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Global Conservation Status Ranks of State-Rare Vegetation Associations in the Eastern Rivers and Mountains Network

Technical Report NPS/NER/ERMN/NRTR—2010/151

ON THE COVER
Upper Delaware Scenic and Recreational River from the mouth of Fish Cabin Creek, 2005.
Photograph by: Greg Edinger.

Global Conservation Status Ranks of State-Rare Vegetation Associations in the Eastern Rivers and Mountains Network

Natural Resource Technical Report NPS/NER/ERMN/NRTR—2010/151

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Abstract

Forty-five state-rare vegetation associations were identified during vegetation classification and mapping of parks of the Eastern Rivers and Mountains Network of the National Park Service; however, most of these associations lacked global conservation ranks. Global status conservation ranks for 33 of these state-rare vegetation associations were developed or revised using standard methods developed by NatureServe. Seven status factors were evaluated individually for each association and information regarding range extent, area of occupancy, estimated number of occurrences, viability of occurrences, threat impact, and trends was gathered using GIS analysis, literature review, and expert interviews of ecologists. Information for each status factor was entered into a spreadsheet rank calculator. Eighteen associations were assigned global conservation status ranks of G3 or rarer as a result.

Delaware Water Gap National Recreational Area has the largest number of rare associations (16 rare association known within the park), including 11 associations newly ranked as a result of this project. New River Gorge National River contains 11 rare associations, including ten rare associations ranked by this project. Upper Delaware Scenic and Recreational River has six rare associations, including four rare associations ranked as a result of this project. Bluestone National Scenic River contains five rare associations, three of which were ranked during this project. The Gauley River National Recreation Area has five rare associations as a result of this project, but because the vegetation mapping and classification process is still in progress, there are at least three additional associations that may be rare that were not included in the analysis. One state-rare association occurrs at Allegheny Portage Railroad National Historic Site, but the global conservation status rank was determined to be G4. No globally rare associations were found at Friendship Hill National Historic Site, Johnstown Flood National Memorial, or Fort Necessity National Battlefield.

Executive Summary

This report provides Global Conservation Status Ranks of 33 U.S. National Vegetation Classification (USNVC) state-rare associations known to occur in the Eastern Rivers and Mountains Network of the National Park Service's Inventory and Monitoring Program. These parks include Delaware Water Gap National Recreation Area, Upper Delaware Scenic and Recreational River, New River Gorge National River, Bluestone National Scenic River, Allegheny Portage Railroad National Historic Site, Fort Necessity National Battlefield, Friendship Hill National Historic Site, Johnstown Flood National Memorial, and Gauley River National Recreation Area. Forty-five state-rare vegetation associations were identified during vegetation classification and mapping of these parks; however, most of these associations lacked global conservation ranks. Methods were drawn from those developed by NatureServe and member programs. In order to prioritize management efforts directed towards rare or threatened associations, National Park Service staff of the Eastern Rivers and Mountains Network wanted information to determine whether these types deemed rare at the state level are also rare throughout their range, or whether they are rare within the state as a consequence of political rather than ecological boundaries, and are otherwise more common. It is important that examples of those communities found to be globally rare are identified as such so that management and other activities can be properly directed.

Seven status factors were evaluated individually for each association and information regarding range extent, area of occupancy, estimated number of occurrences, viability of occurrences, threat impact, and trends was gathered using GIS analysis, literature review, and expert interviews of ecologists. Information for each status factor was entered into a spreadsheet rank calculator. Eighteen associations were assigned global conservation status ranks of G3 or rarer as a result, including six associations ranked G1.

Delaware Water Gap National Recreational Area has the largest number of rare associations (16 rare associations known within the park), including 11 associations newly-ranked as a result of this project. New River Gorge National River contains 11 rare associations, including ten rare associations ranked by this project. Upper Delaware Scenic and Recreational River has seven rare associations, including four newly-ranked rare associations as a result of this project. Bluestone National Scenic River contains six rare associations, three of which were ranked during this project. The Gauley River National Recreation Area has five rare associations as a result of this project, but because the vegetation mapping and classification project is still in progress there are at least three additional associations that may be rare that were not included in the analysis. One state-rare association occurrs at Allegheny Portage Railroad National Historic Site, but the global conservation status rank was determined to be G4. No globally rare associations were found at Friendship Hill National Historic Site, Johnstown Flood National Memorial, or Fort Necessity National Battlefield.

This project provides a means to setting management and monitoring priorities at Eastern Rivers and Mountains Network parks. This "fine filter" approach ensures that associations not previously known to be vulnerable or critically threatened with extirpation receive attention to ensure their long-term survival.

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Introduction

Vegetation maps using the U.S. National Vegetation Classification (USNVC) have been completed or are in final stages in all parks in the Eastern Rivers and Mountains Network (ERMN) of the National Park Service (NPS). Ecologists from Pennsylvania, New Jersey, New York, and West Virginia natural heritage programs developed the maps and classification in collaboration with NatureServe. Approximately 200 associations in total were classified and mapped at the following parks: Delaware Water Gap National Recreation Area (Perles et al. 2007a; http://biology.usgs.gov/npsveg/dewa/); Upper Delaware Scenic and Recreational River (Perles et al. 2008; http://biology.usgs.gov/npsveg/upde/); New River Gorge National River (Vanderhorst et al. 2007; http://biology.usgs.govnpsveg/neri/); Bluestone National Scenic River (Vanderhorst et al. 2008; http://biology.usgs.gov/npsveg/blue/); Allegheny Portage Railroad National Historic Site (Perles et al. 2007b; http://biology.usgs.gov/npsveg/alpo/); Fort Necessity National Battlefield (Perles et al. 2006a; http://biology.usgs.gov/npsveg/fone/); Friendship Hill National Historic Site (Perles et al. 2006b; http://biology.usgs.gov/npsveg/frhi/); and Johnstown Flood National Memorial (Perles et al. 2006c; http://biology.usgs.gov/npsveg/jofl/). The vegetation map of Gauley River National Recreation Area is in progress at the time of writing.

During the vegetation mapping and classification, 42 associations known to be rare within their respective states were identified. Of these, approximately 33 associations had not yet been assigned global conservation status ranks. Table 1 lists the 33 associations lacking global ranks and the state rank of the state-defined type that most closely aligned to the association. Table 2 summarizes the definitions of each of the global status ranks. In order to prioritize management efforts directed towards rare associations, NPS staff of the ERMN wanted information to determine whether these types deemed rare at the state level are also rare throughout their range, or whether they are rare within the state as a consequence of political rather than ecological boundaries, and are otherwise more common. It is important that examples of those communities found to be globally rare are identified as such so that management and other activities can be properly directed.

The goal of this project was to develop global conservation status ranks for the 33 unranked associations. A second goal was to apply newly developed standards (Faber-Langendoen et al. 2009), recently developed by NatureServe and member programs, that have introduced a more quantitative and transparent process to ranking than has generally been the case to date. Their work draws from the Standards and Petitions Working Group of International Union for Conservation of Nature (IUCN) Species Survival Commision (SSC) Biodiversity Assessments Sub-Committee and from the IUCN-CMP alliance to develop standard taxonomies of threats and actions. The intent of developing conservation status ranks is to assess the potential of extinction or extirpation of elements of biodiversity. In order to lend greater clarity to the task of assigning a rank, this work standardizes the criteria used in assessment. The method details a set of rank factors in three major categories: rarity, trends, and threats (Faber-Langendoen et al. 2009).

Table 1. Stateranks for the 33 vegetation associations lacking Global Conservation Ranks known to occur in Eastern Rivers and Mountains Network parks. West Virginia state ranks are unavailable.

Global Name	Global Code	Common Name	NJ Rank	PA Rank	NY Rank
Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum Forest	CEGL006301	Oak - Hickory / Hophornbeam / Sedge Lawn Forest	**S2S3**	S4	S4
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum spp. Forest	CEGL006014	Red Maple - Black Spruce - Highbush Blueberry Palustrine Woodland	**S1?**	**S3**	**S2**
Andropogon gerardii - Panicum virgatum - Baptisia australis Herbaceous Vegetation	CEGL006283	Riverscour Prairie	n/a	**S3**	n/a
Deschampsia caespitosa - Carex viridula Herbaceous Vegetation	CEGL006969	Calcareous Riverside Seep	**S1**	n/a	n/a
Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa Woodland	CEGL006002	Hickory - Eastern Red-cedar Rocky Woodland	**S1S2**	**S2**	**S3**
Pinus rigida - Quercus coccinea / Vaccinium angustifolium Woodland	CEGL006557	Cliff Top Pitch Pine Woodland	n/a	**S2S3**	n/a
Quercus palustris - Acer rubrum / Carex grayi - Geum canadense Forest	CEGL006185	Bottomland oak palustrine forest	n/a	**S3**	**S2S3**
Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest	CEGL007119	Cliff Top Virginia Pine Forest	n/a	n/a	n/a
Quercus prinus / Rhododendron catawbiense - Kalmia latifolia Forest	CEGL008524	Eastern Hemlock - Chestnut Oak / Catawba Rhododendron Forest	n/a	n/a	n/a
Quercus ilicifolia - Prunus pumila Shrubland	CEGL006121	Bear Oak - Wavy Hairgrass Shrubland	SNR	**S3**	S3S4
Quercus rubra - (Quercus prinus) / Vaccinium spp. / Deschampsia flexuosa Woodland	CEGL006134	Red Oak - Heath Woodland / Rocky Summit	SNR	**S3**	S4
Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia Shrubland	CEGL006371	Highbush Blueberry - Steeplebush Wetland	**S1S3**	S5	S5
Vaccinium corymbosum / Sphagnum spp. Shrubland	CEGL006190	Highbush Blueberry - Leatherleaf Wetland	**S1S3**	S4	S1
Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa Woodland	CEGL006116	Pitch Pine - Mixed Hardwood Rocky Summit	**S1**	**S2S3**	S3S4
Prunus pumila / Andropogon gerardii - Sorghastrum nutans Herbaceous Vegetation	CEGL006518	Big Bluestem - Indiangrass River Grassland	SNR	**S3**	**S1**
Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea Forest	CEGL007853	Forest Seep	n/a	n/a	n/a
Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia spp. Herbaceous Vegetation	CEGL006544	Wavy Hairgrass - Common Sheep Sorrel Rock Outcrop	**S1S2?**	**S2**	**S3**

Global Name	Global Code	Common Name	NJ Rank	PA Rank	NY Rank
Betula nigra - Platanus occidentalis / Impatiens capensis Forest	CEGL006184	River Birch Low Floodplain Forest	SNA	S4	**S2S3**
Eastern Woodland Vernal Pool Sparse Vegetation	CEGL006453	Eastern Woodland Vernal Pool Sparse Vegetation	SNR	**S3**	n/a
Carya cordiformis - Prunus serotina / Ageratina altissima Forest	CEGL006445	Bitternut hickory lowland forest	n/a	n/a	n/a
Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii) Nonvascular Vegetation	CEGL004142	Sandstone Talus	**S3?**	**S3**	n/a
Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana Forest	CEGL007861	Yellow Birch Cold Cove Forest	n/a	n/a	n/a
Peltandra virginica - Saururus cernuus - Carex crinita / Climacium americanum Herbaceous Vegetation	CEGL007696	Lizard's-tail Backwater Slough	n/a	n/a	n/a
Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia Forest	CEGL006458	Sycamore - Ash Floodplain Forest	n/a	n/a	n/a
Betula lenta - Quercus prinus / Parthenocissus quinquefolia Woodland	CEGL006565	Oak - Birch Talus Forest	**S3?**	**S3**	n/a
Quercus prinus / Rhus spp. / *Deschampsia flexuosa* Woodland	CEGL006074	Shale Talus Slope Woodland	n/a	**S3**	n/a
Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus Herbaceous	CEGL006448	Golden Ragwort - Sedge Rich Seep	**S1S2**	**S2**	n/a
Carex trichocarpa - Scirpus spp. - *Solidago gigantea* Herbaceous Vegetation	CEGL006447	Hairyfruit Sedge Wetland	**S2?**	**S3**	n/a
Salix nigra - Betula nigra / Schoenoplectus (pungens, tabernaemontani) Wooded Herbaceous Vegetation	CEGL006463	Black Willow Slackwater Woodland	n/a	n/a	n/a
Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation	CEGL006435	Dry Sandstone Cliff	n/a	S5	n/a
Juniperus virginiana var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland	CEGL008449	Eastern Red-cedar - Virginia Pine Flatrock Woodland	n/a	n/a	n/a
Platanus occidentalis - (Betula nigra, Salix spp.) Temporarily Flooded Woodland	CEGL003725	Sycamore - River Birch Riverscour Woodland	n/a	n/a	n/a
Quercus (alba, rubra, velutina) / Halesia tetraptera Forest	CEGL006462	Oak - Tuliptree / Mountain Silverbell Floodplain Forest	n/a	n/a	n/a

Ranks in bold are considered rare in the state.
SNR indicates the type has not been assigned a state rank.
n/a indicates the association is not known to occur in the state.
? indicates the degree of uncertainty for the rank is unknown.

Table 2. Global conservation status rank definitions and descriptions. State ranks parallel global status ranks but definitions are applied to the range of the state as opposed to the global range.

Conservation Status Rank	Definition	Description
GX (species)	Presumed Extinct	Not located despite intensive searches, and virtually no likelihood of rediscovery.
GX (vegetation associations and ecological systems)	Extinct	Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic taxa and/or elimination of the sites and ecological processes on which the type depends.
GH	Possibly Extinct	Known from only historical occurrences but still some hope of rediscovery. There is evidence that the species may be extinct or the ecosystem may be eliminated throughout its range, but not enough to state this with certainty.
G1	Critically Imperiled	At very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors.
G2	Imperiled	At high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors.
G3	Vulnerable	At moderate risk of extinction or elimination due to a restricted range, relatively few populations or occurrences, 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.
G#G#	Range Rank	A numeric range rank (e.g., G2G3, G1G3) is used to indicate uncertainty about the exact status of a taxon or ecosystem type.
GU	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR	Unranked	Global rank not yet assigned
G#?	Inexact Numeric Rank	Used when degree of imprecision is unknown (e.g. G3? rather than G2G4)
G#Q	Questionable taxonomy that may reduce conservation priority	Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; only used at a global level and not at a national or subnational (state) level.

A new tool, the "Rank Calculator," was developed to aid in the production of conservation status ranks. The Rank Calculator is a spreadsheet programmed to calculate ranks from status factor ratings through the application of assigned points and weights according to certain rules and algorithms. See NatureServe (2009) and Master et al. (2009) for a more detailed explanation of the algorithms and description of the tool. The tool produces a rank through a multi-factor analysis, but the end result is a rank that must be verified by the user of the tool. Verification involves the assessment of the rank against the level of confidence of the information that was used to develop the rank, allowing the user to override the rank, if warranted. This option is not intended to allow for casual or trivial changes, but to allow for a level of uncertainty in the data to be accounted for. For example, if the information that yielded the rank was of high uncertainty, then the rank of G2 produced initially by the calculator could be changed to G2G3 if it is unclear whether the type may be G2 or G3 if better information were available. The rank may show greater uncertainty by changing the rank to G2? if it is unclear whether better information would yield a G1 or G3.

Uncertainty may lie not so much with the rank, but with the taxonomy of the type. For example, the rank of G4Q (Q indicates questionable status) would indicate that the information regarding the rank of the type is well documented, but that there is a question of whether the type should be split or lumped with another type, in which the status rank may change. See Master et al. (2009) for more information on use of status rank qualifiers.

Study Area

The ERMN of the NPS Inventory and Monitoring Program includes nine national parks in Pennsylvania, West Virginia, New York, and New Jersey (Figure 1). The 33 state-rare associations without global conservation ranks and their occurrence by park are listed in Table 2. No state-rare associations are known from Johnstown Flood National Memorial (JOFL), Friendship Hill National Historical Site (FRHI), or Fort Necessity National Battlefield (FONE).

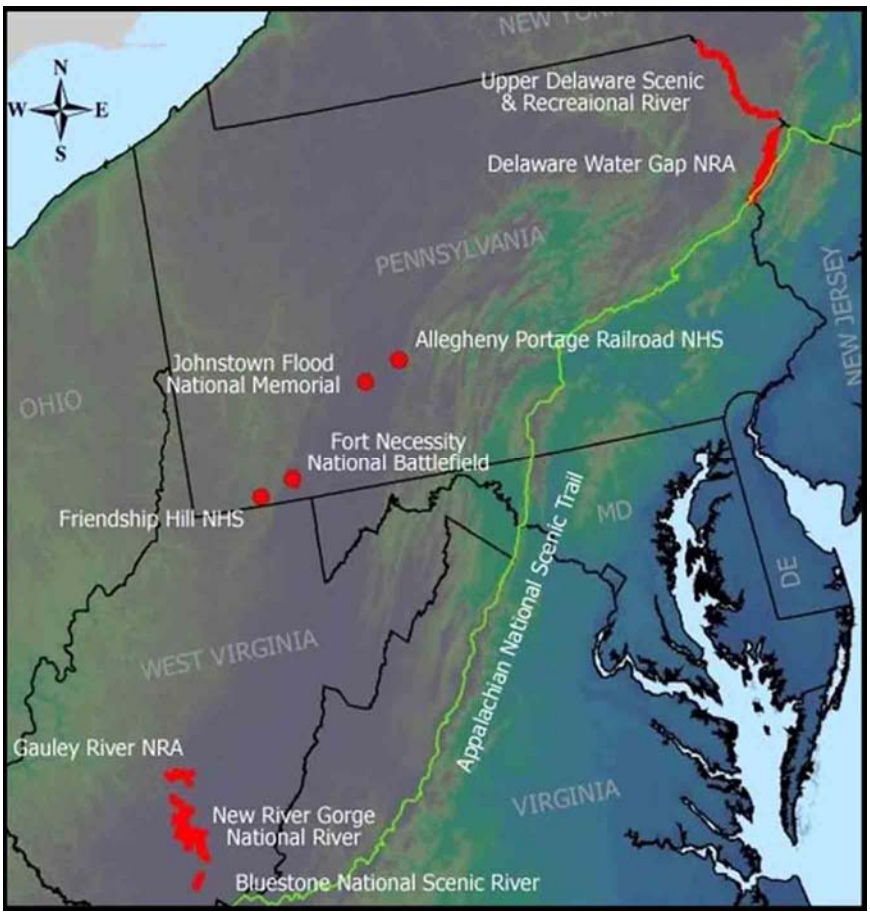

Figure 1. Eastern Rivers and Mountains Network of the National Park Service's Inventory and Monitoring Program.

Methods

This project applies methods developed by NatureServe and its member programs (Faber-Langendoen et al. 2009) to determine the global conservation status ranks of 33 associations (Table 1) presumed to be rare in Pennsylvania, West Virginia, New York, and/or New Jersey.

The method details a set of rank factors in three major categories: rarity, trends, and threat, grouped as follows:

Rarity:

- Range extent (area contained within the shortest continuous imaginary boundary that can be drawn to encompass all known or inferred occurrences)
- Area of occupancy (area within range extent that is occupied by the association)
- Number of occurrences (areas of land or water in which a community is, or was, present; stand or cluster of stands)
- Number of occurrences with good viability or ecological integrity (95% probability of persistence over the next 10–20 years)
- Environmental specificity (used only when number of occurrences or area of occupancy are unknown)[1]

Trends:

- Long-term trend (estimated, observed, or projected degree of change in range extent or area of occupancy or number of occurrences over the past 200 years)
- Short-term trend (estimated, observed, or projected degree of change in range extent or area of occupancy or number of occurrences over the past 10–100 years)

Threats:

- Threat impact (degree to which community is estimated or inferred to be directly threatened by habitat degradation / loss, nonindigenous species, disease of dominant or characteristic species, or threats imposed on small occurrences by stochastic natural disturbances): this factor is generated by evaluating the scope and severity of major threats
- Intrinsic vulnerability (used only if threat impact is unknown)

[1] Environmental specificity was not used in this project as there was adequate occurrence and area of occupancy data

How the Rank Calculator Works

There are seven steps involved in determining a conservation status rank using the Rank Calculator. The first step, assessment of conservation status factors, and the last step, review and assignment of final rank, are done manually by the user. The first step is discussed in detail in the section entitled "Initial Analyses." Table 4 lists the possible ratings assigned to each of the rank factors. The ratings are entered into the Calculator by the user; the Calculator uses a system of points, weights, and rules to determine the rank in the following sequence:

1. Application of rules:
    a. Core vs conditional factors rule: There are two conditional factors that can be applied if information on a core factor is unavailable: a) if Area of Occupancy and Number of Occurrences are both unknown, Environmental Specificity may be used instead; b) if Threat Impact is unknown, Intrinsic Vulnerability may be used instead.
    b. Minimum required fields rule: Information for all of the factors is not required to derive the rank. The minimum required must include either two rarity factors (one of which must either be Range Extent or Area of Occupancy) or one rarity factor and one factor from either trends or threats categories.
    c. Automatic overrides rule: there are two conditions under which a calculated rank would be automatically over-ridden: a) minimum required factors are not met, resulting in GU (unrankable); or b) if Area of Occupancy is rated either A or B, a rank of G1 is automatically applied.
2. Assignment of points to status factors: rating scales applied to factors are variable in extent, ranging from 0 to 3 up to 0 to 9. The Calculator standardizes the point scale from 0 to 5.5 so that each factor has equal contribution with point assignment.
3. Assignment of weights to factors: Weights are doubled for two factors thought to contribute more critically to threat of extinction[2]: Area of Occupancy and Short-term Trend.
4. Assignment of weights to factor categories: Factors in the rarity category are weighted more heavily (50%) than are those in the trends category (30%), and threats category (20%).
5. An overall status score is calculated according to the rules, points, and weights described above.
6. Status score is then calculated to a conservation status rank.
7. The last step involves expert review of the automatically calculated status rank. The final rank is not adjusted casually, but two situations may warrant a change: a) questionable taxonomy of the association under review, particularly if the taxonomy change results in

[2] **Population size is also given a double weight, but this factor applies to species only.**

a change in status rank; or b) more recent and / or robust review has occurred at the state level which renders the global assessment incorrect. For example, an element may not be more at risk of extinction at the state level than it is at the global level (e.g. G3S4). If the state level information is more robust than is the information backing the global conservation status rank, the global rank should be adjusted accordingly. Finally, there may be other extenuating circumstances not easily accounted for in the Rank Calculator.

Data Compilation

Several related mapping efforts in recent years provided NatureServe the opportunity to compile and standardize many large datasets for in-house analyses. NatureServe's Ecological Systems classification provided the basis for map legends developed by the LandFire and GAP Analysis projects. Continued refinement of these maps in the eastern region is the focus of a current project to map Ecological Systems and Wildlife Habitats in the East; a collaborative work by The Nature Conservancy and NatureServe (Gawler et al. 2008). These projects relied on the comprehensive data collected by NatureServe member natural heritage programs over several decades. NatureServe compiled community georeferenced Element Occurrence ("EO") records from each program along with many other data sources, including georeferenced plot data, National Park Service vegetation maps, U.S. Fish and Wildlife Service vegetation maps, National Land Cover Data, and Ecological Land Unit (ELU) data, into a single, large GIS project. The latter data source was developed by The Nature Conservancy's Eastern Regional Office (Anderson and Olivero 2001), and it models ecological features of the landscape depicting combinations of slope, substrate, topographic position, moisture index, elevation, landform, and other variables, that can be used to predict the range and extent of vegetation types. Examples of ELUs include mid-elevation acidic steep slope, low calcareous moist flat, and deep coarse sediments on dry flats. An ELU grid of 30-m cells was developed for the entire eastern region from the Maritime Provinces to Virginia, and was made available to NatureServe for use in this and other projects.

Classification Changes since Completion of Vegetation Maps

Two USNVC associations in this report have been changed subsequent to the completion of vegetation mapping. The first, *Carya (glabra, ovata) - Fraxinus americana - Quercus* spp. Forest (CEGL006236), has since been lumped with another existing association, *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest (CEGL006301). The two types were increasingly more difficult to distinguish as more data became available. Occurrences of the former have been re-classified as either CEGL006301, or those with more mesic species, to another closely related type, *Acer saccharum - Quercus rubra / Hepatica nobilis* var. *obtusa* Forest (CEGL006046). In this report, the change applies to Upper Delaware Scenic and Recreational River, where *Carya (glabra, ovata) - Fraxinus americana - Quercus* spp. Forest (CEGL006236) had been mapped previously and is now classified as *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest (CEGL006301 (Perles et al. 2008). No polygons were attributed to *Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest (CEGL006301) in the initial map.

The other association, *Penstemon hirsutus* Sparse Vegetation (CEGL006535), has also been lumped with another similar association, *Quercus rubra - Quercus prinus - Pinus strobus / Penstemon hirsutus* Woodland (CEGL006074). The name of CEGL006074 has also been changed to better reflect the species composition of the vegetation, to *Quercus prinus / Rhus* spp.

/ *Deschampsia flexuosa* Woodland. In this report, this change affects Delaware Water Gap National Recreation Area, where *Penstemon hirsutus* Sparse Vegetation (CEGL006535) had been mapped (Perles et al. 2007). No polygons had been attributed to CEGL006074 in the original map.

Initial Analyses

For each of the 33 associations, a report from NatureServe's Biotics database was generated detailing a summary description, states of occurrence, state rank, U.S. Forest Service subsections of distribution, and other pertinent information. An Excel® workbook was developed with each association on a separate worksheet. The first column of the worksheet listed states of occurrence on separate rows, with state name, state rank, and relationship of state type to the association. Rank factors and other ancillary issues were also listed as column headings: range extent, estimated area of occupancy, number of Element Occurrences (EOs) documented, acreage of EOs, number of EOs estimated state-wide, number of EOs with good viability, short-term trends, long-term trends, and threats. Data for each column was entered by referring to the EO records provided by member programs.

An initial assessment was done in order to organize all known existing information in a manner that would be easily reviewed by state natural heritage program ecologists. This process included the attribution of the appropriate EO records with the USNVC association being assessed. In the initial assessment, numbers of estimated EOs and estimated area of occupancy were determined state by state. Associations were located in the EO records by referring to the state name of the type. Because the relationship between state type and the association is not always 1:1, each individual occurrence was examined to ensure that it was indeed the association in question.

The process of assessment drew from many data sources, but because data are far from comprehensive in nearly all cases, it was necessary to rely on a number of assumptions as well as on expert interview. Documentation of how estimates were made was recorded in the spreadsheet for review. Although the procedure of estimation varied among associations due to the varied amount of existing data, the following is an account of the general process of assessment for each rank factor:

- Range extent: Conservation status assessment of associations requires examining the entire range of the association; information on associations was aggregated from a considerably wider area, ranging from Alabama to Maine. Prior to the start of this project, the range of all associations was documented in both descriptive form and as attributions to the subsection level of the U.S. Forest Service ecoregion map (Keys et al. 1995). Associations are listed with a confidence level of present, probable, or questionable. Range extent was measured in GIS using subsections of occurrence with high confidence. Where subsections cross into states where the association is not known to occur, the measurement was confined to the state boundary. Measurements were made in km^2. Range extent was determined for the association as a whole, not added by individual state.
- Number of occurrences: In cases where the state type encompasses more than one association, the percentage of EOs crosswalked to the association in question was used as a proxy to estimate the number of occurrences for the association. For example, the state

name for *Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland (CEGL006002) in New York is Red Cedar Rocky Summit. According to the description, 50–500 occurrences are estimated state-wide for state type. Using the median of the stated range (275), and based on number of crosswalked EOs, assume 80% of estimated EOs (or 220) of the state type are CEGL006002. In other cases, an estimated number of occurrences of the state type was lacking in descriptions, but where state rank was available, this was used as a proxy for the estimated number of occurrences, relying on the following scale: S1=1–5 occurrences; S2=6–20 occurrences; S3=21–100 occurrences; S4=101–300 occurrences; and S5≥300 occurrences. It is understood that state ranks reflect more than numbers of occurrences, particularly where ranks were updated in recent years; however, this level of uncertainty during the initial assessment was considered acceptable because the threshold ranges are fairly broad.

- Area of occupancy: Mean area of the association was determined by adding the areas of EOs attributed to that association and then dividing by the number of EOs. The mean size was then multiplied by the number of estimated EOs. Area of occupancy was determined state by state because mean area varies across the range.

For area of occupancy, some accomodation had to be made for the broad variation in how associations exist on the landscape. In the East, where forests are the dominant vegetation structure, single forest associations that are structured mainly by broad environmental drivers, such as climate, can occupy vast areas, generally thousands to tens of thousands of acres. These associations are referred to as “matrix-forming” associations in which other types of vegetation are embedded. Other associations are structured by more localized variables such as soil type or large-scale hydrological factors. These large-patch associations typically occur in their natural state at scales of hundreds to thousands of acres. Still, other associations occur naturally in small patches, from less than an acre to tens or or a few hundred acres. These associations are structured, mainly, by very localized environmental conditions, such as seepage areas within larger forests, or small rock outcrops. Master et al. (2009) indicate the importance of taking these scale effects into account when measuring area of occupancy, but provide little specific guidance.

To address the scale issue, separate sets of thresholds were developed for matrix and for small patch associations. It was assumed that the area of occupancy thresholds developed by Master et al. (2009) largely apply to large patch communities. The EO methodology guidelines for minimum patch size for the three size types (2 ha for matrix, 0.4 ha for large patch, 0.05 ha for small patch) indicate that minimum sizes for small patch types are lower by a factor of 8, and matrix types larger by a factor of 5 from the large patch standard. Extrapolating to the thresholds in the rank calculator yielded the scales identified in Table 3.

Table 3. Alternative scales for matrix and small patch associations.

Threshold	Matrix	Small patch
A	<5 km^2	< 0.125 km^2 (<31 ac)
B	<5–20 km^2	0.125–0.5 km^2 (31–123 ac)
C	20–50 km^2	0.5–1.25 km^2 (123–209 ac)
D	50–100 km^2	1.25–2.5 km^2 (209–618 ac)
E	100–500 km^2	2.5–12.5 km^2 (618–3,088 ac)
F	500–2,500 km^2	12.5–62.5 km^2 (3,088–15,444 ac)
G	2,500–10,000 km^2	62.5–250 km^2 (15,444–61,776)
H	10,000–100,000 km^2	250–2,500 km^2 (61,776–617,763 ac)
I	>100,000 km^2	>2,500 km^2 (617,763 ac)

Threats: Climate Change

In assessing threats, the effects of climate change are difficult to determine, with confidence, without considerable additional research. For the purpose of this study, threats imposed by climate change were considered judiciously. Climate change was weighed as a threat in cases where commonly published evidence of high temperature or drought has begun to have an impact on the vegetation. It is likely that additional research, such as application of NatureServe's Climate Change Vulnerability Index (Young et al. 2009), would provide additional evidence that may have some bearing on the results of this report.

How the Calculator Works

Following individual state assessments, total numbers of EOs and area of occupancy for all states of occurrence were entered into the Rank Calculator with the estimated range extent. Additional information was collected regarding threats and trends, as available, and this information was also entered into the Rank Calculator. An initial rank was produced by the Rank Calculator, and this output was entered into the workbook. The range of values (thresholds) for each of the factors is listed on Table 4.

Individual workbooks were then prepared for each state for review by the natural heritage program ecologists, NatureServe regional ecologists, and other knowledgeable individuals. For types ranging into OH and IN, the workbooks were submitted to the Midwest NatureServe Regional Ecologist, and for types ranging into TN, GA, AL, and SC, the workbook was provided to a contracting ecologist who is familiar with the vegetation and to the Southeast NatureServe Regional Ecologist. Each workbook contained a summary description of the type, the preliminary numbers for each type, and comments and notes regarding how estimates were done. In cases where classification was at issue, descriptions of similar types were also provided.

Responses were provided by natural heritage program ecologists in ME, NH, VT, NY, NJ, PA, VA, WV, MD, NC, and DE, and by NatureServe Regional Ecologists from both Midwest and Southeast offices, and from contract ecologist Tom Govus, who contacted heritage program ecologists in AL and GA. Time did not allow for responses from ecologists in MA and CT, nor for full response by the ecologist in NJ. There is no ecologist position at the RI natural heritage program, so no input was received for that state. In these cases, preliminary results were accepted as final results. Revised numbers were entered into the Rank Calculator for rank revisions.

Table 4. Ratings for element ranking factors used as inputs to the Rank Calculator.

Number of EOs
Z=0 (zero)
A=1–5
B=6–20
C=21–80
D=81–300
E=>300

Area of Occupancy (Large patch associations; see alternative scale for matrix and small patch types)
Z=Zero (no occurrences believed extant)
A=<0.4 km^2 (less than about 100 ac)
B=0.4–4 km^2 (about 100–1000 ac)
C=4–20 km^2 (about 1000–5000 ac)
D=20–100 km^2 (about 5000–25,000 ac)
E=100–500 km^2 (about 25,000–125,000 ac)
F=500–2,000 km^2 (about 125,000–500,000 ac)
G=2,000–20,000 km^2 (about 500,000–5,000,000 ac)
H=>20,000 km^2 (greater than 5,000,000 ac)

Range Extent
Z=Zero (no occurrences believed extant)
A=<100 km^2 (less than about 40 mi^2)
B=100–250 km^2 (about 40–100 mi^2)
C=250–1,000 km^2 (about 100–400 mi^2)
D=1,000–5,000 km^2 (about 400–2000 mi^2)
E=5,000–20,000 km^2 (about 2000–8000 mi^2
F=20,000–200,000 km^2 (about 8000–80,000 mi^2)
G=200,000–2,500,000 km^2 (about 80,000–1,000,000 mi^2)
H=>2,500,000 km^2 (greater than 1,000,000 mi^2)

Short-Term Trend past 10 yrs or 3 generations whichever is longer
A = Severely declining (decline of >70% in population, range, area occupied, and/or # or condition of occurrences)
B = Very rapidly declining (decline of 50–70%)
C = Rapidly declining (decline of 30–50%)
D = Declining (decline of 10–30%)
E = Stable (unchanged or within +/- 10% fluctuation in population, range, area occupied, and/or number or condition of occurrences)
F = Increasing (increase of >10%)

Number of EOs with Good Viability
A = No (A- or B-ranked) occurrences with good viability
B = Very few (1–3) occurrences with good viability
C = Few (4–12) occurrences with good viability
D = Some (13–40) occurrences with good viability
E = Many (41–125) occurrences with good viability
F = Very many (>125) occurrences with good viability

Overall Threat automatically calculated from Scope,
Severity, and Immediacy, no ranges possible
A = Substantial, imminent threat
B = Moderate and imminent threat
C = Substantial, non-imminent threat
D = Moderate, non-imminent threat
E = Localized substantial threat
F = Widespread, low-severity threat
G = Slightly threatened
H = Unthreatened

Scope
High = >60% of total population, occurrences, or area affected
Moderate = 20–60% of total population, occurrences, or area affected
Low = 5–20% of total population, occurrences, or area affected
Insignificant = < 5% of total population or area affected

Severity
High = Loss of species population (all individuals) or essentially irreversible destruction of habitat (>100 yrs for recovery)
Moderate = Major reduction of species population or long-term degradation or reduction of habitat (50–100 yrs for recovery)
Low = Low but nontrivial reduction of species population or reversible degradation or reduction of habitat (10–50 yrs for recovery)
Insignificant = Essentially no reduction or degradation due to threats, or able to recover quickly from minor temporary loss (within 10 yrs)

Long-Term Trend over the past 200 years (ie since 1805)
A = Very large decline (decline of >90%, with <10% of population size, range, area occupied, and/or # or condition of occurrences)
B = Large decline (decline of 75–90%)
C = Substantial decline (decline of 50–75%)
D = Moderate decline (decline of 25–50%)
E = Relatively stable (+/– 25% change)
F = Increase (increase of >25%)

Results

Of the 45 state-rare vegetation associations identified throughout ERMN parks during the respective vegetation classification and mapping projects, nine associations already were assigned global conservation ranks before this project began, 33 association were assigned global conservation ranks during this project, and three associations were identified too late to be included in this project. Of the 33 associations assessed for this project, 18 are considered to be globally rare, that is, having global conservation status ranks ranging from G3 to G1. Conservation status ranks for each of the 33 associations are listed in Table 5. Detailed information on the definitions and criteria for each of the status ranks is provided in Master et al. (2009) and Faber-Langendoen et al. (2009).

The summary output results of the rank calculator for each association are provided in Appendix A. Details for ranking justifications for each association are included in Appendix B. A summary description of the type is given, with the final Conservation Status Rank (G Rank) and reasons for the rank. Results for each rank factor are given, and notes detailing the decision process for each factor are also provided.

Results by Vegetation Type

Eighteen associations are ranked G1 to G3, critically imperiled to vulnerable. Seven associations are ranked G4 or G5, apparently secure, or secure, respectively. Five associations have "Q" ranks, e.g. G3Q, in which taxonomy is still to be resolved. In these cases, lumping with a previously defined association, recognition of it as a separate association or further splitting it into two associations will impact conservation status. Three associations have a rank qualifier, e.g. G2?, indicating a degree of uncertainty about the rank. In these cases, the degree of certainty lies with the numeric rank, reflecting uncertainty of the numeric rank in either direction, but is not as imprecise as a range rank spanning three possible ranks, e.g. G1G3 or of a range rank such as G2G3, in which there is equal likelihood of the true rank as being either G2 or G3.

Four associations are ranked G1, considered to be critically imperiled—a very high risk of extinction or elimination due to extreme rarity, very steep declines, or other factors (Master et al. 2009). Two of these associations, *Deschampsia caespitosa - Carex viridula* Herbaceous Vegetation and *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation, occur at Delaware Water Gap National Recreation Area. The other two G1 associations occur at New River Gorge National River: *Juniperus virginiana* var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland, and *Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest. The latter also occurs at Bluestone National Scenic River and at Gauley River National Recreation Area. No associations were ranked G2 (imperiled, at high risk of extinction or elimination due to very restricted range, very few populations or occurrences, steep declines, or other factors). One association was ranked G2G3: *Carya cordiformis - Prunus serotina / Ageratina altissima* Forest, indicating that there is about equal probability that the association is either G2 or G3.

More than one-third of the associations (13) were ranked G3, or vulnerable, at moderate risk of extinction or elimination due to a restricted range, relatively few occurrences, recent and widespread declines, or other factors.

In only two cases were the global conservation status ranks in contradiction with state ranks; ranked to be more at-risk at the global level than it is at the state level. In the first case, *Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Shrubland (CEGL006371) was ranked G3. The state types in Pennsylvania and New York that were crosswalked to this type (Highbush blueberry - Meadowsweet Wetland, and Shrub Swamp, respectively) were both ranked S5. However, both state types contain several USNVC associations within the concept, so S5 is not likely to reflect the abundance of the association in the state. In the second case, Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation, the global rank is G4Q and the rank for the type crosswalked to it in Pennsylvania, Northern Appalachian Acidic Cliff, is ranked S5. However, the global rank is qualified with "Q" which indicates that the taxonomy is in question.

Results by Park

The distribution of the 45 state-rare vegetation associations and their global conservation ranks is shown in Table 5. Of the nine parks of the Eastern Rivers and Mountains Network, Delaware Water Gap National Recreation Area, by far, supports the largest number of rare associations (16) ranked G1 to G3, including 11 associations newly-ranked as a result of this project. One association, *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation (CEGL006448), occurs in patches too small to be included on the original vegetation map. This association is one of three at Delaware Water Gap National Recreation Area that are ranked G1. The others are *Deschampsia caespitosa - Carex viridula* Herbaceous Vegetation (CEGL006969) and *Deschampsia caespitosa - Claytonia virginica* var. *hammondiae* Herbaceous Vegetation (CEGL006101). One association, *Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Shrub Herbaceous Vegetation (CEGL006457), is ranked G1G2. All of these associations are small-patch seepage wetlands highly dependent on intact hydrology.

Table 5. Global vegetation association name, code, conservation rank, and distribution among Eastern Rivers and Mountains Network parks (indicated by an X) for 45 state-rare vegetation associations.

Global Vegetation Association Name - Newly Ranked by this Project	Global Code	Global Conservation Status Rank	DEWA	UPDE	ALPO	BLUE	NERI	GARI
Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus Herbaceous Vegetation	CEGL006448	G1	X					
Quercus (alba, rubra, velutina) / Halesia tetraptera Forest	CEGL006462	G1				X	X	X
Deschampsia caespitosa - Carex viridula Herbaceous Vegetation	CEGL006969	G1	X					
Juniperus virginiana var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland	CEGL008449	G1					X	
Salix nigra - Betula nigra / Schoenoplectus (pungens, tabernaemontani) Wooded Herbaceous Vegetation	CEGL006463	G1?					X	
Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea Forest	CEGL007853	G1Q					X	X
Carya cordiformis - Prunus serotina / Ageratina altissima Forest	CEGL006445	G2G3	X	X				
Platanus occidentalis - (Betula nigra, Salix spp.) Temporarily Flooded Woodland	CEGL003725	G3				X	X	X
Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa Woodland	CEGL006002	G3	X	X				
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum spp. Forest	CEGL006014	G3	X					
Quercus prinus / Rhus spp. */ Deschampsia flexuosa* Woodland	CEGL006074	G3	X					
Quercus palustris - Acer rubrum / Carex grayi - Geum canadense Forest	CEGL006185	G3	X					
Andropogon gerardii - Panicum virgatum - Baptisia australis Herbaceous Vegetation	CEGL006283	G3					X	
Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia Shrubland	CEGL006371	G3	X					
Eastern Woodland Vernal Pool Sparse Vegetation	CEGL006453	G3	X					
Prunus pumila / Andropogon gerardii - Sorghastrum nutans Herbaceous Vegetation	CEGL006518	G3	X	X				
Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia spp. Herbaceous Vegetation	CEGL006544	G3	X					
Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest	CEGL007119	G3					X	X
Peltandra virginica - Saururus cernuus - Carex crinita / Climacium americanum Herbaceous Vegetation	CEGL007696	G3					X	
Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana Forest	CEGL007861	G3					X	X
Betula nigra - Platanus occidentalis / Impatiens capensis Forest	CEGL006184	G3Q		X				
Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia Forest	CEGL006458	G3Q				X	X	
Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa Woodland	CEGL006116	G4	X	X				

Global Vegetation Association Name - Newly Ranked by this Project	Global Code	Global Conservation Status Rank	DEWA	UPDE	ALPO	BLUE	NERI	GARI
Newly Ranked by this Project (continued)								
Quercus rubra - (Quercus prinus) / Vaccinium spp. / Deschampsia flexuosa Woodland	CEGL006134	G4		X				
Vaccinium corymbosum / Sphagnum spp. Shrubland	CEGL006190	G4	X	X				
Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum Forest	CEGL006301	G4	X	X				
Betula lenta - Quercus prinus / Parthenocissus quinquefolia Woodland	CEGL006565	G4	X					
Quercus prinus / Rhododendron catawbiense - Kalmia latifolia Forest	CEGL008524	G4					X	X
Quercus ilicifolia - Prunus pumila Shrubland	CEGL006121	G4?	X	X				
Carex trichocarpa - Scirpus spp. *- Solidago gigantea* Herbaceous Vegetation	CEGL006447	G4?	X	X				
Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation	CEGL006435	G4Q			X		X	X
Pinus rigida - Quercus coccinea / Vaccinium angustifolium Woodland	CEGL006557	G4Q					X	
Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii) Nonvascular Vegetation	CEGL004142	G5	X					
Previously Ranked								
Deschampsia caespitosa - Claytonia virginica var. *hammondiae* Herbaceous Vegetation	CEGL006101	G1	X					
Juniperus virginiana / Dasiphora fruticosa ssp. *floribunda / Carex flava - Carex tetanica* Shrub Herbaceous Vegetation	CEGL006357	G1G2	X					
Morella pensylvanica - Dasiphora fruticosa ssp. *floribunda / Carex sterilis - Carex flava* Shrub Herbaceous Vegetation	CEGL006103	G2	X					
Andropogon gerardii - Campanula rotundifolia - Solidago simplex Sparse Vegetation	CEGL006284	G2	X	X				
Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum Woodland	CEGL008540	G2G3				X		
Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum Forest	CEGL006459	G3	X	X				
Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus Herbaceous Vegetation	CEGL006483	G3					X	
Tsuga canadensis - Quercus prinus - Betula lenta Forest	CEGL006923	G3				X		
Recent Associations without Global Ranks								
Betual nigra - Ilex verticillata - Andropogon gerardii - Solidago simplex Shrub Prairie	CEGL006623	G1G2?						X
Tsuga canadensis - Quercus rubra - (Platanus occidentalis, Betula nigra) / Rhododendron maximum / Anemone quinquefolia Forest	CEGL006620	GNR				X		X
Pitch Pine Floodplain Forest	CEGL006622	GNR						X

Two associations at Delaware Water Gap National Recreation Area are ranked G2. *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Sparse Vegetation (CEGL006284) occurs at three sites in the park on calcareous bedrock outcrops along the shoreline of the Delaware River in New Jersey. *Morella pensylvanica - Dasiphora fruticosa* ssp. *floribunda / Carex sterilis - Carex flava* Shrub Herbaceous Vegetation (CEGL006103) is a marl fen with one occurrence in the park. One association is ranked G2G3, *Carya cordiformis - Prunus serotina / Ageratina altissima* Forest (CEGL006445), a forest of floodplain terraces. This association occurs in the northern and central portions of the park, usually on the interior portion of curved channels or in oxbows.

The remaining nine rare associations at Delaware Water Gap National Recreation Area are ranked G3. Three of these occupy dry, rocky ridges or talus slopes, and occur in scattered patches through the length of the park. They include *Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland (CEGL006002), a rock outcrop woodland; *Quercus prinus / Rhus* spp. */ Deschampsia flexuosa* Woodland (CEGL006074), a shale scree slope; and *Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia* spp. Herbaceous Vegetation (CEGL006544), vegetation of rock outcrops generally found at the southern end of the park.

Three associations occupy basin wetlands: *Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Forest (CEGL006014), a red maple - black gum swamp occurring mostly in the southern and central portions of the park; *Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Shrubland (CEGL006371), a highbush blueberry seasonally flooded wetland occurring in scattered locations throughout the park; and Eastern Woodland Vernal Pool Sparse Vegetation (CEGL006453), a seasonally flooded wetland also scattered throughout the park.

Three associations are associated with alluvial flooding: *Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Herbaceous Vegetation (CEGL006518), a riverside prairie, confined to islands in the Delaware River; *Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* (CEGL006185) Forest, a floodplain forest occurring on smaller tributaries of the Delaware River; and *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest (CEGL006459), a sugar maple-dominated floodplain forest.

The New River Gorge National River has 11 associations ranked G3 or rarer, ten of which were ranked during this project. Two associations at this park are ranked G1: *Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland (CEGL008449), an Eastern red-cedar - Virginia pine flatrock woodland community that received rare but high-energy flooding prior to the installation of a dam upstream; and *Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest (CEGL006462), an unusual oak-hickory forest of upper floodplain terraces. Two additional associations are ranked G1 with uncertainty. *Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest (CEGL007853), a forested seep, is ranked G1Q, indicating there is some taxonomic uncertainty about the classification of this association. *Salix nigra - Betula nigra / Schoenoplectus (pungens, tabernaemontani)* Wooded Herbaceous Vegetation (CEGL006463), a black willow-dominated wetland found in slackwater areas of the New River floodplain, is ranked G1?.

The remaining seven rare associations are ranked G3. Five of these are influenced by alluvial flooding: *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (CEGL006283), a riverscour prairie; *Peltandra virginica - Saururus cernuus - Carex crinita / Climacium americanum* Herbaceous Vegetation (CEGL007696), a backwater slough characterized by mucky sediments; *Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland (CEGL003725), a sycamore - river birch riverscour woodland characterized by high energy flooding; *Eragrostis hypnoides - Ludwigia palustris - Lindernia dubia - Cyperus squarrosus* Herbaceous Vegetation (CEGL006483), low-growing annuals growing on exposed soil along rivers; and *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), a floodplain forest dominated by sycamore and ash that is taxonomically uncertain (G3Q).

The remaining two rare associations are upland vegetation: *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119) is a clifftop Virginia pine forest that is found in the northern two-thirds of the park, and *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861) is a yellow birch cold cove forest that occurs on steep lower slopes in creek valleys and gorges.

There were five associations ranked G3 or rarer known to occur at the Gauley River National Recreation Area at the start of this project. The Gauley River National Recreation Area vegetation map is nearing completion, and three additional associations that are unranked are likely to be rare, but timing and budget did not allow for their inclusion in this project (see Table 5). More information will be available regarding these types upon the conclusion of the vegetation mapping project.

One of the five rare associations is ranked G1, *Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest (CEGL006462), the oak - hickory floodplain forest also occurring at the New River Gorge National River. On the Gauley River National Recreation Area, this vegetation is restricted to very few small stands in the western portion of the park. One additional association is ranked G1 with uncertainty. *Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest (CEGL007853), a forested seep, is ranked G1Q, indicating there is some taxonomic uncertainty about the classification of this association. The remaining three rare associations are ranked G3: *Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland (CEGL003725) is the sycamore - river birch riverscour woodland also occurring at the New River Gorge National River. The remaining two rare associations are upland vegetation: *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119), the clifftop Virginia pine forest, and *Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861), the yellow birch cold cove forest. Both of these associations also occur at the New River Gorge National River, and in essentially the same environmental settings: rocky, open clifftops, and steep lower slopes in creek valleys and gorges, respectively.

The Bluestone River contains five rare associations, three of which were ranked for this project. One additional association is unranked, but is likely to be rare (see Table 5). However, timing and budget did not allow for the inclusion of this association in this project. One association, *Quercus (alba, rubra, velutina) / Halesia tetraptera* Temporarily Flooded Forest (CEGL006462), is ranked as G1. This oak-hickory floodplain forest was not mapped

individually on the original vegetation map. Instead, it is part of the Floodplain Forest and Woodland map class, comprised of several associations. One association, *Quercus prinus - Pinus virginiana - (Pinus pungens) / Schizachyrium scoparium - Dichanthelium depauperatum* Woodland (CEGL008540), a pine- and oak-dominated woodland found on dry shales, is ranked G2G3.

Three associations are ranked G3: *Platanus occidentalis - (Betula nigra, Salix* spp.) Temporarily Flooded Woodland (CEGL003725), a sycamore - river birch riverscour woodland characterized by high energy flooding; *Tsuga canadensis - Quercus prinus - Betula lenta* Forest (CEGL006923), a dry forest dominated by hemlock and oak; and *Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest (CEGL006458), a floodplain forest dominated by sycamore and ash that is taxonomically uncertain (G3Q).

The Upper Delaware Scenic and Recreational River had six rare associations, four of which were ranked during this project. *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Sparse Vegetation (CEGL006482), vegetation on bedrock outcrops along the Delaware River, is ranked G2. One association is ranked G2G3, *Carya cordiformis - Prunus serotina / Ageratina altissima* Forest (CEGL006445), a forest of floodplain terraces.

The remaining associations are ranked G3: *Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Herbaceous Vegetation (CEGL006518), a riverside prairie subjected to high-energy flooding; *Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland (CEGL006002), an upland rocky woodland that occurs in the southern portion of the park only; *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest (CEGL006459), a sugar maple-dominated floodplain forest; and *Betula nigra - Platanus occidentalis / Impatiens capensis* Forest (CEGL006184), a floodplain forest dominated by river birch that is taxonomically uncertain.

Discussion

The vegetation maps and classifications that were developed for each of the parks in the Eastern Rivers and Mountains Network provide an excellent inventory of what vegetation types are in the parks, where they are, and how much of each type there is. However, with hundreds of USNVC types mapped at these parks, setting management priorities is critical. Towards that end, scientists in the Eastern Rivers and Mountains Network requested two sets of analyses that would aid their decision making. The first, a map of ecological systems of parks (Largay and Sneddon 2009), set the ecological context for the associations in the parks, illustrating landscape patterns and juxtaposition of the associations with others influenced by the same processes on the ground. These maps provided a means to focusing management efforts on broader units than individual associations.

The second analysis, determining the global conservation status ranks of state-rare associations unranked from a global perspective, is the focus of this report. While management of ecological systems is an effective approach on a larger scale, this analysis institutes a "fine filter" method as well, focusing on vegetation types that are rare or threatened, sometimes critically so, that might have been overlooked at a broader management scale.

The application of standardized criteria, and using the rank calculator, resulted in the identification of eighteen associations ranging from G1 to G3 in global conservation status. Many of these associations were suspected to be globally rare at the outset, but the data had not been assembled to support these impressions. The two small-patch seepage wetland associations occurring in New Jersey (*Deschampsia caespitosa - Carex viridula* Herbaceous Vegetation and *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation) were not known to occur elsewhere, but information regarding their possible occurrence outside New Jersey was lacking. The cliff top pitch pine woodland at the New River Gorge National River and Gauley River National Recreation Area was suspected to be G4 at the outset; however, research regarding southern pine bark beetle infestations reported throughout much of the range resulted in a global conservation status rank of G3.

Instituting the two-pronged approach to management focusing on ecological systems and rare associations provides an efficient, effective, and pragmatic means to ensuring the long-term survival of vegetation at the parks.

Conclusions

Determination of the global conservation status ranks of 33 associations deemed rare in individual states of occurrence resulted in the identification of eighteen additional globally rare associations in the Eastern Rivers and Mountains Network of the National Park Service. Application of standardized criteria using a rank calculator provided a means to determine ranks with more objectivity and clarity than has generally been the case in the past. Careful documentation of how the numbers were determined is a key component to this objectivity and clarity. Information was assembled from a wide variety of sources, including NatureServe member program element occurrence records, plot data, vegetation maps from national parks, U.S. Fish and Wildlife Refuges, and a number of GIS data layers including U.S. Forest Service ecoregions, National Land Cover Data, and Ecological Land Units. Other critically important information included expert review of the data and assessments by NatureServe member program ecologists and other knowledgeable individuals. In general, data supporting the generation of global conservation ranks is not complete, so as more data become available, ranks can continue to be updated.

The use of global conservation status ranks for associations complements ecological systems mapping in setting management and monitoring priorities for hundreds of associations across nine parks. Ecological system mapping provides the needed ecological context for associations, illustrating broader landscape units upon which management and monitoring can focus. Knowing which associations are rare or vulnerable to extinction or extirpation provides an additional “fine filter” that aids in the long-term survival of biodiversity in the parks.

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Appendix A. Rank calculator results for associations.

Species or Ecosystem Scientific Name:		*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL007119
Common Name:		
Classification:		
Range Extent:		
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	E	E = Decline of 30–50%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus prinus / Rhododendron catawbiense - Kalmia latifolia* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL008524
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy::	C	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): *OR*	C	C = 4–10 km^2
4 km^2 grid cells (species): *OR*		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: *OR*	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	G	G = Relatively Stable (<=10% change)
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus (alba, rubra, velutina) / Halesia tetraptera* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006462
Common Name:		
Classification:		
Range Extent:	D	D = 1,000–5,000 km^2 (~400–2,000 mi^2)
Area of Occupancy:	A	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	A	A = <1 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	B	B = 6–20
Population Size:		
Good Viability/Ecological Integrity:	C	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	C	C = Few (4–12) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	
Assigned Rank*:	G1	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Betula nigra - Platanus occidentalis / Impatiens capensis* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006184
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	C	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	C	C = 4–10 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	D	D = Decline of 50–70%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3Q	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL007853
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	B	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	B	B = 1–4 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:		
Long-term Trend:		
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	
Assigned Rank*:	G1Q	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Betula alleghaniensis - (Tsuga canadensis) / Rhododendron maximum / Leucothoe fontanesiana* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL007861
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	C	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	C	C = 4–10 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	G	G = Relatively Stable (<=10% change)
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Platanus occidentalis - Betula nigra / Cornus amomum / (Andropogon gerardii, Chasmanthium latifolium)* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL003725
Common Name:		
Classification:		
Range Extent:	D	D = 1,000–5,000 km^2 (~400–2,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR		
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):	D	D = 21–100 1–km^2 grid cells
Number of Occurrences:	B	B = 6–20
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR		
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Juniperus virginiana* var. *virginiana - Pinus virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata - Melica mutica* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL008449
Common Name:		
Classification:		
Range Extent:		
Area of Occupancy:	A	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	A	A = <1 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	A	A = 1–5
Population Size:		
Good Viability/Ecological Integrity:	C	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	C	C = Few (4–12) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	U	U = Unknown
Threat Impact:	BC	BC = High - Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	
Assigned Rank*:	G1	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Deschampsia caespitosa* - *Carex viridula* Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006969
Common Name:		
Classification:		
Range Extent:	A	A = <100 km^2 (< ~40 mi^2)
Area of Occupancy:	A	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	A	A = <1 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	A	A = 1–5
Population Size:		
Good Viability/Ecological Integrity:	B	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	B	B = Very few (1–3) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	U	U = Unknown
Long-term Trend:	U	U = Unknown
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	
Assigned Rank*:	G1	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia* spp. Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006544
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	D	D = Decline of 50–70%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?:	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Peltandra virginica - Saururus cernuus - Carex crinita / Climacium americanum* Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL007696
Common Name:		
Classification:		
Range Extent:	G	G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2)
Area of Occupancy:	C	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	C	C = 0.5–1.25 $km^{2\#}$
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	AD	AD = Decline of >50%
Threat Impact:	BC	BC = High - Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	
Calculated Rank:	G3	
Assigned Rank*:	G3	

#Area of occupancy scaled down by a factor of 8 for small patch communities

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006283
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	C	C = Few (4–12) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	
Calculated Rank:	G3	
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus prinus* / *Rhus* spp. / *Deschampsia flexuosa* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006074
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR		
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL004142
Common Name:		
Classification:		
Range Extent:	G	G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2)
Area of Occupancy:	G	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	G	G = 500–2,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G5	
Assigned Rank*:	G5	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006435
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR		
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	G	G = Relatively Stable (<=10% change)
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank
Assigned Rank*:	G4Q	Adjusted Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006565
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	G	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	G	G = 500–2,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus rubra - (Quercus prinus) / Vaccinium* spp. */ Deschampsia flexuosa* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006134
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	H	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	H	H = 2,000–20,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank.
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		Pinus rigida - Quercus coccinea / Vaccinium angustifolium Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006557
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	U	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	U	U = Unknown
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	G	G = Relatively Stable (<=10% change)
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank.
Assigned Rank*:	G4Q	Adjusted Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum* Forest
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006301
Common Name:		
Classification:		
Range Extent:	G	G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2)
Area of Occupancy:	H	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	H	H = 2,000–20,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:		FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006448
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	B	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	B	B = 1–4 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	B	B = 6–20
Population Size:		
Good Viability/Ecological Integrity:	C	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	C	C = Few (4–12) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	Always review the calculated rank
Assigned Rank*:	G1	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL00651
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	Always review the calculated rank
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Carex trichocarpa* Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006447
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	F	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	F	F = 100–500 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	H	H = Increase of 10–25%
Long-term Trend:	U	U = Unknown
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4?	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006463
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	A	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	A	A = <1 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G1	
Assigned Rank*:	G1?	Adjusted Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		Eastern Woodland Vernal Pool Sparse Vegetation
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006453
Common Name:		
Classification:		
Range Extent:	G	G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2)
Area of Occupancy:	F	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	F	F = 100–500 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	F	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	F	F = Very many (>125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	A	A = Very High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006565
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	G	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	G	G = 500–2,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus rubra - (Quercus prinus) / Vaccinium* spp. */ Deschampsia flexuosa* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006134
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	H	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	H	H = 2,000–20,000 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Pinus rigida - Quercus coccinea / Vaccinium angustifolium* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006557
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	D	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	D	D = 10–20 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	U	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	U	U = Unknown
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	G	G = Relatively Stable (<=10% change)
Threat Impact:	D	D = Low
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank
Assigned Rank*:	G4Q	Adjusted Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Pinus rigida / (Quercus ilicifolia) / Photinia melanocarpa / Deschampsia flexuosa* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006116
Common Name:		
Classification:		
Range Extent:	G	G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus ilicifolia - Prunus pumila* Shrubland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006121
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia* Shrubland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006371
Common Name:		
Classification:		
Range Extent:	D	D = 1,000–5,000 km^2 (~400–2,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	D	D = 81–300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	AB	AB = Very High - High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa* Woodland
Type (enter "infraspecies" for a T-Rank):		
Optional Information:		
Element ID:		
Elcode:		CEGL006002
Common Name:		
Classification:		
Range Extent:	D	D = 1,000–5,000 km^2 (~400–2,000 mi^2)
Area of Occupancy:	F	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	F	F = 100–500 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Vaccinium corymbosum / Sphagnum* spp. Shrubland
Type (enter "infraspecies" for a T-Rank):		Association
Optional Information:		
Element ID:		
Elcode:		CEGL006190
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	F	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	F	F = 100–500 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	BC	BC = High - Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G4	Always review the calculated rank
Assigned Rank*:	G4	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia* Forest
Type (enter "infraspecies" for a T-Rank):		Association
Optional Information:		
Element ID:		
Elcode:		CEGL006458
Common Name:		
Classification:		
Range Extent:	E	E = 5,000–20,000 km^2 (~2,000–8,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	Always review the calculated rank
Assigned Rank*:	G3Q	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Forest
Type (enter "infraspecies" for a T-Rank):		Association
Optional Information:		
Element ID:		
Elcode:		CEGL006185
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	D	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	D	D = Some (13–40) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	F	F = Decline of 10–30%
Threat Impact:	C	C = Medium
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Carya cordiformis - Prunus serotina / Ageratina altissima* Forest
Type (enter "infraspecies" for a T-Rank):		Association
Optional Information:		
Element ID:		
Elcode:		CEGL006445
Common Name:		
Classification:		
Range Extent:	E	E = 5,000–20,000 km^2 (~2,000–8,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	C	C = 21–80
Population Size:		
Good Viability/Ecological Integrity:	U	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	U	U = Unknown
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	F	F = Decline of 10–30%
Long-term Trend:	D	D = Decline of 50–70%
Threat Impact:	AB	AB = Very High - High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G2G3	
Assigned Rank*:	G2G3	Adjusted Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Species or Ecosystem Scientific Name:		*Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum* spp. Forest
Type (enter "infraspecies" for a T-Rank):		Association
Optional Information:		
Element ID:		
Elcode:		CEGL006014
Common Name:		
Classification:		
Range Extent:	F	F = 20,000–200,000 km^2 (~8,000–80,000 mi^2)
Area of Occupancy:	E	FILL OUT ONLY 1 OF FOLLOWING 3 FIELDS
Direct estimate (ecosystems): OR	E	E = 20–100 km^2
4 km^2 grid cells (species): OR		
1 km^2 grid cells (linear species):		
Number of Occurrences:	E	E = >300
Population Size:		
Good Viability/Ecological Integrity:	E	FILL OUT ONLY 1 OF FOLLOWING 2 FIELDS
Number of Occurrences: OR	E	E = Many (41–125) occurrences with excellent or good viability or ecological integrity
Percent Area:		
Environmental Specificity (opt.):		
Short-term Trend:	G	G = Relatively Stable (<=10% change)
Long-term Trend:	E	E = Decline of 30–50%
Threat Impact:	B	B = High
Intrinsic Vulnerability (opt.):		
Minimum factors requirement met?	TRUE	

Calculated Rank:	G3	Always review the calculated rank
Assigned Rank*:	G3	Verified Rank

*Assigned Rank sometimes differs from the Calculated Rank (see text of report on page 14).

Appendix B. Global status rank justifications.

CEGL006301:
Quercus rubra - Carya (glabra, ovata) / Ostrya virginiana / Carex lucorum Forest
Oak - Hickory / Hophornbeam / Sedge Lawn Forest

Status: Standard**.** **Conf.:** 2 - Moderate.

Summary: This association is a dry rich hickory forest of the northeastern United States, from Maine and Vermont to Pennsylvania and northern New Jersey. It is dominated by a mixture of hickories and oaks over a hop-hornbeam subcanopy and a park-like sedge lawn. The vegetation occurs on low-elevation ridgetops, upper slopes, south- or west-facing sideslopes, and is supported by well-drained loams or sandy loams, often derived from alkaline bedrock. The tree canopy, which ranges from nearly closed forest to partially open woodland, is dominated by a mixture of *Carya glabra, Carya ovata, Carya ovalis, Quercus rubra, Quercus alba, Quercus velutina*, with occasional *Ostrya virginiana* and *Acer rubrum*. Minor associates include *Acer saccharum, Pinus strobus*, and *Fraxinus americana*. A subcanopy of *Ostrya virginiana* is conspicuous in most areas. Additional species in the subcanopy or tall-shrub layer that occur in lower abundance can include *Hamamelis virginiana, Cornus florida, Amelanchier arborea, Acer pensylvanicum*, and *Viburnum acerifolium*. Low shrubs can include *Vaccinium angustifolium, Vaccinium pallidum, Rubus idaeus*, or *Viburnum rafinesquianum*. The herb layer is primarily a sedge lawn of *Carex lucorum* with some *Carex pensylvanica, Carex woodii, Carex appalachica*, or *Carex rosea*, but is also quite diverse with scattered *Elymus hystrix, Bromus pubescens, Ageratina altissima, Festuca subverticillata, Uvularia perfoliata, Aralia nudicaulis, Maianthemum racemosum (= Smilacina racemosa), Desmodium glutinosum, Desmodium paniculatum, Prenanthes alba, Solidago bicolor, Hepatica nobilis* var. *obtusa (= Hepatica americana), Carex* (Laxiflorae group), *Deschampsia flexuosa, Packera paupercula (= Senecio pauperculus), Packera obovata (= Senecio obovatus), Symphyotrichum undulatum (= Aster undulatus), Symphyotrichum patens (= Aster patens), Polystichum acrostichoides*, and *Dichanthelium* spp. Spring ephemerals such as *Erythronium americanum* and *Claytonia virginica* also occur in some portions of the range and *Solidago curtisii* occurs in the south.

States: CT, MA, ME, NH, NJ, NY, PA, RI, VT.

TNC ecoregions: 49:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C.

USFS ecoregions: 212E:CC, 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Ga:CCP, 212Gb:CPP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCP, 221Dc:CCC, 221Ea:CCC, 221Fa:CCC, 222I:CC, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Dc:CCC, M212De:CCC, M212Eb:CCC, M221A:CP, M221B:CP, M221C:CP, M221Dc:CCC.

GRANK & REASONS

GRANK: G4 (Reviewed and changed 2009-12-21).

Assigned Rank Reasons: This association is a large-patch to matrix-forming forest association of the northeast. There are likely to be over 1,000 occurrences of this vegetation, with approximately half of those having good ecological integrity. The association is ranked G4 rather than G5 because it has declined up to 30% over the long term and is continued to be threatened by residential and commercial development, invasive species, and repeated gypsy moth infestations. The impact of climate change is not currently known.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: Over 1,000 EOs estimated as follows: CT (30; from state ecologist); MA (40: assume slightly more than CT); ME (12. from state ecologist); NH (30, from state ecologist); NJ (60: interpolated from assumed S2S3 rank); NY (360; interpolated from element state ranking form); PA (360: assumed similar to NY); VT (150; 52 EOs already in Biotics); RI (5: stated to be uncommon in state classification).
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Conservative estimate of fewer than 50% estimated EOs with good viability.
Number of Protected EOs:
Range Extent: G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2).
Range Extent Comments: Range extent measured using GIS is approximately 400,000 km^2.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments:
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: As is the case with most forest types in the northeast, residential and commercial development have decreased the number of occurrences of this vegetation throughout its range.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Large	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads	C	Medium	Large	Moderate
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				

Threat		Impact (calculated)		Scope	Severity
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Threats to this association include forest fragmentation as a result of residential development and road construction; invasive species can be problematic in reducing diversity of the herbaceous layer; repeated gypsy moth infestations can damage canopy trees.

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: New York Natural Heritage Program 2009.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Karen Patterson (Virginian Division of Natural Heritage), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strackosch (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006014:
Acer rubrum - Nyssa sylvatica - Betula alleghaniensis / Sphagnum spp. Forest
Red Maple - Blackgum Basin Swamp

Status: Standard. **Conf.:** 2 - Moderate.

Summary: This blackgum basin swamp of the northeastern United States is found from the Central Appalachians north to central New England, at the northern range limit for *Nyssa sylvatica*. It occupies saturated or seasonally wet basins, typically perched basins in small watersheds within upland forests. In most settings, the mineral soil is overlain with a shallow to deep peat layer. Conditions are highly acidic and nutrient-poor. The tree canopy varies from an open woodland to nearly complete. Shrubs are well represented and may be locally dense. Herbs are likewise patchy, and the herb layer is usually dominated by only a few species. The bryoid layer varies but is often extensive. Hummock-and-hollow microtopography is often pronounced, with bryophytes common on the hummocks and in those hollows where water does not stand for long periods. The canopy is dominated by *Acer rubrum* and *Nyssa sylvatica*; however, even where red maple is more abundant, the longevity and stature of the blackgum trees give them a strong impact. *Betula alleghaniensis, Tsuga canadensis, Pinus strobus*, and occasionally *Picea rubens* or *Picea mariana* may be minor canopy associates. The most abundant shrubs are *Ilex verticillata* and *Vaccinium corymbosum*; associated shrub species include *Viburnum nudum* var. *cassinoides, Nemopanthus mucronatus, Kalmia angustifolia, Gaylussacia baccata, Chamaedaphne calyculata, Lyonia ligustrina, Spiraea alba* var. *latifolia (= Spiraea latifolia)*, and *Cephalanthus occidentalis*. *Osmunda cinnamomea* is the characteristic dominant in the herb layer, with associates including *Osmunda regalis, Thelypteris palustris, Woodwardia virginica, Glyceria canadensis, Coptis trifolia, Carex atlantica, Carex trisperma, Carex folliculata, Carex intumescens, Calla palustris, Triadenum virginicum*, and *Symplocarpus foetidus*. Mosses are primarily *Sphagnum* spp., including *Sphagnum palustre* and *Sphagnum magellanicum*. These swamps are distinguished from other basin swamps in the Northern Appalachians by the presence of *Nyssa sylvatica*. They are distinguished from blackgum swamps further south by the absence of more Central Appalachian species such as *Liquidambar styraciflua, Rhododendron maximum, Rhododendron viscosum*, and *Magnolia virginiana*.

Comments:

States: CT, MA, MD?, ME, NH, NJ, NY, PA, VT.

TNC ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C.

USFS ecoregions: 212A:CC, 212B:CC, 212C:CC, 212D:CC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCC, 221Ae:CCC, 221Af:CCP, 221Ag:CCP, 221Ah:CCC, 221Ai:CCC, 221Ak:CCP, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bd:CCC, 221Da:CCC, M212A:CC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCC, M212Cb:CCP, M212Cc:CCP, M212Eb:CCP.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2010-01-02).

Assigned Rank Reasons: Although there are a large number of occurrences occupying approximately 41 km^2, this vegetation has declined substantially over the long term due to a number of human-caused disturbances. Commercial and residential development, road construction and its associated runoff, altered hydrology due to blocked culverts, impoundments, ditching, and the like; logging and land clearing, and conversion to agriculture caused decline in this vegetation throughout its range over the long term. In recent decades, the establishment of

wetland regulations led to protection of large occurrences by federal and some state regulations, but other smaller occurrences, particularly those in isolated wetland basins, receive no wetlands protection. Continued threats include residential and commercial development, establishment of culverts and impoundments, and, in some cases, invasive species.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: Over 1,100 occurrences are estimated rangewide. Individual state estimates are as follows, based on numbers of known occurrences, state rarity ranks, and information provided by state natural heritage programs: PA: 50; NJ: 10; NY: 10; NH: 1,000 (many are small patch); VT: 25; MA: 12; CT: 50; ME: 20. This vegetation likely does not occur in RI, where the coastal equivalent is documented.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: A conservative estimate based on less than 50% of estimated occurrences has good viability.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This blackgum basin swamp of the northeastern United States occurs from southern Maine and New Hampshire to the Champlain Valley of CT and NY, western MA and CT, PA, and northern and central New Jersey. Range extent determined to be 138,000 km^2 in GIS.
Area and/or Linear Distance of Occupancy (area): E = 20–100 km^2.
Area and/or Linear Distance of Occupancy Comments: The estimated area of occupancy is estimated to be over 10,000 ac, or 41 km^2, in total. Estimates are variable among states, ranging from over 4000 ac (NH) to fewer than 100 ac (Maine).

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: Wetlands protection regulations established in recent decades afford protection to most occurrences, although small occurrences and those occupying isolated wetland basins are not protected by the Federal Clean Water Act.
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments: Red maple swamps, in general, have suffered substantial decline over the long term due to a host of human-caused disturbances: clearing and conversion to agriculture, development and associated runoff; road construction; altered hydrology due to impoundments, filling, or ditching; and other disturbances.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Large	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining	D	Low	Restricted	Moderate
3.1	Oil & gas drilling				

Threat		Impact (calculated)		Scope	Severity
3.2	Mining & quarrying	D	Low	Restricted	Moderate
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads	C	Medium	Large	Moderate
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use	C	Medium	Large	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	C	Medium	Large	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use	C	Medium	Large	Moderate
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Restricted	Moderate
8.1	Invasive nonnative/alien species	D	Low	Restricted	Slight
8.2	Problematic native species	D	Low	Restricted	Moderate
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Continued threats include logging and clearing, conversion for development and altered hydrology. In some cases, invasive species pose a threat. Overbrowse by deer can also lower the ecological integrity of existing vegetation.

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
References: Breden et al. 2001, Cain and Penfound 1938, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Golet et al. 1993, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, NRCS 2001b, Rawinski 1984, Sperduto 2000b, Sperduto et al. 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Vogelmann 1976, Windisch 1995c, Zebryk 1990.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Jason Harrison (Maryland Natural Heritage Program), Bill Nichols (New Hampshire Natural Heritage Bureau), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006283:
Andropogon gerardii - Panicum virgatum - Baptisia australis Herbaceous Vegetation
Fall-line Riverwash Bedrock Prairie

Status: Standard. **Conf.:** 2 - Moderate.
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, Sorghastrum nutans, Panicum virgatum*, and *Spartina pectinata* which resembles prairie vegetation. *Tripsacum dactyloides* may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis, Allium cernuum, Aristida purpurascens, Bidens frondosa, Chasmanthium latifolium, Clematis viorna, Eleocharis compressa, Conoclinium coelestinum (= Eupatorium coelestinum), Eupatorium serotinum, Lespedeza violacea, Packera aurea, Physostegia virginiana, Pycnanthemum virginianum, Solidago rupestris, Teucrium canadense, Veronicastrum virginicum, Zizia trifoliata*, and *Zizia aurea*. Scattered and flood-battered shrubs and tree saplings often occur.
Comments: The distinctions between this community type and *Salix* 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. LAS 2009-12-21: The effect of merging these types with CEGL0006283 (*Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation) would likely have no effect on the Global Conservation Status Rank, as CEGL005175 is currently ranked G2? and CEGL008471 is currently ranked G2Q. In the Central Appalachian region, the type is found predominantly on Western Allegheny Mountains.
States: MD, OH, PA, VA, WV.
TNC ecoregions: 50:C, 59:C, 61:C.
USFS ecoregions: 221D:CC, 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bd:CCC, M221Be:CCC, M221Cb:CCC, M221Da:CCC, M221Db:CC?.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-21 LAS).
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, Centaurea biebersteinii*, and *Lythrum salicaria*.

RARITY

Number of EOs: D = 81–300.
MD: one large EO along the Potomac River includes both MD and VA. Fewer than five EOs estimated in MD in total. An estimated 30 occurrences in OH; 22 occurrences estimated in PA, 20 occurrences in WV. In VA, 15 occurrences are estimated in addition to that on the Potomac River, on the James River, Shenandoah. Potomac/James watershed-local within them. 85–92 occurrences in total are estimated for this association range-wide.

Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Two out of six known occurrences in Virginia are ranked BC or higher. Extrapolating one-third of estimated occurrences yields approximately 30 occurrences with good viability.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This community is found in the east-central United States, from Pennsylvania, Maryland, West Virginia, and Virginia, and Ohio. Polygon measured 129,000 km^2 in GIS.
Area and/or Linear Distance of Occupancy (area): D = 1.25–2.5 km^2 (209–618 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy scaled down by a factor of 8 for small patch communities. Fewer than 100 ac estimated to occur in MD, including Potomac River; 60 ac estimated in OH; 110 ac estimated in PA (35 ac documented to date); 50 ac estimated in WV based on 7 ac mapped at New River Gorge National River and extensive areas noted on the Greenbrier River. A total of 330 ac is estimated range-wide.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: A small number of occurrences are likely to have been lost to shoreline development and trampling in recent years.
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments: It is likely that a large number of occurrences were lost to shoreline development, invasive species, trampling, and the like prior to the institution of wetland regulations.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				

Threat		Impact (calculated)		Scope	Severity
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	D	Low	Restricted	Slight
6.1	Recreational activities	D	Low	Restricted	Slight
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	D	Low	Restricted	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use	D	Low	Restricted	Moderate
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Invasive species including *Sorghum halepense*, Johnson grass, and also *Lythrum salicaria* weeds are a threat.

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
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, Lea 2004, Perles et al. 2004, Rawinski 1988, Rawinski et al. 1996, VDNH 2003, Vanderhorst 2000b, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007.
Reviewers / Contributors: Jim Drake (NatureServe), Greg Edinger (New York Natural Heritage Program), Jason Harrison (Maryland Natural Heritage Program), Karen Patterson (Virginian Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006969:
Deschampsia caespitosa - Carex viridula Herbaceous Vegetation
Calcareous Riverside Seep

Status: Standard. **Conf.:** 3 - Weak.

Summary: This calcareous riverside seep community occurs along sections of river shoreline where winter ice-scouring, limestone outcrops, and natural seepage co-occur. The community is typically characterized by open, sparsely vegetated sections of smooth limestone outcrops that extend for variable lengths from the woodland edge to the river edge or areas of fractured ("latticed") limestone supporting denser vegetation in the crevices. Typically, sites have a north-northwest exposure and are fully exposed to late-day sun. The slope of the outcrops ranges from a gentle incline rising from the river shoreline to a 28-degree incline at the most steeply sloped sites. Species composition is variable and diverse, but the most frequent species are *Symphyotrichum lanceolatum (= Aster lanceolatus), Deschampsia caespitosa, Carex viridula, Lythrum salicaria*, and *Phalaris arundinacea*. Other characteristic species include *Apios americana, Apocynum cannabinum (= Apocynum sibiricum), Artemisia vulgaris, Barbarea vulgaris, Doellingeria umbellata, Eleocharis* spp., *Eupatorium perfoliatum, Galium boreale, Hypericum mutilum, Juncus canadensis, Juncus dudleyi, Lobelia siphilitica, Lychnis flos-cuculi, Lycopus americanus, Lysimachia ciliata, Myosotis scorpioides, Parnassia glauca, Plantago major, Poa* spp., *Prunella vulgaris, Ranunculus repens, Rubus odoratus, Scirpus microcarpus, Spiranthes lucida, Viola* spp., and *Zizia aurea*. Several species of *Carex* are often present, including *Carex granularis, Carex hystericina, Carex pellita (= Carex lanuginosa), Carex scoparia, Carex stipata, Carex vesicaria, Carex viridula*, and *Carex vulpinoidea*. Sparse shrubs may be present, mostly at the upslope end near the forest transition; they include *Alnus incana, Platanus occidentalis, Salix* spp., *Ulmus rubra, Cornus amomum, Rosa palustris*, and *Spiraea alba*.

Comments: Community description based on report completed by Leslie Shank in 1999. All study sites were located in New Jersey along the Delaware River. This community encompasses a wide range of species assemblages.

States: NJ.

TNC ecoregions: 61:C.

USFS ecoregions: 221Bd:CCC.

GRANK & REASONS

GRANK: G1 (Reviewed and changed 2009-12-21).

Assigned Rank Reasons: This association is restricted to three sites along the Delaware River in New Jersey. It is confined to a unique environmental setting where calcareous groundwater emerges among cobbles on a high-energy river shore that maintains the open structure by flood scour. The vegetation occupies a total of 11 ac in complex with calcareous rock outcrops. This association shares a small number of species with other riverside seepage areas in the northeast, but, in general, there is little species overlap. It should be compared quantitatively to other riverside seep vegetation.

RARITY

Number of EOs: A = 1–5.

Number of EOs Comments: Three occurrences of this small-patch association are known from the Delaware River in New Jersey.

Number of EOs with Good Viability: B = Very few (1–3) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: All three known occurrences are on National Park Service lands on Delaware Water Gap National Recreation Area.
Number of Protected EOs:
Range Extent: A = <100 km^2 (< ~40 mi^2).
Range Extent Comments: Measured polygon around occurrences from north to south; 16 km^2 on GIS.
Area and/or Linear Distance of Occupancy (area): A = <1 km^2.
Area and/or Linear Distance of Occupancy Comments: 11 ac (0.04 km^2) mapped at Delaware Water Gap National Recreation Area, in complex with another association.

TREND

Short-Term Trend: U = Unknown.
Short-Term Trend Comments: This vegetation has always been rare due to the restricted distribution of calcareous groundwater seepage emerging along high-energy river shore.
Long-Term Trend: U = Unknown.
Long-Term Trend Comments:

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Restricted	Moderate
8.1	Invasive nonnative/alien species	D	Low	Restricted	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				

Threat		Impact (calculated)		Scope	Severity
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: This vegetation is susceptible to invasion by *Lythrum salicaria* or *Microstegium vimineum.*

NEEDS

Research Needs:
Inventory Needs: Additional inventory should be conducted on other calcareous bedrock areas along the Delaware and its tributaries.
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Breden 1989, Eastern Ecology Working Group n.d., Perles et al. 2007, Shank and Shreiner 1999.
Reviewers / Contributors: Kathleen Strakosch Walz (New Jersey Natural Heritage Program).

CEGL006002:
Juniperus virginiana - Fraxinus americana / Danthonia spicata - Poa compressa Woodland
Traprock Ridge

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This traprock ridge open woodland is known from mountainous sites in New England, New Jersey, and Pennsylvania, and may occur in southeastern New York. The vegetation occurs primarily on exposed outcrops of basaltic rock in the Connecticut Valley of New England and the Piedmont physiographic province in New Jersey. While most sites are on igneous rock, along the Kittatinny Ridge in Pennsylvania and New Jersey, it occurs on conglomerates of the Shawangunk Formation. Sites supporting this community are upper slopes of basalt, diorite, or conglomerate ridges from 365–1050 m elevation, characteristically south- or west-facing and range in slope from 5–30 degrees. Most sites have minimal soil development. Tree cover is sparse, ranging from 5–30% cover (average 20%) with *Juniperus virginiana* being the most constant canopy tree. Other woody species sometimes present include *Fraxinus americana, Quercus rubra, Quercus prinus, Ostrya virginiana*, and *Carya glabra*. The actual canopy composition reflects, to some extent, the surrounding forest. The scattered shrub layer often includes *Rosa carolina, Quercus prinus, Quercus ilicifolia, Rhus typhina (= Rhus hirta), Vaccinium pallidum, Vaccinium angustifolium, Viburnum rafinesquianum*, and *Prunus virginiana*. The herbaceous layer usually covers 12–50% of the ground and is dominated by *Schizachyrium scoparium, Deschampsia flexuosa*, and *Danthonia spicata*, with their relative abundance varying from site to site. Numerous other herbaceous species occur in this community type, including *Carex pensylvanica, Anthoxanthum odoratum, Hypericum gentianoides, Antennaria plantaginifolia, Corydalis sempervirens, Solidago nemoralis, Poa compressa, Maianthemum racemosum, Uvularia perfoliata, Aquilegia canadensis, Asclepias verticillata, Polygonum scandens, Krigia virginica*, and *Houstonia longifolia*. No species is restricted to this community, but the assemblage listed above is very characteristic.
Comments: In general, this community is similar to a number of other sparse woodland ridgetop communities. New Jersey occurrences are floristically related to ridgetop sparse woodlands in Virginia (e.g., greenstone glades) but appear to share more species with the northern occurrences with which they have been grouped here. However, further research may indicate that the New Jersey occurrences represent a unique vegetation assemblage. In Massachusetts, this community typically occurs as herbaceous (and probably successional) patches within a hickory-hop hornbeam forest. New York contains some examples of this community which they classify under the name "red cedar rocky summit community."
States: CT, MA, NH, NJ, NY, ON?, PA, VT.
TNC ecoregions: 60:C, 61:C.
USFS ecoregions: 212B:CC, 212Fc:CCC, 221Ae:CCC, 221Af:CCC, 221Bd:CCC, 221Dc:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2010-01-02).
Assigned Rank Reasons: There are probably 30–60 occurrences of this community rangewide. At least 19 occurrences have been documented from Connecticut, Massachusetts, Pennsylvania, and New Jersey, with outliers in New Hampshire and southeastern New York. This community is restricted to exposed outcrops of basaltic rock in the Connecticut River valley of New England and the Piedmont and High Allegheny Plateau physiographic province of New Jersey and

adjacent Pennsylvania. Most occurrences are small; total acreage is probably less than 500 ac rangewide.

RARITY

Number of Eos: E = >300.
Number of EOs Comments: There are an estimated 375–410 occurrences rangewide. Individual state numbers are as follows: CT:10 (assume at least half of the occurrences are known, with 5 currently in Biotics; MA: 15 (based on state rank of Circumneutral Rocky Summit/Rock Outcrop, ranked as S2S3 but is broader in concept); NH: 100 (based on information provided by NHNHB); NJ: 20 (12 occurrences documented on NJ side of Delaware Water Gap National Recreation Area; state rank S1S2); NY: 220 (50–500 occurrences estimated for state type, Red Cedar Rocky Summit; median 275; based on number of crosswalked EO', assume 80% of state occurrences are CEGL006002); PA: 40 (26 occurrences documented on PA side of Delaware Water Gap National Recreation Area; information reviewed by NHP).
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Conservative estimate of 13–40 occurrences with good viability; 11 occurrences in NY and 4 occurrences in CT ranked above C. Most occurrences in Delaware Water Gap National Recreation Area are in good landscape setting.
Number of Protected EOs:
Range Extent: D = 1,000–5,000 km^2 (~400–2,000 mi^2).
Range Extent Comments: This community has been described from mountainous sites in New England states: Fall Mountain in New Hampshire; Bare Mountain, East Mountain, Mount Tom and Mount Norwottuck in Massachusetts; Onion Mountain, Sugarloaf, Sleeping Giant, and West Mountain in Connecticut. It has also been documented at sites in the Watchung Mountains in New Jersey, Kittatinny Ridge in New Jersey and Pennsylvania, and in southeastern New York. Range measured at approximately 2000 km^2 on GIS.
Area and/or Linear Distance of Occupancy (area): F = 12.5–62.5 km^2 (3,088–15,444 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy decreased by a factor of 8 for small patch associations. Approximately 3,500 ac estimated area of occupancy, based on ranges of 2–15 ac per occurrence.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: This association has likely declined in recent decades due to the desirability of flat, open summits as cell and radio towers.
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments: This association has likely been subjected to significant loss over the long term due to a number of human-caused disturbances: construction, logging, and fire suppression in some areas.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				

Threat		Impact (calculated)		Scope	Severity
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining	C	Medium	Large	Moderate
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy	C	Medium	Large	Moderate
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use	C	Medium	Large	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	C	Medium	Large	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	D	Low	Restricted	Moderate
6.1	Recreational activities	D	Low	Restricted	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression	C	Medium	Large	Moderate
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Restricted	Slight
8.1	Invasive nonnative/alien species	D	Low	Restricted	Slight
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: This vegetation continues to face a number of threats, including construction of cell phone towers and wind turbines; trampling by visitors, fire suppression, logging, and in some areas, invasive species.

SOURCES

Version Date: 31 Jan 2007; 2010-01-02. **Version Author:** C. Reschke, mod. S. C. Gawler, L. Sneddon.
Rank References:
All References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Eyre 1980, Fike 1999, Grossman et al. 1994, Lee 1985, Livingston and Lund 1982, Metzler and Barrett 1992, Metzler and Barrett 2001, Motzkin 1993, New York Natural Heritage Program

2009, Nichols 1914, Perles et al. 2007, Rawinski 1984, Roberts 1914, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Walz 1996.

Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006557:
Pinus rigida - Quercus coccinea / Vaccinium angustifolium Woodland
Pitch Pine - Scarlet Oak Ridgetop

Status: Standard. **Conf.:** 2 - Moderate.
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* contributes between 25 and 75% relative cover. *Pinus pungens* or *Pinus resinosa* may also occur on some sites. Hardwood associates include *Quercus prinus (= Quercus montana), Quercus coccinea, Quercus velutina, Nyssa sylvatica, Sassafras albidum, Betula lenta, Betula populifolia*, and *Acer rubrum*. The shrub layer may be entirely composed of low shrubs, including *Vaccinium corymbosum, Vaccinium pallidum, Comptonia peregrina*, and *Gaylussacia baccata*, or may have an additional layer of taller shrubs such as *Kalmia latifolia, Vaccinium corymbosum*, and *Quercus ilicifolia*. Herbaceous species include *Pteridium aquilinum, Deschampsia flexuosa, Danthonia spicata, Epigaea repens, Gaultheria procumbens, Melampyrum lineare, Carex pensylvanica, Carex communis, Oryzopsis* spp., and *Aralia nudicaulis*. Lichens, such as *Cladonia* spp. and *Cladina* spp., are abundant in some areas.
Comments: This community at New River Gorge National River lacks the global nominal shrub species for this association, *Vaccinium angustifolium*, which, in West Virginia, is mostly confined to higher elevations. Additional species listed in the global description which are lacking here include *Betula populifolia, Comptonia peregrina, Vaccinium corymbosum*, and *Quercus ilicifolia*. This community at New River Gorge National River may be more similar to *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097), but *Pinus pungens* is not known from the park.
States: PA, WV.
TNC ecoregions: 50:C, 59:C.
USFS ecoregions: 212Fb:PPP, 212Fc:PPP, 212Ga:PPP, 221Fa:PPP, 221Ea:PPP, M221Ac:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G4Q (Reviewed and changed 2009-12-30).
Assigned Rank Reasons: Better rangewide information is needed to determine the conservation rank for this type. The taxonomic relationship to other related types requires additional research. At New River Gorge National River, this vegetation is closely related 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.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comments: Approximately 40 EOs estimated rangewide.
Number of EOs with Good Viability: U = Unknown.
Number of EOs with Good Viability Comments:
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This association is centered in the Central Appalachians ecoregion from Pennsylvania to West Virginia. 100,000 km^2 measured range on GIS. Subsections of

occurrences follow Fike 1999; noted as probable where occurrences not documented but suspected.

Area and/or Linear Distance of Occupancy (area): D = 10–20 km^2.

Area and/or Linear Distance of Occupancy Comments: In Pennsylvania, estimated EOs = 40×80 ac per occurrence, based on mean size of crosswalked EOs in Biotics. In WV, 10 ac mapped at New River Gorge National River, with only 5 estimated EOs at 10 ac per occurrence.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).

Short-Term Trend Comments: steep slopes and inaccessible habitat has likely afforded some protection from development over the long term and short term.

Long-Term Trend: G = Relatively Stable (<=10% change).

Long-Term Trend Comments:

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	D	Low	Restricted	Moderate
6.1	Recreational activities	D	Low	Restricted	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	D	Low	Restricted	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	D	Low	Restricted	Moderate
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				

Threat		Impact (calculated)		Scope	Severity
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: These steep, inaccessible sites are generally not attractive for development. Threats include trampling by rock climbers. Although mostly edaphic climaxes, fire suppression may contribute to decline over time.

SOURCES

Version Date: 2009-12-29. **Version Author:** L. Sneddon.
All References: Eastern Ecology Working Group n.d., Fike 1999, Vanderhorst 2001b, Vanderhorst 2002b, Vanderhorst et al. 2007.
Reviewers / Contributors: Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006185:
Quercus palustris - Acer rubrum / Carex grayi - Geum canadense Forest
Pin Oak Small River Floodplain Forest

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This freely drained floodplain forest occurs along smaller rivers in southern New England and the northern Piedmont. The setting can range from high terraces to any broad flat area with diffuse or braided drainage. The canopy is comprised of *Quercus palustris, Fraxinus pennsylvanica, Acer rubrum, Ulmus americana*, and occasionally *Quercus bicolor, Fraxinus americana, Fraxinus nigra, Carya cordiformis, Nyssa sylvatica*, and/or *Platanus occidentalis*. More typically upland trees sometimes found on these terraces include *Quercus alba, Liriodendron tulipifera, Betula alleghaniensis, Pinus strobus*, and *Acer saccharum*. *Carpinus caroliniana* may be present as a small tree. The shrub layer includes *Lindera benzoin, Viburnum recognitum, Cornus amomum, Cornus obliqua*, or *Sambucus canadensis*. The herbaceous layer is variable in composition and usually dense. It can have abundant sedges, including *Carex lurida, Carex crinita, Carex intumescens, Carex rosea, Carex prasina, Carex lupulina*, or *Carex grayi*, with additional species such as *Cinna arundinacea, Leersia virginica, Panax trifolius, Symplocarpus foetidus, Geum canadense, Polygonum virginianum (= Tovara virginiana), Impatiens* spp., *Onoclea sensibilis, Athyrium filix-femina, Arisaema triphyllum, Iris versicolor, Viola sororia*, and *Toxicodendron radicans*. *Berberis thunbergii* and *Microstegium vimineum* are common invasive species in these forests.
Comments:
States: CT, MA, NJ, NY, PA, RI.
TNC ecoregions: 60:C, 61:C, 62:C.
USFS ecoregions: 212Fc:CCC, 221Ac:CCC, 221Ae:CCC, 221Af:CCC, 221Bd:CCC, 221Da:CCC, 221Dc:CCC, 232Ac:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2010-01-02).
Assigned Rank Reasons: Approximately 50 occurrences occupying 10,000 ac or less are estimated over a somewhat limited range from southern New England to central New Jersey. This vegetation has likely declined over the short term and long term due to a number of human activities. Since many occurrences are located not far from large urban centers, existing occurrences face continue threats of construction and agriculture and associated run-off, as well as from hydrological manipulations such as culverts.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comments: Approximately 50 occurrences are estimated rangewide as follows: CT: 7 (documented from few areas); MA: 5 (restricted to Connecticut River Valley); NJ: 24 (NHP information); NY: 10 (only 1 of 44 occurrences of the state type Floodplain Forest crosswalked to this association); PA: 15 (NHP information); RI: 5 (based on documented occurrences on Wood and Pawcatuck Rivers).
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Good examples documented in CT, RI, and NJ. Assume 40–50% of estimated occurrences have good viability.

Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This association is currently known from southern New England to New Jersey and Pennsylvania. 22,000 km^2 measured range extent on GIS.
Area and/or Linear Distance of Occupancy (area): E = 20–100 km^2.
Area and/or Linear Distance of Occupancy Comments:

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: Floodplain habitats in general have been lost to a number of human-caused disturbances, including agriculture, construction run-off, and the like. Many occurrences are near large urban centers.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that this vegetation has declined over the long-term to loss or degradation caused by agriculture, adjacent development, or hydrological manipulations such as culverts.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	C	Medium	Large	Moderate
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution	C	Medium	Large	Moderate
9.1	Household sewage & urban waste water	C	Medium	Large	Moderate
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents	D	Low	Restricted	Moderate

Threat		Impact (calculated)		Scope	Severity
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Several large occurrences are in protected areas. Many of those remaining, however, continue to be threatened by construction, agriculture, and hydrologic manipulations such as culverts.

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
All References: Barrett and Enser 1997, Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Metzler and Barrett 2001, Rawinski 1984, Swain and Kearsley 2001.
Reviewers / Contributors: Ken Metzler (Connecticut Natural Diversity Database), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL007119:
Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest
Appalachian Low-Elevation Mixed Pine / Hillside Blueberry Forest

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Status: Standard. **Conf.:** 1 - Strong.
Summary: This community includes *Pinus virginiana*-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* is the canopy dominant throughout the range of the type. In some parts of the range, other *Pinus* species may be significant canopy associates, as well as dry-site *Quercus* species (e.g., *Quercus prinus, Quercus coccinea*). Deciduous species may form a subcanopy or sapling stratum, particularly in areas where fire has been excluded. Common shrub dominants include *Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, and *Kalmia latifolia*. Herbs vary with geography but are typical of infertile, xeric habitats. Some typical herbs in this forest are *Baptisia tinctoria, Chimaphila maculata, Dichanthelium commutatum, Epigaea repens, Euphorbia corollata, Galax urceolata, Gaultheria procumbens, Hypoxis hirsuta, Iris verna, Pityopsis graminifolia* var. *latifolia, Pteridium aquilinum* var. *latiusculum*, and *Schizachyrium scoparium*.
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* is classified as *Pinus virginiana* 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* 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).
States: AL, GA, IN, KY, MD, NC, OH, PA, SC, TN, WV.
TNC ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:P.
USFS ecoregions: 221Ea:CC?, 221Eb:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCC, 221Jb:CCC, 222Da:CCC, 222Dc:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 222Eo:CCC, 222Fd:CCC, 222Ff:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCC, 231Bc:CCC, 231Cc:CCC, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC,

M221Ac:CCC, M221Bb:CCC, M221Bd:CCP, M221Be:CCP, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 12/17/09).
Assigned Rank 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. Although not rare (more than 300 occurrences range-wide are estimated), this vegetation is threatened by infestations of southern pine beetle (*Dendroctonus frontalis*) that 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. Infestations are wide-ranging and include most of the range of this association, and with fire suppression, killed stands convert to different vegetation over time. This vegetation is also threatened by climate change because higher temperatures exacerbate Southern Pine Beetle infestations.

RARITY

Number of EOs: E = >300.
Number of Eos comments: Number of estimated EOs determined by numbers of EOs in Biotics and expert interview where possible, or by extrapolation based on states of similar with similar range extent. Total number of EOs was added, or if a range was provided, the median. Total of estimated EOs is approx. 730. Individual state numbers: AL: 81–300; GA: 81–300; IN: 20; KY: 81–300; MD: 5; NC: 20–30; OH: 20; PA: 14: SC: 10–15; TN: 20–30; WV: <50.
Number of EOs with Good Viability: E = Many (41–125) occurrences with good viability
Number of EOs with Good Viability comments: Expert interview in GA suggests that >40% of area supporting this vegetation has good viability; all IN 12 EOs in Biotics are EO rank C or higher; however, only 5 of 25 EOs in NC are reported to have an EO rank of BC or better.
Number of Protected EOs:
Range Extent: G = 200,000–2,500,000 km^2 (about 80,000–1,000,000 mi^2).
Range Extent comments: using GIS, measured polygon around perimeter of subsections of occurrence, approximately 512,000 km^2. 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, and West Virginia.
Area and/or Linear Distance of Occupancy (area): D = 20–100 km^2 (about 5000–25,000 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy determined through expert interview of ecologists from each state where possible. Individual state numbers: AL: 1,000–2,500 ac; GA: 1,000–2,500 ac; IN: 500 ac; KY: 3,000 (estimate derived from S5 rank of state type, assuming 300 EOs at average of 10 ac per EO); MD: 100–1,000 ac; NC: 1,000–2,500 ac; SC: 500–1,250 ac (estimate based on assumption of 50% of that of NC); OH: 500 ac; PA: 700 ac; TN: 1,000–2,500 ac (estimate based on assumption of approximate equivalency to NC). Sum of median acreage = approximately 14,000 ac.

TREND

Short-Term Trend: C = Rapidly Declining (decline of 30–50%).

Short-Term Trend Comments: Widespread infestations of southern pine beetle have killed large numbers of stands, including up to 50% of stands of this vegetation in North Carolina (Schafale pers. comm). Infestations of pines in general were found to be greatest in Alabama and Georgia over the period of 1976 to 1996, with substantial impacts in North Carolina and South Carolina (Gan 2004). Lack of fire suppresses regeneration of pines, and stands of this vegetation have succeeded to other types of vegetation.

Long-Term Trend: E = Decline of 30–50%.

Long-Term Trend Comments:

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	B	High	Large	Serious
8.1	Invasive nonnative/alien species	B	High	Large	Serious
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				

Threat		Impact (calculated)		Scope	Severity
11	Climate change & severe weather	B	High	Large	Serious
11	Habitat shifting & alteration				
11	Droughts	B	High	Large	Serious
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments:
Threats include residential development (low impact because this vegetation generally occurs on steep slopes and rocky soils not desirable for development); problematic native species (high impact caused by Southern Pine Beetle infestations that kill high numbers of stands; killed stands that are subjected to fire suppression often convert to other vegetation); and climate change (droughts and high temperatures further augment Southern Pine Beetle infestation).

SOURCES

Version Date: 2009-12-17. **Version Author:** L. Sneddon.
References: Allard 1990, Ambrose 1990a, Barden 1977, Burns and Honkala 1990a, CAP pers. comm. 1998, Cooper 1963, Core 1966, Evans 1991, Eyre 1980, Gan 2004, Gettman 1974, Faller 1975, 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.
Reviewers / Contributors: Jim Drake (NatureServe), Gary Fleming (Virginia Division of Natural Heritage), Tom Govus (private contactor), Jason Harrison (Maryland Natural Heritage Program), Milo Pyne (NatureServe), Mike Schafale (North Carolina Natural Heritage Program), Al Schotz (Alabama Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL008524:
Quercus prinus / Rhododendron catawbiense - Kalmia latifolia Forest
Central Appalachian Chestnut Oak / Catawba Rhododendron Forest

Status: Standard. **Conf.:** 2 - Moderate.
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 ft) 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 (2,700–3,200 ft). 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* is the sole canopy dominant, with occasional associates of *Betula lenta, Tsuga canadensis, Nyssa sylvatica, Acer rubrum*, and *Pinus strobus*. *Rhododendron catawbiense* and *Kalmia latifolia* dominate the shrub layer. *Pieris floribunda* is reported to be a characteristic shrub of this community. Additional shrubs present at low cover include *Hamamelis virginiana, Ilex montana*, and *Amelanchier arborea*. Deciduous ericads such as *Gaylussacia baccata* and *Vaccinium pallidum* are often present but rarely contribute more than 10% cover. Herbs and subshrubs are exceedingly sparse in the densely shaded, forest-floor environment.
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.
States: VA, WV.
TNC ecoregions: 50:C, 52:C, 59:C.
USFS ecoregions: 231Ak:CCC, M221Aa:CPP, M221Ab:CPP, M221Cb:CCC, M221Da:CCC.

GRANK & REASONS

GRANK: G4 (Reviewed and changed 2009-12-09).
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.

RARITY

Number of EOs: C (21–80).
Number of Eos comments: 65–70 occurrences estimated in interviews with state ecologists and on measurement on NPS vegetation maps at Gauley River National Recreation Area and Bluestone National Scenic River. Additional occurrences are noted to occur on BLRI in Virginia, and on the George Washington and Jefferson National Forests.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Many occurrences are on public land and protected from development and other human disturbances. Those at New River Gorge National River and Gauley River National Recreation Area occur as small patches within larger patches of intact forest.
Number of Protected EOs:

Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: Approximately 57,000 km^2 derived from area of subsections of occurrence, calculated in GIS.
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).
Area and/or Linear Distance of Occupancy (area): C = 4–10 km^2.
Area and/or Linear Distance of Occupancy Comments: Approximately 1525 ac (6.2 km^2) determined by extrapolating known occurrence sizes and number of estimated EOs.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: the environmental setting of this vegetation on ridgetops and spurs adjacent to steep slopes has not been particularly attractive for development.
Long-Term Trend: G = Relatively Stable (<=10% change).
Long-Term Trend Comments: There is no evidence to suggest that his association has declined over the long term. It is naturally located on steep slopes and generally inaccessible areas that have not in themselves declined substantially within the range of this type.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	D	Low	Small	Slight
4.1	Roads & railroads				
4.2	Utility & service lines			Small	Slight
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Small	Slight
8.1	Invasive nonnative/alien species			Small	Slight
8.2	Problematic native species				

Threat		Impact (calculated)		Scope	Severity
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: Threats to this association are neither serious nor wide-ranging. The natural occurrence of this vegetation on steep slopes and ridgetops affords some natural protection against anthropogenic disturbance. Utility corridors, where present, cause a relatively small amount of disturbance. Hemlock wooly adelgid, although a pervasive threat to hemlock throughout its range may impact the ecological integrity of stands with high hemlock cover, but would not result in the conversion of the vegetation type.
Assigned Rank Reasons: Although this is a somewhat geographically restricted, mostly small-patch vegetation type, many stands occur in public lands on generally inaccessible steep slopes, ridge, and spurs. Threats to this association are neither serious nor wide-ranging, and include occasional utility corridors with essentially slight impact. Hemlock wooly adelgid may impact some occurrences with high hemlock cover, but in general, this would not cause conversion to a different vegetation type. The dry, acidic soils of this vegetation provide some natural protection against invasive plant species.

NEEDS

Research Needs:
Inventory Needs: 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.
Protection Needs:

SOURCES

Version Date: 11 Dec 2009. **Version Author:** L. A. Sneddon.
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.
Reviewers / Contributors: Gary Fleming and Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006121:
Quercus ilicifolia - Prunus pumila Shrubland
Ridgetop Scrub Oak Barrens

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This *Quercus ilicifolia* shrubland occurs on ridgetops, summits and rock outcrops in the northeastern United States. It occurs on extremely shallow, stable acidic soils over bedrock. Open bedrock is common. This shrubland is dominated by *Quercus ilicifolia*, which occurs with variable cover depending on site conditions. Associated shrubs include *Vaccinium angustifolium, Vaccinium pallidum, Comptonia peregrina, Kalmia angustifolia, Gaylussacia baccata, Photinia melanocarpa (= Aronia melanocarpa), Quercus prinoides*, and *Prunus pumila*. The herbaceous layer varies from sparse to well-developed depending on the density of shrub cover. Typical herbs include *Deschampsia flexuosa, Carex pensylvanica, Danthonia spicata, Schizachyrium scoparium, Pteridium aquilinum, Gaultheria procumbens, Comandra umbellata, Melampyrum lineare, Hypericum gentianoides, Corydalis sempervirens, Sibbaldiopsis tridentata (= Potentilla tridentata)*, plus *Andropogon gerardii* or *Polygonatum biflorum* at some sites. Scattered and stunted trees are common and include species from the surrounding ridgetop forests, such as *Quercus prinus, Quercus rubra, Quercus alba, Pinus rigida, Populus tremuloides, Betula populifolia*, and *Carya glabra*.
Comments:
States: CT, MA, NJ, NY, PA.
TNC ecoregions: 59:C, 60:C, 61:C.
USFS ecoregions: 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCC, 221A:CP, 221Bd:CCP, 221D:CP, M212Ea:CCP, M212Eb:CCP.

GRank & Reasons

GRANK: G4? (Reviewed and changed 2010-01-01).
Assigned Rank Reasons: There are estimated to be 100–105 occurrences of this vegetation range-wide, occupying an area of 6,200 ac. The open, exposed rocky summits that support this association are attractive for cell tower and wind turbine construction. In addition, recreational hikers pose a threat of trampling, although this is mitigated somewhat by the density of this vegetation. More inventory and documentation of this association is required to determine the conservation status rank.

Rarity

Number of EOs: D = 81–300.
Number of EOs Comments: 105 occurrences estimated rangewide as follows: CT:10 (description notes widely scattered; assumed state rank of S2); MA: 5 (2 occurrences documented; state rank S1; assume most are known); NJ:10 (based on limited available habitat); NY:40 (based on number of Pitch Pine - Oak - Heath Rocky Summit EOs crosswalk to this association); PA:40 (based on crosswalked EOs and review by PANHP).
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Conservative estimate of fewer than 50% of estimated number of occurrences have good viability.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).

Range Extent Comments: This association is known from ridgelines from southern New England south to interior New Jersey and Pennsylvania. 144,000 km^2 measured range extent on GIS.
Area and/or Linear Distance of Occupancy (area): E = 20–100 km^2.
Area and/or Linear Distance of Occupancy Comments: Approximately 6,200 ac (25 km^2) estimated from number of estimated occurrences per state and size of known occurrences.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: There has likely been some loss of this vegetation to cell tower and wind turbine construction over the short term.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: Logging, residential development, and fire suppression have likely caused a decline in the amount of this vegetation over the long term.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining	C	Medium	Large	Moderate
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy	C	Medium	Large	Moderate
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	D	Low	Restricted	Moderate
6.1	Recreational activities	D	Low	Restricted	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression	C	Medium	Large	Moderate
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				

Threat		Impact (calculated)		Scope	Severity
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: The open, exposed, and relatively flat summits supporting this vegetation are very attractive sites for construction of cell towers and wind turbines. Recreational hiking can cause trampling of this vegetation, although this is mitigated to some degree by the density of the vegetation. In addition, fire suppression will lead to succession and eventual conversion of this vegetation if left unchecked.

NEEDS

Research Needs:
Inventory Needs: Additional inventory is required to determine the conservation status with greater confidence.
Protection Needs:

SOURCES

Version Date: 2010-01-01. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Fike 1999, Metzler and Barrett 2001, Swain and Kearsley 2000.
Reviewers / Contributors: Ken Metzler (Connecticut Natural Diversity Database), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006134:
Quercus rubra - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland
Red Oak - Heath Woodland / Rocky Summit

Status: Standard. **Conf.:** 2 - Moderate.

Summary: This dry, acidic oak woodland occurs on rocky upper slopes and summits from New England south to the highest peaks in West Virginia. Typical settings are low- to mid-elevation summits and south-facing, upper slopes. Elevations of known occurrences range from near sea level to about 610 m (0–2,000 ft) in New England, and to 1,370 m (4,500 ft) in West Virginia. Soils are shallow, well-drained, acidic, nutrient-poor gravels and coarse sands, often with prominent exposed bedrock. Canopy cover is variable, ranging from open and patchy to closed, depending on site conditions. It overtops a dwarf-shrub layer that is frequently extensive and a sparse tall-shrub layer. Herb cover is patchy and variable. Bryoid cover is minor, scattered patches on the rocky substrate. The canopy is dominated by scattered, often stunted *Quercus rubra* with minor associates depending on geography and often including *Quercus velutina, Quercus prinus, Betula populifolia, Betula papyrifera, Betula lenta*, and *Acer rubrum* or *Quercus coccinea* in more coastal regions. *Quercus rubra* tends to be the only oak at the northern end of the range. *Pinus strobus, Pinus rigida*, or other conifers may be present, but only in minor amounts. The dwarf-shrub layer is strongly dominated by heaths, especially *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata* with *Gaylussacia frondosa, Comptonia peregrina*, and *Kalmia angustifolia* also common. Tall shrubs may include *Quercus ilicifolia, Hamamelis virginiana, Amelanchier* spp., and *Prunus pensylvanica*. The herbaceous layer is comprised of *Deschampsia flexuosa, Danthonia spicata, Carex lucorum, Pteridium aquilinum, Comandra umbellata, Melampyrum lineare, Polygala paucifolia, Epigaea repens, Gaultheria procumbens*, and *Aralia nudicaulis*. The bryophyte layer includes *Polytrichum commune, Leucobryum glaucum*, and others.

Comments:

States: CT, MA, ME, NH, NJ, NY, PA, VT.

TNC ecoregions: 59:C, 60:C, 61:C, 62:?, 63:C, 64:C.

USFS ecoregions: 212Cb:CCC, 212Da:CCP, 212Dc:CCP, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Db:C??, M212Ba:CCC, M212Bb:CCP, M212Bd:CCC, M212Cb:CCC, M212Dc:CCP, M212De:CCC, M212Ea:CCP, M212Eb:CCP, M212F:CP, M221Aa:CPP, M221Ac:CPP, M221Bb:CPP, M221Da:CPP.

GRANK & REASONS

GRANK: G4 (Reviewed and changed 2009-12-2).

Assigned Rank Reasons: There are nearly 300 estimated occurrences of this vegetation rangewide, occupying over 3,000 mi^2. However, threats to this association are many. Continued residential and commercial development, road construction, and lack of land use planning will continue to decrease the amount of this vegetation if left unchecked. As a large-patch to matrix-forming vegetation type, one of the largest threats is fragmentation. In addition, repeated gypsy moth infestations can damage, if not destroy, this vegetation. Invasive species, however, are not generally a threat.

RARITY

Number of EOs: D = 81–300.
Number of EOs Comments: Approximately 290 occurrences estimated rangewide.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Assuming that 25–50% of estimated occurrences have good viability, which would total 75 occurrences.
Number of Protected EOs:
Range Extent: Approximately 127,000 km^2 measured range extent in GIS.
Range Extent Comments: This red oak woodland occurs on low- to mid-elevation summits and south-facing, steep upper slopes from New England south to southern Pennsylvania.
Area and/or Linear Distance of Occupancy (area): H = 2,000–20,000 km^2.
Area and/or Linear Distance of Occupancy Comments: Approximately 760,000 ac or 3,075 km^2.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: Although these forests tend to occur on upper slopes, they have still declined in the short term as a result of a myriad of human land uses: residential and commercial development, road construction, and the like.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that this vegetation has sustained significant loss over the long term. Upland vegetation receives no legal protection except as habitat for endangered species. Lack of land use planning has resulted in residential and commercial development, agriculture, logging, road construction, and other land uses.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Large	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads	C	Medium	Large	Moderate
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use	D	Low	Restricted	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	D	Low	Restricted	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				

Threat		Impact (calculated)		Scope	Severity
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression	C	Medium	Large	Moderate
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Threats to this association are many. Continued residential and commercial development, road construction, and lack of land use planning will continue to decrease the amount of this vegetation if left unchecked. As a large-patch to matrix-forming vegetation type, one of the largest threats is fragmentation. In addition, repeated gypsy moth infestations can damage, if not destroy, this vegetation. Invasive species, however, are not generally a threat.

NEEDS

Research Needs:
Inventory Needs: As a relatively common type, little heritage inventory has been done. Additional inventory and plot sampling is needed to better determine the range and taxonomic relationship to other similar associations.
Protection Needs:

SOURCES

Version Date: 2009-12-29. **Version Author:** L. Sneddon.
References: Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming 1985, Gawler 2002, Lundgren 1999a, Metzler and Barrett 2003, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Karen Patterson (Virginian Division of Natural Heritage), Eric Sorenson (Vermont Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006371:
Vaccinium corymbosum - Rhododendron viscosum - Clethra alnifolia Shrubland
Blueberry Wetland Thicket

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This is a tall-shrub swamp of seasonally flooded basins in the eastern United States. It occurs in small open basins, closed sandplain basins, and seasonally flooded zones within larger wetlands. This vegetation can occur on the margins of Coastal Plain ponds. This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer followed by a drop in the water table below soil surface usually by late summer. There is usually a shallow organic layer often over sand. Dominant shrubs include *Vaccinium corymbosum, Ilex verticillata*, and *Rhododendron viscosum*. Scattered *Acer rubrum* are not uncommon. *Lyonia ligustrina* and *Cephalanthus occidentalis* are characteristic although not necessarily dominant. Associated shrub species may include *Clethra alnifolia, Spiraea tomentosa, Chamaedaphne calyculata, Ilex glabra, Leucothoe racemosa, Decodon verticillatus, Kalmia angustifolia, Alnus serrulata, Myrica gale*, and *Photinia* spp. (= *Aronia* spp.). Herbaceous composition is variable; some of the more typical species include *Osmunda cinnamomea, Osmunda regalis, Thelypteris palustris, Onoclea sensibilis, Calla palustris, Lycopus uniflorus, Triadenum virginicum, Glyceria striata, Leersia oryzoides, Dulichium arundinaceum, Juncus effusus*, and *Woodwardia virginica*. A layer of peatmoss is common and varies in cover; species include *Sphagnum fimbriatum, Sphagnum rubellum, Sphagnum magellanicum, Sphagnum fallax*, and *Sphagnum viridum*.
Comments: More inland examples of this association may lack some characteristically Coastal Plain species such as *Clethra alnifolia* and *Ilex glabra*.
States: CT, DE, MA, NH, NJ, NY, PA, RI.
TNC ecoregions: 60:C, 61:C, 62:C.
USFS ecoregions: 212Fc:CCC, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Bd:CCC, 232Ab:CCC, 232Ac:CCC, M212Bd:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2010-01-01).
Assigned Rank Reasons: This association is considered moderately vulnerable to extinction. There are an estimated 1000 occurrences of this association range-wide. As a small-patch wetland community occurring in many cases in isolated wetland settings, it is not always afforded Federal protection under the Clean Water Act.

RARITY

Number of EOs: D = 81–300.
Number of EOs Comments: There are estimated to be 290–300 occurrences range-wide. Estimates based on 20–50 occurrences per state, except in DE where state rank is S1.

Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Assume 50% or less have good ecological integrity.

Number of Protected EOs:

Range Extent: D = 1,000–5,000 km^2 (~400–2,000 mi^2).

Range Extent Comments: This association occurs from southern New England through southeastern NY and PA, on coastal plain of New Jersey, to Delaware.

Area and/or Linear Distance of Occupancy (area): E = 2.5–12.5 km^2 (618–3,088 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy decreased by a factor of 8 for small patch communities. Approximately 1000 ac estimated range-wide. Approximately 1000 ac estimated to occur range-wide, based on average size of known occurrences and estimated number of occurrences.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: This vegetation is protected in part through wetland regulations, although many are now considered isolated wetlands and no longer receive federal protection on that basis. This vegetation occurs in part on the periphery of coastal plain ponds, many of which are the target of protection efforts by conservation groups and state governments.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that this vegetation has declined over the long term to either outright destruction by ditching or filling, or indirectly impacted by adjacent residential construction.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Large	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	C	Medium	Large	Moderate
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				

Threat		Impact (calculated)		Scope	Severity
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): AB = Very High - High.
Threat comments: Continued threats include development, as well as altered hydrology. Many occurrences are in pine barrens settings, in areas of aquifers that can be overused in areas of high population. These wetlands are vulnerable to loss with prolonged droughts brought on by climate change.

SOURCES

Version Date: 2010-01-02. **Version Author:** L.A. Sneddon.
References: Breden et al. 2001, Conard 1935, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Gawler 2002, Golet 1973, Johnson 1981b, Lynn and Karlin 1985, Metzler and Barrett 2001, Niering and Egler 1966, Reschke 1990, Schall and Murley 1984, Sperduto 2000a, Sperduto and Nichols 2004.
Reviewers / Contributors: Robert Coxe (Delaware Natural Heritage Program), Andy Cutko (Maine Natural Areas Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Karen Patterson (Virginian Division of Natural Heritage), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006190:
Vaccinium corymbosum / Sphagnum spp. Shrubland
Highbush Blueberry Bog Thicket

Status: Standard. **Conf.:** 2 - Moderate.
Summary: Highbush blueberry peat bog of glaciated regions in the eastern and northeastern United States. This tall-shrub bog thicket occurs on oligotrophic to weakly minerotrophic peat soils, commonly as a border thicket around more open dwarf heath shrub peatlands or within small, isolated basins. Significant seasonal water level fluctuation can occur, especially in isolated basins without inlet or outlet streams. A tall-shrub layer is characterized by abundant *Vaccinium corymbosum* plus *Gaylussacia baccata, Chamaedaphne calyculata, Kalmia angustifolia, Rhododendron canadense, Lyonia ligustrina*, and *Nemopanthus mucronatus* in more northern or cooler microclimates, and *Ilex verticillata* and *Rhododendron viscosum* in the south. In locally wetter areas, *Cephalanthus occidentalis* or *Decodon verticillatus* can occur. Coastal occurrences may have additional shrub species such as *Leucothoe racemosa, Clethra alnifolia*, and *Gaylussacia dumosa*. Sparse, scattered trees may occur, including *Acer rubrum, Picea mariana, Larix laricina, Pinus strobus, Pinus rigida, Betula populifolia*, or *Nyssa sylvatica*, with species dependent on environmental setting. The herbaceous layer tends to be sparse, although can be locally abundant. Common herbs include *Osmunda cinnamomea, Woodwardia virginica, Carex trisperma, Sarracenia purpurea, Thelypteris palustris, Triadenum virginicum*, and *Maianthemum trifolium*. *Sphagnum* mosses blanket well-developed hummocks and hollows, including *Sphagnum magellanicum, Sphagnum centrale, Sphagnum rubellum, Sphagnum capillifolium, Sphagnum fimbriatum*, and *Sphagnum fuscum*.
Comments: These tall heath shrub bog thickets tend to occur in wetter, more minerotrophic settings relative to dwarf heath shrub bogs.
States: CT, MA, ME, NH, NJ, NY, PA, RI, VT.
TNC ecoregions: 48:C, 59:C, 60:C, 61:C, 62:C.
USFS ecoregions: 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ab:CCC, 221Ac:CCP, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Bd:CCC, 221D:CC, 232Aa:CCC, M212Ad:CCC, M212Bc:CCC, M212Bd:CCC, M212Ea:CCC, M212Eb:CCC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC.

GRANK & REASONS

GRANK: G4 (Reviewed and changed 2010-01-02).
Assigned Rank Reasons: There are an estimated 1200 occurrences of this small-patch vegetation type throughout the northeast from New Jersey to southern Maine. Although larger examples are protected by some state laws, smaller examples, and those in isolated basins, do not receive federal protection from the Clean Water Act. Much of this vegetation continues to be threatened by adjacent development and runoff associated with these activities, as well as hydrological manipulations such as ditching and filling, or flooding by beaver dams.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: An estimated 1,200 occurrences exist rangewide. Individual state estimates as follows: estimates for CT, MA, and RI (125, 150, and 50, respectively) are based on limited information from state classifications and from vegetation map of Cape Cod National Seashore. NJ: 30 (based on state rank of S1S3); NY: 500 (conservation guide notes “several

hundred occurrences statewide" and ESR notes "300–2000 extant occurrences"); PA: 150 (state type ranked S5 but includes at two associations); ME: 40 (NHP estimates 10 –100 EOs statewide), and VT: 5 (2 EOs potentially crosswalk to this type; state type is ranked S2 but contains several associations).
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Even if 50% or fewer of estimated occurrences are of good viability, the number would still surpass 125. Conservative estimate.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: Occurs from Pennsylvania and New Jersey north to New York, New Hampshire, southern Maine and Vermont. Range extent determined to be 200,000 km^2 on GIS.
Area and/or Linear Distance of Occupancy (area): F = 12.5–62.5 km^2 (3,088–15,444 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy threshold reduced by a factor of 8 for small patch associations. Approximately 4600 ac estimated range-wide, assuming 2–4 ac per occurrence on average.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: Larger examples of this association receive protection under some state laws, including New York. Those not occurring in isolated basins are protected by the Federal Clean Water Act.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that this association has sustained significant losses over the long term due to a number of human-caused disturbances: logging, development and its associated runoff; ditching, filling, and the like.

THREATS

Residential & commercial development	**C**	**Medium**	**Large**	**Moderate**
Housing & urban areas	C	Medium	Large	Moderate
Commercial & industrial areas				
Tourism & recreation areas				
Agriculture & aquaculture				
Annual & perennial non-timber crops				
Wood & pulp plantations				
Livestock farming & ranching				
Marine & freshwater aquaculture				
Energy production & mining				
Oil & gas drilling				
Mining & quarrying				
Renewable energy				
Transportation & service corridors				
Roads & railroads				
Utility & service lines				
Shipping lanes				
Flight paths				
Biological resource use				
Hunting & collecting terrestrial animals				
Gathering terrestrial plants				
Logging & wood harvesting				
Fishing & harvesting aquatic resources				
Human intrusions & disturbance				
Recreational activities				
War, civil unrest & military exercises				
Work & other activities				

Residential & commercial development	C	Medium	Large	Moderate
Natural system modifications	C	Medium	Large	Moderate
Fire & fire suppression				
Dams & water management/use				
Other ecosystem modifications	C	Medium	Large	Moderate
Invasive & other problematic species & genes	D	Low	Restricted	Slight
Invasive nonnative/alien species	D	Low	Restricted	Slight
Problematic native species				
Introduced genetic material				
Pollution	C	Medium	Large	Moderate
Household sewage & urban waste water	C	Medium	Large	Moderate
Industrial & military effluents				
Agricultural & forestry effluents				
Garbage & solid waste				
Air-borne pollutants				
Excess energy				
Geological events				
Volcanoes				
Earthquakes/tsunamis				
Avalanches/landslides				
Climate change & severe weather				
Habitat shifting & alteration				
Droughts				
Temperature extremes				
Storms & flooding				

Threat (calculated): BC = High - Medium.
Threat comments: This association continues to be threatened by development and its associated runoff, hydrological changes such as ditching, filling, as well as flooding by beavers; invasive species is a minor threat to some occurrences.

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Conard 1935, Damman and French 1987, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Gawler 2002, Johnson 1981b, Karlin and Lynn 1988, Kearsley 1999a, Lundgren et al. 2000, Lynn and Karlin 1985, Metzler and Barrett 1982, Metzler and Barrett 2001, New York Natural Heritage Program 2009, Perles et al. 2007, Radis 1986, Rawinski 1984, Rozsa and Metzler n.d., Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Swain and Kearsley 2001.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006116:
Pinus rigida / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland
Pitch Pine Rocky Summit

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This northeastern pitch pine community occurs on dry rocky ridges and summits of low to moderate elevations. Soils are derived from acidic bedrock and are typically shallow, well- to excessively drained, coarse sands or gravels that develop in pockets of the exposed bedrock expanses. The canopy is open and trees are often stunted, usually less than 15 m in height and may be under 10 m. Tall shrubs are scattered and not abundant. The dwarf-shrub layer is moderately to well-developed (>20% cover, often more dense). Herbs are sparse. The bryoid layer is of variable cover, with lichens prominent. The ground cover is bare rock and deciduous and coniferous litter. The canopy is dominated by *Pinus rigida* with a variable mixture of associates, such as *Betula populifolia, Quercus rubra, Quercus prinus, Carya glabra, Pinus strobus, Pinus resinosa, Betula lenta, Acer rubrum*, and *Prunus serotina*. The tall-shrub layer is comprised of scattered *Quercus ilicifolia, Quercus prinoides*, or less commonly *Nemopanthus mucronatus*. The shrub layer is dominated by heaths, such as *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium myrtilloides*, and *Gaylussacia baccata*, as well as other shrubs, such as *Comptonia peregrina* and *Photinia melanocarpa (= Aronia melanocarpa)*. The herbaceous layer typically includes *Pteridium aquilinum, Schizachyrium scoparium, Deschampsia flexuosa, Danthonia spicata, Carex pensylvanica* and/or *Carex lucorum, Maianthemum canadense, Aralia nudicaulis, Melampyrum lineare, Fragaria virginiana, Rumex acetosella, Erechtites hieraciifolia, Corydalis sempervirens, Trientalis borealis*, and *Cypripedium acaule*. In the northern Appalachian Mountains, this community generally occurs at elevations from near sea level to 520 m (1700 ft) and may include species of northern affinity, such as *Viburnum nudum, Kalmia angustifolia, Betula papyrifera, Picea rubens*, and *Rhododendron canadense*, while in the Central Appalachians, this community occurs at elevations up to 1340 m (4400 ft), with occasional associates including *Pinus pungens, Pinus virginiana*, and *Ilex montana*. Periodic fires are probably necessary for persistence of this type, except at the most extreme sites. This association is differentiated from ~*Pinus rigida / Corema conradii* Woodland (CEGL006154)$$ by the absence of *Corema*, and from other *Pinus rigida*-dominated woodlands of rocky habitats by the absence or very low cover of the scrub oak *Quercus ilicifolia*.
Comments:
States: CT, MA, MD, ME, NH, NJ, NY, PA, QC?, RI, VT.
TNC ecoregions: 49:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C.
USFS ecoregions: 212Ca:CCP, 212Cb:CCC, 212Da:CCP, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Ea:CPP, M212A:CC, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212De:CCP, M212Ea:CCC, M212Eb:CCP, M221Aa:CCC, M221Ac:CCC, M221B:CC, M221Da:CCC.

GRANK & REASONS

GRANK: G4 (Reviewed and changed 2010-01-01).
Assigned Rank Reasons: There are many occurrences of this association over a large range, including many examples with good ecological integrity. Major threats include loss to cell

towers, wind turbines, and utility lines; trampling by visitors on hiking trails, and fire suppression.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: Approximately 1100 occurrences estimated rangewide as follows: CT, MA, MD, MD, ME, NH, NJ, RI, VT: ranges between 5–20 occurrences per state. PA: 40; NY: 1000 based on ESR for state type Pitch Pine - Oak - Heath Rocky Summit. State type, which is estimated by the NYNHP to have 400–3,000 occurrences. The New York type includes several associations, so estimate is adjusted to less than median number.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity**.**
Number of EOs with Good Viability Comments: The greatest number of occurrences is apparently in New York, where 1000 or more are estimated. NYNHP estimates that there are 41–125 occurrences in NY alone with good viability.
Number of Protected EOs:
Range Extent: G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2).
Range Extent Comments: This association occurs in the northeastern United States from central New England south to Pennsylvania and Maryland.221,000 km^2 measured range extent on GIS.
Area and/or Linear Distance of Occupancy (area): E = 20–100 km^2.
Area and/or Linear Distance of Occupancy Comments: 68 km^2 estimated total area of occupancy; each state estimated individually by the state natural heritage program or by interpolation based on average size of known occurrences x number of estimated occurrences.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: Some loss of this type in recent years to cell tower and wind turbine construction.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: A significant loss of this type over the long term is likely due to logging, development, and fire suppression.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads				
4.2	Utility & service lines	C	Medium	Large	Moderate
4.3	Shipping lanes				
4.4	Flight paths				

Threat		Impact (calculated)		Scope	Severity
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	C	Medium	Large	Moderate
6.1	Recreational activities	C	Medium	Large	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Large	Moderate
7.1	Fire & fire suppression	C	Medium	Large	Moderate
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: The most pressing threats are posed by cell tower and wind turbine construction on these open summits. Fire suppression over much of the range may result in conversion to other vegetation if not actively managed.

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming 1985, Gawler 2002, Harrison 2004, Hunt 1999, Kuchler 1956, Lundgren 1999a, Metzler and Barrett 2001, Moore and New York Natural Heritage Program 2009, Taylor 1927, Rawinski 1984, Sperduto 1997a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Jason Harrison (Maryland Natural Heritage Program), Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Eric Sorenson (Vermont Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006518:
Prunus pumila / Andropogon gerardii - Sorghastrum nutans Herbaceous Vegetation
Riverside Prairie Grassland

Status: Standard. **Conf.:** 3 - Weak.
Summary: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas. Herbaceous plants dominate, and may form a dense cover; scattered shrubs may grow among them, but are generally kept short by the annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Asclepias tuberosa*, and *Lespedeza capitata*. *Spiraea alba, Rosa virginiana, Quercus ilicifolia, Betula nigra*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Solidago rugosa, Solidago nemoralis, Solidago gigantea, Spartina pectinata, Achillea millefolium, Baptisia tinctoria, Asclepias syriaca, Dichanthelium clandestinum, Euthamia graminifolia, Apocynum androsaemifolium, Thelypteris palustris, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*. This association differs from more northerly riverside ice meadows in being dominated by prairie grasses (*Andropogon gerardii, Sorghastrum nutans)* rather than by *Calamagrostis canadensis*.
Comments:
States: CT, MA, NH, NJ, NY, PA, QC, VT.
TNC ecoregions: 59:C, 60:P, 61:C, 63:C, 64:C.
USFS ecoregions: 212E:CC, 212Fc:CCC, 221Af:CCC, 221Ba:CC?, 221Bc:CCC, 221Bd:CCC, M212Bb:CCC, M212De:CCC, M212Eb:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: Although there are likely well over 300 occurrences of this vegetation rangewide, many occurrences are very small patch, especially in the northern portions of the range. This vegetation is vulnerable to shoreline development, bank stabilization, invasive species, and some minor impacts as a result of recreational activities (trampling, boat ramp building, etc.)

RARITY

Number of EOs: E = >300.
Number of EOs Comments: 378 EOs estimated rangewide.
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Conservative estimate of viable occurrences; many are very small patch and vulnerable to invasive species.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: 86,000 km^2 measured around presumed range on GIS.

Area and/or Linear Distance of Occupancy (area): E = 2.5–12.5 km^2 (618–3,088 ac); estimate decreased by a factor of 8 for small patch associations.
Area and/or Linear Distance of Occupancy Comments: 651 ac is estimated total area of occupancy based on: CT: 16 ac (4 EOs at 4 ac per eo); MA: 94 ac (78 ac mapped plus 4 additional EOs at 4 ac per; likely to be well inventoried); NH: 10 ac (20 estimated EOs at 0.5 acre per eo); NY: 285 ac (230 ac mapped plus 6 additional estimated EOs); PA: 56 ac (interpolated from mapped EOs and current acreage); NJ: 40 ac (10 EOs estimated at 4 ac per; interpolated from mapped acreage at Delaware Water Gap National Recreation Area and reported occurrence from upper Delaware in NJ): VT: 150 ac (300 EOs estimated by state ecologist, at 0.5 acre per eo).

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: Over all, relatively stable over the short term.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: There has likely been significant loss of this vegetation over the long term as a result of adjacent development and associated runoff, recreational activities (boat ramps, etc.), and bank stabilization.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	D	Low	Restricted	Moderate
6.1	Recreational activities	D	Low	Restricted	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				

Threat		Impact (calculated)		Scope	Severity
9	Pollution	D	Low	Restricted	Moderate
9.1	Household sewage & urban waste water	D	Low	Restricted	Moderate
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Threats include adjacent development and associated runoff; bank stabilization and shoreline development; minor impacts brought on by recreational activities (boat ramps, trampling); invasive species such as *Phalaris arundinacea, Phragmites australis, Lythrum salicaria, Fallopia japonica.*

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, New York Natural Heritage Program 2009, Nichols et al. 2001, Perles et al. 2004, Thompson and Sorenson 2000.
Reviewers / Contributors: Ken Metzler (Connecticut Natural Diversity Database), Bill Nichols (New Hampshire Natural Heritage Bureau), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL007853:
Acer rubrum - Nyssa sylvatica / Ilex verticillata - Vaccinium fuscatum / Osmunda cinnamomea Forest
Central Appalachian Acidic Seepage Swamp

Status: Standard. **Conf.:** 2 - Moderate.
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 ft). The canopy is usually closed and consists of *Acer rubrum, Nyssa sylvatica*, and *Liriodendron tulipifera*. *Pinus rigida* 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, Magnolia acuminata, Betula lenta*, and *Pinus strobus*. The shrub stratum may be well-developed and includes *Ilex verticillata, Vaccinium corymbosum, Kalmia latifolia, Alnus serrulata, Viburnum nudum* var. *cassinoides, Viburnum dentatum, Smilax* spp., and, less consistently, *Carpinus caroliniana, Lindera benzoin, Gaylussacia frondosa, Gaylussacia baccata, Menziesia pilosa, Vaccinium fuscatum, Chionanthus virginicus, Viburnum nudum* var. *nudum, Rhododendron viscosum*, and *Toxicodendron vernix*. *Rubus hispidus* is an abundant creeping vine in many stands. Typical herbaceous plants are *Osmunda cinnamomea, Carex gynandra, Thelypteris noveboracensis, Medeola virginiana, Lycopodium obscurum, Osmunda regalis* var. *spectabilis, Symplocarpus foetidus, Veratrum viride*, and *Viola cucullata*.
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* (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.
States: MD, NC, PA?, VA, WV
TNC ecoregions: 50:C, 52:C, 59:C.
USFS ecoregions: 231Aa:CC?, 231Ae:CCC, 231Ak:CC?, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:C??, M221Ca:CC?, M221Cb:CCC, M221Cc:CC?, M221Ce:CC?, M221Da:CCC, M221Db:CC?.

GRANK & REASONS

GRANK: G1Q (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: This association has a narrow geographic range and is further limited by its requirement for special, localized wetlands, resulting in a relatively high number of occurrences but very limited area of occupancy. The type is confined to groundwater-saturated, nutrient-poor habitats that are large enough to support forest vegetation, but still only reaching an average of 10 ac in size. Threats include logging and infestations of southern pine beetle that kill pitch pines where they occur in this vegetation. The low area of occupancy results in a rank of

G1, but estimates of acreage are difficult to establish on a wetland type that varies in size. G1Q was assigned to this association because comparison of this type to others in the alliance is needed.

RARITY

Number of EOs: D = 81–300.
Number of Eos Comment: Individual state estimates are as follows: VA (35–40); WV (50, based 36–40 estimated at New River Gorge National River, accounting for separation distances of <0.5 km); MD (3–5).
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comment: Based on EO Ranks in VA, and occurrences in national parks, approximately 50% of occurrences have good viability.
Number of Protected EOs:
Range Extent: The probable range of this community type encompasses the Central Appalachian region of, 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). This association likely does not occur in Pennsylvania, as all known occurrences of vegetation in this alliance crosswalk to other associations.
Area and/or Linear Distance of Occupancy (area): B = 1–4 km^2.
Area and/or Linear Distance of Occupancy Comments: Despite the relatively high number of occurrences estimated for this vegetation, a generous calculation of area based on average size of known occurrences is 1.6 km^2. The global conservation status calculator automatically assigns a G1 rank if area of occupancy is below 4 km^2.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: logging, presence of invasive species, and power lines have continued to impact small patch wetlands.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: Small patch wetlands in general have declined since European settlement when forests were cleared, and lands converted to agriculture, especially in the Piedmont.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Slight
1.1	Housing & urban areas	D	Low	Restricted	Slight
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	D	Low	Restricted	Moderate
4.1	Roads & railroads				
4.2	Utility & service lines	D	Low	Restricted	Moderate
4.3	Shipping lanes				

Threat		Impact (calculated)		Scope	Severity
4.4	Flight paths				
5	Biological resource use	D	Low	Restricted	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	D	Low	Restricted	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Restricted	Moderate
8.1	Invasive nonnative/alien species	D	Low	Restricted	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Evidence of logging was noted at several occurrences in Virginia; southern pine beetle has killed pitch pines in several occurrences.

NEEDS

Research Needs: Quantitative analysis of plot data over the range is needed to assign a global conservation status rank with greater confidence.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Allard and Leonard 1943, Byers et al. 2007, Carr 1939, Faber-Langendoen et al. 2009, 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, Young et al. 2006.
Reviewers / Contributors: Karen Patterson (Virginia Division of Natural Heritage), Mike Schafale (North Carolina Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006544:
Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia spp. Herbaceous Vegetation
Little Bluestem - Poverty Grass Rock Outcrop

Status: Standard. **Conf.:** 3 - Weak.
Summary: These grassy openings are found on rock outcrops and summits at 365–1220 m (1200–4000 ft) elevation in the Central Appalachians and adjacent regions. Settings include flat summits, outcrops, plateaus and southwest-facing upper slopes. Bare rock (acidic sandstone and conglomerates) typically makes up a large part of the cover. *Danthonia spicata, Schizachyrium scoparium*, and *Deschampsia flexuosa* are all typical. Total herbaceous cover is usually 25–50%. Other associates include *Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Piptatherum racemosum (= Oryzopsis racemosa), Prunus pumila, Rumex acetosella, Rubus* spp., *Sibbaldiopsis tridentata, Cladonia* sp., and *Umbilicaria* sp. There may be small patches of shrubs within the graminoid matrix, including *Vaccinium* spp., *Gaylussacia baccata*, and *Photinia melanocarpa (= Aronia melanocarpa).*
Comments:
States: CT, MA, NJ, NY, PA, QC.
TNC ecoregions: 59:C, 60:C, 61:C.
USFS ecoregions: 212Fc:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Am:CCC, 221Ba:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, M221Ad:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-20).
Assigned Rank Reasons: Although an estimated 385 occurrences occupy 3600 ac range-wide, there are substantial threats to this association. Fire suppression and utility lines, including cell towers, and possibly wind turbines, threaten this vegetation throughout its range. Where trails cross these grasslands, trampling also poses a threat.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: 385 EOs estimated rangewide: CT (15): NJ (20); NY (600); PA (35) from state ranks and from NY ESR. Note: NY estimates between 200 to 1000 occurrences statewide; given the low numbers from adjoining states, I used the lower end, or 300 for NY. This may be conservative, as the crosswalk between USNVC and NY type is 1:1.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Referred to NY EO ranks: 17 of 20 EOs were ranked C or higher. Extrapolated 50% of EOs from other states as viable for a total of 57.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: calculated in GIS on basis of subsections of attribution within states of occurrence: approximately 57,000 km^2.

Area and/or Linear Distance of Occupancy (area): D = 10–20 km^2.
Area and/or Linear Distance of Occupancy Comments: Approximately 3600 ac (14.6 km^2) estimated area of occupancy. Individual state estimates ranged from several hundred ac to 2000 in NY.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: This association has likely decreased over recent decades due to fire suppression, maintenance of power lines, and establishment of cell towers.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: This association has likely decreased substantially (NY ESR estimates up to 75%) due to fire suppression.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads				
4.2	Utility & service lines	C	Medium	Large	Moderate
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	C	Medium	Large	Moderate
6.1	Recreational activities	C	Medium	Large	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Pervasive	Moderate
7.1	Fire & fire suppression	C	Medium	Pervasive	Moderate
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				

Threat		Impact (calculated)		Scope	Severity
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Fire suppression and utility lines, including cell towers, and possibly wind turbines, threaten this vegetation throughout its range. Where trails cross these grasslands, trampling also poses a threat.

NEEDS

Research Needs:
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Fike 1999, New York Natural Heritage Program 2009.
Reviewers / Contributors: Ken Metzler (Connecticut Natural Diversity Database).

CEGL006184:
Betula nigra - Platanus occidentalis / Impatiens capensis Forest
River Birch Low Floodplain Forest

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This Mid-Atlantic floodplain forest of large and moderately large rivers occurs on sandy, gravelly, well-drained soils of levees, gravel bars, braided channels and other areas of frequent flooding. The tree canopy is well-developed and dominated by *Betula nigra* and *Platanus occidentalis*, with associates including *Acer negundo* and occasionally *Acer saccharinum* and *Fraxinus pennsylvanica*. The shrub layer can include *Cornus amomum, Cornus sericea*, and *Lindera benzoin*. The vine and herb layers are lush and diverse and may include *Boehmeria cylindrica, Elymus hystrix, Stellaria pubera, Impatiens capensis, Impatiens pallida, Laportea canadensis, Pilea pumila, Toxicodendron radicans, Parthenocissus quinquefolia, Vitis rotundifolia* or *Vitis riparia, Chasmanthium latifolium (= Uniola latifolia), Podophyllum peltatum, Polygonum virginianum, Apocynum cannabinum*, and *Urtica* sp. Exotic species are typical and may include *Lysimachia* sp., *Microstegium vimineum, Lonicera japonica, Lonicera morrowii, Polygonum cuspidatum, Phalaris arundinacea*, and *Alliaria petiolata*.
Comments:
States: MD?, NJ, NY, PA.
TNC ecoregions: 58:C, 59:C, 60:C, 61:C, 62:C.
USFS ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCC, 221Bd:CCC, M212Eb:CCC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC.

GRANK & REASONS

GRANK: G3Q (Reviewed and changed 2009-12-18).
Assigned Rank Reasons: This association occurs on the northern range limit of *Betula nigra* and is apparently limited in distribution to a few large mid-Atlantic rivers. Occurrences are generally from 10's to 200 ac in size. The ecological integrity of this vegetation is threatened by the easy dispersal of exotic species via alluvial flooding. However, the taxonomy of this association remains in question, and its relationship to other associations of this alliance requires further study.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comment: Approximately 60 occurrences rangewide are estimated for this association. In PA, estimated 33 EOs (20 in addition to 13 mapped on Upper Delaware Scenic and Recreational River); in NY, 15 estimated EOs based on estimate from PA; in NJ, assume S2 or approximately 8–10 EOs. This association is not documented from MD, but may occur on the lower reaches of the Susquehanna; 5 estimated EOs.

Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comment: The ecological integrity of many occurrences is diminished by the presence of invasive species.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).

This association is apparently confined to large river basins and is so far documented from the Delaware and Susquehanna drainages in NY, PA, NJ, and possibly Maryland. Range extent is estimated to be 43,000 km^2, the area of a polygon delineating the known range of *Betula nigra* in the basins of the Delaware and Susquehanna rivers.

Area and/or Linear Distance of Occupancy (area): C = 4–10 km^2.

Area and/or Linear Distance of Occupancy Comments: This association occupies approximately 1000 ac, or 4 km^2, range-wide. Individual state estimates are: NJ: 100; NY: 600; PA: 300; and 10 estimated for MD.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).

Short-Term Trend Comments: The number and area of floodplain forests have probably remained stable in recent decades as a result of floodplain restoration efforts, and agricultural abandonment followed by natural succession.

Long-Term Trend: D = Decline of 50–70%.

Long-Term Trend Comments: Floodplain forests in general have undergone substantial losses as a result of agriculture.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution	D	Low	Large	Slight
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				

Threat		Impact (calculated)		Scope	Severity
9.3	Agricultural & forestry effluents	D	Low	Large	Slight
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Invasive species such as *Polygonum cuspidatum, Lonicera* spp., *Berberis thunbergii* and others present the greatest threat to this vegetation. Propagules are easily dispersed during flooding, and once introduced, must be treated aggressively to keep in check or reverse. Pollution poses a restricted threat, close to urban centers.

NEEDS

Research Needs: Rangewide classification analyses of this type and others in the alliance are needed.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-20. **Version Author:** L. Sneddon.
All References: Bartgis 1986, Bowman 2000, CAP pers. comm. 1998, Clancy 1996, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Harrison 2004, Podniesinski and Wagner 2002, Robichaud and Buell 1973, Thomson et al. 1999.
Reviewers / Contributors: Robert Coxe (Delaware Natural Heritage Program), Karen Patterson (Virginian Division of Natural Heritage), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

Status: Provisional. **Conf.:** 3 - Weak.
Summary: This association is characterized by seasonally fluctuating water levels; it may dry out completely in the summer. Hydrology may be affected by impermeable soils, seasonally high water tables, seasonal flooding in nearby streams and drainages, and/or impervious bedrock at or near the surface. The substrate is mineral soil with or without a layer of muck. The species composition is variable among sites, as well as annually and seasonally. Larger examples of this community type may exhibit strong zonation. Many smaller, shaded vernal ponds are unvegetated, their bottoms consisting of dead leaves and algae.
Comments: Recognition of vernal pool associations is complicated not only by the lack of good data but by the seasonal and spatial variability in composition. The largest factor, however, is that vernal pools are generally defined by their invertebrate and amphibian communities and often do not have characteristic suites of plant species. This type should be considered tentative pending more data.
States: CT, MA, ME, NH, NJ, NY, PA, RI, VT.
TNC ecoregions: 48:C, 49:C, 60:C, 61:C, 62:C, 63:C.
USFS ecoregions: 212C:CC, 221Ae:CCC, 221Bc:CCC, 221Da:CCC, 221Fa:CCC, 222:C, 232Ab:CCC, M212:C.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-29).
Assigned Rank Reasons: Despite large numbers of occurrences, vernal pools are small patch isolated wetlands that are not protected by the EPA's Clean Water Act. As such, they are vulnerable to a host of threats, including outright destruction, as well as impacts of logging, development, overuse of ATV's, altered hydrology such as ditching, filling or impoundments, and pollution as a result of runoff from agriculture, development, road construction, etc.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: Nearly 15,000 EOs estimated over the presumed range; see Area of Occupancy Comments.
Number of EOs with Good Viability: F = Very many (>125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Even assuming only 50% have good viability, the very high number of occurrences assures that over 125 are of good viability.
Number of Protected EOs:
Range Extent: G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2).
Range Extent Comments: 430,000 km^2 measured on GIS (Maine through WV, excluding VA). This association occurs in the northeastern U.S., from central Maine south to West Virginia. This association presumably occurs in Canada, but the range has not been evaluated outside the U.S.
Area and/or Linear Distance of Occupancy (area): F = 12.5–62.5 km^2 (3,088–15,444 ac).
Area and/or Linear Distance of Occupancy Comments: Approximately 6000 ac estimated area of occupancy. Assumed 0.5 acre per EO (which may be generous in many cases). Area of occupancy downscaled by a factor of 8 for small patch associations. Estimates for CT (1,500

EOs, 700 ac), RI (660 EOs, 330 ac), and ME (1,100 EOs, 600 ac) based on vernal pool inventory of MA (2,400 EOs, 1,100 ac): approximately 0.6 vernal pools per square mile; assumed 50% of vernal pools mapped in the inventory are covered by other associations. NJ: from http://www.dbcrssa.rutgers.edu/ims/vernal/viewer.htm; nearly 2,700 mapped, but 50% assumed covered by other associations. NY: (1,400 estimated EOs, 700 ac) from NY ESR and from NY Conservation Guides; PA (1,000 EOs, 500 ac) estimates from Pennsylvania Seasonal Pools Registry project; MD (200 EOs, 100 ac) from Maryland Wildlife Diversity Conservation Plan (assumed that 50% are covered by other associations); VT (5,500 EOs, 1,500 ac) from Vermont Natural Heritage Program; NH (200 EOs, 10 ac) from NH Natural Heritage Bureau; WV (20 EOs, 10 ac, conservative estimate). Virginia Division of Natural Heritage reports that vernal pools in that state are covered by other associations.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments:
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments:

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Large	Moderate
1.1	Housing & urban areas	C	Medium	Large	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture	B	High	Large	Serious
2.1	Annual & perennial non-timber crops	B	High	Large	Serious
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Large	Moderate
4.1	Roads & railroads	C	Medium	Large	Moderate
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use	C	Medium	Large	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	C	Medium	Large	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution	C	Medium	Large	Moderate
9.1	Household sewage & urban waste water	D	Low	Restricted	Moderate
9.2	Industrial & military effluents				

Threat		Impact (calculated)		Scope	Severity
9.3	Agricultural & forestry effluents	C	Medium	Large	Moderate
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather	B	High	Pervasive	Serious
11	Habitat shifting & alteration				
11	Droughts	B	High	Pervasive	Serious
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): A = Very High.
Threat comments: Despite their large numbers, vernal pools are vulnerable to a number of threats. Many are too small to be protected by Section 404 of the Clean Water Act as a result of a Supreme Court ruling in 2001 and a subsequent decision by the EPA against protection of isolated wetlands. Vernal pools are vulnerable to a host of threats, including outright destruction, as well as impacts of logging, development, overuse of ATV's, altered hydrology such as ditching, filling or impoundments, and pollution as a result of runoff from agriculture, development, road construction, etc.

SOURCES

Version Date: 2009-12-22. **Version Author:** L. Sneddon.
References: Colburn 2004, Comer et al. 2005, Eastern Ecology Working Group n.d., Fike 1999, Massachusetts Natural Heritage and Endangered Species Program 2009, New York Natural Heritage Program 2009, NRCS 2004, Soil Conservation Service 1987, Pennsylvania Seasonal Pools Registry (undated), Rutgers University Center for Remote Sensing and Spatial Analysis (undated), Thompson and Sorenson 2000.
Reviewers / Contributors: Robert Coxe (Delaware Natural Heritage Program), Andy Cutko (Maine Natural Areas Program), Jason Harrison (Maryland Natural Heritage Program), Bill Nichols (New Hampshire Natural Heritage Bureau), Karen Patterson (Virginian Division of Natural Heritage), Mike Schafale (North Carolina Natural Heritage Program), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006445:
Carya cordiformis - Prunus serotina / Ageratina altissima Forest
Floodplain Terrace Forest

Status: Standard. **Conf.:** 3 - Weak.
Summary: This association is characterized by the dominance or codominance of *Carya cordiformis* on mid to high floodplain terraces. Soils are derived from alluvial deposits and consist of fine sandy loams and loamy fine sand. Codominant or associate canopy species include *Quercus rubra, Juglans cinerea, Prunus serotina, Ulmus americana, Fraxinus americana*, and *Acer saccharinum*. The canopy is usually somewhat open, occasionally closed, and about 20 m in height. The subcanopy cover is usually 20 to 30%. Composition of the subcanopy is similar to the canopy layer and may also include *Acer rubrum* and *Acer saccharum*. The tall-shrub and short-shrub layers are usually sparse and include occasional saplings of canopy and subcanopy species, as well as scattered individuals of *Rosa multiflora, Lonicera morrowii, Berberis thunbergii, Rubus occidentalis*, and *Rubus flagellaris*. The herbaceous layer is weedy, with invasive exotic species common or dominant, including *Microstegium vimineum, Alliaria petiolata*, and *Glechoma hederacea*. Common native species include *Ageratina altissima* var. *altissima, Hydrophyllum virginianum*, and *Carex* spp.
Comments:
States: NJ, NY, PA, WV.
TNC ecoregions: 59:C, 60:C, 61:C.
USFS ecoregions: 212Fc:CCC, 221Bd:CCC, M221Bb:CCC.

GRANK & REASONS

GRANK: G2G3 (Reviewed and changed 2010-01-02).
Assigned Rank Reasons: This association is known from Upper Delaware Scenic and Recreational River and Delaware Water Gap National Recreation Area, as well as from the Cheat and Tygart Rivers in West Virginia. Much of this vegetation in West Virginia has been extirpated from agriculture, and agricultural runoff has contributed to substantial cover by invasive species. Known occurrences in West Virginia continue to face threats of conversion to agriculture.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comments: There is an estimated total of 45 occurrences rangewide. There is low confidence associated with these estimates, however. 10 Occurrences each are estimated for NJ, PA, and NY, and 15 for WV.
Number of EOs with Good Viability: U = Unknown.
Number of EOs with Good Viability Comments: There are substantial numbers of invasive species on known occurrences on Delaware Water Gap National Recreation Area and Upper Delaware Scenic and Recreational River. The number of additional occurrences outside these parks, and their condition, are not known. Occurrences in West Virginia have not been evaluated for ecological integrity.
Number of Protected EOs:
Range Extent: E = 5,000–20,000 km^2 (~2,000–8,000 mi^2).

Range Extent Comments: This type is currently documented from northern New Jersey, New York, and Pennsylvania, south to northern West Virginia. 18,000 km^2 range extent measured in GIS.
Area and/or Linear Distance of Occupancy (area): E = 2.5–12.5 km^2 (618–3,088 ac).
Area and/or Linear Distance of Occupancy Comments: Thresholds for area of occupancy have been decreased by a factor of 8 for small patch associations. 645 ac, or approximately 2.6 km^2 estimated area of occupancy. Low confidence is associated with this estimate.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: This vegetation has declined in recent decades due to agriculture.
Long-Term Trend: D = Decline of 50–70%.
Long-Term Trend Comments: Much of this vegetation in West Virginia is reported to be extirpated due to agriculture, road, and railroad construction.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture	C	Medium	Large	Serious
2.1	Annual & perennial non-timber crops	C	Medium	Large	Serious
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	B	High	Pervasive	Serious
8.1	Invasive nonnative/alien species	B	High	Pervasive	Serious
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				

Threat		Impact (calculated)		Scope	Severity
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): AB = Very High - High.
Threat comments: This vegetation faces serious threats from agriculture, particularly in West Virginia. The number of occurrences with good viability is unknown. Occurrences documented from Upper Delaware Scenic and Recreational River and Delaware Water Gap National Recreation Area are characterized by substantial cover of a number of invasive plant species.

NEEDS

Research Needs:
Inventory Needs: Additional inventory for this type is needed throughout the range.
Protection Needs:

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Vanderhorst 2001a, Vanderhorst and Streets 2006.
Reviewers / Contributors: Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL004142:
Lasallia (*papulosa, pensylvanica*) - *Dimelaena oreina* - (*Melanelia culbersonii*) Nonvascular Vegetation
Central Appalachian Acidic Boulderfield

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This association is widely but locally distributed from the western Piedmont foothills in Maryland and Virginia through the Blue Ridge and Ridge and Valley portions of the central Appalachians, north at least to the Delaware Water Gap National Recreation Area in Pennsylvania and New Jersey. It occurs primarily on fully exposed, minimally weathered quartzite and sandstone boulderfields at elevations from about 300 to 1000 m (1000–3300 ft). On the largest occurrences, vascular plants are generally absent and lichens dominate these habitats. *Lasallia papulosa* and *Lasallia pensylvanica*, either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* spp. and larger foliose lichens. Although of scattered occurrence, *Melanelia culbersonii* has been found across the full elevation range of the type and is a good diagnostic species, as it appears to be restricted mostly to siliciclastic rocks (and occasionally coarse-grained, quartz-rich granites that are nearly devoid of dark minerals) in this region. A variety of other foliose, crustose and fruticose lichen species are associated. Smaller, more marginal occurrences have sparse vascular plant cover, primarily stunted trees of *Betula lenta, Sassafras albidum*, and *Quercus prinus*, ericaceous shrubs, and scrambling vines of *Parthenocissus quinquefolia*.
Comments: Classification of this association is based on geographically limited lichen inventories in Shenandoah National Park, but it is believed to be widely applicable to similar boulderfields that are characteristic of central Appalachian siliciclastic ridges. In the park inventory, lichens were mass-collected from boulderfield and outcrop habitats on different geologic substrates, and specimens were identified by Richard Harris (New York Botanical Garden), Don Flenniken (author of Macrolichens of West Virginia), and James Lawry (George Mason University). Classification of lichen communities in eastern North America is currently difficult and tentative because inventory and data are generally lacking. The classification of this type versus *Betula lenta - Quercus prinus / Parthenocissus quinquefolia* Woodland (CEGL006565) can be tricky where there is a continuous gradation of vegetation cover (as at Delaware Water Gap National Recreation Area), but generally this is applied where there is less than 25% vascular vegetation and nonvascular species are dominant.
States: MD, NJ, PA, VA, WV.
TNC ecoregions: 52:C, 59:C, 60:C, 61:C.
USFS ecoregions: 212Fc:CCC, 221Da:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Da:CCC.

GRANK & REASONS

GRANK: G5 (Reviewed and changed 2009-12-30).
Assigned Rank Reasons: Although aggregate acreage is not large, there are probably several hundred occurrences of this association in Virginia alone, with many more known from or likely in adjacent states. Habitats are typically remote, extremely steep and difficult to traverse, minimizing potential human threats.

RARITY

Number of EOs: E = >300.
Number of EOs Comment: Approximately 310 occurrences are estimated; 30–60 occurrences estimated on average for most states of occurrence, with 15–20 for states at the northern end of the range.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comment: Even if only 50% of occurrences are of good viability, many would still be viable.
Number of Protected EOs:
Range Extent: G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2).
Range Extent Comment: This association is widely but locally distributed from the western Piedmont foothills in Maryland (e.g., Sugarloaf Mountain) and Virginia (e.g., Bull Run Mountain) through the Blue Ridge and Ridge and Valley portions of the central Appalachians, north to southern New England. The range extent was approximated by excluding the range of *Picea rubens,* which was used as a proxy for the range of CEGL006534, the northern equivalent of this association. In Virginia, the type is fairly common on the siliciclastic western flank of the northern Blue Ridge and throughout the Ridge and Valley in west-central and northwestern Virginia. It is also frequent in the Ridge and Valley region of Pennsylvania (T. Smith pers. comm.) but may be restricted to the northeastern tier of counties in West Virginia.
Area and/or Linear Distance of Occupancy (area): G = 62.5–250 km^2 (15,444–61,776 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy scaled down by a factor of 8 for small patch vegetation.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: There is little evidence of loss of this vegetation over recent decades.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that up to 30% of this vegetation has been lost over the long term to development, land clearance, and the like, however, the steep slopes and unstable substrate are generally undesirable locations for development.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				

Threat		Impact (calculated)		Scope	Severity
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution	D	Low	Restricted	Moderate
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants	D	Low	Restricted	Moderate
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: Air pollution poses a threat to lichen species in areas near urban locations. In general, the inaccessible location of this vegetation minimizes the risk of human disturbances.

NEEDS

Research Needs: Monitoring of lichen diversity and cover is needed to determine if air pollution is altering the ecological integrity of these sites.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-29. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Fleming et al. 2006, Fleming et al. 2007, Flenniken 1999.
Reviewers / Contributors: Andy Cutko (Maine Natural Areas Program), Jim Drake (NatureServe), Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Bill Nichols (New Hampshire Natural Heritage Bureau), Karen Patterson (Virginian Division of Natural Heritage), Mike Schafale (North Carolina Natural Heritage Program), Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL007861:
Betula alleghaniensis - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest
Blue Ridge Hemlock - Northern Hardwood Forest

Status: Standard. **Conf.:** 2 - Moderate.
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 ft) to around 1350 m (4400 ft), but the community can probably occur as high as 1524 m (5000 ft) or until *Picea rubens* 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* and/or *Tsuga canadensis*, although either of these species may be locally dominant at a small scale. Other minor canopy and subcanopy species may include *Aesculus flava, Halesia tetraptera* var. *monticola, Picea rubens, Prunus pensylvanica, Betula lenta, Quercus rubra, Liriodendron tulipifera* (at lower elevations), and *Tilia americana* var. *heterophylla*. The tall-shrub stratum is over 2 m in height, very dense (50–100% coverage) and dominated by *Rhododendron maximum*. Other minor shrubs can include *Acer pensylvanicum, Acer spicatum, Hamamelis virginiana, Hydrangea arborescens, Ilex montana, Kalmia latifolia, Rubus allegheniensis, Sambucus racemosa (= Sambucus pubens), Ribes cynosbati*, and *Vaccinium erythrocarpum*. Additional shrubs include *Acer pensylvanicum, Ilex montana, Kalmia latifolia, Rubus allegheniensis, Sambucus racemosa (= Sambucus pubens), Vaccinium erythrocarpum*. 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, Medeola virginiana, Mitchella repens, Tiarella cordifolia, Oxalis montana, Polypodium appalachianum*, and *Smilax rotundifolia*. The bryophyte layer can be well-developed and diverse. This association grades into forests dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations.
Comments:
States: NC, TN, VA, WV.
TNC ecoregions: 50:C, 51:C, 59:C.
USFS ecoregions: M221Aa:CCC, M221Ba:CCC, M221Bd:CC?, M221Cb:CCC, M221Dc:CCC, M221Dd:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-29).
Assigned Rank 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* 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, North Carolina, West Virginia, and Tennessee.

RARITY

Number of EOs: C = 21–80.
Number of Eos Comments: Approximately 10 occurrences are estimated for each state where this vegetation occurs.
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Many known occurrences are on protected lands, but infestation by wooly adelgid has lowered the ecological integrity rank.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range extent is calculated as approximately 69,000 km^2 by GIS delineation of polygon around subsections of occurrence, excluding northern Virginia and Maryland. 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.
Area and/or Linear Distance of Occupancy (area): C = 4–10 km^2.
Area and/or Linear Distance of Occupancy Comments:

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: Decline of this association in recent years is due in large part to alteration of the vegetation by hemlock wooly adelgid.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: Logging likely removed a portion of this vegetation throughout its range.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				

Threat		Impact (calculated)		Scope	Severity
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Perhaps the greatest current threat to this vegetation is decline in ecological integrity due to hemlock wooly adelgid infestation, potentially exacerbated by climate change.

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
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.
Reviewers / Contributors: Karen Patterson (Virginia Division of Natural Heritage), Milo Pyne (NatureServe), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL007696:
Peltandra virginica - Saururus cernuus - Boehmeria cylindrica / Climacium americanum
Herbaceous Vegetation
Floodplain Pool

Status: Standard. **Conf.:** 2 - Moderate.
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, Dulichium arundinaceum*, and *Polygonum* spp. *Carex crinita* or some other wetland *Carex* species are almost always present. *Saururus cernuus* and *Boehmeria cylindrica* are other typical herbs. Larger examples may have pad-leaved aquatic species such as *Brasenia schreberi* or *Nymphaea odorata*. Some examples have wetland shrubs on edges or in shallow portions, including *Cornus amomum* and *Cephalanthus occidentalis*. The moss *Climacium americanum* is often abundant on the landward side.
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.
States: CT, DE, MD, NC, NJ,OH?, PA, TN?, VA, WV.
TNC ecoregions: 50:C, 51:C, 52:C, 61:C, 62:C.
USFS ecoregions: 221Ae:CCC, 221Da:CCC, 231:C, 232Ac:CCC, M221Cb:CCC, M221Dc:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-21).
Assigned Rank 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.

RARITY

Number of EOs: D = 81–300.
Number of EOs Comments: Approximately 250 EOs are estimated over the range of this vegetation, but additional inventory is needed to determine number with greater confidence.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: In NC, 19 of 32 EOs in the Biotics database are ranked AB or higher; determined the number of EOs with good viability based on the conservative estimate of 50% of estimated EOs.

Number of Protected EOs:
Number of Protected EOs Comments:
Range Extent: G = 200,000–2,500,000 km^2 (~80,000–1,000,000 mi^2).
Range Extent Comments: This association is found in the Piedmont, Southern Blue Ridge and related ecoregions, north to the Atlantic Plain in Connecticut. It likely occurs in Ohio, but requires confirmation.
Area and/or Linear Distance of Occupancy (area):

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: There is no evidence for notable changes in this vegetation in the short term, although the impacts of climate change are hard to predict.
Long-Term Trend: AD = Decline of >50%.
Long-Term Trend Comments: Floodplain settings in general have declined greatly over the long term due to agriculture, water diversions, and the like.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use	D	Low	Restricted	Moderate
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting	D	Low	Restricted	Moderate
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				

Threat		Impact (calculated)		Scope	Severity
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather	BC	High - Medium	Pervasive	Serious - Moderate
11	Habitat shifting & alteration	BC	High - Medium	Pervasive	Serious - Moderate
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Small patch wetlands are threatened by human development and logging in surrounding areas, if they are not destroyed outright by these activities. Hydrology of this vegetation is threatened by droughts brought on by climate change.

SOURCES

Version Date: 2009-12-20. **Version Author:** L. Sneddon.
References: Breden et al. 2001, Fleming et al. 2001, Harrison 2004, Metzler and Barrett 2001, Perles et al. 2004, Schafale 1998a, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Suiter 1995, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007.
Reviewers / Contributors: Robert Coxe (Delaware Natural Heritage Program), Jason Harrison (Maryland Natural Heritage Program), Karen Patterson (Virginian Division of Natural Heritage), Milo Pyne (NatureServe), Mike Schafale (North Carolina Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006458:
Platanus occidentalis - Fraxinus pennsylvanica / Carpinus caroliniana / Verbesina alternifolia Forest
New River Sycamore - Ash Floodplain Forest

Status: Standard. **Conf.:** 3 - Weak.
Summary: This association represents closed-canopy deciduous floodplain forests along the New River and nearby rivers in West Virginia, occurring in small to medium-sized patches (<0.1–13 ha) 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 476 m. The tree canopy is dominated by *Platanus occidentalis, Fraxinus pennsylvanica, Ulmus americana*, and *Liriodendron tulipifera*. Additional important trees in the canopy include *Betula nigra, Fraxinus americana, Juglans nigra, Nyssa sylvatica, Quercus rubra, Robinia pseudoacacia, Ulmus americana*, and *Ulmus rubra*. The subcanopy includes canopy species and *Acer saccharum, Carpinus caroliniana* ssp. *virginiana, Cercis canadensis, Chionanthus virginicus, Cornus florida, Halesia tetraptera, Sassafras albidum*, and *Zanthoxylum americanum*. Species in the shrub layers not included in the canopy include *Asimina triloba, Campsis radicans, Dirca palustris, Hamamelis virginiana, Lindera benzoin, Toxicodendron radicans*, and *Viburnum recognitum*. Cover in the diverse herb layer ranges from 5 to 90% depending on the degree of canopy shading, and includes species typical of mesic forests as well as those of floodplains.
Comments:
States: WV.
TNC ecoregions: 50:C, 59:C.
USFS ecoregions: M221Be:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G3Q (Reviewed and changed 2010-01-02).
Assigned Rank Reasons: This floodplain forest association is known from a restricted range in West Virginia, but may occur in Virginia and Tennessee. Much of this vegetation has likely been lost to dam construction, and it still faces threats from agricultural runoff, if not direct conversion to crops on other unprotected sites. The taxonomic relationship to other *Platanus occidentalis* forests requires further study, particularly the relationship to CEGL006492–*Liriodendron tulipifera - Acer (rubrum, negundo) - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Forest, documented from the Potomac River in Virginia and Maryland.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comments: 27 occurrences known from New River Gorge National River; upstream occurrences limited by Bluestone Dam, and downstream by development. 40 occurrences are estimated in total.
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.

Number of EOs with Good Viability Comments: 27 occurrences are known from New River Gorge National River.
Number of Protected EOs:
Range Extent: E = 5,000–20,000 km^2 (~2,000–8,000 mi^2).
Range Extent Comments: This association is currently documented from the New River Gorge National River and nearby rivers in West Virginia. A small number of occurrences in TN and VA are possible but not documented.
Area and/or Linear Distance of Occupancy (area): E = 2.5–12.5 km^2 (618–3,088 ac).
Area and/or Linear Distance of Occupancy Comments: Thresholds decreased by a factor of 8 for small patch associations. Approximately 600–800 ac estimated rangewide; 465 ac known from New River Gorge National River; degraded examples at Bluestone National Scenic River; others suspected on Greenbrier.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: This vegetation has likely been lost or degraded as a result of agricultural runoff, as well as peak flow restrictions as a result of dams.
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments: Over the long term, it is probably that much of this vegetation was lost to the building of dams, particularly on the Bluestone River.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture	D	Low	Restricted	Moderate
2.1	Annual & perennial non-timber crops	D	Low	Restricted	Moderate
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	D	Low	Restricted	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	D	Low	Restricted	Moderate
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				

Threat		Impact (calculated)		Scope	Severity
8.3	Introduced genetic material				
9	Pollution	C	Medium	Large	Moderate
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents	C	Medium	Large	Moderate
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: Occurrences at the New River Gorge National River receive protection through the National Park Service, but off-site effects such as agricultural runoff can still pose a threat. Other occurrences, such as those on the Greenbrier, are threatened by adjacent development, agricultural runoff, and the like. Floodplain settings in general are vulnerable to loss through agricultural activities.

NEEDS

Research Needs: The taxonomic relationship to other associations of this alliance requires further analysis. In particular, relationship to CEGL006492–*Liriodendron tulipifera - Acer (rubrum, negundo) - (Platanus occidentalis) / Carpinus caroliniana / Polygonum virginianum* Forest, documented from the Potomac River in Virginia and Maryland, needs further study.

Inventory Needs: Additional inventory is needed on other rivers in West Virginia, as well as Virginia and Tennessee. *Platanus* forests in West Virginia are poorly sampled in some regions.
Protection Needs:

SOURCES

Version Date: 2010-01-02. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Suiter 1995, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008.
Reviewers / Contributors: Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Karen Patterson (Virginia Division of Natural Heritage), Milo Pyne (NatureServe).

CEGL006565:
Betula lenta - Quercus prinus / Parthenocissus quinquefolia Woodland
Sweet Birch - Chestnut Oak Talus Woodland

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This talus or rocky slope woodland community occurs in the central Appalachian Mountains and extends west to the Western Allegheny Plateau in Pennsylvania. The substrate is generally quartzite or sandstone talus. Sites are usually steeply sloping, but the type also sometimes occurs on gentler benches and ridge crests. Soils, where present, are shallow, organic, acidic and infertile. The canopy is of variable cover but generally open with gnarled, widely spaced trees. Characteristic trees are birches, primarily *Betula lenta* but less frequently including *Betula papyrifera, Betula populifolia*, or *Betula alleghaniensis*, as well as *Nyssa sylvatica*. Other tree associates may include *Tsuga canadensis, Acer rubrum, Carya glabra, Quercus prinus, Quercus alba, Quercus rubra, Quercus velutina*, or *Quercus coccinea*. Typical shrubs include *Acer spicatum, Acer pensylvanicum, Amelanchier arborea, Castanea dentata, Kalmia latifolia, Hamamelis virginiana, Menziesia pilosa, Ribes rotundifolium, Vaccinium angustifolium, Vitis* spp., *Toxicodendron radicans, Smilax rotundifolia*, and *Parthenocissus quinquefolia*. Ferns characterize the herb layer and may include *Dryopteris marginalis, Polypodium virginianum, Woodsia obtusa*, or *Asplenium platyneuron*. The forbs *Aralia nudicaulis, Heuchera* spp., and *Scutellaria saxatilis* are also well-adapted to the bouldery habitats. Lichens, especially the rock-tripes *Lasallia papulosa* and *Umbilicaria mammulata* and the foliose species *Flavoparmelia baltimorensis*, characterize the nonvascular layer.
Comments:
States: MD, NJ, PA, VA, WV.
TNC ecoregions: 49:C, 59:C, 60:P, 61:C.
USFS ecoregions: 212Fc:PPP, 221Bd:CCC, 221D:CC, 221Ea:CCC, M221Ac:CCC, M221Bf:CCC.

GRANK & REASONS

GRANK: G4 (Reviewed 2009-12-29).
Assigned Rank Reasons: Although this community type occurs in small patches over a limited geographic range, there are probably >200 sites (if not many hundreds of sites) in Virginia and West Virginia alone. Moreover, stands occupy rugged habitats that are not prone to anthropogenic disturbances.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: Approximately 335 occurrences estimated rangewide based on state ranks and heritage program review.
Number of EOs with Good Viability: E = Many (41–125) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: The steep slope and unstable substrate generally protects this vegetation from residential and commercial development. Assume 50% of estimated occurrences have good ecological integrity.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).

Range Extent Comments: This community occurs locally throughout the Blue Ridge and Ridge and Valley sections of Pennsylvania, Virginia, West Virginia, and Maryland, extending northeast to northeastern Pennsylvania, northern New Jersey, and the lower Hudson Valley and portions of the Catskills region of New York. Approximately 100,000 km^2 measured on GIS.
Area and/or Linear Distance of Occupancy (area): G = 62.5–250 km^2 (15,444–61,776 ac).
Area and/or Linear Distance of Occupancy Comments: Area of occupancy scaled down by a factor of 8 for small patch associations. Total acreage estimated as 3,350 ac. Individual state areas determined as follows: MD, NJ, and WV = 150 ac each, based on median of S2 multiplied by 10 ac per occurrence; NY 500 ac (state type S3S4 but only a portion of the state type is this association); VA and PA = 1,200 based on state ranks of S3S4 and 10 ac per EO.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: It is assumed that inaccessibility and undesirability have ensured that only a small amount of this vegetation has been lost in recent decades.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: It is likely that some occurrences, perhaps 10–15%, have been lost to large-scale development and other disturbances over the long term.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining	D	Low	Restricted	Moderate
3.1	Oil & gas drilling				
3.2	Mining & quarrying	D	Low	Restricted	Moderate
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				

Threat		Impact (calculated)		Scope	Severity
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: Threats to this vegetation are relatively minor. Stone cutting and quarrying in some areas may pose a threat to this vegetation.

SOURCES

Version Date: 1 Oct 2001; 2009-12-29. **Version Author:** G. Fleming; L. Sneddon.
References: Anderson et al. 1998, Eastern Ecology Working Group n.d., Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Fleming et al. 2007, Hack and Goodlett 1960, Harrison 2004, Hupp 1983, Lea 2003, Lea 2004, Rawinski et al. 1996, Russell and Schuyler 1988, VDNH 2003, Young et al. 2006.
Reviewers / Contributors: Greg Edinger (New York Natural Heritage Program), Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Karen Patterson (Virginian Division of Natural Heritage), Kathleen Strakosch Walz (New Jersey Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program), Ephraim Zimmerman (Pennsylvania Natural Heritage Program).

CEGL006074:
Quercus prinus / Rhus spp. / *Deschampsia* flexuosa Woodland
Shale Talus Slope Woodland

Status: Standard. **Conf.:** 3 - Weak.
Summary: This association consists of variably structured vegetation occurring on harsh, steep, unstable shale talus and cliffs. Physiognomy ranges from woodland to shrubland to herbaceous, with areas of very sparse vegetation. Heat, drought and lack of soil development prevent the establishment of many species and limit the community to crevice-rooting herbaceous plants and widely scattered small trees and shrubs. Vegetation cover is variable and patchy. Typical tree species include *Quercus prinus, Pinus strobus,* and *Juniperus virginiana*. Shrubs include scattered *Vaccinium pallidum, Rhus typhina, Rhus glabra, Gaylussacia baccata*, and *Amelanchier arborea*. The herbaceous layer ranges from absent to nearly 30% cover in patches, and consists of drought-tolerant graminoids such as *Deschampsia flexuosa, Carex pensylvanica,* and *Danthonia spicata,* as well as drought-tolerant forbs such as *Comandra umbellata, Solidago arguta, Baptisia tinctoria,* and *Tephrosia virginiana.*
Comments:
States: NJ.
NY: Shale talus slope woodland S? (broader), PA: no crosswalk, VT: Temperate Acidic Cliff: S?; I.
TNC ecoregions: 60:C, 61:C, 64:P.
USFS ecoregions: 212Ed:CCC, 212Fc:CCC, 212Fb:CCC, 221Bc:CCC, 221Bd:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: Approximately 80 occurrences occupying 12 km^2 (2910 ac) are estimated rangewide. This vegetation has a somewhat limited range in four states. Although the steep slopes and unstable substrate supporting this vegetation does not attract developers, some degradation is likely to be caused by any development occurring on ridgetops. In addition, large cliffs overtopping scree slopes in general are attractive to rock climbers who can cause trampling to this fragile vegetation.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comment: Approximately 80 occurrences are estimated rangewide. Estimates by state: NJ: 5 (none of this type at Delaware Water Gap National Recreation Area was mapped on the NJ side; estimate fewer than 5 EOs in the state); NY: 35 (based on low end of S3 state rank); PA: 35 (estimated assumed to be similar to NY); VT: 7 based on estimate provided by state ecologist.
Number of EOs with Good Viability: D = some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: based on EO ranks that were crosswalked to this type, assume 50% are of good viability.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: 43,000 km^2 measured on GIS. This association is known from central Vermont and New York State south to northern New Jersey and Pennsylvania.

Area and/or Linear Distance of Occupancy (area): D = 10–20 km^2.
Area and/or Linear Distance of Occupancy Comments: Estimated 12 km^2 (2910 ac) based on a conservative portion of total amount of potential habitat measured by GIS on ELU map (steep acidic shale or acidic metasediment steep slopes) in NY and PA; 20 ac X 5 EOs in NJ; 10 ac total estimated by VT ecologist.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: steep slopes with unstable habitat generally not attractive to developers, but overtopping cliffs are attractive for rock climbers who cause trampling.
Long-Term Trend: G = Relatively Stable (<=10% change).
Long-Term Trend Comments:

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Slight
1.1	Housing & urban areas	D	Low	Restricted	Slight
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	C	Medium	Large	Moderate
6.1	Recreational activities	C	Medium	Large	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				

Threat		Impact (calculated)		Scope	Severity
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Although the steep slopes and unstable substrate supporting this vegetation does not attract developers, some degradation is likely to be caused by any development occurring on ridgetops. In addition, large cliffs overtopping scree slopes in general are attractive to rock climbers who can cause trampling to this fragile vegetation.

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, NRCS 2004, Perles et al. 2007, Thompson 1996, Thompson and Sorenson 2000.
Reviewers / Contributors: Eric Sorenson (Vermont Natural Heritage Program), Kathleen Strakosch Walz (New Jersey Natural Heritage Program).

CEGL006448:
Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus Herbaceous Vegetation
Mid-Atlantic Rich Seep

Status: Standard. **Conf.:** 3 - Weak.
Summary: These small wetlands (<1–6 ac) occur as patches within the forest matrix where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm). This association is characterized by a highly variable species composition. *Juniperus virginiana* may be present, and tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. *Dasiphora fruticosa* ssp. *floribunda (= Pentaphylloides floribunda)* is not a typical associate, and if present, is at low cover. The shrub layers may contain invasive shrubs, especially *Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla*, *Solidago uliginosa, Drosera rotundifolia, Parnassia glauca,* and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides*, *Muhlenbergia glomerata, Rhynchospora alba,* and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present; the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.
Comments
States: NJ, NY, PA.
TNC ecoregions: 60:C, 61:C.
USFS ecoregions: 212Fc:CCC, 221Bd:CCC.

GRANK & REASONS

GRANK: G1 (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: This small patch association is restricted to seepage areas in calcareous bedrock. It has a narrow range extent, occurring in only three states, and occurrences are only a few ac in size. This association is vulnerable to runoff from development and road construction, logging and other activities adjacent to the fen. This vegetation is prone to invasive species incursion, and is threatened by altered hydrology, both human-induced and that caused by beavers.

RARITY

Number of EOs: B = 6–20.
Number of EOs Comments: 15 occurrences are estimated; 5 each in NY, NJ, and PA.
Number of EOs with Good Viability: C = Few (4–12) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: occurrence ranks for NY occurrences are all C or above, but only 15 occurrences are estimated to exist rangewide.
Number of Protected EOs:

Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This community is currently known from New Jersey, Pennsylvania and New York. Range extent measured on GIS around periphery of known occurrences is approximately 49,000 km^2.
Area and/or Linear Distance of Occupancy (area): B = 0.125–0.5 km^2 (31–123 ac) Area of occupancy was scaled down by a factor of 8 for small patch communities.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments: Occurrences have likely stabilized in recent years due to wetland protection regulations.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: Agriculture, clearing, and ditching have likely decreased the numbers of occurrences over the long term.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	D	Low	Restricted	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	D	Low	Restricted	Moderate
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species	C	Medium	Large	Moderate
8.3	Introduced genetic material				
9	Pollution	D	Low	Restricted	Moderate
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents	D	Low	Restricted	Moderate
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				

Threat		Impact (calculated)		Scope	Severity
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: These small patch wetlands are vulnerable to development and associated runoff, ditching and culverts, and invasive species including *Phragmites australis* and *Lythrum salicaria.* In addition, beaver activity can flood and kill occurrences.

NEEDS

Research Needs: Global ranking requires review.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Fike 1999, New York Natural Heritage Program 2009, Western Pennsylvania Conservancy 1995.
Reviewers / Contributors:

CEGL006447:
Carex trichocarpa Herbaceous Vegetation
Hairy-fruit Sedge Alluvial Wetland

Status: Standard. **Conf.:** 2 - Moderate.
Summary: This association occurs in small patches on floodplain edges, deposition bars, and islands where tree canopy is lacking, on medium- to large-sized rivers in the mid-Atlantic region and on third- or fourth-order streams above 800 m elevation in the Central Appalachians. This community is routinely flooded during most high-water events and commonly occurs on low flats associated with the active floodplain, either directly adjacent to the channel or in association with backwater depressions and sloughs. Ice-scour during high winter flows contributes to the open physiognomy of this community. *Carex trichocarpa* is the dominant species in this association. Shrubs may be present but at less than 25% cover, including *Rosa multiflora, Cornus amomum*, and *Rubus allegheniensis*. This type is susceptible to invasion by *Phalaris arundinacea*. Other common herbaceous species include *Solidago gigantea, Boehmeria cylindrica, Dichanthelium clandestinum, Urtica dioica, Polygonum* spp., *Scirpus cyperinus, Euthamia graminifolia* var. *graminifolia, Verbena hastata* var. *hastata, Doellingeria umbellata* var. *umbellata, Asclepias syriaca, Arisaema triphyllum, Onoclea sensibilis*, and *Lilium superbum*. Vines may be present at low cover, including *Polygonum convolvulus* and *Clematis virginiana*.
Comments:
States: NJ, NY, PA, VA, WV.
TNC ecoregions: 60:C, 61:C.
USFS ecoregions: 212Fc:CCC, 221Bc:CCC, 221Bd:CCC.

GRANK & REASONS

GRANK: G4? (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: This community occurs on the upper Delaware River but not on the Susquehanna River (G. Podniesinski pers. comm.). It is critically imperiled (two occurrences, slightly threatened by *Phalaris arundinacea* invasion) in West Virginia. Its status north and east of Pennsylvania is unknown; however, it appears to be relatively common and expanding in the mountainous areas of Virginia. Additional information is needed to determine the global rank with more confidence.

RARITY

Number of EOs: D = 81–300.
Number of EOs Comments: Approximately 82 occurrences estimated from existing EOs on Upper Delaware Scenic and Recreational River, Delaware Water Gap National Recreation Area, and estimates provided by state ecologists.
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Assume 50% or fewer have good viability.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This community occurs in northern New Jersey, northeastern Pennsylvania, southeastern New York, and the Allegheny Mountains region of West Virginia. Measured an area of 115,000 km^2 in GIS.

Area and/or Linear Distance of Occupancy (area): F = 12.5–62.5 km^2 (3,088–15,444 ac).
Area and/or Linear Distance of Occupancy Comments: Approximately 900 ac estimated area of occupancy; this number should be regarded with caution until further data is available. Area of occupancy scaled down by a factor of 8 for small patch communities.

TREND

Short-Term Trend: H = Increase of 10–25%.
Short-Term Trend Comments: Although this association is regarded to be rare in many parts of its range, Virginia ecologists report that *Carex trichocarpa* has been observed to be weedy and aggressive on riverside prairies, decreasing diversity and crowding out rare plants. Since 1960, *C. trichocarpa* was known from only a few locations in Virginia, but is now known from every mountain county, as well as several counties on the piedmont and coastal plain. The relationship of this expansion to the association described here is unknown; however, it is assumed that the association has increased slightly as a result.
Long-Term Trend: U = Unknown.
Long-Term Trend Comments: More information is needed to determine the history of this association over the long term.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	D	Low	Restricted	Moderate
1.1	Housing & urban areas	D	Low	Restricted	Moderate
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	D	Low	Restricted	Moderate
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications	D	Low	Restricted	Moderate
8	Invasive & other problematic species & genes	C	Medium	Large	Moderate
8.1	Invasive nonnative/alien species	C	Medium	Large	Moderate
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				

Threat		Impact (calculated)		Scope	Severity
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Threats are not known for this association in particular, but riverside prairies in general are vulnerable to invasive species, as well as shoreline development and bank stabilization, and impacts of residential development.

NEEDS

Research Needs: Monitoring of *Carex trichocarpa* and of the association is needed to determine whether this association expands at the expense of other rare vegetation.
Inventory Needs: Additional inventory is required to determine the global rank with more confidence. *Carex trichocarpa* has a much broader range than that of the association described here; this association should be searched for more broadly in the northeast.
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Byers et al. 2007, Eastern Ecology Working Group n.d., NRCS 2004, Podniesinski pers. comm.
Reviewers / Contributors: Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006463:
Salix nigra - Betula nigra / Schoenoplectus pungens Wooded Herbaceous Vegetation
Black Willow Alluvial Woodland

Status: Provisional. **Conf.:** 3 - Weak.
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*, often rooted on the uphill side of stands; individuals are flood-battered or toppled, and overhang or extend horizontally into the community. *Betula nigra* is common as a small tree or shrub. The shrub layer is also dominated by *Salix nigra*, sometimes with *Cephalanthus occidentalis*. Herb cover in plots ranges from 10 to 40%, with a large component of wetland indicator species. *Schoenoplectus pungens* is the dominant herb (5–40% cover and high constancy). Additional herbs with high constancy in plots include *Chasmanthium latifolium, Conoclinium coelestinum, Dichanthelium clandestinum, Eleocharis* spp., *Equisetum arvense, Eragrostis hypnoides, Justicia americana, Leersia virginica, Panicum rigidulum, Polygonum caespitosum* var. *longisetum*, and *Saururus cernuus*. Additional characteristic herbs include *Bidens frondosa, Cyperus odoratus, Eleocharis obtusa, Eragrostis pilosa, Hibiscus laevis, Lindernia dubia, Ludwigia palustris, Panicum dichotomiflorum*, and *Vernonia noveboracensis*.
Comments: The nominal species *Schoenoplectus pungens* was previously included in the genus *Scirpus*. 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* 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.
States: WV.
TNC ecoregions: 50:C.
USFS ecoregions: M221Cb:CCC.

GRANK & REASONS

GRANK: G1? (Reviewed and changed 2009-12-21).
This small patch association is known only from the New River Gorge National River, where there are 17 documented occurrences. It is likely that this association has declined over the long term as a result of mining and damming activities. It is suspected to have occurred on the lower Ohio and Kanawha Rivers. Area of occupancy is very small, even accounting for additional EOs not discovered yet. However, additional inventory is required to determine the rank with confidence.

RARITY

Number of EOs: C = 21–80.
Number of EOs Comments: 35 EOs estimated; 17 documented at New River Gorge National River, and others are suspected from elsewhere in West Virginia.
Number of EOs with Good Viability: D = Some (13–40) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: EOs on New River Gorge National River are in good condition and in intact systems.
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: This association is currently known from the New River Gorge National River in West Virginia, with wider distribution in the Central Appalachians, Cumberland, and Western Allegheny Plateau ecoregions possible. Approximately 30,000 km^2 measured on GIS.
Area and/or Linear Distance of Occupancy (area): A = < 0.125 km^2 (<31 ac).
Area and/or Linear Distance of Occupancy Comments: 8 ac mapped at New River Gorge National River, mean patch size approximately 0.5 ac; assume perhaps twice that range-wide or 17 ac (this number is scaled down by a factor of 8 for small patch communities).

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: Damming and mining activities likely reduced the original extent of this association.
Long-Term Trend: E = Decline of 30–50%.
Long-Term Trend Comments: WV ecologist reports that this association was likely to have been present on the lower Ohio and Kanawha Rivers prior to damming.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining	C	Medium	Large	Moderate
3.1	Oil & gas drilling				
3.2	Mining & quarrying	C	Medium	Large	Moderate
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				

Threat		Impact (calculated)		Scope	Severity
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution	D	Low	Restricted	Moderate
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Coal mining and resulting effluent damage riparian systems in general in large parts of West Virginia.

NEEDS

Research Needs:
Inventory Needs: Additional inventory is needed to determine the global rank of this association with confidence.
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007
Reviewers / Contributors: Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006435:
Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation
Appalachian - Alleghenian Sandstone Dry Cliff

Status: Standard. **Conf.:** 3 - Weak.
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, Pinus virginiana, Betula alleghaniensis (= Betula lutea), Rhododendron periclymenoides (= Rhododendron nudiflorum), Kalmia latifolia, Toxicodendron radicans*, and rarely *Hydrangea arborescens*. Herbs are sparse but may include the forbs *Agrostis perennans, Aquilegia canadensis, Mitchella repens, Sedum ternatum*, and *Viola blanda*. *Silene rotundifolia* often occurs at the drip line. Ferns such as *Asplenium montanum, Asplenium pinnatifidum, Asplenium rhizophyllum, Asplenium trichomanes, Cystopteris tenuis, Dennstaedtia punctilobula, Dryopteris intermedia, Dryopteris marginalis, Polypodium virginianum, Polypodium appalachianum, Woodsia obtusa*, and the rare *Asplenium bradleyi* also occur.
Comments: These cliffs are known locally as "rock houses." In Ohio, Anderson (1996) provides several references to lichen composition on sandstone cliffs.
States: OH, MD, PA, WV.
TNC ecoregions: 49:C, 50:C, 59:C.
USFS ecoregions: 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, M221Ac:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G4Q (Reviewed and changed 2009-12-29).
Assigned Rank Reasons: This vegetation appears to be fairly common in the central Appalachians and western Alleghenies, where sandstone and other acidic rock have fractured to form steep cliffs. The inaccessibility of cliff settings in general affords protection from commercial and residential development. The greatest threats are likely those caused by rock climbers at recreational sites. The taxonomic relationship of this association to CEGL004931 (*Asplenium montanum* Central Appalachian Sandstone Sparse Vegetation) must be resolved before the conservation status rank can be determined with greater confidence. It is likely that there is some overlap between the two associations.

RARITY

Number of EOs: E = >300.
Number of EOs Comments: 100 occurrences are estimated in OH; similar numbers are expected in PA and WV.
Number of EOs with Good Viability:
Number of EOs with Good Viability Comments:
Number of Protected EOs:
Range Extent: F = 20,000–200,000 km^2 (~8,000–80,000 mi^2).
Range Extent Comments: Measured range extent in GIS yielded approximately 100,000 km^2. This association is currently documented from the Western Allegheny Plateau and central

Appalachian Mountains of the United States, extending to the New River Gorge National River in West Virginia.
Area and/or Linear Distance of Occupancy (area): F = 2.5–12.5 km^2 (618–3,088 ac).
Area and/or Linear Distance of Occupancy Comments: Area of Occupancy scaled down by a factor of 8 for small patch vegetation.

TREND

Short-Term Trend: G = Relatively Stable (<=10% change).
Short-Term Trend Comments:
Long-Term Trend: G = Relatively Stable (<=10% change).
Long-Term Trend Comments: It is likely that the inaccessibility of cliff settings has protected these sites from decline.

THREATS

Residential & commercial development	C	Medium	Large	Moderate
Housing & urban areas				
Commercial & industrial areas				
Tourism & recreation areas	C	Medium	Large	Moderate
Agriculture & aquaculture				
Annual & perennial non-timber crops				
Wood & pulp plantations				
Livestock farming & ranching				
Marine & freshwater aquaculture				
Energy production & mining				
Oil & gas drilling				
Mining & quarrying				
Renewable energy				
Transportation & service corridors				
Roads & railroads				
Utility & service lines				
Shipping lanes				
Flight paths				
Biological resource use				
Hunting & collecting terrestrial animals				
Gathering terrestrial plants				
Logging & wood harvesting				
Fishing & harvesting aquatic resources				
Human intrusions & disturbance				
Recreational activities				
War, civil unrest & military exercises				
Work & other activities				
Natural system modifications				
Fire & fire suppression				
Dams & water management/use				
Other ecosystem modifications				
Invasive & other problematic species & genes				
Invasive nonnative/alien species				
Problematic native species				
Introduced genetic material				
Pollution				
Household sewage & urban waste water				
Industrial & military effluents				
Agricultural & forestry effluents				
Garbage & solid waste				
Air-borne pollutants				
Excess energy				
Geological events				
Volcanoes				
Earthquakes/tsunamis				

Residential & commercial development	C	Medium	Large	Moderate
Avalanches/landslides				
Climate change & severe weather				
Habitat shifting & alteration				
Droughts				
Temperature extremes				
Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: The inaccessibility of cliff environments in general minimizes the risk of development; however, rock climbing at recreation areas can pose a moderate threat of trampling.

NEEDS

Research Needs: Plot data should be collected on acidic cliffs in the central Appalachians, and compared with that of other related vegetation to resolve taxonomic questions.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-29. **Version Author:** L. Sneddon.
References: Anderson 1996, Eastern Ecology Working Group n.d., Perles et al. 2007, Sneddon and Menard 2002, Vanderhorst et al. 2007.
Reviewers Contributors: Jim Drake (NatureServe), Gary Fleming and Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL008449:
Pinus virginiana - Juniperus virginiana var. virginiana - Quercus stellata / Amelanchier stolonifera / Danthonia spicata / Leucobryum glaucum Woodland
Appalachian / Northern Piedmont Riverside Outcrop Woodland

Status: Standard. **Conf.:** 2 - Moderate.

Summary: This community occupies exposed, xeric outcrops along high-gradient stretches of the New River Gorge National River in West Virginia and the Potomac River in Maryland and northern 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. In West Virginia stands, the open canopy is dominated by about equal amounts of *Juniperus virginiana* var. *virginiana* and *Pinus virginiana*. Associated deciduous tree species include *Quercus stellata, Fraxinus americana, Celtis occidentalis, Ulmus americana*, and *Cercis canadensis*. The dense shrub layer includes *Amelanchier stolonifera, Rhus copallinum, Rosa carolina*, and *Viburnum prunifolium*. Vines include *Toxicodendron radicans, Parthenocissus quinquefolia*, and *Vitis aestivalis*. The exotics *Ligustrum vulgare, Rubus phoenicolasius, Lonicera japonica*, and *Rosa multiflora* may also be present. The herbaceous layer has high representation of grasses; species include *Andropogon virginicus, Danthonia spicata, Leersia virginica, Melica mutica*, and *Piptochaetium avenaceum*. The fern ally *Selaginella rupestris* may also contribute significant ground cover. Cover by mosses and lichens is variable and may approach 90%. The Potomac Gorge stands are woodlands or open forests of stunted trees (usually 7 m tall or less). The overstory may be strongly dominated by *Pinus virginiana* or by a mix of *Pinus virginiana, Carya glabra, Quercus prinus, Quercus rubra*, and *Quercus stellata*. *Fraxinus americana* and *Juniperus virginiana* var. *virginiana* are minor, but constant, associates and are most often limited to the subcanopy, where *Juniperus virginiana* var. *virginiana* is often abundant. A sparse tall-shrub layer is present, with *Chionanthus virginicus, Viburnum prunifolium, Amelanchier arborea*, and *Rhus copallinum* most frequent. A short-shrub layer is often present and dominated by *Vaccinium pallidum*; *Hypericum prolificum, Rosa carolina*, and *Amelanchier stolonifera* are less frequent. The herbaceous layer is somewhat sparse to moderately dense, with *Danthonia spicata* the most abundant species, and *Carex umbellata, Carex tonsa* var. *tonsa, Carex nigromarginata, Helianthus divaricatus, Comandra umbellata, Solidago ulmifolia, Eupatorium hyssopifolium* var. *laciniatum, Potentilla canadensis, Silene caroliniana, Stylosanthes biflora, Symphyotrichum patens (= Aster patens), Dichanthelium laxiflorum, Dichanthelium depauperatum, Dichanthelium commutatum, Dichanthelium sphaerocarpon, Dichanthelium villosissimum, Houstonia caerulea*, and *Houstonia longifolia* often present. Vines are occasional; *Smilax glauca* and *Vitis aestivalis* are the most frequent species.

Comments: This community was first 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* 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). In 2007, as part of the NCR parks vegetation mapping project, ecologists at VDNH and WVNHP compared classifications of the New River Gorge National River and Potomac Gorge stands. They agreed that, both compositionally and environmentally, the vegetation of the two areas was very similar and should be treated as a single USNVC association. Plots of the Potomac Gorge vegetation were examined in a large regional dataset assembled for the NCR project and performed as a discrete group.
States: MD, VA, WV.
TNC ecoregions: 50:C, 61:C.
USFS ecoregions: 221Db:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G1 (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: The natural distribution of this community has no doubt always been extremely limited by its high environmental specificity and restriction to high-gradient river gorges. There are currently only two occurrences of this vegetation known (New River Gorge National River and occurrences on the Maryland and Virginia sides of the Potomac) totaling less than 100 hectares in aggregate. 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 regimes since building of Bluestone Dam in 1949. Succession of this community towards deciduous woodland has been very slow, probably due to shallow, droughty soils and occasional catastrophic flooding impacts. Occurrences of this community are in extremely rocky areas which are protected and not vulnerable to resource extraction, conversion, or development; however, these areas may be impacted by trampling associated with recreational activities. Currently stands of this association are probably most threatened by encroachment of exotic weeds such as *Lonicera japonica, Rubus phoenicolasius*, and *Rosa multiflora*.

RARITY

Number of EOs: A = 1–5.
Number of EOs Comments: The patches on either side of the Potomac River may considered as a single occurrence. Only one other is known, on the New River Gorge National River of West Virginia.
Number of EOs with Good Viability: B = Very few (1–3) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Long-term viability of the occurrence at New River Gorge National River is unknown. The natural flooding regime has been altered over the long term by the establishment of the Bluestone dam decades ago. In addition, the occurrence was subjected to several experimental treatments in 2002, including a controlled burn. An increase in the exotic plant *Rubus phoenocolasius* was noted following the burn.
Number of Protected EOs:
Range Extent: E = 5,000–20,000 km^2 (~2,000–8,000 mi^2).

Range Extent Comments: This community is currently restricted to the New River Gorge National River of West Virginia and the Potomac Gorge in Maryland and Virginia. A polygon measured in GIS from the New River Gorge National River to the occurrence on the Potomac River yielded approximately 14,000 km^2.
Area and/or Linear Distance of Occupancy (area): A = <1 km^2.
Area and/or Linear Distance of Occupancy Comments: A total of 60 ac (0.24 km^2) from the two known occurrences was determined from NPS vegetation maps at Chesapeake and Ohio Canal National Historical Park and New River Gorge National River.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: The New River Gorge National River occurrence has been subjected to a decrease in ecological integrity in the form of increasing cover of the exotic plant *Rubus phoenocolasius* following a controlled burn in 2002.
Long-Term Trend: U = Unknown.
Long-Term Trend Comments: The long-term history of this vegetation is not known, but its natural distribution has always been limited by its environment. At New River Gorge National River, the composition and structure of this vegetation may have been quite different prior to dam construction, but was not likely to have been more extensive than it is today.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance	C	Medium	Large	Moderate
6.1	Recreational activities	C	Medium	Large	Moderate
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications	C	Medium	Restricted	Serious
7.1	Fire & fire suppression				
7.2	Dams & water management/use	C	Medium	Restricted	Serious
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				
8.3	Introduced genetic material				

Threat		Impact (calculated)		Scope	Severity
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): B = High.
Threat comments: The long-term impact of restricted peak flow imposed by the Bluestone Dam at New River Gorge National River is unknown. Flooding regime here was likely to have been erratic due to the terrace position on the channel, but when it did occur, flooding was high energy and would have caused scour and natural disturbance. This vegetation continues to be subjected to trampling by park visitors at New River Gorge National River and at the Potomac Gorge. Fleming (2007) reports that a popular cliff-top trail runs through this vegetation at Great Falls, and as a result of excessive trampling, it was difficult to locate vegetation to sample adequately.

NEEDS

Research Needs: Monitoring effects of experimental treatments at New River Gorge National River.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Eastern Ecology Working Group n.d., Fleming 2007, Gellerstedt and Johnson 2005, Lea 2000, Lea 2004, 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.
Reviewers / Contributors: Gary Fleming (Virginia Division of Natural Heritage), Jason Harrison (Maryland Natural Heritage Program), Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL003725:
Platanus occidentalis - Betula nigra / Cornus amomum / (*Andropogon gerardii, Chasmanthium latifolium)* Woodland
Appalachian / Cumberland Sycamore - Birch Riverscour Woodland

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Status: Standard. **Conf.:** 2 - Moderate.
Summary: These woodlands occur along high-energy Appalachian rivershores, such as along the New, Bluestone, and Gauley rivers 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* and *Betula nigra*. 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, Carpinus caroliniana, Catalpa speciosa, Diospyros virginiana, Fraxinus americana, Fraxinus pennsylvanica, Robinia pseudoacacia, Salix nigra, Ulmus americana*, and *Ulmus rubra*. Common shrubs include *Alnus serrulata, Cephalanthus occidentalis, Chionanthus virginicus, Cornus amomum, Hypericum prolificum, Lindera benzoin*, and *Salix caroliniana*. There is often a large component of woody vines, including *Campsis radicans, Toxicodendron radicans*, and *Vitis rupestris*. 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, Apocynum cannabinum, Baptisia australis, Chasmanthium latifolium, Conoclinium coelestinum, Cryptotaenia canadensis, Dichanthelium clandestinum, Eupatorium fistulosum, Galium triflorum, Justicia americana, Lobelia cardinalis, Lysimachia ciliata, Onoclea sensibilis, Packera aurea, Panicum virgatum, Pilea pumila, Rudbeckia laciniata, Solidago gigantea, Solidago juncea, Symphyotrichum prenanthoides, Tradescantia ohiensis, Tripsacum dactyloides, Verbesina alternifolia*, and *Viola cucullata*.
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*, and occurs on sites less severely impacted by flooding. It is also similar to *Salix nigra - Betula nigra / Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463), which occurs on finer textured alluvium in riverside positions along lower energy reaches. Similar vegetation was described from the New River Gorge National River by Suiter (1995) as *Platanus occidentalis - Betula nigra* forest. Two phases of this association can be recognized along the Bluestone River and its tributaries. Stands on cobble and boulder substrate, which are subject to more frequent, higher energy floods, have more open canopies and relatively sparse herb layers with *Andropogon gerardii* prominent in late season. Stands on sand substrate, which are subject to less frequent, lower energy floods, have taller, more closed canopies, often dominated by *Betula nigra*, over lush, tall herb layers with abundant *Dichanthelium clandestinum* and *Chasmanthium latifolium*. The tough-rooted, flood-tolerant *Carex emoryi* often grows in a line along the riverside edge of this association, sometimes beyond the woodland canopy. These zones are included within the association concept presented here. 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 classified as *Platanus occidentalis - Betula nigra - Salix (caroliniana, nigra)* Woodland (CEGL003896).
States: WV.
TNC ecoregions: 50:C, 59:C.
USFS ecoregions: M221Be:CCC, M221Ca:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G3 (Reviewed and changed 2009-12-21).
Assigned Rank Reasons: This vegetation is known from only two locations, one on the New River Gorge National River in West Virginia, and from Maryland and Virginia on both sides of the Potomac River. It occurs in small patches.

RARITY

Number of EOs: B = 6–20.
Number of Eos Comments: Number of occurrences is difficult to estimate, since this association is mapped as a part of several different map units on the three National Park vegetation maps. The linear features supporting this association (steep riparian edge at New River Gorge National River, and Floodplain Forest and Woodland at Bluestone National Scenic River) extend the length of the parks with no separation distances of >0.5km between segments. However, a conservative estimate is 4 to 6 occurrences per park.
Number of EOs with Good Viability: C = Few (4–12) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Although there are likely to be fewer than 20 occurrences range-wide, most known occurrences are on National Park lands and in areas of good ecological integrity.
Number of Protected EOs:
Range Extent: D = 1,000–5,000 km^2 (~400–2,000 mi^2).
Range Extent Comments: This type is currently documented from high-energy Appalachian rivers, and appears to be restricted to the New, Bluestone, and Gauley rivers in West Virginia. It is possible that the range may include some of western Virginia as well, but this type is not currently known from Virginia.
Area and/or Linear Distance of Occupancy (area): D = 21–100 1-km^2 grid cells linear distance of occupancy.
Area and/or Linear Distance of Occupancy Comments: Estimate is derived from measurement of steep riparian zone map unit of New River Gorge National River, riparian zone map unit of Gauley River National Recreation Area , and Floodplain Forest and Woodland map unit of Bluestone National Scenic River. Approximately 24% of the total distance, plus an additional 5 km outside of park boundaries, is estimated to support this vegetation. The estimate of 41 km is based on the report that 24% of accuracy assessment points of the Bluestone National Scenic River map unit are comprised of this vegetation.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: WV ecologist reports that this vegetation is declining; more information regarding trends is needed.
Long-Term Trend: F = Decline of 10–30%.

Long-Term Trend Comments: WV ecologist reports that this vegetation has declined over the long term; more information regarding trends is needed.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development				
1.1	Housing & urban areas				
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors				
4.1	Roads & railroads				
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications				
7.1	Fire & fire suppression				
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes	D	Low	Restricted	Slight
8.1	Invasive nonnative/alien species	D	Low	Restricted	Slight
8.2	Problematic native species				
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): D = Low.
Threat comments: The invasive plant *Rosa multiflora* was reported on Bluestone National Scenic River, but the lack of soil development is not generally conducive to invasive species establishment.

NEEDS

Research Needs:
Inventory Needs: Additional inventory is needed on high-energy rivers of western Virginia.
Protection Needs:

SOURCES

Version Date: 2009-12-21. **Version Author:** L. Sneddon.
References: Fleming et al. 2001, Mitchem 2004, Southeastern Ecology Working Group n.d., Suiter 1995, Vanderhorst 2000b, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst pers. comm.
Reviewers / Contributors: Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

CEGL006462:
Quercus (*rubra, velutina, alba*) / *Carpinus caroliniana* - (*Halesia tetraptera*) / *Maianthemum racemosum* Forest
Oak-Hickory Floodplain Forest

Status: Standard. **Conf.:** 3 - Weak.
Summary: This association is a closed-canopy to somewhat open-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, Quercus velutina, Quercus alba, Liriodendron tulipifera*, and *Acer saccharum*. Additional trees which may occur in the canopy and subcanopy include *Acer rubrum, Carya alba, Carya cordiformis, Carya ovata, Fagus grandifolia, Fraxinus pennsylvanica, Juglans nigra, Magnolia acuminata, Magnolia tripetala, Nyssa sylvatica, Platanus occidentalis, Prunus serotina* var. *serotina*, and *Ulmus americana*. The small tree *Halesia tetraptera* is dominant in some areas as a well-developed tall-shrub layer and may extend into the tree subcanopy. Additional shrubs include *Carpinus caroliniana, Dirca palustris, Hamamelis virginiana, Lindera benzoin, Smilax rotundifolia*, and *Viburnum prunifolium*. Characteristic herbs include *Ageratina altissima, Amphicarpaea bracteata, Arisaema triphyllum, Cynoglossum virginianum, Dichanthelium boscii, Eurybia divaricata, Galium circaezans, Galium triflorum, Hydrastis canadensis, Maianthemum racemosum, Packera aurea, Sedum ternatum*, and *Verbesina alternifolia*.
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* and other mesophytic species in the understory.
States: WV.
TNC ecoregions: 50:C, 59:C.
USFS ecoregions: M221Be:CCC, M221Cb:CCC.

GRANK & REASONS

GRANK: G1 (Reviewed and changed 2009-12-17).
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.

RARITY

Number of EOs: B = 6–20.
Number of EOs Comments: <10 occurrences estimated by WV ecologist.
Number of EOs with Good Viability: C = Few (4–12) occurrences with excellent or good viability or ecological integrity.
Number of EOs with Good Viability Comments: Occurrences within Gauley River National Recreation Area, New River Gorge National River, and Bluestone National Scenic River are generally in settings of high or moderately high ecological integrity, Condition of occurrences outside the parks is unknown.

Number of Protected EOs:
Range Extent: D = 1,000–5,000 km^2 (~400–2,000 mi^2).
Range Extent Comments: Approximately 650 mi^2 (1683 km^2) by measuring polygon around area enclosing New River Gorge National River, Gauley River National Recreation Area , and Bluestone National Scenic River. This association is currently known only from West Virginia along the New, Bluestone, and Gauley rivers.
Area and/or Linear Distance of Occupancy (area): A = <1 km^2.
Area and/or Linear Distance of Occupancy comments: Approximately 150 ac or 0.6 km^2 (56 ac at New River Gorge National River, 7 ac at Gauley River National Recreation Area , 28 ac at Bluestone National Scenic River - assuming 20% of Floodplain forest and woodland is this type) plus additional 50 ac on potential habitat on steep slopes along large rivers.

TREND

Short-Term Trend: F = Decline of 10–30%.
Short-Term Trend Comments: Railroad and road grades and agriculture reduced this community at New River Gorge National River, Gauley River National Recreation Area , and Bluestone National Scenic River.
Long-Term Trend: F = Decline of 10–30%.
Long-Term Trend Comments: This association has been reduced by railroad and road construction, as well as by agriculture.

THREATS

Threat		Impact (calculated)		Scope	Severity
1	Residential & commercial development	C	Medium	Restricted	Serious
1.1	Housing & urban areas	C	Medium	Restricted	Serious
1.2	Commercial & industrial areas				
1.3	Tourism & recreation areas				
2	Agriculture & aquaculture				
2.1	Annual & perennial non-timber crops				
2.2	Wood & pulp plantations				
2.3	Livestock farming & ranching				
2.4	Marine & freshwater aquaculture				
3	Energy production & mining				
3.1	Oil & gas drilling				
3.2	Mining & quarrying				
3.3	Renewable energy				
4	Transportation & service corridors	C	Medium	Restricted	Serious
4.1	Roads & railroads	C	Medium	Restricted	Serious
4.2	Utility & service lines				
4.3	Shipping lanes				
4.4	Flight paths				
5	Biological resource use				
5.1	Hunting & collecting terrestrial animals				
5.2	Gathering terrestrial plants				
5.3	Logging & wood harvesting				
5.4	Fishing & harvesting aquatic resources				
6	Human intrusions & disturbance				
6.1	Recreational activities				
6.2	War, civil unrest & military exercises				
6.3	Work & other activities				
7	Natural system modifications			Large	Unknown
7.1	Fire & fire suppression			Large	Unknown
7.2	Dams & water management/use				
7.3	Other ecosystem modifications				
8	Invasive & other problematic species & genes				
8.1	Invasive nonnative/alien species				
8.2	Problematic native species				

Threat		Impact (calculated)		Scope	Severity
8.3	Introduced genetic material				
9	Pollution				
9.1	Household sewage & urban waste water				
9.2	Industrial & military effluents				
9.3	Agricultural & forestry effluents				
9.4	Garbage & solid waste				
9.5	Air-borne pollutants				
9.6	Excess energy				
10	Geological events				
10	Volcanoes				
10	Earthquakes/tsunamis				
10	Avalanches/landslides				
11	Climate change & severe weather				
11	Habitat shifting & alteration				
11	Droughts				
11	Temperature extremes				
11	Storms & flooding				

Threat (calculated): C = Medium.
Threat comments: Position on high floodplain continues to be targeted for conversion/development outside NPS lands; roads and railroads may affect this association outside NPS lands. This association may be decreasing (or already decreased) due to reduced peak flows caused by damming of large rivers.
Assigned Rank Reasons: This association is a small-patch high floodplain terrace forest known only from the Gauley, New, and Bluestone Rivers in West Virginia. It has been reduced in extent by agriculture from the eighteenth century until the middle of twentieth century, and more recently has been further reduced by the construction of a railroad in the Gauley River valley. Fewer than ten occurrences are estimated, covering less than one km^2 in area. Continued threats include housing development and road construction outside of NPS lands. Dams on these rivers have reduced peak flow, and it is possible that this lack of natural flooding will further reduce the extent of this vegetation.

NEEDS

Research Needs: Long-term impacts from reduced peak flow caused by dams.
Inventory Needs:
Protection Needs:

SOURCES

Version Date: 2009-12-17. **Version Author:** L. A. Sneddon.
References: Eastern Ecology Working Group n.d., Vanderhorst et al. 2007, Vanderhorst et al. 2008.
Reviewers / Contributors: Gary Fleming and Karen Patterson (Virginia Division of Natural Heritage), Jim Vanderhorst (West Virginia Natural Heritage Program).

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