturated soils throughout the year. There are often dead standing trees in this community which indicate past forest physiognomy prior to inundation by beaver damming. Soils in plots were described as poorly drained sandy loam, clay loam, and muck, with hydric indicators, including low chroma horizons, oxidized root channels, and high water tables. Soil chemistry analyzed from two plots indicates strongly acidic soils (mean pH = 4.6) with relatively high levels of Fe and low to average levels of other nutrients. Slopes range from level to moderate but are typically gentle (beaver-influenced wetland mapping unit values range from 0 to 16 degrees, mean = 6 degrees). Elevations of mapped stands (beaver-influenced wetland mapping unit, which includes this type) range from 528 to 801 m. This community occurs in patchy mosaics with other wetland associations, including *Alnus serrulata* (smooth alder) Saturated Southern Shrubland (CEGL003912) and *Hypericum densiflorum* (bushy St. Johnswort) Shrubland (CEGL006464).

Vegetation Description: This association represents herbaceous marsh vegetation dominated or codominated by *Sparganium americanum* (American bur-reed). Woody species are not characteristic of this community but were included in plot samples due to the ecotonal and patchy distribution of wetland vegetation in the park. Trees and shrubs in the plots include *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), *Alnus serrulata* (smooth alder), *Kalmia latifolia* (mountain laurel), and *Hypericum densiflorum* (bushy St. Johnswort). Herb cover in the plots ranges from 70 to 100%. Cover by *Sparganium americanum* (American bur-reed) ranges from 5 to 90%. Additional species with high constancy and/or cover in the herb layer include *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), and *Typha latifolia* (broadleaf cattail). The state-rare plant *Schoenoplectus purshianus* (weakstalk bulrush) occurs in this community at Kate's Branch. Vascular plant species richness in the 5 sampled plots ranges from 7 to 36 (mean = 24.8). Bryophyte cover in plots, dominated by *Sphagnum* (sphagnum) spp., ranges from 0 to 10%.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Sparganium americanum* (American bur-reed)

Characteristic Species: *Carex crinita* (fringed sedge), *Carex intumescens* (greater bladder sedge), *Carex lurida* (shallow sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Typha latifolia* (broadleaf cattail).

Other Noteworthy Species:

Species	GRank	Type	Note
Schoenoplectus purshianus (weakstalk bulrush)	-	plant	state-rare (S2)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	S2	=	1	*Sparganium (americanum, chlorocarpum)* marsh	Byers et al. 2007

Local Range: Beaver-influenced wetlands are scattered on plateaus from Kate's Branch north, and it is likely that this association occurs in at least small patches across this same range. Plots were sampled from Kate's Branch and from Dowdy Creek.

Classification Comments: Suiter (1995) included the herbaceous wetland community at Kate's Branch in his *Carex gynandra* (nodding sedge) wetland. Vegetation elsewhere in West Virginia dominated by *Sparganium americanum* (American bur-reed) occurs in the Ridge and Valley (Hall 2005), along the Ohio River (Grafton and Eye 1982), and up to middle elevations in the Alleghany Mountains, including Canaan Valley (Byers et al. 2007). A community type dominated by *Sparganium eurycarpum* (broadfruit bur-reed) has been described from the Meadow River wetlands (Putnam 1995), however, stands dominated by *Sparganium americanum* (American bur-reed) have also been observed by West Virginia Natural Heritage Program ecologists in that area. At higher elevations in the Alleghany Mountains, *Sparganium erectum ssp. stoloniferum* (simplestem bur-reed) is the dominant bur-reed in early-successional communities of beaver-influenced sites (Byers et al. 2007). The species of *Sparganium* (bur-reed) are difficult to distinguish in vegetative condition, and positive identification may require late-season material.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.21, NERI.83, NERI.89, NERI.291, NERI.302.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)

Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
Alliance (English name)	American Bur-reed Seasonally Flooded Herbaceous Alliance
Association	Sparganium americanum - (Sparganium erectum ssp. stoloniferum) - Epilobium leptophyllum Herbaceous Vegetation
Association (English name)	American Bur-reed - (Simple-stem Bur-reed) - Bog Willowherb Herbaceous Vegetation
Ecological System(s):	Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018) South-Central Interior Small Stream and Riparian (CES202.706) High Allegheny Wetland (CES202.069)

GLOBAL DESCRIPTION

Concept Summary: This vegetation occupies marshes and small streams with seasonal flooding, especially in areas currently or formerly flooded by beavers. *Sparganium americanum* (American bur-reed) strongly dominates the dense herb layer, although at elevations above 900 m in the Allegheny Mountains, it is generally replaced by *Sparganium erectum ssp. stoloniferum* (simplestem bur-reed). Other species vary with geography and may include *Epilobium leptophyllum* (bog willowherb), *Epilobium coloratum* (purpleleaf willowherb), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Polygonum punctatum* (dotted smartweed), *Potamogeton* (pondweed) sp., *Ludwigia palustris* (marsh seedbox), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and others. A very sparse shrub layer may be present.

Environmental Description: This vegetation occupies marshes and small streams with seasonal flooding, especially in areas currently or formerly flooded by beavers. In the Allegheny Mountains area, it occurs within northern hardwood or red spruce forest zones at 600 to 1300 m elevation. In Virginia, it is restricted to gentle, upper-slope streamhead valleys above 1060 m (3500 feet) elevation, where it occurs in patch-mosaics with wet spruce forests, sphagnous seepage bogs, and open to scrubby meadows. Most sites were heavily altered by logging in the late 1800s through the early 1900s, and this disturbance may have altered the distribution, cover, and physiognomy of these wetlands. Soils are variable and may consist of poorly to very poorly drained muck, or organic-rich loamy soils of varying texture. Average depth of organic soil is 35 cm. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, 2 cm muck, sandy gleyed matrix, depleted matrix, redox depressions, and iron/manganese masses. Soil pH averages 4.4 (n=7) and can be as low as 3.9. Soil chemistry is characterized by high Al, B, Fe, Na, S; moderate Ca, Cu, K, Mg, Zn, exchangeable nitrogen, and total exchange capacity; and low Mn, P, and organic matter (n=7).

Vegetation Description: Vegetation of this community type is almost entirely herbaceous, although some stands may have a sparse (<10%) shrub layer. *Sparganium americanum* (American bur-reed) strongly dominates the dense herb layer. Associated species include *Epilobium leptophyllum* (bog willowherb), *Epilobium coloratum* (purpleleaf willowherb), *Polygonum punctatum* (dotted smartweed), *Potamogeton* (pondweed) sp., *Ludwigia palustris* (marsh seedbox), and others. In the Allegheny Mountains, *Sparganium americanum* (American bur-reed) and *Scirpus expansus* (woodland bulrush) dominate in variable proportions. At elevations above 900 m in the Allegheny Mountains, *Sparganium americanum* (American bur-

reed) is generally replaced by *Sparganium erectum ssp. stoloniferum* (simplestem bur-reed). Common associates include *Carex scoparia* (broom sedge), *Carex gynandra* (nodding sedge), *Carex stipata* (owlfruit sedge), *Epilobium leptophyllum* (bog willowherb), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Hydrocotyle americana* (American marshpennywort), *Impatiens capensis* (jewelweed), *Poa palustris* (fowl bluegrass), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus hattorianus* (mosquito bulrush), *Scutellaria lateriflora* (blue skullcap), *Solidago rugosa* (wrinkleleaf goldenrod), *Sphenopholis pensylvanica* (swamp wedgescale), and *Symphyotrichum prenanthoides* (crookedstem aster). More locally, *Glyceria grandis* (American mannagrass) is an abundant grass. In West Virginia, species (in addition to *Sparganium americanum* (American bur-reed) and *Sparganium erectum ssp. stoloniferum* (simplestem bur-reed)) with high constancy are *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and *Lycopus uniflorus* (northern bugleweed); other common herbs include *Scirpus cyperinus* (woolgrass) and other *Scirpus* (bulrush) spp. or *Schoenoplectus* (bulrush) spp., *Ludwigia palustris* (marsh seedbox), *Carex lurida* (shallow sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Callitriche heterophylla ssp. heterophylla* (twoheaded water-starwort), *Impatiens capensis* (jewelweed), and *Agrostis hyemalis* (winter bentgrass).

Most Abundant Species: Information not available.

Characteristic Species: *Carex gynandra* (nodding sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Epilobium leptophyllum* (bog willowherb), *Glyceria grandis* (American mannagrass), *Hydrocotyle americana* (American marshpennywort), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed).

Other Noteworthy Species:

Species	GRank	Type	Note
Aeshna canadensis (canada darner)	-	animal	
Aeshna tuberculifera (black-tipped darner)	-	animal	
Aeshna verticalis (green-striped darner)	-	animal	
Arigomphus furcifer (lilypad clubtail)	-	animal	
Colias interior (pink-edged sulphur)	-	animal	
Cordulegaster diastatops (delta-spotted spiketail)	-	animal	
Cordulia shurtleffii (american emerald)	-	animal	
Enallagma annexum (northern bluet)	-	animal	
Enallagma hageni (hagen's bluet)	-	animal	
Epitheca canis (beaverpond baskettail)	-	animal	
Gomphus borealis (beaverpond clubtail)	-	animal	
Juncus brevicaudatus (narrowpanicle rush)	-	plant	VA S2
Ladona julia (chalk-fronted corporal)	-	animal	
Lanthus parvulus (northern pygmy clubtail)	-	animal	
Lestes disjunctus (northern spreadwing)	-	animal	
Leucorrhinia frigida (frosted whiteface)	-	animal	
Leucorrhinia hudsonica (hudsonian whiteface)	-	animal	
Nehalennia irene (sedge sprite)	-	animal	
Nemotaulius hostilis (a limnephilid caddisfly)	-	animal	
Poa palustris (fowl bluegrass)	-	plant	VA S1S2
Rhionaeschna mutata (spatterdock darner)	-	animal	

Somatochlora elongata (ski-tipped emerald)	-	animal
Somatochlora williamsoni (williamson's emerald)	-	animal
Sympetrum obtrusum (white-faced meadowhawk)	-	animal

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is known from a few high-elevation sites in the Southern Blue Ridge of North Carolina, the Southern Cumberland/ Ridge and Valley of Georgia, and the greater Allegheny Mountains area of Virginia and West Virginia.
States/Provinces: GA, NC, TN, VA:S1?, WV:S2.
Federal Lands: NPS (Chickamauga-Chattanooga, New River Gorge); USFS (George Washington, Monongahela, Pisgah); USFWS (Canaan Valley).

CONSERVATION STATUS

Rank: G2G3 (1-Mar-2001).
Reasons: This association is known from only a few sites, each very small. It is dependent on periodic re-establishment by beaver flooding.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: Similar vegetation may occur in the Ridge and Valley of Virginia in abandoned beaver ponds. [See VDNH's Laurel Fork report, *Carex stipata - Sparganium americanum* subassociation (Fleming and Morehead 1996).]
Similar Associations: Information not available.
Related Concepts:

- *Picea rubens / Vaccinium angustifolium - Epilobium leptophyllum* Association: *Carex stipata - Sparganium americanum* Subassociation (Fleming and Moorhead 1996) ?
- *Sparganium americanum - Epilobium leptophyllum* Herbaceous Vegetation (Fleming and Coulling 2001) ?
- *Sparganium americanum - Scirpus* spp. herbaceous wetland (Vanderhorst 2001b) =
- *Sparganium americanum* herbaceous vegetation (Hall 2005) =
- IID6a. Natural Impoundment Pond (Allard 1990) B
- Piedmont/Mountain Semipermanent Impoundment (Montane Boggy Subtype) (Schafale 1998b) ?
- Strong *Sparganium americanum* marsh (Byers et al. 2007) =

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. S. C. Gawler and E. A. Byers.
References: Allard 1990, Allard and Leonard 1952, Byers et al. 2007, FNA Editorial Committee 2000, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Fleming et al. 2004, Hall 2005, Peet et al. unpubl. data 2002, Putnam 1995, Schafale 1998b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Strausbaugh and Core 1978, Suiter 1995, Suiter and Evans 1999, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): BLACK WILLOW SLACKWATER WOODLAND

SYNONYMS

NVC English Name: **Black Willow - River Birch / Common Threesquare Wooded Herbaceous Vegetation**

NVC Scientific Name: ***Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional]**

NVC Identifier: **CEGL006463**

LOCAL INFORMATION

Environmental Description: This association occurs along the shores of the New River, usually in positions with slack water (the "eddy zone") just downstream from rapids. These are frequently flooded positions within the active channel shelf which receive sediments of relatively fine-textured alluvium. Substrates often exhibit definite layering of sand and silt laid down by successive flood events. Ground cover by rocks is usually low and by flotsam is often high. Substrates are usually saturated, with water inputs from flooding and from upslope seepage, and most occurrences would qualify as jurisdictional wetlands. Additional hydric soil indicators observed in plots include low chroma horizons, diffuse mottle, and odor of hydrogen sulfide. Soil pH measured in the field from plots ranges from 6.5 to 7. Soil chemistry analyzed from one plot indicates pH of 6.2, relatively low levels of Al and K, and relatively high levels of Ca, Fe, Mg, Mn, P, Su, and Zn. Slopes range from gentle to moderate (mapping unit values range from 3 to 21 degrees, mean = 10 degrees). Elevations of mapped stands range from 305 to 346 m. Adjacent associations commonly include *Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland (CEGL003725), which occurs along higher energy reaches of river, and *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), which occurs on floodplains above the channel bank.

Vegetation Description: This association represents woodland or wooded herbaceous vegetation which occurs on wet beaches along the New River downstream from rapids. The three plots were placed to sample herbaceous physiognomy, but further observations made during river floats suggest that the tree species *Salix nigra* (black willow) has high indicator value for this community and that it is better recognized as a woodland. Additional tree species in plots include *Betula nigra* (river birch) and *Platanus occidentalis* (sycamore). Trees are often rooted on the uphill side of stands, are flood-battered or toppled, and overhang or extend horizontally into the community. Cover in the shrub layers is also dominated by *Salix nigra* (black willow). The shrub *Cephalanthus occidentalis* (common buttonbush), a wetland indicator, may also occur in this community. Herb cover in plots ranges from 10 to 40%, with a large component of wetland indicator species. *Schoenoplectus pungens var. pungens* (common threesquare) is the dominant herb (5-40% cover) and constant in plots; this species, along with *Betula nigra* (river birch), has high indicator value for this association, but it may be absent in some stands. Additional herbs with highest constancy in plots include *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass), *Panicum rigidulum* (redtop panicgrass), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and *Saururus cernuus* (lizard's tail). Additional characteristic herbs

include *Bidens frondosa* (devil's beggartick), *Cyperus odoratus* (fragrant flatsedge), *Eleocharis obtusa* (blunt spikerush), *Eragrostis pilosa* (Indian lovegrass), *Hibiscus laevis* (halberdleaf rosemallow), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum ssp. dichotomiflorum* (fall panicgrass), and *Vernonia noveboracensis* (New York ironweed). Vascular plant species richness in the 3 sampled plots ranges from 14 to 28 (mean = 23).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Salix nigra* (black willow)
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	*Salix nigra* (black willow)
Herb (field)	Graminoid	*Schoenoplectus pungens* var. *pungens* (common threesquare)

Characteristic Species: *Bidens frondosa* (devil's beggartick), *Cephalanthus occidentalis* (common buttonbush), *Chasmanthium latifolium* (Indian woodoats), *Cyperus odoratus* (fragrant flatsedge), *Dichanthelium clandestinum* (deertongue), *Eleocharis obtusa* (blunt spikerush), *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Eragrostis pilosa* (Indian lovegrass), *Eupatorium coelestinum* (blue mistflower), *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass), *Lindernia dubia* var. *dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum* ssp. *dichotomumiflorum* (fall panicgrass), *Panicum rigidulum* (redtop panicgrass), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Salix nigra* (black willow), *Saururus cernuus* (lizard's tail), *Vernonia noveboracensis* (New York ironweed).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association occurs in small patches along the New River. Mapped stands are located in the middle section of the park from the vicinity of the town of Meadow Creek downstream to Sewell, but small patches may occur upstream and downstream beyond this range.

Classification Comments: The nominal species *Schoenoplectus pungens var. pungens* was previously included in the genus *Scirpus* (bulrush), and, due to taxonomic confusion, plants of this species in West Virginia were misidentified as *Scirpus americanus*, a species which is now known to be restricted to the Coastal Plain. In a previous report (Vanderhorst 2001b), this association was described as an herbaceous type, the *Scirpus americanus (Scirpus tabernaemontani)* riparian herbaceous wetland. Although *Scirpus tabernaemontani* was included in the name for this community, its occurrence in this type has not been documented. The three plots were placed to sample herbaceous physiognomy, but further observations made during river floats suggest that the tree species *Salix nigra* (black willow) has high indicator value for this community and that it is better recognized as woodland. These observations also support the recognition of this association because its occurrences are easily distinguished on the ground and are repeated on the landscape in a pattern which reflects environmental gradients.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.226, NERI.227, NERI.306.
New River Gorge National River Inventory Notes: Additional plots are needed to improve the classification confidence of this association. Plot sampling should emphasize the whole woodland community, rather than focusing on stands of *Schoenoplectus pungens* var. *pungens*.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse tree layer (V.A.6.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse tree layer (V.A.6.N.)
Formation	Semipermanently flooded temperate or subpolar grassland with a sparse cold-deciduous tree layer (V.A.6.N.n.)
Alliance	*Schoenoplectus pungens* Semipermanently Flooded Wooded Herbaceous Alliance (A.3034)
Alliance (English name)	Common Threesquare Semipermanently Flooded Wooded Herbaceous Alliance
Association	*Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional]
Association (English name)	Black Willow - River Birch / Common Threesquare Wooded Herbaceous Vegetation
Ecological System(s):	Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This association represents woodland or wooded herbaceous vegetation which occurs on wet beaches along the New River downstream from rapids (the "eddy zone"). These are frequently flooded positions within the active channel shelf which receive sediments of relatively fine-textured alluvium. Substrates often exhibit definite layering of sand and silt laid down by successive flood events. Ground cover by flotsam is often high. Substrates are usually saturated, with water inputs from flooding and from upslope seepage. The dominant tree is *Salix nigra* (black willow), often rooted on the uphill side of stands; individuals are flood-battered or toppled, and overhang or extend horizontally into the community. *Betula nigra* (river birch) is common as a small tree or shrub. The shrub layer is also dominated by *Salix nigra* (black willow), sometimes with *Cephalanthus occidentalis* (common buttonbush). Herb cover in plots ranges from 10 to 40%, with a large component of wetland indicator species. *Schoenoplectus pungens* (common threesquare) is the dominant herb (5-40% cover and high constancy). Additional herbs with high constancy in plots include *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass), *Panicum rigidulum* (redtop panicgrass), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and *Saururus cernuus* (lizard's tail). Additional characteristic herbs include *Bidens frondosa* (devil's beggartick), *Cyperus odoratus* (fragrant flatsedge), *Eleocharis obtusa* (blunt spikerush), *Eragrostis pilosa* (Indian lovegrass), *Hibiscus laevis* (halberdleaf rosemallow), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum* (fall panicgrass), and *Vernonia noveboracensis* (New York ironweed).

Environmental Description: This association is documented from the shores of the New River, usually in positions with slack water (the "eddy zone") just downstream from rapids. These are frequently flooded positions within the active channel shelf which receive sediments of relatively fine-textured alluvium. Substrates often exhibit definite layering of sand and silt laid down by successive flood events. Ground cover by rocks is usually low and ground cover by flotsam is often high. Substrates are usually saturated, with water inputs from flooding and from upslope seepage, and most occurrences would qualify as jurisdictional wetlands. Additional hydric soil indicators observed in plots include low chroma horizons, diffuse mottle, and odor of hydrogen sulfide. Soil pH measured in the field from plots ranges from 6.5 to 7. Soil chemistry analyzed from one plot indicates pH of 6.2, relatively low levels of Al and K, and relatively high levels of Ca, Fe, Mg, Mn, P, Su, and Zn. Slopes range from gentle to moderate. Elevations of mapped stands range from 305 to 346 m.

Vegetation Description: This association represents woodland or wooded herbaceous vegetation which occurs on wet beaches along the New River downstream from rapids. The three plots were placed to sample herbaceous physiognomy, but further observations suggest that the tree species *Salix nigra* (black willow) has high indicator value for this community and that it is better recognized as a woodland. Additional tree species in plots include *Betula nigra* (river birch) and *Platanus occidentalis* (Sycamore). Trees are often rooted on the uphill side of stands, are flood-battered or toppled, and overhang or extend horizontally into the community. Cover in the shrub layers is also dominated by *Salix nigra* (black willow). The shrub *Cephalanthus occidentalis* (common buttonbush), a wetland indicator, may also occur in this community. Herb cover in plots ranges from 10 to 40%, with a large component of wetland indicator species. *Schoenoplectus pungens* (common threesquare) is the dominant herb (5-40% cover) and constant in plots, and this species, along with *Betula nigra* (river birch), has high indicator value for this association, but it may be absent in some stands. Additional herbs with highest constancy in plots include *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass), *Panicum rigidulum* (redtop panicgrass), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and *Saururus cernuus* (lizard's tail). Additional characteristic herbs include *Bidens frondosa* (devil's beggartick), *Cyperus odoratus* (fragrant flatsedge), *Eleocharis obtusa* (blunt spikerush), *Eragrostis pilosa* (Indian lovegrass), *Hibiscus laevis* (halberdleaf rosemallow), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum* (fall panicgrass), and *Vernonia noveboracensis* (New York ironweed). Vascular plant species richness in the 3 sampled plots ranges from 14 to 28 (mean = 23).

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Salix nigra* (black willow)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Salix nigra* (black willow)
Herb (field)	Graminoid	*Schoenoplectus pungens* (common threesquare)

Characteristic Species: *Bidens frondosa* (devil's beggartick), *Cephalanthus occidentalis* (common buttonbush), *Chasmanthium latifolium* (Indian woodoats), *Cyperus odoratus* (fragrant

flatsedge), *Dichanthelium clandestinum* (deertongue), *Eleocharis obtusa* (blunt spikerush), *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Eragrostis pilosa* (Indian lovegrass), *Eupatorium coelestinum* (blue mistflower), *Justicia americana* (American water-willow), *Leersia virginica* (whitegrass), *Lindernia dubia* (yellowseed false pimpernel), *Ludwigia palustris* (marsh seedbox), *Panicum dichotomiflorum* (fall panicgrass), *Panicum rigidulum* (redtop panicgrass), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Salix nigra* (black willow), *Saururus cernuus* (lizard's tail), *Vernonia noveboracensis* (New York ironweed).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION
Range: This association is currently known from the New River in West Virginia, with wider distribution in the Central Appalachians, Cumberland, and Western Allegheny Plateau ecoregions possible.
States/Provinces: WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS
Rank: GNR (5-Jun-2006).
Reasons: Information not available.

CLASSIFICATION INFORMATION
Status: Provisional.
Confidence: 3 - Weak.
Comments: The nominal species *Schoenoplectus pungens* (common threesquare) was previously included in the genus *Scirpus* (bulrush). This association was described by Vanderhorst (2001b) as an herbaceous type, *Scirpus americanus (Scirpus tabernaemontani)* riparian herbaceous wetland. Although *Scirpus tabernaemontani* was originally included in the name for this community, its occurrence in this type has not been documented. The three plots on which this description is based were placed to sample herbaceous physiognomy, but further observations suggest that the tree species *Salix nigra* (black willow) has high indicator value for this community and that it is better recognized as a woodland. These observations also support the recognition of this association because its occurrences are easily distinguished on the ground and are repeated on the landscape in a pattern which reflects environmental gradients.
Similar Associations:
- *Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland (CEGL003725).

Related Concepts: Information not available.

SOURCES
Description Authors: S. C. Gawler and J. Vanderhorst.
References: Eastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): RIVERBANK TALL HERBS

SYNONYMS

NVC English Name: **Wingstem - American Germander - Riverbank Wild Rye - (Giant Goldenrod) Herbaceous Vegetation**

NVC Scientific Name: ***Verbesina alternifolia - Teucrium canadense - Elymus riparius - (Solidago gigantea)*** **Herbaceous Vegetation**

NVC Identifier: **CEGL006480**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches on sandy floodplains and banks along the shores of the New River. Patches typically occur along slow, straight reaches of river with high banks, often on eroded alluvial fans at the mouths of small drainages. Soils are deep alluvial sands with little horizon development. In one plot, pH measured in the field was 6.5. Elevations of mapped stands range from 292 to 318 m. Slopes are flat to gentle. Occurrences may be partially shaded but generally have high solar exposure. Trees along the river edge of this community often lean out over the river due to undercutting of the bank which creates a sunny corridor back from the river's edge. Adjacent forested communities include *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) and *Acer saccharinum - Ulmus americana* Forest (CEGL002586).

Vegetation Description: This association represents herbaceous vegetation or wooded herbaceous vegetation dominated by tall herbs which occurs on sandy banks of the New River. Tree cover in the two plots range from 10 to 30%. Tree species in the plots include *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (American sycamore), and *Robinia pseudoacacia* (black locust). Cover in the tall-shrub layer of plots averages about 20% dominated by *Lindera benzoin* (northern spicebush). There is a lush tall-herb layer with average cover of 90% in plots. Herbs with high constancy and/or cover include *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus virginicus var. virginicus* (Virginia wildrye), *Eupatorium fistulosum* (trumpetweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Glechoma hederacea* (ground ivy), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Microstegium vimineum* (Nepalese browntop), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Senna hebecarpa* (American senna), *Solanum carolinense var. carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tripsacum dactyloides* (eastern gamagrass), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). Vascular plant species richness in the 2 sampled plots ranges from 40 to 43 (mean = 41.5).

Most Abundant Species: Information not available.

Characteristic Species: *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus virginicus* var. *virginicus* (Virginia wildrye), *Eupatorium coelestinum* (blue mistflower), *Eupatorium fistulosum* (trumpetweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Glechoma hederacea*

(ground ivy), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Lindera benzoin* (northern spicebush), *Microstegium vimineum* (Nepalese browntop), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Senna hebecarpa* (American senna), *Solanum carolinense* var. *carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tripsacum dactyloides* (eastern gamagrass), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem), *Vernonia noveboracensis* (New York ironweed).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst et al. 2007

Local Range: This association was sampled and observed along the New River in the northern section of the park between Thurmond and Mann's Creek, but additional small patches are likely to occur throughout the length of the river in the park.

Classification Comments: This association shares many herbaceous species with the adjacent floodplain forest types *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) and *Acer saccharinum - Ulmus americana* Forest (CEGL002586), but it is distinguished by an open canopy which promotes rank growth of herbs adapted to full sunlight. Recognition of individual occurrences may depend on the size of the sampled patch.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI.230, NERI.325.

New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	*Eupatorium serotinum - Diodia virginiana* Temporarily Flooded Herbaceous Alliance (A.2017)
Alliance (English name)	Late Thoroughwort - Virginia Buttonweed Temporarily Flooded Herbaceous Alliance
Association	*Verbesina alternifolia - Teucrium canadense - Elymus riparius - (Solidago gigantea)* Herbaceous Vegetation
Association (English name)	Wingstem - American Germander - Riverbank Wild Rye - (Giant Goldenrod) Herbaceous Vegetation
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609) Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This tall herb-dominated association is known from the shores of rivers and large streams in the Piedmont and mountain regions of Maryland, Virginia, and West Virginia. It occupies well-drained riverbanks and, less commonly, depositional bars or alluvial fans of medium-sized to large rivers that experience low rates of sediment erosion and turnover during small to moderate floods. The type typically occurs as a narrow, linear strip along the outer edge of a floodplain forest. Occurrences may be partially shaded but generally have high solar exposure. Vegetation is characterized by a dense growth of tall (1-3 m), light-demanding, native perennial herbs. The most characteristic species across the range are *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Verbesina alternifolia* (wingstem), *Elymus* (wildrye) spp. (*Elymus riparius* (riverbank wildrye), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye)), *Conoclinium coelestinum* (blue mistflower), several species of *Eupatorium* (thoroughwort) (*Eupatorium fistulosum* (trumpetweed), *Eupatorium perfoliatum* (common boneset), *Eupatorium serotinum* (lateflowering thoroughwort)), *Solidago gigantea* (giant goldenrod), and *Verbena urticifolia* (white vervain). Along the Potomac in the Great Valley of Virginia downstream to the fall line, *Teucrium canadense* (Canada germander) and *Scrophularia marilandica* (carpenter's square) are also abundant; less abundant species include *Ageratina altissima* (white snakeroot), *Helianthus decapetalus* (thinleaf sunflower), *Oenothera biennis* (common evening-primrose), *Phytolacca americana* (American pokeweed), *Monarda fistulosa* (wild bergamot), and *Rudbeckia laciniata* (cutleaf coneflower). Along the New River in West Virginia, additional characteristic species include *Conoclinium coelestinum* (blue mistflower), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Senna hebecarpa* (American senna), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tripsacum dactyloides* (eastern gamagrass), and *Vernonia noveboracensis* (New York ironweed). Tall annual species characteristically dominant on less stabilized bars may be present but generally do not dominate. Vines are often common and include *Toxicodendron radicans* (eastern poison ivy), *Vitis riparia* (riverbank grape), and *Calystegia sepium* (hedge false bindweed). Scattered shrubby or occasionally full-sized trees of flood-tolerant species may occur, with *Acer saccharinum* (silver maple), *Platanus occidentalis* (Sycamore), *Fraxinus pennsylvanica* (green ash), *Betula nigra* (river birch), and *Acer negundo* (box-elder) the most frequent. *Lindera benzoin* (northern spicebush) may be present as a shrub. This type often has a number of invasive exotic weeds, including *Polygonum cuspidatum* (Japanese knotweed), *Polygonum perfoliatum* (Asiatic tearthumb), *Lolium arundinaceum* (tall fescue), *Phalaris arundinacea* (reed canarygrass), *Humulus japonicus* (Japanese hop), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), and *Stellaria media* (common chickweed).

Environmental Description: This community occupies well-drained riverbanks and, less commonly, depositional bars of medium-sized to large rivers that experience low rates of sediment erosion and turnover during small to moderate floods. The type typically occurs as a narrow, linear strip along the outer edge of a floodplain forest. Along the Potomac River in the Potomac River Gorge west of Washington, DC, habitats are inundated for 1-4% of the full year and are generally exposed for nearly all of the growing season in most years (Lea 2000). Hydrologic regime is best described as temporarily flooded. Substrates in Potomac River Gorge

are sandy loams or loamy sands (Lea 2000). Samples collected from 10 plots in the Potomac drainage had 100% total base saturation, high pH, and very high calcium levels. Along the New River, West Virginia, patches typically occur along slow, straight reaches of river with high banks, often on eroded alluvial fans at the mouths of small drainages. Soils are deep alluvial sands with little horizon development. In one plot, pH measured in the field was 6.5. Elevations range from near sea level on the Potomac River to 320 m on the New River.

Vegetation Description: This association represents vegetation consisting of a dense growth (90% cover) of tall (1-3 m), light-demanding, native perennial herbs. Along the Potomac River in the Great Valley of Virginia downstream to the fall line, the most abundant species are *Verbesina alternifolia* (wingstem), *Teucrium canadense* (Canada germander), *Elymus riparius* (riverbank wildrye), *Verbena urticifolia* (white vervain), *Conoclinium coelestinum* (blue mistflower), several species of *Eupatorium* (thoroughwort) (*Eupatorium fistulosum* (trumpetweed), *Eupatorium perfoliatum* (common boneset), *Eupatorium serotinum* (lateflowering thoroughwort)), *Dichanthelium clandestinum* (deertongue), *Scrophularia marilandica* (carpenter's square), and *Chasmanthium latifolium* (Indian woodoats). Less abundant species include *Ageratina altissima* (white snakeroot), *Elymus villosus* (hairy wildrye), *Elymus virginicus* (Virginia wildrye), *Helianthus decapetalus* (thinleaf sunflower), *Oenothera biennis* (common evening-primrose), *Phytolacca americana* (American pokeweed), *Monarda fistulosa* (wild bergamot), *Rudbeckia laciniata* (cutleaf coneflower), and *Solidago gigantea* (giant goldenrod). *Hasteola suaveolens* (false Indian plaintain), *Sida hermaphrodita* (Virginia fanpetals), *Iresine rhizomatosa* (Juda's bush), *Rumex altissimus* (pale dock), and *Ruellia strepens* (limestone wild petunia) are Maryland rare species known from this type. Tall annual species characteristically dominant on less stabilized bars may be present but generally do not dominate. Vines are often common and include *Toxicodendron radicans* (eastern poison ivy), *Vitis riparia* (riverbank grape), and *Calystegia sepium* (hedge false bindweed). Scattered shrubby or occasionally full-sized trees of flood-tolerant species may occur, with *Acer saccharinum* (silver maple), *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), and *Acer negundo* (boxelder) the most frequent. On the Potomac River above the Great Valley, on the Monocacy River, and on smaller streams outside the Great Valley, several of the more characteristic species for the Shenandoah River, Antietam Creek, and the rest of the Potomac are apparently rare or absent, particularly *Rudbeckia laciniata* (cutleaf coneflower) and *Solidago gigantea* (giant goldenrod). These differences may reflect the influence of more calcareous substrates and/or stream order on the communities. Along the New River, herbs with high constancy and/or cover include *Chasmanthium latifolium* (Indian woodoats), *Conoclinium coelestinum* (blue mistflower), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus virginicus* (Virginia wildrye), *Eupatorium fistulosum* (trumpetweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Packera aurea* (golden ragwort), *Phlox paniculata* (fall phlox), *Polygonum scandens* (climbing false buckwheat), *Polygonum virginianum* (jumpseed), *Senna hebecarpa* (American senna), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Symphyotrichum lanceolatum* (white panicle aster), *Symphyotrichum lateriflorum* (calico aster), *Tripsacum dactyloides* (eastern gamagrass), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). This type often has a number of invasive exotic weeds, including *Polygonum cuspidatum* (Japanese knotweed), *Polygonum perfoliatum* (Asiatic

tearthumb), *Lolium arundinaceum* (tall fescue), *Phalaris arundinacea* (reed canarygrass), *Humulus japonicus* (Japanese hop), *Glechoma hederacea* (ground ivy), *Microstegium vimineum* (Nepalese browntop), and *Stellaria media* (common chickweed). During years of more continuous high water during the growing season, vegetation may be sparse.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Verbesina alternifolia* (wingstem)
Herb (field)	Graminoid	*Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue)

Characteristic Species: *Chasmanthium latifolium* (Indian woodoats), *Dichanthelium clandestinum* (deertongue), *Elymus canadensis* (Canada wildrye), *Elymus riparius* (riverbank wildrye), *Elymus virginicus* (Virginia wildrye), *Eupatorium fistulosum* (trumpetweed), *Eupatorium serotinum* (lateflowering thoroughwort), *Helianthus strumosus* (paleleaf woodland sunflower), *Heliopsis helianthoides* (smooth oxeye), *Leersia virginica* (whitegrass), *Packera aurea* (golden ragwort), *Polygonum virginianum* (jumpseed), *Rudbeckia laciniata* (cutleaf coneflower), *Scrophularia marilandica* (carpenter's square), *Solanum carolinense* (Carolina horsenettle), *Solidago canadensis* (Canada goldenrod), *Solidago gigantea* (giant goldenrod), *Verbena urticifolia* (white vervain), *Verbesina alternifolia* (wingstem), *Vernonia noveboracensis* (New York ironweed).

Other Noteworthy Species:

Species	GRank	Type	Note
Hasteola suaveolens (false Indian plaintain)	-	plant	MD state-rare
Iresine rhizomatosa (Juda's bush)	-	plant	MD state-rare
Ruellia strepens (limestone wild petunia)	-	plant	MD state-rare
Rumex altissimus (pale dock)	-	plant	MD state-rare
Sida hermaphrodita (Virginia fanpetals)	G3	plant	MD state-rare

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community type is known from the shores of rivers and large streams in the Piedmont and mountain regions of Maryland, Virginia, and West Virginia. It has been documented by plots or observed on the Potomac, Shenandoah, New, and Monocacy rivers and Antietam Creek (Maryland). Small-stream analogues or variants have been observed on Fifteen Mile Creek (Maryland) and on the South Fork of Quantico Creek (Virginia). Potential habitat for this association is widespread, and the type is likely to have a much wider geographic range than current documentation indicates.

States/Provinces: DC, MD, VA, WV.

Federal Lands: NPS (Antietam, C&O Canal, Harpers Ferry, New River Gorge, Prince William).

CONSERVATION STATUS

Rank: GNR (2-Aug-2006).

Reasons: More data on the global distribution are needed to determine a conservation rank for this community.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: The classification of this type was based, in part, on analysis of data from 10 plots collected during the National Capital Region Parks project, with additional data from the New River Gorge in West Virginia. Although some plots of this type performed convincingly as a discrete group in the National Capital Region analysis, others could not be separated from a group representing the Central Appalachian silver maple floodplain forest, with which this type frequently co-occurs. These results suggest that this type is weakly distinct floristically, sharing many species with the silver maple forest and varying from it along a gradual cline of (presumed) light exposure and increased stress from flooding near the channel. Because the type also tends to occur in small patches, it might, therefore, be considered as an ecotonal expression of the silver maple forest. However, the distinctiveness of its physiognomy and habitat (open canopy which promotes rank growth of herbs adapted to full sunlight), as well as certain conservation issues, supports its recognition.
Similar Associations: Information not available.
Related Concepts:

- *Rudbeckia laciniata - Solidago gigantea - Teucrium canadense* Wooded Herbaceous Vegetation (Lea 2000) =
- *Verbesina alternifolia - Teucrium canadense - Verbena urticifolia - (Rudbeckia laciniata - Solidago gigantea)* Wooded Herbaceous Vegetation (Lea 2003) =

SOURCES

Description Authors: C. Lea and G. P. Fleming, mod. S. C. Gawler.
References: Eastern Ecology Working Group n.d., Lea 2000, Lea 2003, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): AMERICAN WATER-WILLOW COBBLE BAR

SYNONYMS
NVC English Name: **American Water-willow Herbaceous Vegetation**
NVC Scientific Name: ***Justicia americana* Herbaceous Vegetation**
NVC Identifier: **CEGL004286**

LOCAL INFORMATION

Environmental Description: This association occurs in shallow water within the main channel and back channels of the New River. Stands commonly occur on the edge of the river and at the heads and tails of islands and may sometimes occur on deposition bars in the middle of the river. They are subject to frequent high-energy floods. Substrates, including bedrock, boulders, cobble, gravel, and sand, are saturated and semipermanently flooded, but stands may be exposed during dry periods. Substrate pH measured in the field from two plots ranges from 6.0 to 6.5. Slopes range from level to moderate but are typically gentle (mapping unit values range from 0 to 12 degrees, mean = 3 degrees). Elevations of mapped stands range from 292 to 409 m. Stands typically occur in full sunlight, but there may be scattered trees or an overhanging canopy in some areas. Adjacent community types include aquatic *Potamogeton* (pondweed) spp. - *Ceratophyllum* (hornwort) spp. - *Elodea* (waterweed) spp. Permanently Flooded Herbaceous Vegetation (CEGL004725)% in deeper water, *Peltandra virginica* - *Saururus cernuus* - *Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696) in backwater positions, and *Platanus occidentalis* - *(Betula nigra, Salix* (willow) spp.) Temporarily Flooded Woodland (CEGL003725) in less flooded riverside positions.
Vegetation Description: This association represents herbaceous vegetation dominated by *Justicia americana* (American water-willow). Some stands have low cover by scattered flood-suppressed trees or an overhanging canopy. Trees in plots include *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), and *Platanus occidentalis* (Sycamore). Many occurrences are near monocultures of the dominant herb which forms picturesque lawn-like stands in shallow reaches of the river. Cover by *Justicia americana* (American water-willow) in plots ranges from 40 to 85%. Herbs which may codominate in some stands, typically in positions subjected to somewhat lower energy flooding, include *Saururus cernuus* (lizard's tail) and *Schoenoplectus pungens var. pungens* (common threesquare). Additional characteristic herbs which may occur in small amounts include *Bidens* (beggarticks) spp., *Leersia virginica* (whitegrass), and *Polygonum caespitosum var. longisetum* (oriental ladysthumb). The exotic invasive *Lythrum salicaria* (purple loosestrife) was found in trace amount in one plot but has not been observed in abundance in this community, possibly due to intolerance of high-energy flooding. Vascular plant species richness in the 5 sampled plots ranges from 6 to 14 (mean = 9.4).
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Justicia americana* (American water-willow)

Characteristic Species: *Leersia virginica* (whitegrass), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Saururus cernuus* (lizard's tail), *Schoenoplectus pungens* var. *pungens* (common threesquare).
Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs in small patches within the river channel scattered throughout the length of the park. It is most abundant in the southern section near Hinton.
Classification Comments: This association may grade towards *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696) which occurs in positions, typically backwater sloughs, which are subject to less high-energy flooding. The latter association is characterized by extremely high diversity, whereas *Justicia americana* (American water-willow) Herbaceous Vegetation (CEGL004286) usually has very low diversity.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.57, NERI.61, NERI.228, NERI.229, NERI.319.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	*Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
Alliance (English name)	American Water-willow Temporarily Flooded Herbaceous Alliance
Association	*Justicia americana* Herbaceous Vegetation
Association (English name)	American Water-willow Herbaceous Vegetation
Ecological System(s):	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609) South-Central Interior Small Stream and Riparian (CES202.706) Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) Cumberland Riverscour (CES202.036) South-Central Interior Large Floodplain (CES202.705) Ozark-Ouachita Riparian (CES202.703)

GLOBAL DESCRIPTION

Concept Summary: This association is found primarily in the Piedmont, Central Appalachians, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. Stands occur on the shoals or bars of rocky streams and riverbeds, where they are subject to frequent high-energy floods. It provides habitat in some portions of its range for globally rare dragonflies and herbs. *Justicia americana* (American water-willow) is the characteristic dominant. *Saururus cernuus* (lizard's tail) is often present and may be codominant. Other

herbaceous species that may be present include *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Lemna minor* (common duckweed), *Orontium aquaticum* (goldenclub), *Podostemum ceratophyllum* (hornleaf riverweed), *Scirpus* (bulrush) sp., *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush), *Cyperus* (flatsedge) spp., *Eleocharis* (spikerush) spp., *Diodia teres* (poorjoe), *Gratiola brevifolia* (sticky hedgehyssop), *Bidens* (beggarticks) spp., *Polygonum caespitosum var. longisetum* (oriental ladysthumb), and *Xyris difformis var. difformis* (bog yelloweyed grass). Exotics include *Lythrum salicaria* (purple loosestrife) and *Lysimachia vulgaris* (garden yellow loosestrife). A sparse canopy layer, which can include *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Salix interior* (sandbar willow), *Acer saccharinum* (silver maple), *Platanus occidentalis* (Sycamore), *Betula nigra* (river birch), *Fagus grandifolia* (American beech), and *Fraxinus pennsylvanica* (green ash), among other species, may be present. Scattered shrub seedlings of *Salix nigra* (black willow), *Betula nigra* (river birch), *Acer saccharinum* (silver maple), or *Platanus occidentalis* (Sycamore) may also be present.

Environmental Description: This association occurs on the shoals or bars of rocky streams and riverbeds, on bedrock, boulders, cobble, gravel, and sands. They are subject to frequent high energy floods, and are entirely submerged by most flood events. During extreme low water periods, the soil below the beds can be exposed, showing a varied mixture of sand, gravel and cobbles, often with deposits of silt and muck. Stands commonly occur on the edge of the river and at the heads and tails of islands and may sometimes occur on deposition bars in the middle of the river. Substrate pH was circumneutral (6.0 - 6.5) in two samples. Slopes range from level to moderate but are typically gentle. Elevations of West Virginia stands range from 73 to at least 654 m; the type occurs at lower elevations in the Piedmont and Coastal Plain.

Vegetation Description: *Justicia americana* (American water-willow) is the dominant(and sometimes the only) species,, forming lawn-like stands in shallow reaches of rivers. Cover by *Justicia americana* (American water-willow) ranges from 40 to 85%. *Saururus cernuus* (lizard's tail) is often present and may be codominant. Other herbaceous species may be present but rarely achieve more than 1% cover; they include *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Lemna minor* (common duckweed), *Orontium aquaticum* (goldenclub), *Podostemum ceratophyllum* (hornleaf riverweed), *Scirpus* (bulrush) sp., *Schoenoplectus pungens* (common threesquare), *Schoenoplectus tabernaemontani* (softstem bulrush), *Cyperus* (flatsedge) spp., *Elodea* (waterweed) sp., *Eleocharis* (spikerush) spp., *Equisetum arvense* (field horsetail), *Bidens* (beggarticks) spp., *Polygonum caespitosum var. longisetum* (oriental ladysthumb), *Diodia teres* (poorjoe), *Gratiola brevifolia* (sticky hedgehyssop), and *Xyris difformis var. difformis* (bog yelloweyed grass). Exotics include *Lythrum salicaria* (purple loosestrife) and *Lysimachia vulgaris* (garden yellow loosestrife). In some areas, *Justicia* (water-willow) usually grows in nearly pure patches, so that few other species are associated with it. *Bidens* (beggarticks) spp., *Cuscuta gronovii* (scaldweed), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum* (knotweed) spp., *Rumex* (dock) spp., and *Salix interior* (sandbar willow) can occur (Anderson 1982). Some stands have low cover by scattered flood-suppressed trees or an overhanging canopy. Trees in plots include *Acer saccharinum* (silver maple), *Betula nigra* (river birch), *Fraxinus pennsylvanica* (green ash), and *Platanus occidentalis* (Sycamore). A sparse canopy layer may be present, which can include *Carpinus caroliniana* (American hornbeam), *Fagus grandifolia* (American beech), and *Fraxinus pennsylvanica* (green ash), among others. Scattered shrub seedlings of *Salix nigra* (black willow), *Betula nigra* (river birch), *Acer saccharinum* (silver maple), or *Platanus occidentalis* (Sycamore) may also be present. In the

Cumberland Plateau of Alabama, *Justicia americana* (American water-willow) is present in dense patches with some interspersion of other species, including *Pilea pumila* (Canadian clearweed), *Boehmeria cylindrica* (smallspike false nettle), *Eclipta prostrata* (false daisy), *Juncus coriaceus* (leathery rush), *Mikania scandens* (climbing hempvine), *Ludwigia palustris* (marsh seedbox), *Leersia* (cutgrass) sp., and *Bidens* (beggarticks) sp. Schmalzer and DeSelm (1982) discuss *Orontium aquaticum* (goldenclub) growing along streambanks or in shallow riffles "along or with" *Justicia americana* (American water-willow) in the Obed River in the Cumberland Plateau of Tennessee. In 29 plots sampled in the Potomac River watershed (Piedmont, Blue Ridge and Ridge and Valley provinces), *Justicia* (water-willow) was overwhelmingly dominant (50-75% mean cover), and no associated species occurred in more than 48% of the plots. Vascular plant species richness in sampled plots is low (typically 6-14 taxa). The exotic invasive *Lythrum salicaria* (purple loosestrife) was found in one West Virginia plot but has not been observed in abundance in this community, possibly due to intolerance of high-energy flooding.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Justicia americana* (American water-willow)

Characteristic Species: *Justicia americana* (American water-willow), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Polygonum amphibium* (water knotweed), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Saururus cernuus* (lizard's tail), *Schoenoplectus pungens* (common threesquare).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This type is found primarily in the Piedmont, Interior Low Plateau, Cumberland Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. It ranges from Alabama, Georgia and the Carolinas west to Arkansas and Oklahoma and north to Ohio, Pennsylvania, and Delaware.

States/Provinces: AL, AR, GA, KY, MD, NC, NJ, NY, OH:S4, OK, PA:S5, SC?, TN, VA, WV.

Federal Lands: NPS (Big South Fork, C&O Canal, Delaware Water Gap, George Washington Parkway, Harpers Ferry, Little River Canyon?, Mammoth Cave, Manassas, Natchez Trace, New River Gorge, Obed, Stones River, Upper Delaware); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ouachita (Mountains), Ozark, Pisgah, Sumter (Mountains)?, Sumter (Piedmont)?, Sumter?, Uwharrie).

CONSERVATION STATUS

Rank: G4G5 (12-Sep-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: This type, in Ohio, often forms pure patches, but consistent identification may require a simple cutoff rule, such as at least 50% cover of *Justicia* (water-willow) (Anderson 1982). However, Anderson (1996) no longer recognizes this type.

Similar Associations:

- *Hymenocallis coronaria - Justicia americana* Herbaceous Vegetation (CEGL004285).
- *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696).

Related Concepts:

- *Justicia americana* riparian herbaceous vegetation (Vanderhorst 2001b) =
- Aquatic Types (Schmalzer and DeSelm 1982) B
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B
- Lizard's tail emergent bed (Perles et al. 2004) ?
- Rocky Bar and Shore (Water Willow Subtype) (Schafale 1998b) ?
- Water willow emergent bed (Perles et al. 2004) ?

SOURCES

Description Authors: A. S. Weakley, mod. D. Faber-Langendoen and S. C. Gawler.

References: Allard 1990, Anderson 1982, Anderson 1996, Fike 1999, Fleming et al. 2001, Harrison 2004, Hoagland 1997, Hoagland 2000, Major et al. 1999, McCoy 1958, Nelson 1986, ONHD unpubl. data, Palmer-Ball et al. 1988, Peet et al. unpubl. data 2002, Penfound 1953, Perles et al. 2004, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC and WPC 2004, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): LIZARD'S-TAIL BACKWATER SLOUGH

SYNONYMS

NVC English Name:	**Green Arrow-arum - Lizard's-tail - Small-spike False Nettle / Tree Moss Herbaceous Vegetation**
NVC Scientific Name:	***Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation**
NVC Identifier:	**CEGL007696**

LOCAL INFORMATION

Environmental Description: This association occurs in backwater sloughs associated with floodplains of the New River. These alluvial landforms are located at the bottom of upland gorge slopes behind larger floodplains, typically on point bars on the inside bends of river meanders. These positions may be flooded by forward-flowing water during larger floods and by back-flowing water during smaller floods. They also receive water inputs from seepage and rain. Patches of this vegetation type can be highly ephemeral but are likely to develop again on the same site following their destruction by large floods. As these habitats dry out, bare substrate is exposed, which is colonized in a zonal pattern by a high diversity of weedy and flood-adapted species. There are usually some more-or-less permanent pools which provide important habitat for aquatic animals, including fish and amphibians. Most sites would qualify as jurisdictional wetlands. Soils in plots are described as moderately well- to very poorly drained sand, clay loam, and muck. Slopes range from level to moderate but are typically gentle (mapping unit values range from 0 to 17 degrees, mean = 6 degrees). Elevations of mapped stands (backwater slough mapping unit) range from 300 to 413 m. Stands are usually partially shaded by overhanging trees from adjacent forest types. Occurrences of this association are typically imbedded within or located behind patches of *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458) and downslope from upland *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum / Magnolia tripetala* Forest (CEGL005222).

Vegetation Description: This association represents herbaceous wetland vegetation which is usually partially shaded by overhanging trees rooted outside of the community. Dominant tree species in plots include *Aesculus flava* (yellow buckeye), *Juglans nigra* (black walnut), and *Platanus occidentalis* (American sycamore). Shrubs which may occur on the edges of the community include *Asimina triloba* (pawpaw), *Cornus amomum* (silky dogwood), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose), *Salix nigra* (black willow), and *Sambucus canadensis* (common elderberry). Herbaceous cover in plots ranges from 80 to 100%, but cover may be less early in the season or in years following large floods. Herbs are usually sorted out in zones along a hydrologic gradient and include a high diversity of wetland emergent and "weedy" native and exotic taxa. Characteristic herbs with highest constancy and/or cover in plots include *Amphicarpaea bracteata* (American hogpeanut), *Apios americana* (groundnut), *Arthraxon hispidus* (small carpgrass), *Bidens* (beggarticks) spp., *Boehmeria cylindrica* (smallspike false nettle), *Calystegia sepium* (hedge false bindweed), *Cardamine impatiens* (narrowleaf bittercress), *Cuscuta gronovii var. gronovii* (scaldweed), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus var. virginicus* (Virginia wildrye), *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Galium tinctorium* (stiff marsh bedstraw), *Glechoma hederacea* (ground ivy),

Glyceria striata (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Iris pseudacorus* (paleyellow iris), *Juncus effusus* (common rush), *Justicia americana* (American water-willow), *Lindernia dubia* (yellowseed false pimpernel), *Lobelia cardinalis* (cardinalflower), *Lonicera japonica* (Japanese honeysuckle), *Ludwigia palustris* (marsh seedbox), *Lysimachia ciliata* (fringed loosestrife), *Lysimachia nummularia* (creeping jenny), *Mentha arvensis* (wild mint), *Microstegium vimineum* (Nepalese browntop), *Mimulus alatus* (sharpwing monkeyflower), *Mimulus ringens var. ringens* (Allegheny monkeyflower), *Onoclea sensibilis* (sensitive fern), *Panicum anceps ssp. anceps*, *Panicum rigidulum var. elongatum* (redtop panicgrass), *Penthorum sedoides* (ditch stonecrop), *Pilea pumila var. pumila* (Canadian clearweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Sagittaria latifolia* (broadleaf arrowhead), *Saururus cernuus* (lizard's tail), *Scutellaria lateriflora var. lateriflora* (blue skullcap), *Silphium perfoliatum var. connatum* (cup plant), *Toxicodendron radicans* (eastern poison ivy), *Verbesina alternifolia* (wingstem), *Veronica anagallis-aquatica* (water speedwell), and *Viola striata* (striped cream violet). Vascular plant species richness in the 5 sampled plots ranges from 38 to 108 (mean = 58.6).

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Saururus cernuus* (lizard's tail)

Characteristic Species: *Amphicarpaea bracteata* (American hogpeanut), *Apios americana* (groundnut), *Arthraxon hispidus* (small carpgrass), *Boehmeria cylindrica* (smallspike false nettle), *Calystegia sepium* (hedge false bindweed), *Cardamine impatiens* (narrowleaf bittercress), *Cuscuta gronovii* (scaldweed), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* var. *virginicus* (Virginia wildrye), *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Galium tinctorium* (stiff marsh bedstraw), *Glechoma hederacea* (ground ivy), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Iris pseudacorus* (paleyellow iris), *Juncus effusus* (common rush), *Justicia americana* (American water-willow), *Lindernia dubia* (yellowseed false pimpernel), *Lobelia cardinalis* (cardinalflower), *Lonicera japonica* (Japanese honeysuckle), *Ludwigia palustris* (marsh seedbox), *Lysimachia ciliata* (fringed loosestrife), *Lysimachia nummularia* (creeping jenny), *Mentha arvensis* (wild mint), *Microstegium vimineum* (Nepalese browntop), *Mimulus alatus* (sharpwing monkeyflower), *Mimulus ringens* var. *ringens* (Allegheny monkeyflower), *Onoclea sensibilis* (sensitive fern), *Panicum anceps* (beaked panicgrass), *Panicum rigidulum* var. *elongatum* (redtop panicgrass), *Penthorum sedoides* (ditch stonecrop), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* var. *lateriflora* (blue skullcap), *Toxicodendron radicans* (eastern poison ivy), *Verbesina alternifolia* (wingstem), *Veronica anagallis-aquatica* (water speedwell), *Viola striata* (striped cream violet).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	Vanderhorst 2001b

Local Range: This association occurs in small patches along the New River from Hinton downstream to Mann's Creek.

Classification Comments: Suiter (1995) described the occurrence of this association at Sandstone Falls as *Saururus cernuus* (lizard's tail) silt accumulations. This association may grade towards *Justicia americana* (American water-willow) Herbaceous Vegetation (CEGL004286)

which occurs in positions, typically in the main channel of the river, that are subject to higher energy flooding. The latter association is characterized by extremely low diversity, whereas *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696) usually has very high diversity.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.68, NERI.75, NERI.76, NERI.78, NERI.137.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Semipermanently flooded temperate perennial forb vegetation (V.B.2.N.e.)
Alliance	*Pontederia cordata - Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
Alliance (English name)	Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance
Association	*Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation
Association (English name)	Green Arrow-arum - Lizard's-tail - Small-spike False Nettle / Tree Moss Herbaceous Vegetation
Ecological System(s):	Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This vegetation occupies depressions of Piedmont and mountain floodplains, as well as broad flat floodplains of the Coastal Plain of Delaware and New Jersey. These depressions are usually abandoned channel segments or swales behind natural levees in which water is ponded for all or much of the year. Water may be supplied primarily by stream flooding or by rainfall. Vegetative cover is variable and may be confined to edges or shallower portions that dry out during the growing season. The vascular plant species vary widely among examples. Emergent vegetation may include *Peltandra virginica* (green arrow arum), *Dulichium arundinaceum* (threeway sedge), and *Polygonum* (knotweed) spp. *Carex crinita* (fringed sedge) or some other wetland *Carex* (sedge) species are almost always present. *Saururus cernuus* (lizard's tail) and *Boehmeria cylindrica* (smallspike false nettle) are other typical herbs. Larger examples may have pad-leaved aquatic species such as *Brasenia schreberi* (watershield) or *Nymphaea odorata* (American white waterlily). Some examples have wetland shrubs on edges or in shallow portions, including *Cornus amomum* (silky dogwood) and *Cephalanthus occidentalis* (common buttonbush). The moss *Climacium americanum* (American climacium moss) is often abundant on the landward side.
Environmental Description: This vegetation occurs in Piedmont and mountain floodplains, as well as broad flat floodplains of the Coastal Plain of Delaware and New Jersey. These depressions are usually abandoned channel segments or swales behind natural levees in which

water is ponded for all or much of the year. These alluvial landforms are located at the bottom of upland gorge slopes behind larger floodplains, typically on point bars on the inside bends of river meanders. These positions may be flooded by forward-flowing water during larger floods and by back-flowing water during smaller floods. They also receive water inputs from seepage and rain. Patches of this vegetation type can be highly ephemeral but are likely to develop again on the same site following their destruction by large floods. As these habitats dry out, bare substrate is exposed which is colonized in a zonal pattern by a high diversity of weedy and flood-adapted species. There are usually some more-or-less permanent pools which provide important habitat for aquatic animals, including fish and amphibians. Soils are moderately well- to very poorly drained sand, clay loam, and muck. Slopes range from level to moderate but are typically gentle Water may be supplied primarily by stream flooding or by rainfall. Stands are usually partially shaded by overhanging trees from adjacent forests.

Vegetation Description: This association represents herbaceous wetland vegetation that is usually partially shaded by overhanging trees rooted outside of the community. Herbs are usually sorted out in zones along a hydrologic gradient and include a high diversity of wetland emergent and "weedy" native and exotic taxa. Emergent vegetation may include *Peltandra virginica* (green arrow arum), *Dulichium arundinaceum* (threeway sedge), and *Polygonum* (knotweed) spp. Other vascular plant species vary widely among examples. *Carex crinita* (fringed sedge) or some other wetland *Carex* (sedge) species are almost always present. Other herbs with relatively high cover or constancy include *Amphicarpaea bracteata* (American hogpeanut), *Apios americana* (groundnut), *Arthraxon hispidus* (small carpgrass), *Bidens* (beggarticks) spp., *Boehmeria cylindrica* (smallspike false nettle), *Calystegia sepium* (hedge false bindweed), *Cardamine impatiens* (narrowleaf bittercress), *Cuscuta gronovii* (scaldweed), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), *Equisetum arvense* (field horsetail), *Eragrostis hypnoides* (teal lovegrass), *Galium tinctorium* (stiff marsh bedstraw), *Glechoma hederacea* (ground ivy), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Iris pseudacorus* (paleyellow iris), *Juncus effusus* (common rush), *Justicia americana* (American water-willow), *Lindernia dubia* (yellowseed false pimpernel), *Lobelia cardinalis* (cardinalflower), *Lonicera japonica* (Japanese honeysuckle), *Ludwigia palustris* (marsh seedbox), *Lysimachia ciliata* (fringed loosestrife), *Lysimachia nummularia* (creeping jenny), *Mentha arvensis* (wild mint), *Microstegium vimineum* (Nepalese browntop), *Mimulus alatus* (sharpwing monkeyflower), *Mimulus ringens* (Allegheny monkeyflower), *Onoclea sensibilis* (sensitive fern), *Panicum anceps* (beaked panicgrass), *Panicum rigidulum var. elongatum* (redtop panicgrass), *Penthorum sedoides* (ditch stonecrop), *Pilea pumila* (Canadian clearweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Sagittaria latifolia* (broadleaf arrowhead), *Saururus cernuus* (lizard's tail), *Scutellaria lateriflora* (blue skullcap), *Silphium perfoliatum var. connatum* (cup plant), *Toxicodendron radicans* (eastern poison ivy), *Verbesina alternifolia* (wingstem), *Veronica anagallis-aquatica* (water speedwell) and *Viola striata* (striped cream violet). Larger examples may have pad-leaved aquatic species such as *Brasenia schreberi* (watershield) or *Nymphaea odorata* (American white waterlily). Some examples have wetland shrubs on edges or in shallow portions, including *Cornus amomum* (silky dogwood), *Asimina triloba* (pawpaw), *Ilex verticillata* (common winterberry), *Lindera benzoin* (northern spicebush), *Rosa multiflora* (multiflora rose), *Salix nigra* (black willow), *Sambucus canadensis* (common elderberry), and *Cephalanthus occidentalis* (common buttonbush). Vascular plant species richness is typically high. The moss *Climacium americanum* (American climacium moss) is often abundant on the landward side.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Boehmeria cylindrica* (smallspike false nettle), *Peltandra virginica* (green arrow arum), *Saururus cernuus* (lizard's tail)
Herb (field)	Graminoid	*Dulichium arundinaceum* (threeway sedge)

Characteristic Species: *Cardamine impatiens* (narrowleaf bittercress), *Carex crinita* (fringed sedge), *Dichanthelium clandestinum* (deertongue), *Elymus virginicus* (Virginia wildrye), *Equisetum arvense* (field horsetail), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Iris pseudacorus* (paleyellow iris), *Juncus effusus* (common rush), *Justicia americana* (American water-willow), *Lindernia dubia* (yellowseed false pimpernel), *Lobelia cardinalis* (cardinalflower), *Ludwigia palustris* (marsh seedbox), *Lysimachia ciliata* (fringed loosestrife), *Mentha arvensis* (wild mint), *Mimulus alatus* (sharpwing monkeyflower), *Mimulus ringens* (Allegheny monkeyflower), *Onoclea sensibilis* (sensitive fern), *Panicum anceps* (beaked panicgrass), *Panicum rigidulum* var. *elongatum* (redtop panicgrass), *Peltandra virginica* (green arrow arum), *Pilea pumila* (Canadian clearweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Veronica anagallis-aquatica* (water speedwell).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is found in the Piedmont, Southern Blue Ridge and related ecoregions, north to the Coastal Plain in Connecticut. It may range south to Tennessee and North Carolina.
States/Provinces: CT, DE, MD, NC, NJ, PA, TN?, VA, WV.
Federal Lands: NPS (New River Gorge); USFWS (Great Swamp).

CONSERVATION STATUS

Rank: G2G3? (20-Dec-2006).
Reasons: This community is apparently rare but extends over a moderate geographic range. Individual occurrences are small, generally less than an acre. Many sites for this community have been lost to clearing for agriculture, ditching and draining, hydrologic alteration, and development. These sites are important for amphibian breeding.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: These floodplain pools are transitional between wetland vegetated communities and aquatic communities. They are more distinctive for their aquatic fauna (and probably microflora) than for their higher plant communities. In fact, vegetation and floristics can be highly variable among sites. Two distinct kinds can be recognized based on the aquatic animal communities. Pools that are flooded by overbank streamflow at least as often as they dry out support fish as the dominant animal component. Those that are flooded more rarely and dry out between floods lack fish most of the time and support significant amphibian communities. These differences are not known to be reflected in vegetation but are important ecologically.

Similar Associations:

- *Justicia americana* Herbaceous Vegetation (CEGL004286).
- *Peltandra virginica - Polygonum amphibium var. emersum - Carex emoryi - Impatiens capensis* Herbaceous Vegetation (CEGL006244).

Related Concepts:

- *Saururus cernuus - Boehmeria cylindrica* herbaceous wetland (Vanderhorst 2001b) =
- Floodplain Pool (Schafale 1998a) ?

SOURCES

Description Authors: M. P. Schafale and M. Pyne, mod. S. C. Gawler.

References: Breden et al. 2001, Fleming et al. 2001, Harrison 2004, Metzler and Barrett 2001, Schafale 1998a, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Suiter 1995, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): SUBMERGED AQUATIC VEGETATION

SYNONYMS

NVC English Name: **Pondweed species - Coontail species - Waterweed species Permanently Flooded Herbaceous Vegetation**

NVC Scientific Name: ***Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation**

NVC Identifier: **CEGL004725**

LOCAL INFORMATION

Environmental Description: This association occurs in shallow water within the channel of the New River.

Vegetation Description: This association represents submerged aquatic vegetation. Herbaceous cover in plots ranges from 60 to 80%. Species in plots include *Elodea canadensis* (Canadian waterweed), *Justicia americana* (American water-willow), *Najas gracillima* (slender waternymph), *Podostemum ceratophyllum* (hornleaf riverweed), *Potamogeton crispus* (curly pondweed), *Potamogeton foliosus ssp. foliosus* (leafy pondweed), *Potamogeton nodosus* (longleaf pondweed), and *Vallisneria americana* (American eelgrass). In addition, *Heteranthera dubia* (grassleaf mudplantain) was observed by West Virginia Natural Heritage Program ecologists in this community. Vascular plant species richness in the 3 sampled plots ranges from 4 to 6 (mean = 5).

Most Abundant Species:

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb (floating & submergent)	*Elodea canadensis* (Canadian waterweed), *Vallisneria americana* (American eelgrass)

Characteristic Species: *Heteranthera dubia* (grassleaf mudplantain), *Justicia americana* (American water-willow), *Najas gracillima* (slender waternymph), *Podostemum ceratophyllum* (hornleaf riverweed), *Potamogeton crispus* (curly pondweed), *Potamogeton foliosus* ssp. *foliosus* (leafy pondweed), *Potamogeton nodosus* (longleaf pondweed), *Vallisneria americana* (American eelgrass).

Other Noteworthy Species:

Species	GRank	Type	Note
Najas gracillima (slender waternymph)	-	plant	state-rare (S2)

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR	=	1	[gname]	WVNHP unpubl. data b

Local Range: This association was sampled only in the southern third of the park between Sandstone Falls and Hinton, and it is likely to be most abundant in this stretch of river. However, Suiter (1995) documented similar vegetation from several sites downstream as far as Keeney's Creek.

Classification Comments: Dominance by *Vallisneria americana* (American eelgrass) in one plot may merit recognition of this stand as *Vallisneria americana* (American eelgrass) Herbaceous Vegetation (CEGL002284), however, little is known about relative abundance of species, their distribution, and the environmental factors affecting their occurrence in this

community. Similar vegetation is described from the New River by Suiter (1995) as the *Vallisneria americana* - *Potamogeton* spp. wetland.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: NERI.62, NERI.63, NERI.67.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Hydromorphic-rooted vegetation (V.C.)
Physiognomic Group	Temperate or subpolar hydromorphic-rooted vegetation (V.C.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.)
Formation	Permanently flooded temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.a.)
Alliance	*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
Alliance (English name)	Pondweed species - Coontail species - Waterweed species Permanently Flooded Herbaceous Alliance
Association	*Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation
Association (English name)	Pondweed species - Coontail species - Waterweed species Permanently Flooded Herbaceous Vegetation
Ecological System(s):	Mississippi River Bottomland Depression (CES203.490) Central Appalachian River Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This broadly defined type represents vegetation dominated by various floating-leaved and submerged aquatic species (including *Potamogeton* (pondweed) spp., *Ceratophyllum* (hornwort) spp., *Utricularia* (bladderwort) spp., and *Elodea* (waterweed) spp.) from the Cumberlands across to the Atlantic and Gulf coastal plains. Individual stands are typically species-poor and may be dominated by a single species, this leading to any number of apparent dominance types. Until the patterns are better understood, these are all grouped together here.
Environmental Description: This community type is found in shallow to relatively deep (1 m) freshwater basins, marshes, or bays that remain flooded in all but the driest years. Species composition varies with substrate, water depth, water chemistry, turbidity, water temperatures and other factors, but these are poorly understood.
Vegetation Description: This association represents submerged aquatic vegetation in the southeastern U.S. Hydrophytes dominate the vegetation, forming 50-80% cover. Composition is variable, but typical plants include *Ceratophyllum demersum* (coon's tail), *Elodea canadensis* (Canadian waterweed), *Elodea nuttallii* (western waterweed), *Heteranthera dubia* (grassleaf mudplantain), *Justicia americana* (American water-willow), *Najas gracillima* (slender waternymph), *Podostemum ceratophyllum* (hornleaf riverweed), *Potamogeton crispus* (curly pondweed), *Potamogeton diversifolius* (waterthread pondweed), *Potamogeton foliosus* (leafy

pondweed), *Potamogeton nodosus* (longleaf pondweed), *Stuckenia pectinata* (sago pondweed), *Utricularia* (bladderwort) spp., and *Vallisneria americana* (American eelgrass).

Most Abundant Species:

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb (floating & submergent)	*Elodea canadensis* (Canadian waterweed)

Characteristic Species: *Ceratophyllum demersum* (coon's tail), *Elodea canadensis* (Canadian waterweed), *Heteranthera dubia* (grassleaf mudplantain), *Najas gracillima* (slender waternymph), *Potamogeton crispus* (curly pondweed), *Potamogeton diversifolius* (waterthread pondweed), *Potamogeton foliosus* (leafy pondweed), *Potamogeton nodosus* (longleaf pondweed), *Vallisneria americana* (American eelgrass).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This aquatic vegetation is found in the southeastern United States, from West Virginia and Tennessee south into Georgia and Mississippi.

States/Provinces: AL, GA, MS, NC, SC, TN, WV.

Federal Lands: DOD (Fort Benning); NPS (Natchez Trace, New River Gorge); USFS (Oconee?); USFWS (Reelfoot).

CONSERVATION STATUS

Rank: G4? (19-Sep-2001).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 3 - Weak.

Comments: Additional types may be developed as more information becomes available. *Vallisneria americana* (American eelgrass) may be present, and in some cases this would overlap with *Vallisneria americana* (American eelgrass) Herbaceous Vegetation (CEGL002284).

Similar Associations:

- *Ceratophyllum demersum - Stuckenia pectinata* Herbaceous Vegetation (CEGL004528)--west of the Mississippi River.
- *Vallisneria americana* Herbaceous Vegetation (CEGL002284).

Related Concepts:

- *Elodea canadensis - (Vallisneria americana) - Potamogeton* spp. aquatic herbaceous vegetation (Vanderhorst 2001b) =

SOURCES

Description Authors: Southeastern Ecology Group, mod. S. C. Gawler.

References: Aulbach-Smith pers. comm., Guthrie 1989, Schotz pers. comm., Southeastern Ecology Working Group n.d., Suiter 1995, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): RIVERBANK ANNUALS

SYNONYMS

NVC English Name:	**Creeping Lovegrass - Marsh Seedbox - Yellowseed False Pimpernel - Awned Flatsedge Herbaceous Vegetation**
NVC Scientific Name:	***Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation**
NVC Identifier:	**CEGL006483**

LOCAL INFORMATION

Environmental Description: This association occurs in small patches and linear zones along the shores of the New River. It occurs in positions within the active channel shelf which are very frequently flooded and submerged for long periods. It occurs on eroded riverbanks and wet beaches and may also occur in back channels and sloughs. The short periods of exposure and heavy disturbance regime result in vegetation dominated by fast-growing annual species. Patches may be highly ephemeral, but this association will likely persist on the landscape under natural or altered flooding regimes. Substrates are sand or silty sand. In the one sampled plot, pH measured in the field was 6.0. Occurrences may be partially shaded by overhanging trees but are best developed in areas with full solar exposure. They are likely to be scattered throughout the length of the New River in the park with elevations ranging from 244 to 402 m.

Vegetation Description: This association represents herbaceous vegetation dominated by weedy native and exotic annuals and short-lived perennials which occur on the shores of the New River. Overhanging trees in the one sampled plot include *Platanus occidentalis* (American sycamore) and *Acer saccharinum* (silver maple). There are seedlings and young saplings of *Betula nigra* (river birch) in the plot. Herbaceous cover in the plot when sampled was 60%. Characteristic herbs include *Acalypha rhomboidea* (Virginia threeseed mercury), *Chamaesyce humistrata* (spreading sandmat), *Chenopodium ambrosioides var. ambrosioides* (Mexican tea), *Cyperus strigosus* (strawcolored flatsedge), *Digitaria ischaemum* (smooth crabgrass), *Diodia virginiana var. virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis hypnoides* (teal lovegrass), *Erechtites hieraciifolia var. hieraciifolia* (American burnweed), *Fimbristylis autumnalis* (slender fimbry), *Glechoma hederacea* (ground ivy), *Hypericum mutilum* (dwarf St. Johnswort), *Leersia virginica* (whitegrass), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Microstegium vimineum* (Nepalese browntop), *Oxalis stricta* (common yellow oxalis), *Panicum dichotomiflorum ssp. dichotomiflorum*, *Panicum gattingeri*, *Polygonum caespitosum var. longisetum* (oriental ladysthumb), *Solanum ptychanthum* (West Indian nightshade), *Verbascum thapsus* (common mullein), and *Verbena urticifolia* (white vervain). Vascular plant species richness in the 1 sampled plot is 31.

Most Abundant Species: Information not available.

Characteristic Species: *Acalypha rhomboidea* (Virginia threeseed mercury), *Chamaesyce humistrata* (spreading sandmat), *Chenopodium ambrosioides* var. *ambrosioides* (Mexican tea), *Cyperus strigosus* (strawcolored flatsedge), *Digitaria ischaemum* (smooth crabgrass), *Diodia virginiana* var. *virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis hypnoides* (teal lovegrass), *Erechtites hieraciifolia* var. *hieraciifolia* (American burnweed), *Fimbristylis autumnalis* (slender fimbry), *Glechoma hederacea* (ground ivy), *Hypericum mutilum* (dwarf St. Johnswort), *Leersia virginica*

(whitegrass), *Lindernia dubia* var. *dubia* (yellowseed false pimpernel), *Microstegium vimineum* (Nepalese browntop), *Oxalis stricta* (common yellow oxalis), *Panicum dichotomiflorum* ssp. *dichotomiflorum* (fall panicgrass), *Panicum gattingeri* (Gattinger's panicgrass), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Solanum ptychanthum* (West Indian nightshade), *Verbascum thapsus* (common mullein), *Verbena urticifolia* (white vervain).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association is likely to occur in small patches along the shores of the New River throughout its length in the park.
Classification Comments: Many of the annual species which characterize this association are also common in *Salix nigra - Betula nigra / Schoenoplectus (pungens, tabernaemontani)* Wooded Herbaceous Vegetation (CEGL006463) and *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696), and distinction among these types may depend on the size of the sampled patch. Because it occurs in very small, potentially ephemeral patches, it is recognized as an association which occurs in the park, but no attempt was made to map individual patches.
Other Comments: Information not available.
Local Description Authors: J.P. Vanderhorst.
Plots: NERI.326.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Annual graminoid or forb vegetation (V.D.)
Physiognomic Group	Temperate or subpolar annual grasslands or forb vegetation (V.D.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar annual grasslands or forb vegetation (V.D.2.N.)
Formation	Seasonally flooded temperate annual grassland (V.D.2.N.g.)
Alliance	Eragrostis hypnoides - Lipocarpha micrantha - Micranthemum umbrosum Seasonally Flooded Herbaceous Alliance (A.1816)
Alliance (English name)	Creeping Lovegrass - Small-flower Hemicarpha - Shaded Mudflower Seasonally Flooded Herbaceous Alliance
Association	*Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation
Association (English name)	Creeping Lovegrass - Marsh Seedbox - Yellowseed False Pimpernel - Awned Flatsedge Herbaceous Vegetation
Ecological System(s):	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609)

GLOBAL DESCRIPTION

Concept Summary: This association occurs along major rivers in the Piedmont and mountains of Maryland, Virginia, West Virginia, and the District of Columbia. It occupies the lowest parts of riverbanks or very low rivershore depositional bars in areas that receive essentially full

sunlight. These habitats are inundated for most of the winter and spring and are generally consistently exposed only from early summer to early autumn (i.e., the "drawdown" zone). During wet years they may be nearly continuously inundated. The type usually occurs as a narrow strip (frequently <2 m wide) along the shoreline. This association may also develop, sometimes as very large (>1 ha) patches, on the drawdown shores and seasonally exposed islands of impounded rivers. Vegetation of stands varies from sparse to dense (10-80% cover) and is characterized by low-growing mats of predominantly annual species, with some low, fast-growing perennials also present. *Eragrostis hypnoides* (teal lovegrass), *Ludwigia palustris* (marsh seedbox), *Lindernia dubia var. dubia* (yellowseed false pimpernel), and *Cyperus squarrosus* (bearded flatsedge) are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea* (Virginia threeseed mercury), *Ammannia coccinea* (valley redstem), *Artemisia annua* (sweet sagewort), *Bidens frondosa* (devil's beggartick), *Chamaesyce humistrata* (spreading sandmat), *Chamaesyce maculata* (spotted sandmat), *Chenopodium ambrosioides* (Mexican tea), *Cyperus bipartitus* (slender flatsedge), *Cyperus odoratus* (fragrant flatsedge), *Diodia virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis frankii* (sandbar lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Mollugo verticillata* (green carpetweed), *Panicum dichotomiflorum var. dichotomiflorum*, *Panicum gattingeri*, *Paspalum fluitans* (horsetail paspalum), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), *Rorippa palustris ssp. fernaldiana* (Fernald's yellowcress), *Rotala ramosior* (lowland rotala), *Solanum ptychanthum* (West Indian nightshade), and *Xanthium strumarium* (rough cockleburr). Frequent perennials include *Boehmeria cylindrica* (smallspike false nettle), *Cyperus strigosus* (strawcolored flatsedge), *Leersia virginica* (whitegrass), *Justicia americana* (American water-willow), *Lycopus americanus* (American water horehound), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Phyla lanceolata* (lanceleaf fogfruit), *Rorippa sylvestris* (creeping yellowcress), and *Samolus valerandi ssp. parviflorus* (seaside brookweed). Stranded mats of *Heteranthera dubia* (grassleaf mudplantain) are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis* (halberdleaf rosemallow), *Eupatorium* (thoroughwort) spp., and *Polygonum* (knotweed) spp. are also frequent but rarely reach full stature. Overhanging trees of *Platanus occidentalis* (American sycamore) and *Acer saccharinum* (silver maple) may be present, as well as saplings of *Betula nigra* (river birch).

Environmental Description: Natural occurrences of this community occupy the lowest parts of riverbanks or very low rivershore depositional bars in areas that receive essentially full sunlight. It occurs on eroded riverbanks and wet beaches and may also occur in back channels and sloughs. These habitats are inundated for most of the winter and spring and are generally consistently exposed only from early summer to early autumn (i.e., the "drawdown" zone). During wet years they may be nearly continuously inundated. The type usually occurs as a narrow strip (frequently <2 m wide) along the shoreline. Though more frequently flooded than higher depositional bars that support tall annual or perennial herbaceous vegetation, the habitats of this type probably experience lesser amounts of sediment turnover (erosion and deposition) during a flood of a given magnitude (i.e., are less stochastically disturbed). Soils are usually deep to somewhat shallow sandy loams, loamy sands, or silt loams that are likely saturated to near the surface throughout the growing season. They would likely be classified as Entisols and generally

have high pH (7.0), high calcium levels, and are 100% base-saturated. Mean particle size (phi) of samples collected from several Potomac River sites is 2.7 to 1.9. This association may also develop, sometimes as very large (>1 ha) patches, on the drawdown shores and seasonally exposed islands of impounded rivers, e.g., at the upper end of the John H. Kerr Reservoir on the Roanoke River in Halifax, Mecklenburg, and Charlotte counties, Virginia.

Vegetation Description: With the exception of several semi-aquatic perennial species, the short periods of exposure and heavy disturbance regime select for opportunistic, non-competitive annual species and low, short-lived, fast-growing perennials, all of which can grow and reproduce quickly. It would be expected that many species in this community type have relatively long-lived seedbanks and, possibly, specialized germination requirements. Vegetation of stands varies from sparse to dense (10-80% cover) and is characterized by low-growing mats of predominantly annual species. *Eragrostis hypnoides* (teal lovegrass), *Ludwigia palustris* (marsh seedbox), *Lindernia dubia var. dubia* (yellowseed false pimpernel), and *Cyperus squarrosus* (bearded flatsedge) are constant and often abundant. Other characteristic annuals (and biennials) are *Acalypha rhomboidea* (Virginia threeseed mercury), *Ammannia coccinea* (valley redstem), *Artemisia annua* (sweet sagewort), *Bidens frondosa* (devil's beggartick), *Chamaesyce humistrata* (spreading sandmat), *Chamaesyce maculata* (spotted sandmat), *Chenopodium ambrosioides* (Mexican tea), *Cyperus bipartitus* (slender flatsedge), *Cyperus odoratus* (fragrant flatsedge), *Diodia virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Elsholtzia ciliata* (crested latesummer mint), *Eragrostis frankii* (sandbar lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Lindernia dubia var. anagallidea* (yellowseed false pimpernel), *Lindernia dubia var. dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Mollugo verticillata* (green carpetweed), *Panicum dichotomiflorum var. dichotomiflorum*, *Panicum gattingeri*, *Paspalum fluitans* (horsetail paspalum), *Polygonum caespitosum var. longisetum* (oriental ladysthumb), *Rorippa palustris ssp. fernaldiana* (Fernald's yellowcress), *Rotala ramosior* (lowland rotala), *Solanum ptychanthum* (West Indian nightshade), and *Xanthium strumarium* (rough cockleburr). Frequent perennials include *Boehmeria cylindrica* (smallspike false nettle), *Cyperus strigosus* (strawcolored flatsedge), *Leersia virginica* (whitegrass), *Justicia americana* (American water-willow), *Lycopus americanus* (American water horehound), *Mimulus alatus* (sharpwing monkeyflower), *Penthorum sedoides* (ditch stonecrop), *Phyla lanceolata* (lanceleaf fogfruit), *Rorippa sylvestris* (creeping yellowcress), and *Samolus valerandi ssp. parviflorus* (seaside brookweed). Stranded mats of *Heteranthera dubia* (grassleaf mudplantain) are also frequent. Seedlings of taller annuals and perennials such as *Hibiscus laevis* (halberdleaf rosemallow), *Eupatorium* (thoroughwort) spp., and *Polygonum* (knotweed) spp. are also frequent but rarely reach full stature. A variant of this community in the Potomac River drainage is characterized primarily by low, rhizomatous colonies of *Eleocharis tenuis* (slender spikerush). Species that are more characteristic of the James River and Roanoke River occurrences in central and southern Virginia include *Cyperus flavicomus* (whiteedge flatsedge), *Cyperus erythrorhizos* (redroot flatsedge), *Ludwigia decurrens* (wingleaf primrose-willow), *Paspalum dissectum* (mudbank crowngrass), *Rorippa sessiliflora* (stalkless yellowcress), and *Sagittaria calycina var. calycina* (hooded arrowhead). Overhanging trees of *Platanus occidentalis* (American sycamore) and *Acer saccharinum* (silver maple) may be present, as well as saplings of *Betula nigra* (river birch).

Most Abundant Species: Information not available.

Characteristic Species: *Acalypha rhomboidea* (Virginia threeseed mercury), *Artemisia annua* (sweet sagewort), *Chamaesyce humistrata* (spreading sandmat), *Chenopodium ambrosioides* (Mexican tea), *Diodia virginiana* (Virginia buttonweed), *Echinochloa crus-galli* (barnyardgrass), *Eclipta prostrata* (false daisy), *Eragrostis frankii* (sandbar lovegrass), *Eragrostis hypnoides* (teal lovegrass), *Fimbristylis autumnalis* (slender fimbry), *Hypericum mutilum* (dwarf St. Johnswort), *Leersia virginica* (whitegrass), *Lindernia dubia* (yellowseed false pimpernel), *Lipocarpha micrantha* (smallflower halfchaff sedge), *Mimulus alatus* (sharpwing monkeyflower), *Oxalis stricta* (common yellow oxalis), *Panicum dichotomiflorum* (fall panicgrass), *Panicum gattingeri* (Gattinger's panicgrass), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), *Rotala ramosior* (lowland rotala), *Solanum ptychanthum* (West Indian nightshade), *Verbascum thapsus* (common mullein), *Verbena urticifolia* (white vervain).
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community occurs along major rivers in the Piedmont and mountains of Maryland, Virginia, West Virginia, and the District of Columbia. It is definitely known from the Potomac, Shenandoah, Monocacy, New, James, and Roanoke rivers, and likely occurs in other drainages of the region.
States/Provinces: DC, MD, VA, WV.
Federal Lands: NPS (C&O Canal, George Washington Parkway, Harpers Ferry, Monocacy, New River Gorge).

CONSERVATION STATUS

Rank: G3 (29-Sep-2006).
Reasons: Although natural stands occur in very small, somewhat ephemeral patches, this type is widely distributed along major rivers in the greater Mid-Atlantic Piedmont and mountain region and is adaptable to artificial drawdown shores, where it sometimes occurs in extensive patches.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 - Moderate.
Comments: The classification is supported by analysis of data from 25 plots collected for the National Capital Region Parks project, three plots collected along the Roanoke River in southern Virginia, and one plot from the New River in West Virginia. Many of the annual species which characterize this association are also common in *Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463) and *Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum* Herbaceous Vegetation (CEGL007696), and distinction between these types may depend on the size of the sampled patch.
Similar Associations:
- *Eragrostis hypnoides - Micranthemum umbrosum - Lipocarpha micrantha - (Juncus repens)* Herbaceous Vegetation (CEGL004341)--on drawdown shores of Coastal Plain rivers.

Related Concepts:
- *Eragrostis hypnoides - Lindernia dubia - Ludwigia palustris - Cyperus squarrosus* Herbaceous Vegetation (Fleming et al. 2004) =
- *Eragrostis hypnoides - Lindernia dubia - Ludwigia palustris* Herbaceous Vegetation (Lea 2000) =

- *Eragrostis hypnoides - Ludwigia palustris - Cyperus squarrosus* Herbaceous Vegetation (Lea 2003) F
- *Panicum rigidulum - Eleocharis tenuis - Phyla lanceolata* Herbaceous Vegetation (Lea 2003) F

SOURCES

Description Authors: C. Lea and G. P. Fleming, mod. S. C. Gawler.

References: Eastern Ecology Working Group n.d., Fleming et al. 2004, Lea 2000, Lea 2003, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): COMMON ROCKTRIPE CLIFF FACE

SYNONYMS
NVC English Name: **Common Rocktripe Nonvascular Vegetation**
NVC Scientific Name: ***Umbilicaria mammulata* Nonvascular Vegetation**
NVC Identifier: **CEGL004387**

LOCAL INFORMATION

Environmental Description: This association occurs on bedrock cliffs and vertical surfaces of large exfoliated boulders composed of acidic sandstone of the New River Formation in the Pottsville group. It usually occurs in shaded positions, typically with northerly aspects, or in areas which receive some water seepage from above. Elevations of mapped cliffs in the park range from 350 to 611 m.
Vegetation Description: This association represents rock faces dominated by the lichen *Umbilicaria mammulata* (navel lichen).
Most Abundant Species:

Stratum	Lifeform	Species
Nonvascular	Lichen	*Umbilicaria mammulata* (navel lichen)

Characteristic Species: Information not available.
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association is likely to occur in small patches on most cliff faces in the park. It has been observed along the Endless Wall and South Nuttall Wall cliff bands and on large boulders north of Keeney's Creek. Large cliffs are mapped in the northern third of the park, and additional smaller patches are likely to occur on gorge slopes in other areas with sandstone geology.
Classification Comments: Classification of this type within the park is based on observations and photographs. Plot data are lacking.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: None.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Nonvascular Vegetation (VI)
Physiognomic Subclass	Lichen vegetation (VI.B.)
Physiognomic Group	Temperate or subpolar lichen vegetation (VI.B.1.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar lichen vegetation (VI.B.1.N.)
Formation	Alpine to submontane temperate or subpolar lichen vegetation (VI.B.1.N.b.)
Alliance	*Umbilicaria mammulata* Nonvascular Alliance (A.1827)
Alliance (English name)	Common Rocktripe Nonvascular Alliance

Association	*Umbilicaria mammulata* Nonvascular Vegetation
Association (English name)	Common Rocktripe Nonvascular Vegetation
Ecological System(s):	North-Central Appalachian Acidic Cliff and Talus (CES202.601) Southern Appalachian Montane Cliff and Talus (CES202.330)

GLOBAL DESCRIPTION

Concept Summary: Vegetation is strongly dominated by *Umbilicaria mammulata* (navel lichen), on relatively moist, shaded rock outcrops, typically on slopes with northerly aspects. This vegetation occurs where periodic seepage occurs on acidic rock outcrops. Individual occurrences can be as large as an acre. Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day. Other umbilicate lichens, shade-tolerant foliose lichens such as *Flavoparmelia baltimorensis*, and numerous crustose lichens may also occur. Associates include scattered individuals of *Dryopteris intermedia* (intermediate woodfern) and *Polypodium appalachianum* (Appalachian polypody).

Environmental Description: This lichen-dominated community occurs on relatively moist, shaded, acidic rock outcrops (bedrock cliffs and vertical surfaces of large exfoliated boulders) where periodic seepage occurs. It is typically found on slopes with northerly aspects. Individual occurrences can be as large as an acre.

Vegetation Description: The vegetation is strongly dominated by *Umbilicaria mammulata* (navel lichen). Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day. Other umbilicate lichens, shade-tolerant foliose lichens such as *Flavoparmelia baltimorensis*, and numerous crustose lichens may also occur. Associates include scattered individuals of *Dryopteris intermedia* (intermediate woodfern) and *Polypodium appalachianum* (Appalachian polypody).

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Fern or fern ally	*Dryopteris intermedia* (intermediate woodfern), *Polypodium virginianum* (rock polypody)
Nonvascular	Lichen	*Umbilicaria mammulata* (navel lichen)

Characteristic Species: *Umbilicaria mammulata* (navel lichen).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: Information not available.

States/Provinces: CT, GA, NC, PA, SC, TN, VA, WV.

Federal Lands: NPS (Blue Ridge Parkway?, New River Gorge, Shenandoah, Weir Farm); USFS (Cherokee?, George Washington, Jefferson, Monongahela?, Nantahala, Pisgah).

CONSERVATION STATUS

Rank: G4? (15-Aug-1994).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 - Moderate.

Comments: Potentially very widespread in Southeast and beyond.

Similar Associations:

- *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Vegetation (CEGL004386).

Related Concepts:

- IE2a. Southern Appalachian Acidic Cliff (Allard 1990) ?
- Lichen-dominated shaded outcrops (CAP pers. comm. 1998) ?
- Montane Cliff (Carolina Rocktripe Subtype) (Schafale 1998b) ?
- SNE acidic cliff community (Rawinski 1984) ?

SOURCES

Description Authors: A. S. Weakley, mod. G. P. Fleming.

References: Allard 1990, CAP pers. comm. 1998, Fike 1999, Rawinski 1984, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Swain and Kearsley 2001, TDNH unpubl. data, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): DRY SANDSTONE CLIFF

SYNONYMS
NVC English Name: **Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation**
NVC Scientific Name: **Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation**
NVC Identifier: **CEGL006435**

LOCAL INFORMATION

Environmental Description: This association occurs on bedrock cliffs composed of acidic sandstone of the New River Formation in the Pottsville group. It occurs in areas which do not receive much water seepage from above and is the dominant association of cliffs with southerly aspects. Elevations of mapped cliffs in the park range from 350 to 611 m.
Vegetation Description: This association represents sparsely vegetated rock faces of cliffs and large boulders. Vegetation is limited to crustose lichens and a few individuals of vascular plants which cling to cracks and ledges. Small, contorted specimens of the conifer tree species *Pinus virginiana* (Virginia pine) and *Tsuga canadensis* (eastern hemlock) have been observed on these cliffs.
Most Abundant Species: Information not available.
Characteristic Species: *Pinus virginiana* (Virginia pine).
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: This association is likely to occur in small patches on most cliff faces in the park. It has been observed along the Endless Wall and South Nuttall Wall cliff bands. Large cliffs are mapped in the northern third of the park, and additional smaller patches are likely to occur on gorge slopes in other areas with sandstone geology.
Classification Comments: Classification of this type within the park is based on observations and photographs. Plot data are lacking.
Other Comments: Information not available.
Local Description Authors: J. P. Vanderhorst.
Plots: None.
New River Gorge National River Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Consolidated rock sparse vegetation (VII.A.)
Physiognomic Group	Sparsely vegetated cliffs (VII.A.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated cliffs (VII.A.1.N.)
Formation	Cliffs with sparse vascular vegetation (VII.A.1.N.a.)
Alliance	Open Cliff Sparsely Vegetated Alliance (A.1836)
Alliance (English name)	Open Cliff Sparsely Vegetated Alliance
Association	Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation
Association (English name)	Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation
Ecological System(s):	North-Central Appalachian Acidic Cliff and Talus (CES202.601)

GLOBAL DESCRIPTION

Concept Summary: This dry sandstone cliff community occurs in the Western Allegheny Plateau and central Appalachian Mountains of the United States. Stands occur as steep to vertical rock exposures of sandstone bedrock. Aspect is variable, but stands are best developed on south- and west-facing slopes. Vegetation is restricted to shelves, cracks and crevices in the rock, generally averaging less than 20%. Mosses and lichens are common, including crustose lichens. Woody species include *Tsuga canadensis* (eastern hemlock), *Pinus virginiana* (Virginia pine), *Betula alleghaniensis* (yellow birch), *Rhododendron periclymenoides* (pink azalea), *Kalmia latifolia* (mountain laurel), *Toxicodendron radicans* (eastern poison ivy), and rarely *Hydrangea arborescens* (wild hydrangea). Herbs are sparse but may include the forbs *Agrostis perennans* (upland bentgrass), *Aquilegia canadensis* (red columbine), *Mitchella repens* (partridgeberry), *Sedum ternatum* (woodland stonecrop), and *Viola blanda* (sweet white violet). *Silene rotundifolia* (roundleaf catchfly) often occurs at the drip line. Ferns such as *Asplenium montanum* (mountain spleenwort), *Asplenium pinnatifidum* (lobed spleenwort), *Asplenium rhizophyllum* (walking fern), *Asplenium trichomanes* (maidenhair spleenwort), *Cystopteris tenuis* (upland brittle bladderfern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Polypodium virginianum* (rock polypody), *Polypodium appalachianum* (Appalachian polypody), *Woodsia obtusa* (bluntlobe cliff fern), and the rare *Asplenium bradleyi* (Bradley's spleewort) also occur.

Environmental Description: This dry sandstone cliff community occurs in the Western Allegheny Plateau and central Appalachian Mountains of the United States. Stands occur as steep to vertical rock exposures of sandstone bedrock. Aspect is variable, but stands are best developed on south- and west-facing slopes.

Vegetation Description: Vegetation is restricted to shelves, cracks and crevices in the rock, generally averaging less than 20%. Mosses and lichens are common, including crustose lichens. Woody species include *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Rhododendron periclymenoides* (pink azalea), *Kalmia latifolia* (mountain laurel), *Toxicodendron radicans* (eastern poison ivy), and rarely *Hydrangea arborescens* (wild hydrangea). The herbaceous layer contains the forbs *Agrostis perennans* (upland bentgrass), *Aquilegia canadensis* (red columbine), *Mitchella repens* (partridgeberry), *Sedum ternatum* (woodland stonecrop), and *Viola blanda* (sweet white violet). *Silene rotundifolia* (roundleaf catchfly) often occurs at the drip line. Ferns such as *Asplenium montanum* (mountain spleenwort), *Asplenium pinnatifidum* (lobed spleenwort), *Asplenium rhizophyllum* (walking fern), *Asplenium trichomanes* (maidenhair spleenwort), *Cystopteris tenuis* (upland brittle bladderfern), *Dennstaedtia punctilobula* (eastern hayscented fern), *Dryopteris intermedia* (intermediate woodfern), *Dryopteris marginalis* (marginal woodfern), *Polypodium virginianum* (rock polypody), *Polypodium appalachianum* (Appalachian polypody), *Woodsia obtusa* (bluntlobe cliff fern), and the rare *Asplenium bradleyi* (Bradley's spleewort) also occur.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Semi-shrub	*Mitchella repens* (partridgeberry)
Herb (field)	Forb	*Aquilegia canadensis* (red columbine)
Herb (field)	Graminoid	*Agrostis perennans* (upland bentgrass)
Herb (field)	Fern or fern ally	*Dennstaedtia punctilobula* (eastern hayscented fern)

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This association is currently documented from the Western Allegheny Plateau and central Appalachian Mountains of the United States, extending to the New River in West Virginia.
States/Provinces: OH, PA, VA, WV.
Federal Lands: NPS (Allegheny Portage Railroad, New River Gorge).

CONSERVATION STATUS

Rank: GNR (24-Jan-2003).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 3 - Weak.
Comments: These cliffs are known locally as "rock houses." In Ohio, Anderson (1996) provides several references to lichen composition on sandstone cliffs.
Similar Associations:

- *Asplenium montanum* - *Heuchera parviflora* var. *parviflora* - *Silene rotundifolia* Sparse Vegetation (CEGL004392).
- *Juniperus virginiana* - *Corydalis sempervirens* Cliff Sparse Vegetation (CEGL006422).
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045).
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287).

Related Concepts:

- Cliff Communities (Anderson 1996) B

SOURCES

Description Authors: L. A. Sneddon, mod. S. C. Gawler.
References: Anderson 1996, Eastern Ecology Working Group n.d., Podniesinski et al. 2006, Sneddon and Menard 2002, Vanderhorst et al. 2007.

COMMON NAME (PARK-SPECIFIC): TRIBUTARY FLOODPLAIN FOREST

SYNONYMS
NVC English Name: **Placeholder – no USNVC association**
NVC Scientific Name: **Placeholder – no USNVC association**
NVC Identifier: **CEGL006487 (Nonstandard placeholder in Biotics)**

LOCAL INFORMATION

Environmental Description: This forest type occurs in small patches and linear zones on floodplains of major tributaries of the New River. These are relatively narrow alluvial landforms which may flood at any time of year. Catastrophic tributary floods occurred during the summer of 2001, which severely impacted many stands of this association by toppling trees, scouring soil and ground cover, and rearranging channel and floodplain topography. Four plots were sampled in less severely flood-impacted sites. Soils in plots are described as well-drained alluvial sands and sandy loams with pH ranging from 5.0 to 7.0. There is a high level of variation in soil chemistry in the plots, but average values indicate slightly acidic soils (mean pH = 5.75) with relatively high levels of Ca, Cu, Mg, P, and Zn. Elevations of mapped stands range from 272 to 633 m. Topography is typically undulating or gently sloping (slope of mapping units ranges from 0.3 to 32 degrees, mean = 9.3 degrees). Adjacent communities are mostly upland forest types. Small patches of *Carex torta* (twisted sedge) Herbaceous Vegetation (CEGL004103) may occur within the adjacent creek channel.

Vegetation Description: This type represents a variety of deciduous floodplain forests along major tributaries of the New River. There is a high degree of variation in vegetation composition within this type. Canopy cover in the plots ranges from 50 to 70% and cover in the subcanopy ranges from 20 to 50%. Dominant canopy tree species include *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (sycamore), *Quercus rubra* (northern red oak), and *Ulmus rubra* (slippery elm). Additional important trees in the canopy and subcanopy include *Acer negundo* (box-elder), *Aesculus flava* (yellow buckeye), *Carya cordiformis* (bitternut hickory), *Magnolia acuminata* (cucumber-tree), *Nyssa sylvatica* (blackgum), *Quercus alba* (white oak), and *Robinia pseudoacacia* (black locust). The shrub layers may include *Carpinus caroliniana ssp. virginiana* (American hornbeam), *Cornus florida* (flowering dogwood), *Corylus americana* (American hazelnut), *Halesia tetraptera* (mountain silverbell), *Lindera benzoin* (northern spicebush), and *Lonicera morrowii* (Morrow's honeysuckle). One distinctive plot (NERI.353) with a canopy dominated by *Quercus rubra* (northern red oak) has a dense short-shrub layer dominated by *Xanthorhiza simplicissima* (yellowroot). Common species in the herb layer include *Amphicarpaea bracteata* (American hogpeanut), *Elymus hystrix* (eastern bottlebrush grass), *Glechoma hederacea* (ground ivy), *Pedicularis canadensis ssp. canadensis*, *Pilea pumila var. pumila* (Canadian clearweed), *Polygonum cuspidatum* (Japanese knotweed), *Polystichum acrostichoides* (Christmas fern), *Symphyotrichum prenanthoides* (crookedstem aster), and *Verbesina occidentalis* (yellow crownbeard). Vascular plant species richness in the 4 sampled plots ranges from 24 to 55 (mean = 39.5).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (sycamore), *Quercus rubra* (northern red oak)
Short shrub/sapling	Broad-leaved deciduous shrub	*Xanthorhiza simplicissima* (yellowroot)

Characteristic Species: *Acer negundo* (box-elder), *Aesculus flava* (yellow buckeye), *Amphicarpaea bracteata* (American hogpeanut), *Carpinus caroliniana* ssp. *virginiana* (American hornbeam), *Carya cordiformis* (bitternut hickory), *Cornus florida* (flowering dogwood), *Corylus americana* (American hazelnut), *Elymus hystrix* (eastern bottlebrush grass), *Glechoma hederacea* (ground ivy), *Halesia tetraptera* (mountain silverbell), *Lindera benzoin* (northern spicebush), *Lonicera morrowii* (Morrow's honeysuckle), *Magnolia acuminata* (cucumber-tree), *Nyssa sylvatica* (blackgum), *Pedicularis canadensis* (Canadian lousewort), *Pilea pumila* var. *pumila* (Canadian clearweed), *Polygonum cuspidatum* (Japanese knotweed), *Polystichum acrostichoides* (Christmas fern), *Quercus alba* (white oak), *Symphyotrichum prenanthoides* (crookedstem aster).

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk Data:

State	SRank	Rel	Conf	SName	Reference
WV	SNR			[not crosswalked]	

Local Range: Mapped stands occur in the floodplains along Meadow Creek, Laurel Creek, Glade Creek, Piney Creek, Mann's Creek, and Wolf Creek.

Classification Comments: This floodplain forest of tributary streams was created as a park special type because it is poorly sampled and very heterogeneous. It occurs in narrow zones which quickly grade to uplands. Sampling was further complicated by catastrophic flooding in 2001 which impacted or destroyed many stands. Further sampling within the park and/or analysis with plots outside the park may support splitting this unit and lumping parts with broader association concepts.

Other Comments: Information not available.

Local Description Authors: J. P. Vanderhorst.

Plots: NERI. 304, NERI.308, NERI.309, NERI.353.

New River Gorge National River Inventory Notes: Additional plot sampling within and outside the park is needed to resolve classification issues involving tributary floodplain forests.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Information not available.
Physiognomic Subclass	Information not available.
Physiognomic Group	Information not available.
Physiognomic Subgroup	Information not available.
Formation	Information not available.
Alliance	Information not available.
Alliance (English name)	Information not available.
Association	Information not available.
Association (English name)	Information not available.
Ecological System(s):	Information not available.

GLOBAL DESCRIPTION

Concept Summary: Information not available.
Environmental Description: Information not available.
Vegetation Description: Information not available.
Most Abundant Species: Information not available.
Characteristic Species: Information not available.
Other Noteworthy Species: Information not available.
USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: Information not available.
States/Provinces: WV.
Federal Lands: NPS (New River Gorge).

CONSERVATION STATUS

Rank: GNR (20-Dec-2006).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Nonstandard.
Confidence: Information not available.
Comments: Information not available.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES

Description Authors: Information not available.
References: Eastern Ecology Working Group n.d., Vanderhorst et al. 2007.

Appendix J. Bibliography for global vegetation association descriptions from the U.S. National Vegetation Classification System.

Adams, H. S., and S. L. Stephenson. 1991. High elevation coniferous forests in Virginia. Virginia Journal of Science 42:391-399.

Allard, D. J. 1990. Southeastern United States ecological community classification. Interim report, Version 1.2. The Nature Conservancy, Southeast Regional Office. Chapel Hill, NC. 96 pp.

Allard, H. A., and E. C. Leonard. 1943. The vegetation and floristics of Bull Run Mountain, Virginia. Castanea 8:1-64.

Allard, H. A., and E. C. Leonard. 1952. The Canaan and the Stony River valleys of West Virginia, their former magnificent spruce forests, their vegetation and floristics today. Castanea 17:1-60.

Ambrose, J. 1990a. Georgia's natural communities--A preliminary list. Unpublished document. Georgia Natural Heritage Inventory. 5 pp.

Anderson, D. M. 1982. Plant communities of Ohio: A preliminary classification and description. Division of Natural Areas and Preserves, Ohio Department of Natural Resources. Columbus. 182 pp.

Anderson, D. M. 1996. The vegetation of Ohio: Two centuries of change. Draft. Ohio Biological Survey.

Andreu, M. G., and M. L. Tukman. 1995. Forest communities of the Tellico Lake Area, East Tennessee. M.F. project report. Duke University, School of the Environment. Durham, NC. 66 pp. plus appendices.

Arends, E. 1981. Vegetation patterns a half century following the chestnut blight in the Great Smoky Mountains National Park. M.S. thesis. University of Tennessee, Knoxville. 79 pp.

Aulbach-Smith, C. Personal communication. Botanical Services of SC.

Baalman, R. J. 1965. Vegetation of the Salt Plains National Wildlife Refuge, Jet, Oklahoma. Unpublished Ph.D. dissertation. University of Oklahoma, Norman.

Bacon, C . W., and M . R. Siegel. 1988. Endophyte parasitism of tall fescue. Journal of Production Agriculture 1:45-55.

Barden, L. S. 1977. Self-maintaining populations of *Pinus pungens* Lam. in the southern Appalachian Mountains. Castanea 42:316-323.

Bartgis, R. L. 1985a. A limestone glade in West Virginia. Bartonia 51:34-36.

Bartgis, R. L. 1993. The limestone glades and barrens of West Virginia. Castanea 58:69-89.

Berdine, M. A., and A. M. A. Gould. 1999. Identification and protection of reference wetland natural communities in Maryland: Delmarva Bay Wetlands. The Biodiversity Program, Maryland Department of Natural Resources, Wildlife and Heritage Division. 87 pp.

Blair, W. F. 1938. Ecological relationships of the mammals of the Bird Creek region, northeastern Oklahoma. The American Midland Naturalist 20:473-526.

Boufford, D. E., and E. W. Wood. 1977. An unusual plant community in South Carolina. Castanea 42:116-119.

Bowen, B., M. Pyne, and D. Withers. 1995. An ecological survey of selected tracts in the Tennessee River Gorge: A report to the Tennessee River Gorge Trust. Tennessee Natural Heritage Program, Department of Environment and Conservation. Nashville. 100 pp.

Bowman, P. 2000. Draft classification for Delaware. Unpublished draft. Delaware Natural Heritage Program.

Bransby, D .L. No date. Herbaceous biomass sources for the southeastern United States: Have all the options been properly evaluated? Department of Agronomy and Soils, Auburn University. Abstract.

Braun, E. L. 1928. The vegetation of the Mineral Springs region of Adams County, Ohio. The Ohio State University Bulletin, Volume 32, No. 30. Ohio Biological Survey, Bulletin 15. 3(5):383-517.

Braun, E. L. 1950. Deciduous forests of eastern North America. Hafner Press, NY. 596 pp.

Breden, T. F. 1989. A preliminary natural community classification for New Jersey. Pages 157-191 *in*: E. F. Karlin, editor. New Jersey's rare and endangered plants and animals. Institute for Environmental Studies, Ramapo College. Mahwah, NJ. 280 pp.

Breden, T. F., Y. R. Alger, K. S. Walz, and A. G. Windisch. 2001. Classification of vegetation communities of New Jersey: Second iteration. Association for Biodiversity Information and New Jersey Natural Heritage Program, Office of Natural Lands Management, Division of Parks and Forestry, New Jersey Department of Environmental Protection. Trenton.

Burns, R. M., and B. H. Honkala, technical coordinators. 1990a. Silvics of North America: Volume 1: Conifers. USDA Forest Service. Agriculture Handbook 654. Washington, DC. 675 pp.

Burns, R. M., and B. H. Honkala, technical coordinators. 1990b. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. USDA Forest Service. Washington, DC. 877 pp.

Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007. Classification and conservation assessment of high elevation wetland communities in the Allegheny Mountains of West Virginia. West Virginia Natural Heritage Program, West Virginia Division of Natural Resources. Elkins.

Central Appalachian Forest Working Group (CAP). 1998. Central Appalachian Working group discussions. The Nature Conservancy. Boston, MA.

Callaway, R. M., E. E. C. Clebsch, and P. S. White. 1987. A multivariate analysis of forest communities in the western Great Smoky Mountains National Park. The American Midland Naturalist 118:107-120.

Campbell, J. J. N. 1980. Present and presettlement forest conditions in the Inner Bluegrass region of Kentucky. Ph.D. dissertation. University of Kentucky, Lexington. 109 pp. (Excerpts only).

Campbell, J. J. N. 1989b. Historical evidence of forest composition in the Bluegrass Region of Kentucky. Pages 231-246 *in*: Proceedings of the Seventh Central Hardwood Forest Conference, Southern Illinois University, Carbondale.

Campbell, Julian J. N. Personal communication. Kentucky Field Office, The Nature Conservancy.

Carr, L. G. 1939. Some notes on the ecology of plants of Magnolia Swamp, August County, Virginia. Claytonia 5:37-47.

Chapman, J. A. 1957. The natural vegetation of English Mountain, Tennessee. Ph.D. dissertation. University of Tennessee, Knoxville. 102 pp.

Collins, B. R., and K. H. Anderson. 1994. Plant communities of New Jersey. Rutgers University Press. New Brunswick, NJ. 287 pp.

Cooper, A. W. 1963. A survey of the vegetation of the Toxaway River Gorge with some remarks about early botanical explorations and an annotated list of the vascular plants of the gorge area. Journal of the Elisha Mitchell Scientific Society 79:1-22.

Cooper, A. W., and J. W. Hardin. 1970. Floristics and vegetation of the gorges on the southern Blue Ridge escarpment. Pages 291-330 *in*: P. C. Holt, editor. The distributional history of the biota of the southern Appalachians, Part II: Flora. Virginia Polytechnical Institute and State University, Research Division. Monograph No. 2.

Core, E. L. 1966. Vegetation of West Virginia. McClain Printing. Parsons, WV. 217 pp.

Coulling, P. P., and T. J. Rawinski. 1999. Classification of vegetation and ecological land units of the Piney River and Mt. Pleasant area, Pedlar Ranger District, George Washington and Jefferson National Forests, Virginia. Natural Heritage Technical Report 99-03. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Biological Service Program. FWS/OBS-79/31. Washington, DC. 103 pp.

Crites, G. D., and E. E. C. Clebsch. 1986. Woody vegetation in the inner Nashville Basin: An example from the Cheek Bend area of the central Duck River valley. ASB Bulletin 33:167-177.

Curtis, J. T. 1959. The vegetation of Wisconsin: An ordination of plant communities. University of Wisconsin Press. Madison. 657 pp. (reprinted in 1987).

DeYoung, H. R. 1979. The white pine-hardwood vegetation types of the Great Smoky Mountains National Park. M.S. thesis. University of Tennessee, Knoxville.

Dellinger, B. 1992. Natural areas survey, Nantahala National Forest, Highlands Ranger District: Site survey reports. Unpublished data. North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program. Raleigh.

Diamond, D. D. 1993. Classification of the plant communities of Texas (series level). Unpublished document. Texas Natural Heritage Program. Austin. 25 pp.

DuMond, D. M. 1970. Floristic and vegetational survey of the Chattooga River Gorge. Castanea 35:201-244.

Duble, R. L. No date. Tall fescue. Texas Agricultural Extensions Service Publication. 3 pp.

Eastern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe. Boston, MA.

Edwards, M. B. 1982. Kudzu--ecological friend or foe: *Pueraria lobata* in the southern United States. Proceedings of the Southern Weed Science Society 35:232-236.

Ehrenfeld, J. G. 1977. Vegetation of Morristown National Historical Park: Ecological analysis and management alternatives. Final Report. USDI National Park Service. Contract No. 1600-7-0004. 166 pp.

Elias, T. B. 1980. The complete trees of North America, field guide and natural history. Book Division, Times Mirror Magazines, Inc. 948 pp.

Evans, M. 1991. Kentucky ecological communities. Draft report to the Kentucky Nature Preserves Commission. 19 pp.

Evans, Marc. Personal communication. Ecologist. Kentucky Natural Heritage Program, Kentucky State Nature Preserves Commission. Frankfort.

Eyre, F. H., editor. 1980. Forest cover types of the United States and Canada. Society of American Foresters. Washington, DC. 148 pp.

Faber-Langendoen, D., and Midwest State Natural Heritage Program Ecologists. 1996. Terrestrial vegetation of the midwest United States. International classification of ecological communities: Terrestrial vegetation of the United States. The Nature Conservancy. Arlington, VA.

Fike, J. 1999. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Natural Diversity Inventory. Pennsylvania Department of Conservation and Recreation. Bureau of Forestry. Harrisburg. 86 pp.

Fleetwood, R. J. 1973. Plants of Brazoria/San Bernard National Wildlife Refuges. Brazoria National Wildlife Refuge, U.S. Fish and Wildlife Service. Angleton, TX. 61 pp.

Fleming, G. P. 1998. Virginia natural community framework, version January 30, 1998. Unpublished document. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. 6 pp.

Fleming, G. P. 1999. Plant communities of limestone, dolomite, and other calcareous substrates in the George Washington and Jefferson national forests, Virginia. Natural Heritage Technical Report 99-4. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. Unpublished report submitted to the USDA Forest Service. 218 pp. plus appendices.

Fleming, G. P., P. P. Coulling, D. P. Walton, K. M. McCoy, and M. R. Parrish. 2001. The natural communities of Virginia: Classification of ecological community groups. First approximation. Natural Heritage Technical Report 01-1. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. Unpublished report. January 2001. 76 pp.

Fleming, G. P., P. P. Coulling, K. D. Patterson, and K. M. McCoy. 2004. The natural communities of Virginia: Classification of ecological community groups. Second approximation. Natural Heritage Technical Report 04-01. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. http://www.dcr.virginia.gov/dnh/ncintro.htm.

Fleming, G. P., and N. E. Van Alstine. 1999. Plant communities and floristic features of sinkhole ponds and seepage wetlands in southeastern Augusta County, Virginia. Banisteria 13:67-94.

Fleming, G. P., and P. P. Coulling. 2001. Ecological communities of the George Washington and Jefferson national forests, Virginia. Preliminary classification and description of vegetation types. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. 317 pp.

Fleming, G. P., and W. H. Moorhead, III. 1996. Ecological land units of the Laurel Fork Area, Highland County, Virginia. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Report 96-08. Richmond. 114 pp. plus appendices.

Fleming, G. P., and W. H. Moorhead, III. 2000. Plant communities and ecological land units of the Peter's Mountain area, James River Ranger District, George Washington and Jefferson national forests, Virginia. Natural Heritage Technical Report 00-07. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. Unpublished report submitted to the USDA Forest Service. 195 pp. plus appendices.

Fleming, Gary P. Personal communication. Ecologist. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond.

Flinchum, D. M. 1977. Lesser vegetation as indicators of varying moisture regimes in bottomland and swamp forests of northeastern North Carolina. Ph.D. dissertation. North Carolina State University, Raleigh. 105 pp.

Fortney, R. H. 1975. The vegetation of Canaan Valley, West Virginia: A taxonomic and ecological study. Ph.D. dissertation. University of West Virginia, Morgantown.

Foti, T. 1994a. Natural communities of Arkansas (terrestrial and palustrine). Unpublished document. Arkansas Natural Heritage Commission. Little Rock. 2 pp.

Foti, T., M. Blaney, X. Li, and K. G. Smith. 1994. A classification system for the natural vegetation of Arkansas. Proceedings of the Arkansas Academy of Science 48:50-53.

Foti, T., compiler. 1994b. Natural vegetation classification system of Arkansas, draft five. Unpublished document. Arkansas Natural Heritage Commission. Little Rock. 8 pp.

Foti, Tom. Personal communication. Ecologist. Arkansas Natural Heritage Commission. Little Rock.

Fowells, H. A, compiler. 1965. Silvics of the forest trees of the United States. Agriculture Handbook No. 271. USDA Forest Service. Washington, DC. 762 pp.

Fralish, J. S., F. B. Crooks, J. L. Chambers, and F. M. Harty. 1991. Comparison of presettlement, second-growth and old-growth forest on six site types in the Illinois Shawnee Hills. The American Midland Naturalist 125:294-309.

Fralish, J. S., and F. B. Crooks. 1989. Forest composition, environment and dynamics at Land Between the Lakes in northwest Middle Tennessee. Journal of the Tennessee Academy of Science 64:107-112.

Franklin, S. B., P. A. Robertson, J. S. Fralish, and S. M. Kettler. 1993. Overstory vegetation and successional trends of Land Between the Lakes, USA. Journal of Vegetation Science 4:509-520.

Frothingham, E. H., J. S. Holmes, W. J. Damtoft, E. F. McCarthy, and C. F. Korstian. 1926. A forest type classification for the southern Appalachian Mountains and adjacent plateau and coastal region. Journal of Forestry 24:673-684.

Funk, V. A. 1975. A floristic and geologic survey of selected seeps in Calloway County, Kentucky. M.S. thesis. Murray State University. Murray, KY. 84 pp.

Funk, V. A., and M. J. Fuller. 1978. A floristic survey of the seeps of Calloway County, Kentucky. Castanea 43:162-172.

Gaertner, F. 1955. Honeylocust (*Gleditsia triacanthos* L.) in field shelterbelts of western Oklahoma. Unpublished M.S. thesis. Oklahoma State University, Stillwater.

Gallyoun, M., G. Meyer, A. Andreu, and W. Slocumb. 1996. Mapping vegetation communities with The Nature Conservancy's vegetation classification system on five small national parks in the southeastern USA. Unpublished report. The Nature Conservancy, Southeast Regional Office, Conservation Science Department. Chapel Hill, NC.

Gellerstedt, L. S., and J. E. Johnson. 2005. Restoration of a New River flatrock forest community, New River Gorge National River, West Virginia. Unpublished report. Department of Forestry, Virginia Polytechnic Institute and State University. Blacksburg. 134 pp.

Gettman, R. W. 1974. A floristic survey of Sumter National Forest--The Andrew Pickens Division. M.S. thesis. Clemson University. Clemson, SC. 131 pp.

Gibbon, E. L. 1966. The vegetation of three monadnocks in the eastern Piedmont of North Carolina. M.S. thesis, North Carolina State University, Raleigh. 98 pp.

Golden, M. S. 1974. Forest vegetation and site relationships in the central portion of the Great Smoky Mountains National Park. Ph.D. dissertation. University of Tennessee, Knoxville. 275 pp.

Golden, M. S. 1979. Forest vegetation of the lower Alabama Piedmont. Ecology 60:770-782.

Golden, M. S. 1981. An integrated multivariate analysis of forest communities of the central Great Smoky Mountains. The American Midland Naturalist 106:37-53.

Govus, T. E. 1982. Vegetative profiles of the major forest types in the Pisgah and Nantahala national forests. USDA Forest Service. Contract No. 00-4550-1-1399. 71 pp.

Grafton, W. N., and C. McGraw. 1976. The vascular flora of New River Gorge, West Virginia. Center for Extension and Continuing Education, West Virginia University, Beckley. 19 pp.

Grafton, W. N., and O. L. Eye. 1982. Vascular flora of eight selected West Virginia wetlands with special reference to rare species. Pages 107-115 in: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region. West Virginia University, Morgantown.

Greenlee, K. W. 1974. A vegetation analysis of a pristine and a selectively cut cove forest of the Unicoi Mountains, western North Carolina. M.S. thesis. Western Carolina University. Cullowhee, NC. 36 pp.

Grossman, D. H., K. Lemon Goodin, and C. L. Reuss, editors. 1994. Rare plant communities of the conterminous United States: An initial survey. The Nature Conservancy. Arlington, VA. 620 pp.

Guthrie, M. 1989. Silurian limestone glades and barrens of the Western Valley of Tennessee. Contract report to the Division of Ecological Services, Tennessee Department of Conservation. Nashville. 113 pp.

Hall, M. E. 2005. Classification and gradient analysis of plant communities at Short Mountain Wildlife Management Area, Hampshire County, West Virginia. M.S. thesis. Western Carolina University. Cullowhee, NC. 108 pp.

Hall, R. L., and E. D. Mathews. 1974. Soil survey of Charles County, Maryland. U.S. Department of Agriculture Soil Conservation Service. Washington, DC.

Hansen, P. L., R. D. Pfister, K. Boggs, B. J. Cook, J. Joy, and D. K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana. Miscellaneous Publication No. 54. 646 pp. + posters.

Hansen, P. L., S. W. Chadde, and R. D. Pfister. 1988b. Riparian dominance types of Montana. University of Montana. Miscellaneous Publication 49. Montana Forest and Conservation Experiment Station. Missoula. 411 pp.

Hansen, P., K. Boggs, and R. Pfister. 1991. Classification and management of riparian and wetland sites in Montana. Unpublished draft version prepared for Montana Riparian Association, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula. 478 pp.

Harris, A. G., S. C. McMurray, P. W. C. Uhlig, J. K. Jeglum, R. F. Foster, and G. D. Racey. 1996. Field guide to the wetland ecosystem classification for northwestern Ontario. Ontario Ministry of Natural Resources, Northwest Science and Technology. Thunder Bay, Ontario. Field guide FG-01. 74 pp. plus appendix.

Harrison, J. W., compiler. 2004. Classification of vegetation communities of Maryland: First iteration. A subset of the International Classification of Ecological Communities: Terrestrial Vegetation of the United States, NatureServe. Maryland Natural Heritage Program, Maryland Department of Natural Resources. Annapolis. 243 pp.

Harvill, A. M., Jr. 1967. The vegetation of Assateague Island, Virginia. Castanea 32:105-108.

Heath, M. E., D. S. Metcalfe, and R. E. Barnes. 1973. Forages: the science of grassland agriculture. Iowa State University Press. Ames.

Heckscher, S. 1994. The vegetation of the Glades Region, Cumberland County, New Jersey. Bartonia 58:101-113.

Heineke, T. E. 1987. The flora and plant communities of the middle Mississippi River Valley. Ph.D. dissertation. Southern Illinois University. Carbondale. 653 pp.

Hinkle, C. R. 1989. Forest communities of the Cumberland Plateau of Tennessee. Journal of the Tennessee Academy of Science 64:123-129.

Hoagland, B. 2000. The vegetation of Oklahoma: A classification for landscape mapping and conservation planning. The Southwestern Naturalist 45(4):385-420.

Hoagland, B. W. 1997. Preliminary plant community classification for Oklahoma. Unpublished draft document. Version 35629. University of Oklahoma, Oklahoma Natural Heritage Inventory. Norman. 47 pp.

Hoagland, B. W. 1998a. Classification of Oklahoma vegetation types. Working draft. University of Oklahoma, Oklahoma Natural Heritage Inventory. Norman. 43 pp.

Hoagland, B. W. 1998b. The vegetation of Oklahoma: A classification for landscape mapping and conservation planning. Oklahoma Biological Survey. University of Oklahoma, Norman.

Homoya, Michael. Personal communication. Indiana Natural Heritage Data Center. Division of Nature Preserves, Department of Natural Resources, 402 West Washington Street, Room W267, Indianapolis, IN 46204. 317/232-4052. Personal communication with S. L. Neid. MRO. March/April 1997.

Horn, J. C. 1980. Short-term changes in vegetation after clearcutting in the southern Appalachians. Castanea 45:88-96.

Hupp, C. R. 1982. Stream-grade variation and riparian forest ecology along Passage Creek, Virginia. Bulletin of the Torrey Botanical Club 109:488-499.

Iowa Natural Areas Inventory (INAI). No date. Vegetation classification of Iowa. Iowa Natural Areas Inventory, Iowa Department of Natural Resources. Des Moines.

Jones, G. P., and G. M. Walford. 1995. Major riparian vegetation types of eastern Wyoming. Submitted to Wyoming Department of Environmental Quality, Water Quality Division. Wyoming Natural Diversity Database. Laramie, WY. 245 pp.

Kartesz, J. T. 1999. A synonymized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. First edition. *In*: J. T. Kartesz and C. A. Meacham. Synthesis of the North American Flora, Version 1.0. North Carolina Botanical Garden. Chapel Hill.

Keever, C. 1973. Distribution of major forest species in southeastern Pennsylvania. Ecological Monographs 43:303-327.

Kittel, G. M., and N. D. Lederer. 1993. A preliminary classification of the riparian vegetation of the Yampa and San Miguel/Dolores river basins. Unpublished report prepared for Colorado Department of Health and the Environmental Protection Agency by The Nature Conservancy, Colorado Field Office. Boulder.

Kittel, G., E. Van Wie, M. Damm, R. Rondeau, S. Kettler, and J. Sanderson. 1999a. A classification of the riparian plant associations of the Rio Grande and Closed Basin watersheds, Colorado. Unpublished report prepared by the Colorado Natural Heritage Program, Colorado State University, Fort Collins.

Kittel, G., R. Rondeau, N. Lederer, and D. Randolph. 1994. A classification of the riparian vegetation of the White and Colorado River basins, Colorado. Final report submitted to Colorado Department of Natural Resources and the Environmental Protection Agency. Colorado Natural Heritage Program. Boulder. 166 pp.

Kotar, J., J. A. Kovach, and C. T. Locey. 1988. Field guide to forest habitat types of northern Wisconsin. Department of Forestry, University of Wisconsin and Department of Natural Resources.

Kuchler, A. W. 1964. Potential natural vegetation of the conterminous United States. American Geographic Society Special Publication 36. New York, NY. 116 pp.

Lea, C. 2000. Plant communities of the Potomac Gorge and their relationship to fluvial factors. M.S. thesis. George Mason University. Fairfax, VA. 219 pp.

Lea, C. 2003. Vegetation types in the National Capital Region Parks. Draft for review by NatureServe, Virginia Natural Heritage, West Virginia Natural Heritage, Maryland Natural Heritage, and National Park Service. March 2003. 140 pp.

Leahy, Mike. Personal communication. Missouri Natural Heritage Database, Missouri Department of Conservation. Jefferson City.

Livingston, D., and C. Mitchell. 1976. Site classification and mapping in the Mt. LeConte growth district, Great Smoky Mountains National Park. Unpublished report. Great Smoky Mountains National Park Library.

Ludwig, J. C. 1996. Shoreline flora of the Blackwater River in Southampton and Isle of Wight counties, Virginia. Banisteria 8:44-46.

Minnesota Natural Heritage Program (MNNHP). 1993. Minnesota's native vegetation: A key to natural communities. Version 1.5. Minnesota Department of Natural Resources, Natural Heritage Program. St. Paul. 110 pp.

Major, C. S., C. Bailey, J. Donaldson, R. McCoy, C. Nordman, M. Williams, and D. Withers. 1999. An ecological inventory of selected sites in the Cherokee National Forest. Tennessee Department of Environment and Conservation, Tennessee Division of Natural Heritage. Cost Share Agreement #99-CCS-0804-001. Nashville.

Malter, J. L. 1977. The flora of Citico Creek Wilderness Study Area, Cherokee National Forest, Monroe County, Tennessee. M.S. thesis. University of Tennessee, Knoxville. 116 pp.

Martin, W. H. 1971. Forest communities of the Great Valley of East Tennessee and their relationship to soil and topographic properties. Ph.D. dissertation. University of Tennessee, Knoxville. 366 pp.

Martin, W. H. 1989. Forest patterns in the Great Valley of Tennessee. Journal of the Tennessee Academy of Science 64:137-144.

Maxwell, R. S. 2006. Establishing a historic benchmark for rimrock pine communities at New River Gorge National River, West Virginia. M.S. thesis. West Virginia State University, Morgantown. 90 pp.

McCoy, D. A. 1958. Vascular plants of Pontotoc County, Oklahoma. American Midland Naturalist 59:371-396.

McDonald, A. 1938. Erosion and its control in Oklahoma Territory. Miscellaneous Publication 301. U.S. Department of Agriculture. Washington, DC.

McDonald, B. R., and P. Trianosky. 1995. Assessment of and management recommendations for plant communities and rare species of Camp Brookside, New River Gorge National River. West Virginia Natural Heritage Program, Division of Natural Resources and The Nature Conservancy. Elkins. 25 pp.

McGee, C. E., and R. M. Hooper. 1970. Regeneration after clearcutting in the southern Appalachians. USDA Forest Service. Research Paper SE-70. 12 pp.

McLeod, D. E. 1988. Vegetation patterns, floristics, and environmental relationships in the Black and Craggy mountains of North Carolina. Ph.D. dissertation. University of North Carolina, Chapel Hill. 222 pp.

Metzler, K. J., and A. W. H. Damman. 1985. Vegetation patterns in the Connecticut River flood plain in relation to frequency and duration of flooding. Naturaliste Can. (Rev. Ecol. Syst.) 112:535-547.

Metzler, K. J., and J. P. Barrett. 2001. Vegetation classification for Connecticut. Draft 5/21/2001. Connecticut Department of Environmental Protection, Natural Resources Center, Natural Diversity Database. Hartford.

Midwestern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe. Minneapolis, MN.

Mitchem, D. O. 2004. Characterization of the vegetation and soils of the forest communities at Camp Brookside in Summers County, West Virginia. Major paper. Virginia Polytechnic Institute and State University. Blacksburg.

Mitchem, D. O., and J. E. Johnson. 2001. Characterization of the overstory and understory vegetation of the flat-rock plant community at Camp Brookside. Department of Forestry, Virginia Polytechnic Institute and State University. Blacksburg. 48 pp.

Mowbray, T. B. 1966. Vegetational gradients in the Bearwallow Gorge of the Blue Ridge escarpment. Journal of the Elisha Mitchell Scientific Society 82:138-149.

NatureServe Ecology - Southeastern United States. No date. Unpublished data. NatureServe. Durham, NC.

Nelson, J. B. 1986. The natural communities of South Carolina: Initial classification and description. South Carolina Wildlife and Marine Resources Department, Division of Wildlife and Freshwater Fisheries. Columbia. 55 pp.

Nelson, P. W. 1985. The terrestrial natural communities of Missouri. Missouri Natural Areas Committee. Jefferson City. 197 pp. Revised edition, 1987.

Newell, C. L. 1997. Local and regional variation in the vegetation of the southern Appalachian Mountains. Ph.D. dissertation. University of North Carolina, Chapel Hill. 1,008 pp.

Newell, C. L., R. K. Peet, and J. C. Harrod. 1997. Vegetation of Joyce Kilmer-Slickrock Wilderness, North Carolina. Unpublished report to USDA Forest Service. University of North Carolina, Curriculum in Ecology & Department of Biology, Chapel Hill. 282 pp. plus maps.

Newell, C. L., and R. K. Peet. 1995. Vegetation of Linville Gorge Wilderness, North Carolina. Unpublished report to USDA Forest Service. University of North Carolina, Department of Biology, Chapel Hill. 211 pp.

Newell, C. L., and R. K. Peet. 1996a. Vegetation of Shining Rock Wilderness, North Carolina. Unpublished report to USDA Forest Service. University of North Carolina, Department of Biological Science, Chapel Hill. 253 pp. plus map.

Nowacki, G. J., and M. D. Abrams. 1992. Community, edaphic, and historical analysis of mixed oak forests of the Ridge and Valley Province in central Pennsylvania. Canadian Journal of Forest Research 22:790-800.

Ohio Natural Heritage Database (OHNHD). No date. Vegetation classification of Ohio. Ohio Natural Heritage Database, Division of Natural Areas and Preserves, Ohio Department of Natural Resources. Columbus.

Oberholster, C. 1993. Preliminary list of natural communities of Alabama. Unpublished document. Alabama Department Conservation and Natural Resources, Natural Heritage Section. Montgomery, AL. 6 pp.

Ohmann, L. F., and P. R. Ream. 1971. Wilderness ecology: Virgin plant communities of the Boundary Waters Canoe Area. USDA Forest Service, North Central Forest Experiment Station. Research Paper NC-63. St. Paul, MN. 35 pp.

Overlease, W. R. 1987. 150 years of vegetation change in Chester County, Pennsylvania. Bartonia 53:1-12.

Padgett, W. G., A. P. Youngblood, and A. H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region. Report R4-ECOL-89-01. Ogden, UT. 191 pp.

Palmer-Ball, B., Jr., J. J. N. Campbell, M. E. Medley, D. T. Towles, J. R. MacGregor, and R. R. Cicerello. 1988. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Somerset Ranger District. USDA Forest Service, Daniel Boone National Forest. Berea, KY. 244 pp.

Patterson, D. T. 1976. The history and distribution of five exotic weeds in North Carolina (*Ailanthus altissima, Lonicera japonica, Polygonum cuspidatum, Pueraria lobata, Rosa multiflora*). Castanea 41:177-180.

Patterson, K. D. 1994. Classification of vegetation in Ellicott Rock Wilderness, Southeastern Blue Ridge Escarpment. M.S. thesis. North Carolina State University, Raleigh. 91 pp.

Patterson, K. D., C. J. Ulrey, and J. Drake. 1999. Vegetation classification of Great Smoky Mountains National Park: Cades Cove and Mount Le Conte quadrangles. Unpublished report submitted to BRD-NPS Vegetation Mapping Program. The Nature Conservancy. Chapel Hill, NC.

Patterson, K. D., D. J. Allard, and S. Landaal. 1994. Rare plant communities of the conterminous United States: Southeastern region. Pages 105-210 *in*: D. H. Grossman, K. Lemon Goodin, and C. L. Reuss, editors. Rare plant communities of the conterminous United States: An initial survey. The Nature Conservancy. Arlington, VA.

Patterson, W. B., and H. R. DeSelm. 1989. Classification of forest vegetation of the bottomlands of west Tennessee. University of Tennessee, Department of Biological Sciences, Knoxville, and Tennessee Department of Conservation, Ecological Services Division. Report for Contract No. 89-3347. Nashville. 151 pp.

Peet, R. K., T. R. Wentworth, M. P. Schafale, and A.S. Weakley. 2002. Unpublished data of the North Carolina Vegetation Survey. University of North Carolina, Chapel Hill.

Peet, R. K., and N. L. Christensen. 1980. Hardwood forest vegetation of the North Carolina Piedmont. Veroffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rubel, in Zurich 68:14-39.

Penfound, W. T. 1952. Southern swamps and marshes. Botanical Review 7:413-446.

Penfound, W. T. 1953. Plant communities of Oklahoma lakes. Ecology 34:561-583.

Perles, S., G. Podniesinski, and J. Wagner. 2004. Classification, assessment and protection of non-forested floodplain wetlands of the Susquehanna drainage. Report to the U.S. Environmental Protection Agency and Pennsylvania Department of Conservation and Natural Resources. Pennsylvania Natural Heritage Program. Harrisburg. 128 pp.

Phillips, D. L., and D. J. Shure. 1990. Patch-size effects on early succession in southern Appalachian forests. Ecology 71:204-212.

Pittman, Dr. Albert. Personal communication. South Carolina Heritage Trust, South Carolina Department of Natural Resources, PO Box 167, Columbia, SC 29202. (803)734-3920.

Podniesinski, G. S., S. J. Perles, W. A. Millinor, and L. A. Sneddon. 2006. Vegetation classification and mapping at Delaware Water Gap National Recreation Area. Technical Report NPS/NER/NRTR--XXXX/XXX. National Park Service. Philadelphia, PA.

Putnam, N. 1995. Plant communities of the Meadow River wetlands. Final report submitted to the West Virginia Division of Natural Resources.

Pyne, M. 1994. Tennessee natural communities. Unpublished document. Tennessee Department of Conservation, Ecology Service Division. Nashville. 7 pp.

Pyne, M., and D. I. Withers. 1996. Terrestrial and subterranean natural heritage survey of TVA Columbia Project lands. Tennessee Department of Conservation, Division of Natural Heritage. Nashville. DNH Report No. 96-001.

Racine, C. H. 1966. Pine communities and their site characteristics in the Blue Ridge escarpment. Journal of the Elisha Mitchell Scientific Society 82:172-181.

Rawinski, T. 1984. Natural community description abstract - southern New England calcareous seepage swamp. Unpublished report. The Nature Conservancy. Boston, MA. 6 pp.

Rawinski, T. J. 1988. Ecology forum: Notes on riverside vegetation. The Nature Conservancy News 38:24-25.

Rawinski, T. J. 1992. A classification of Virginia's indigenous biotic communities: Vegetated terrestrial, palustrine, and estuarine community classes. Unpublished document. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Report No. 92-21. Richmond. 25 pp.

Rawinski, T. J. 1997. Vegetation ecology of the Grafton Ponds, York County, Virginia, with notes on waterfowl use. Natural Heritage Technical Report 97-10. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. 42 pp. plus appendix.

Rawinski, T. J., K. N. Hickman, J. Waller-Eling, G. P. Fleming, C. S. Austin, S. D. Helmick, C. Huber, G. Kappesser, F. C. Huber, Jr., T. Bailey, and T. K. Collins. 1996. Plant communities and ecological land units of the Glenwood Ranger District, George Washington and Jefferson national forests, Virginia. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Report 96-20. Richmond. 65 pp. plus appendices.

Rayburn, E. B. 1993. Tall fescue management. Forage Management, West Virginia University Extension Service. [http://www.caf.wvu.edu/~forage/tallfesc.htm]. Accessed May 8, 2003.

Remo, J. 1999. Geologic controls on mass movement in the New River Gorge, West Virginia. M.S. thesis. West Virginia University, Morgantown. 106 pp.

Reschke, C. 1990. Ecological communities of New York State. New York Natural Heritage Program. New York State Department of Environmental Conservation. Latham. 96 pp.

Rheinhardt, R. D. 1981. The vegetation of the Balsam Mountains of Southwest Virginia: A phytosociological study. M.A. thesis. College of William and Mary. Williamsburg, VA. 146 pp.

Richard, C., G. Kittel, and S. Kettler. 1996. A classification of the riparian vegetation of the San Juan National Forest. Draft 1 report. Colorado Natural Heritage Program. Colorado State University, Fort Collins.

Rodgers, C. L., and R. E. Shake. 1965. Survey of vascular plants in Bearcamp Creek watershed. Castanea 30:149-166.

Rouse, G. D., and B. R. McDonald. 1986. Rare vascular plant survey: New River Gorge National River. Nongame Wildlife and Natural Heritage Program, Wildlife Resources Section, West Virginia Division of Natural Resources. Elkins. 55 pp.

Russell, E. W. B., and A. E. Schuyler. 1988. Vegetation and flora of Hopewell Furnace National Historic Site, eastern Pennsylvania. Bartonia 54:124-143.

Schafale, M. 1998a. Fourth approximation guide. Mountain wetlands. February 1998 draft. North Carolina Natural Heritage Program. Raleigh.

Schafale, M. 1998b. Fourth approximation guide. High mountain communities. March 1998 draft. North Carolina Natural Heritage Program. Raleigh.

Schafale, M. 2002. Fourth approximation guide. Mountain communities. November 2002 draft. North Carolina Natural Heritage Program. Raleigh.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina. Third approximation. North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program. Raleigh. 325 pp.

Schafale, Mike P. Personal communication. Ecologist, North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program, Raleigh.

Schmalzer, P. A. 1978. Classification and analysis of forest communities in several coves of the Cumberland Plateau in Tennessee. M.S. thesis. University of Tennessee, Knoxville. 24 pp.

Schmalzer, P. A., and H. R. DeSelm. 1982. Vegetation, endangered and threatened plants, critical plant habitats and vascular flora of the Obed Wild and Scenic River. Unpublished report. USDI National Park Service. Obed Wild and Scenic River. 2 volumes. 369 pp.

Schotz, Al. Personal communication. Community Ecologist. Alabama Natural Heritage Program Huntingdon College, Massey Hall, 1500 East Fairview Avenue, Montgomery, AL 36106-2148.

Shreve, F., M. A. Chrysler, F. H. Blodgett, and F. W. Besley. 1910. The plant life of Maryland. Maryland Weather Service. Special Publication, Volume III. Johns Hopkins Press. Baltimore, MD.

Simon, Steve. Personal communication. Ecologist. USDA Forest Service, National Forests in North Carolina. Asheville.

Sims, R. A., W. D. Towill, K. A. Baldwin, and G. M. Wickware. 1989. Field guide to the forest ecosystem classification for northwestern Ontario. Ontario Ministry of Natural Resources.

Smith, T. L. 1991. Natural ecological communities of Pennsylvania. First revision. Unpublished report. Pennsylvania Science Office of The Nature Conservancy. Middletown. 111 pp.

Sneddon, L., M. Anderson, and K. Metzler. 1996. Community alliances and elements of the Eastern Region. Unpublished report. The Nature Conservancy, Eastern Heritage Task Force. Boston, MA. 235 pp.

Sneddon, L., and S. Menard, editors. 2002. International classification of ecological communities: Terrestrial vegetation of the United States, Western Allegheny Plateau. Draft revisions based on contributions of the Western Allegheny Plateau Ecology Group. Unpublished report. NatureServe. Boston, MA.

Southeastern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe. Durham, NC.

Steyermark, J. A. 1940. Studies of the vegetation of Missouri. I. Natural plant associations and succession in the Ozarks of Missouri. Field Museum of Natural History Botany Series 9:349-475.

Suiter, D. W. 1995. The vascular flora, rare species and plant migrations of New River Gorge National River, West Virginia. Master's thesis. Marshal University,. Huntington, WV. 174 pp.

Suiter, D. W., and D. K. Evans. 1999. Vascular flora and rare species of New River Gorge National River, West Virginia. Castanea 64: 23-49.

Swain, P. C., and J. B. Kearsley. 2001. Classification of natural communities of Massachusetts. September 2001 draft. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough.

Szaro, R. C. 1989. Riparian forest and scrubland community types of Arizona and New Mexico. Desert Plants Special Issue 9(3-4):70-139.

Tennessee Division of Natural Heritage (TDNH). Unpublished data. Tennessee Division of Natural Heritage, 14th Floor, L&C Tower, 401 Church Street, Nashville, TN 37243-0447. 615-532-0431

The Nature Conservancy (TNC). 1998c. Vegetation Classification of Rock Creek Park. Report for the NBS/NPS Vegetation Mapping Program. TNC. Boston. 50 pp.

The Nature Conservancy and Western Pennsylvania Conservancy (TNC and WPC). 2004. Classification, assessment, and protection of non-forested floodplain wetlands of the Susquehanna drainage. Pennsylvania Natural Heritage Program. Harrisburg. 128 pp.

Thomas, R. D. 1966. The vegetation and flora of Chilhowee Mountain. Ph.D. dissertation,. University of Tennessee, Knoxville. 355 pp.

Thomson, D., A. M. Gould, and M. A. Berdine. 1999. Identification and protection of reference wetland natural communities in Maryland: Potomac watershed floodplain forests. The Biodiversity Program, Maryland Department of Natural Resources, Wildlife and Heritage Division. Annapolis. 119 pp.

Tobe, J. D., J. E. Fairey, III, and L. L. Gaddy. 1992. Vascular flora of the Chauga River Gorge, Oconee County, South Carolina. Castanea 57:77-109.

Tucker, L. W. 1973. Vegetational analysis of Joyce Kilmer Memorial Forest. M.A. thesis. Western Carolina University. Cullowhee. 79 pp.

Virginia Division of Natural Heritage (VDNH). 2003. The natural communities of Virginia: Hierarchical classification of community types. Unpublished document, working list of November 2003. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Ecology Group. Richmond.

Virginia Division of Natural Heritage (VDNH). No date. Unpublished data. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond.

Vanderhorst, J. 2000a. Plant communities of the New River Gorge National River, West Virginia: (southern and northern thirds). Draft. West Virginia Natural Heritage Program. West Virginia Division of Natural Resources. Elkins.

Vanderhorst, J. 2000b. Plant communities of Harper's Ferry National Historical Park: Analysis, characterization, and mapping. West Virginia Natural Heritage Program, West Virginia Division of Natural Resources, Elkins, WV. 37 pp.

Vanderhorst, J. 2001a. Plant community classification and mapping of the Camp Dawson Collective Training Area, Preston County, West Virginia. West Virginia Natural Heritage Program, West Virginia Division of Natural Resources, Elkins. 101 pp.

Vanderhorst, J. 2001b. Plant communities of the New River Gorge National River, West Virginia: Northern and southern thirds. Non-game Wildlife and Natural Heritage Program. West Virginia Division of Natural Resources. Elkins. 146 pp.

Vanderhorst, J. 2002b. Two cliff top pine communities in the north section of New River Gorge National River, West Virginia. USDI National Park Service. New River Gorge National River. WV. Order P4780010401. 16 pp.

Vanderhorst, J. P., J. Jeuk, and S. C. Gawler. 2007. Vegetation Classification and Mapping of New River Gorge National River, West Virginia. Technical Report NPS/NER/NRTR—XXXX/XXX. National Park Service. Philadelphia, PA.

Vanderhorst, J., and B. P. Streets. 2006. Vegetation classification and mapping of Camp Dawson Army Training Site, West Virginia: Second approximation. Natural Heritage Program. West Virginia Division of Natural Resources. Elkins. 83 pp.

Vanderhorst, Jim. Personal communication. Ecologist. West Virginia Natural Heritage Program. West Virginia Division of Natural Resources. Elkins, WV.

Voigt, J. W., and R. H. Mohlenbrock. 1964. Plant communities of southern Illinois. Southern Illinois University Press. Carbondale. 202 pp.

Wisconsin Natural Heritage Inventory Program (WNHIP). No date. Vegetation classification of Wisconsin. Wisconsin Natural Heritage Program. Wisconsin Department of Natural Resources. Madison.

Western Pennsylvania Conservancy and The Nature Conservancy (WPC and TNC). 2002. Classification, assessment, and protection of forest floodplain wetlands of the Susquehanna drainage. Pennsylvania Natural Heritage Program. Harrisburg. 160 pp.

West Virginia Natural Heritage Program (WVNHP). No date. Unpublished data. West Virginia Natural Heritage Program. Elkins.

Walbridge, M. R. 1982. Vegetation patterning and community distribution in four high-elevation headwater wetlands in West Virginia. M.S. thesis. West Virginia University, Morgantown.

Walbridge, M. R., and G. E. Lang. 1982. Major plant communities and patterns of community distribution in four wetlands of the unglaciated Appalachian region. *In*: R. B. MacDonald, editor. Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region. West Virginia University, Morgantown.

Walton, D. P., C. M. Jesse, and N. J. Putnam. 1996. Plant communities of the Ohio River riparian zone. Natural Heritage Program, West Virginia Division of Natural Resources. Elkins.

Walton, D., N. Putnam, and P. Trianosky. 1997. A classification of the terrestrial plant communities of West Virginia. Second draft. West Virginia Natural Heritage Program. Elkins.

Ware, D. M. E., and S. Ware. 1992. An *Acer barbatum*-rich ravine forest community in the Virginia coastal plain. Castanea 57:110-122.

Washburn, B. E., T. G. Barnes, and C. C. Rhoades. 2002. Using imazapic and prescribed fire to enhance native warm-season grasslands in Kentucky, USA. Natural Areas Journal 22(1):20-27.

Weakley, A. S., L. A. Mehrhoff, III, and L. Mansberg. 1979. Natural area inventory--Master plan for Bluff Mountain, Ashe County, North Carolina. Unpublished report. The Nature Conservancy, North Carolina Field Office. Carrboro. 225 pp.

Wells, E. F. 1970c. A vascular flora of the Uwharrie Wildlife Management Area, Montgomery County, North Carolina. M.S. thesis. University of North Carolina, Chapel Hill. 85 pp.

Wells, E. F. 1974. A vascular flora of the Uwharrie Wildlife Management Area, Montgomery County, North Carolina. Castanea 39:39-57.

Wharton, C. H. 1978. The natural environments of Georgia. Georgia Department of Natural Resources. Atlanta. 227 pp.

Wheat, R. M. 1986. Classification of forest plant communities and their relationships to landtypes on the highly dissected plateau of the western Highland Rim in middle Tennessee. M.S. thesis. University of Tennessee, Knoxville. 146 pp.

Whigham, D. F. 1969. Vegetation patterns on the north slopes of Bluff Mountain, Ashe County, North Carolina. Journal of the Elisha Mitchell Scientific Society 85:1-15.

Whittaker, R. H. 1956. Vegetation of the Great Smoky Mountains. Ecological Monographs 26:1-80.

Wieboldt, Thomas F. Personal communication.

Wieland, R. G. 1994b. Mississippi Natural Heritage Program: Ecological communities. Unpublished document. Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, Natural Heritage Program,. Jackson, MS. 7 pp.

Winstead, J. E., and K. A. Nicely. 1976. A preliminary study of a virgin forest tract of the Cumberland Plateau in Laurel County, Kentucky. Transactions of the Kentucky Academy of Science 37:29-32.

Wood, J. 1999. Final report: Hemlock ecosystem inventory and monitoring project of the New River Gorge National River and Gauley River National Recreation Area. Unpublished report prepared for USDI National Park Service. Glen Jean, WV.

Youngblood, A. P., W. G. Padgett, and A. H. Winward. 1985a. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service, Intermountain Region. R4-Ecol-85-01. Ogden, UT. 78 pp.

Zollner, Douglas. Personal communication. Ecologist. The Nature Conservancy, Arkansas Field Office. Little Rock.

Appendix K. State and global conservation status rank definitions.

West Virginia State Ranks

State ranks are assigned by the West Virginia Natural Heritage Program and refer to the conservation status of the element across its range within West Virginia.

Rank	Definition
S1	Five or fewer documented occurrences, or very few remaining individuals within the state. Extremely rare and critically imperiled; or because of some factor(s) making it especially vulnerable to extirpation.
S2	Six to 20 documented occurrences, or few remaining individuals within the state. Very rare and imperiled; or because of some factor(s) making it vulnerable to extirpation.
S3	Twenty-one to 100 documented occurrences. May be somewhat vulnerable to extirpation.
S4	Common and apparently secure with more than 100 occurrences.
S5	Very common and demonstrably secure.
SH	Historical. Species which have not been relocated within the last 20 years. May be rediscovered.
SR	Reported from state, but not yet verified.
SX	Believed extirpated. Little likelihood of rediscovery.
SU	Possibly rare, but status uncertain until more data are gathered.
S?	Unranked, or, if following a number, rank uncertain (ex. S2?).
SNR	Not ranked.

Global Ranks

Global ranks are assigned by NatureServe and refer to the conservation status acoss the global range of the element.

Global basic ranks

Rank	Definition
GX	Presumed Extinct (species) - Not located despite intensive searches and virtually no likelihood of rediscovery.
	Eliminated (ecological communities) - Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	Possibly Extinct (species) - Missing; known from only historical occurrences but still some hope of rediscovery.
	Presumed Eliminated - (Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.
G1	Critically Imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure - Common; widespread and abundant.

Global variant ranks

Rank	Definition
G#G#	Range Rank - A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
GU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and a question mark qualifier may be added (e.g., G2?) to express minor uncertainty, or a range rank (e.g., G2G3) may be used to delineate the limits (range) of uncertainty.
GNR	Unranked - Global rank not yet assessed.
GNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

Global rank qualifiers

Rank	Definition
?	Inexact Numeric Rank - Denotes some uncertainty about the numeric rank (e.g. G3? - Believed most likely a G3, but some chance of either G2 or G4).
Q	Questionable taxonomy - Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.
C	Captive or Cultivated Only - At present extant only in captivity or cultivation, or as a reintroduced population not yet established.

Infraspecific taxon conservation status ranks

Infraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Infraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities.

Rank	Definition
T#	Infraspecific Taxon (trinomial) - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

As the nation's primary conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS D-225 August 2007

National Park Service
U.S. Department of the Interior

Northeast Region
Natural Resource Stewardship and Science
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2878

http://www.nps.gov/nero/science/

EXPERIENCE YOUR AMERICA ™