

**Classification and Conservation Assessment of High Elevation  
Wetland Communities in the Allegheny Mountains of West Virginia**



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## Table of Contents

<b>ABSTRACT .....</b>	<b>4</b>
<b>ACKNOWLEDGEMENTS.....</b>	<b>5</b>
<b>INTRODUCTION.....</b>	<b>5</b>
Background and objectives.....	5
Ecological communities and conservation.....	6
<b>METHODOLOGY.....</b>	<b>7</b>
Sampling plan .....	7
Field methods .....	8
Analysis methods .....	9
Collections and data entry.....	9
Statistical analysis.....	10
Integration into the National Vegetation Classification .....	12
Conservation Ranking.....	12
Mapping and assessing the quality of occurrences .....	13
Dissemination of results .....	13
<b>STUDY AREA.....</b>	<b>13</b>
Ecoregional context .....	15
Physical characteristics .....	17
<b>Fauna .....</b>	<b>21</b>
Mammals .....	21
Birds.....	22
Amphibians and reptiles .....	23
Invertebrates .....	24
Land Snails.....	24
Crayfish.....	24
Dragonflies and Damselflies .....	25
Butterflies and Moths.....	25
Other Insects and Springtails .....	26
Spiders and Harvestmen.....	27
<b>Flora.....</b>	<b>27</b>
<b>Landscape change.....</b>	<b>29</b>

**RESULTS ..... 32**

**Ecological systems.....34**  
High Allegheny Wetland .....34  
Central Appalachian Stream and Riparian .....37  
Central and Southern Appalachian Spruce-Fir Forest.....38  
Appalachian (Hemlock)-Northern Hardwood Forest.....38

**Communities with global conservation importance .....39**  
Critically imperiled .....39  
    Balsam Fir - Black Ash Swamp .....39  
    Bog-rosemary Peatland .....40  
    Monongahela Barbara's-buttons Riverscour Prairie .....41  
Imperiled.....42  
    Balsam Fir - Oatgrass Swamp .....42  
    Balsam Fir - Winterberry Swamp .....43  
    Cranberry - Beakrush Peatland .....44  
    Nodding Sedge – Prickly Bog Sedge Seep .....45  
    Pitch Pine - Heath Peat Woodland .....46  
    Red Spruce - Hemlock - Great Laurel Swamp.....47  
    Red Spruce – Southern Mountain Cranberry Swamp .....49  
    Red Spruce - Three-seeded Sedge Peat Woodland .....50  
    Star Sedge Fen .....51  
Vulnerable.....52  
    American Bur-reed Marsh.....52  
    Cottongrass Fen.....53  
    Golden Saxifrage Seep.....54  
    Hairy-fruit Sedge Floodplain Prairie.....55  
    Rough Sedge Seep .....56  
    Red Spruce – Heath Peat Woodland .....57  
    Red Spruce - Yellow Birch - Mannagrass Swamp.....58  
    Twisted Sedge Riverscour Prairie .....59

**Communities with state conservation importance.....60**  
Critically imperiled .....60  
    Lake Sedge Fen.....60  
    Tamarack Swamp.....61  
Imperiled.....62  
    Beaked Sedge Fen .....62  
    Bluejoint Grass Wet Meadow .....63  
    Silvery Sedge Fen .....64  
    Softstem Bulrush Marsh.....65  
    Steeplebush Shrub Swamp.....66  
Vulnerable.....67  
    Blueberry - Bracken Fern Shrub Swamp .....67  
    Bushy St. Johnswort Shrub Swamp .....68  
    Chokeberry - Northern Wild Raisin Shrub Peatland .....69  
    Cinnamon Fern Seep .....70  
    Goldenrod Wet Meadow .....71  
    Meadowsweet Shrub Swamp .....72  
    Quaking Aspen Swamp.....73  
    Rice Cutgrass Marsh .....75  
    Silky Willow Shrub Swamp.....75  
    Speckled Alder Shrub Swamp .....76  
    Speckled Alder - Arrowwood Shrub Swamp .....78  
    Threeway Sedge Fen.....79

Tussock Sedge Wet Meadow .....	80
Woolgrass Wet Meadow .....	81

**LITERATURE CITED..... 82**

**Tables**

- Table 1. Conservation rank definitions
- Table 2. Site-specific references for high Allegheny wetlands in West Virginia
- Table 3. High elevation wetland communities and conservation ranks

**Figures**

- Figure 1. Rarity-weighted species richness in the northeastern states
- Figure 2. Elevation map with plot locations
- Figure 3. 30-year average precipitation map with study area
- Figure 4. Geologic profile of dipping resistant strata in high elevation wetlands
- Figure 5. Successional wetland model for Canaan Valley National Wildlife Refuge

**Appendices**

- A. Sample plot data collection field form
- B. Soil chemistry by community type
- C. Samples of statistical results used in community classification
- D. Key to the high elevation wetlands of the Allegheny Mountain region
- E. Annotated bibliography
- F. Animal species records and conservation ranks
- G. Plant species records and conservation ranks
- H. Floristic tables by community type
- I. Detailed state and National Vegetation Classification descriptions of wetland associations

**Abstract**

Wetland communities above 730 meters (2400 feet) elevation in the Allegheny Mountain region of West Virginia are characterized by exceptionally high biodiversity and conservation value. A new ecological system for the High Allegheny Wetlands and 41 classified wetland associations were classified, ranked for conservation purposes, and published in the National Vegetation Classification. Eleven of these associations represent wetland types that are new to the national system. Twenty of the types have high global conservation priority, and the remaining 21 types have high state conservation priority. The highest conservation priorities at both the global and state levels are forested conifer and mixed swamps, ancient peatlands, and an ice-scour community. Documented species occurrences in the study area include 590 animal species and more than 900 plant species. Rare taxa include five mammals, 13 breeding birds, one reptile, three amphibians, two snails, two crayfish, 58 dragonflies and damselflies, six butterflies, four spiders, and 145 species of vascular plants. The study was undertaken by the West Virginia Division of Natural Resources with financial assistance from the U.S. Environmental Protection Agency.

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## Introduction

### ***Background and objectives***

The purpose of this project was to classify, document, map, and rank occurrences of high elevation wetland communities of the Allegheny Mountains in West Virginia. The results provide a framework for assessing conservation priorities and serve as a baseline for assessing wetland health and functions related to biological diversity. The project also developed protocols, infrastructure, and technologies that can be applied to future assessments of natural communities in our state.

For this project, high elevation wetlands are defined as headwater and riparian palustrine habitats over 730 meters (2,400 feet) in elevation in the Allegheny Mountain region of West Virginia. Although subsets of West Virginia's high elevation wetlands have been studied by several workers (e.g., Ceperley 2002, Darlington 1943, Francl 2003, Fortney 1975, Walbridge 1982), none have presented a comprehensive conservation assessment and classification of community types. Lack of a wetland community classification and standards for ranking individual occurrences are impediments to the success of our state's wetland protection programs. To address this need, we integrated existing data with field data collected during this project to classify and characterize the high elevation wetland community types and rank individual occurrences. By collecting and analyzing plot data according to standards established for contributions to the National Vegetation Classification (Ecological Society of America 2004), this project also contributes to regional and national conservation assessments.

The project was supported by grant CD-98381801 from the U.S. Environmental Protection Agency (EPA), with matching funds from the West Virginia Division of Natural Resources (WVDNR). Staffing consisted of a Project Leader and Project Assistant, working under the supervision of the WVDNR Natural Heritage Program Ecologist. The project was initiated in August 2003, and personnel were hired in March 2004. Field work was conducted during June through September in 2004 and 2005. A one-year budget extension was granted by EPA through the end of 2007, to allow the completion of data synthesis, mapping, and reporting.

### ***Ecological communities and conservation***

Ecological communities are groups of organisms (plants, animals, fungi, and microbes) that live together in a particular physical environment. Conservation of ecological communities is important because communities maintain processes and food pathways necessary for survival of many interdependent species. Communities provide habitat for a multitude of common and poorly known organisms that are not the focus of individual species conservation efforts.

Terrestrial ecological communities are classified based on vegetation because plants are the least transient, most observable life form in these systems. Plant communities repeat across the landscape under similar environmental conditions, and present recognizable habitat units that can be described and mapped. The West Virginia Natural Heritage Program is developing a vegetation classification to use as the basis for tracking and ranking occurrences of all types of terrestrial ecological communities in the state. Our classification is consistent with the U.S. National Vegetation Classification, which is maintained by NatureServe, a nonprofit organization providing biodiversity information for conservation.

The West Virginia Natural Heritage Program, part of the Wildlife Resources Section of the WVDNR, conducts inventories for, maps, and maintains databases on the natural biological diversity of the state, including natural ecological communities and rare plants and animals. Natural Heritage Program ecologists track occurrences of rare ecological communities as well as high quality examples of common natural communities. Rarity is determined from both state and global perspectives. The quality of an occurrence is determined by its size, environmental condition, and landscape context. Natural Heritage Program data is provided to government

agencies, conservation organizations, researchers, educators, developers, and private landowners to inform and encourage conservation of biodiversity in our state.

## **Methodology**

### ***Sampling plan***

A Quality Management Plan and Quality Assurance Project Plan were completed on 16 September 2002. All project activities and methods comply with these plans.

Prior to the first field season, we collected existing quantitative vegetation plot data and assessed its suitability for classification purposes. Data sets were screened to determine whether they could be combined with the WV Natural Heritage Program standard plot data for multivariate statistical analyses. The Natural Heritage database contained an initial 100 plots. Published plot data existed for Cranesville Swamp (Robinette 1964) and for wetlands at Big Run Bog, Cupp Run, Tub Run, and Laurel Run (Walbridge 1982). Several researchers generously contributed unpublished plot data from high elevation wetlands in Blister Swamp (Berdine 1999), Canaan Valley (CVI 2004, Rentch 2003, Rentch 2005), Cranesville Swamp (Berdine 1995), Monongahela National Forest (USFS 2005), and the Central Appalachians (Ceperley 2002, Franc 2004).

Based on our review of literature and original data sources, we determined which wetlands were already adequately sampled and which required additional sampling. Additional sources for identifying target wetlands included interviews with experienced surveyors and biologists, USGS topographic maps, USFWS National Wetland Inventory maps, 1997 infrared aerial photography, 2003 true-color aerial photography, NRCS soil survey maps, Natural Heritage rare species records, and a state wetland synopsis (McDonald 1982).

Plot locations were stratified to sample the diversity of high elevation wetland community types across their range in the state. We did not sample every community occurrence at every wetland, but rather a large enough subset to develop a comprehensive classification, document abundance and variation of individual community types across their range in the state, and assess relative quality of individual occurrences. High elevation wetlands in West Virginia are mostly on public lands including the Monongahela National Forest, the Canaan Valley National Wildlife Refuge, Canaan Valley State Park, and Blackwater Falls State Park. Additional large areas of wetlands are owned by The Nature Conservancy, by corporations (e.g. MeadWestVaCo) and by private individuals. We obtained all needed permissions and permits before conducting surveys. The results of this project should yield benefits for all of these cooperators, in terms of better understanding of the wetland types present on their land, the quality and rarity of these wetlands, and the ecological processes that maintain them.

After a wetland was chosen for field inventory, we reviewed aerial photography, maps, and written sources of information to identify the presence and distribution of individual stands (occurrences of putative community types) as indicated by photographic signatures and environmental, physiognomic, and floristic patterns. During the project, an additional 280 plots were field sampled, with particular emphasis on gaps in the existing data set. A total of 780

quantitative plot samples were assembled from published sources, unpublished sources, and project field sampling.

Animal data linked to specific habitat types was sparse within the project area; however, prior to the project onset we compiled existing small mammal data (Francl et al. 2003) and bird point count data (WVPIF 2006). Interviews and informal reports from experienced biologists (Donna Mitchell, Thomas Pauley, Rob Tallman, Craig Stihler, and Jennifer Wykle) supplemented our understanding of animal use prior to field sampling.

## ***Field methods***

We sampled wetland communities in compliance with standards for vegetation field plots established by the Ecological Society of America (2004) for describing and classifying associations in the U.S. National Vegetation Classification. Specific sampling protocols are described by Sneddon (1994). Plot locations were carefully selected in the field to be homogenous and representative of their stand. Most plots measured 20 x 20 meters, but size and shape were altered as necessary to accommodate small patch and linear communities. Coordinates for the center of each plot were collected using a Trimble GeoExplorer Global Positioning System (GPS).

Two hundred and eighty plots were sampled during 2004-2006. Four types of data were collected: metadata, environmental data, vegetation data, and animal data. Metadata documented the plot identifiers, methods and equipment used, surveyors' names, sampling date and time, photographic record, location information, and GPS data. A sample plot data collection form is included as Appendix A.

Environmental data included hydrologic descriptors, aspect, elevation, slope, slope shape, landform, Cowardin system (Cowardin et al. 1979), surficial geology, hummock microtopography, topographic position, and stand size. Soil information included a profile description, texture determined by hand in the field, pH determined in the field, horizon, color, stoniness, and depth of organic soil. Hydric soil indicators were noted as per USDA (2003). Soil samples were collected from the top 10 cm of the mineral horizon, or from the upper peat horizon if no mineral soil was present, for chemical analysis in the lab. Each soil sample was composited from four locations in the plot. Pore water was tested for pH, electrical conductivity, and temperature in the field using a WTW pH/Conductivity 340i probe. We also made a qualitative written evaluation detailing whether the plot was representative of the community as a whole, the overall environmental condition of the plot, and its landscape context. Both natural and anthropogenic disturbances and threats were noted, and an overall quality rank was assigned to each stand.

Vegetation data included information on physiognomy (structure) and species composition. Dominant leaf type, leaf phenology, and physiognomic class were noted, along with the height and total cover in each stratum (canopy, subcanopy, tall shrub, short shrub, herbaceous, and nonvascular). Percent cover in each stratum and total cover by each vascular plant species in a plot was determined by ocular estimation. We recorded the diameter at breast height (dbh) for all woody species with dbh of 7 cm or greater. A few trees were cored in each

forested plot to help determine stand age and growth rates. Bryophytes and lichens were recorded for species having greater than 1% cover. Unknown plant and lichen taxa were collected for identification in the herbarium or by specialists.

Animal data was collected on an opportunistic basis. We used sweep nets to collect invertebrates occupying the above-ground vegetation in each plot. When odonates (dragonflies and damselflies) were present in a community, we attempted to capture them with nets, and were often successful. We noted animal sign such as scat, trails, browsed vegetation, or beaver impacts. Dragonflies, butterflies, spiders, and insects were preserved and/or mounted and sent to experts for identification. Small mammals and crayfish were trapped at Cranberry Glades using a combination of live traps and pit traps.

## ***Analysis methods***

### **Collections and data entry**

Vascular plants that could not be identified in the field were collected and later identified in the WVDNR herbarium. A few difficult specimens were taken to the WVU herbarium for comparison with other vouchers, or were examined by experts, e.g., *Carex* sect. *ovales* identifications were confirmed by R.F.C. Naczi of Delaware State University. Bryophyte specimens were identified by Susan M. Studlar of West Virginia University, and lichens were identified by Don G. Flenniken, author of “The Macrolichens in West Virginia.”

Brookside Labs analyzed the chemistry of soil samples from each plot. Tests were made for the following parameters: aluminum, boron, calcium, copper, estimated nitrogen release, hydrogen ions, iron, magnesium, manganese, organic matter, pH, phosphorus, potassium, SMP buffer, sodium, soluble sulphur, total exchange capacity, and zinc (see Appendix B for data and test protocols). Soil chemistry data was entered in the Plots2-WV database.

We entered all community plot data collected during this project and any legacy data deemed compatible for classification purposes in the Plots2-WV Microsoft Access database, which was developed during the project based on the Plots Database System of the National Park Service Vegetation Mapping Program (USGS 2002). The redesigned Plots2-WV database meets standards established by the Ecological Society of America (2004), facilitates import and export of plot data, and is now used for all of West Virginia’s Natural Heritage Program community classification projects.

A standard for species names (Harmon et al. 2006 for vascular plants, Studlar et al. 2002 for bryophytes, Flenniken 1999 for lichens) was applied to the entire data set. Environmental variables (units and categories) were also standardized across the data set. Two biologists checked all data for errors, comparing recitation from the database with visual checking of original plot sheets.

## Statistical analysis

Classification of wetland communities was based primarily on vegetation. We performed multivariate statistical analyses using PC-Ord software (McCune and Mefford 1999) to develop a classification of wetland communities within the study area. A brief sampling of the statistical outputs from the classification analysis is included as Appendix C.

An initial statewide cluster analysis of all palustrine plots provided essential information about the geographic extent of the potential community types. Communities that are restricted to the high-elevation Allegheny Mountain region formed exclusive clades, whereas communities with broad ecological amplitude clustered with the similar plots from outside the study area.

The first step in preparing plot data for analysis was to reconcile differing levels of species identification. For example, many of the legacy plots contained bryophyte data that were identified to genus rather than species. Also, varieties and subspecies were noted by some researchers but not by all. When the ecological amplitudes at the different levels of taxonomic identification were closely similar (e.g., *Sphagnum* spp.), the specific or infraspecific data were lumped. When the level of taxonomic identification was too broad (e.g., most genera) to be meaningful in terms of ecological amplitude, the data were deleted from the analysis.

Data preparation continued with the development of different analysis scenarios based on the quality and distribution of the plot data. For example, analysis sets were compiled for plots with and without bryophyte data, or with differing physiognomies (e.g. forest, shrubland, and herbaceous communities).

The next part of scenario development was to choose a data transformation that made ecological sense. Ecological reasons to use data transformations include (a) making statistical distance measures work better, (b) altering the relative importance of common and rare species, and emphasizing informative species at the expense of uninformative species. Transformations also improve assumptions of normality, linearity, and homogeneity of variance (McCune and Grace 2002). The entire data set was first analyzed without any transformation, and then with combinations of square root transformation, log transformation, relativization by plot maximum, relativization by species maximum, double relativization, and Beals smoothing. The results that consistently made the most sense in terms of matching the researchers understanding of natural groupings and outliers were derived from the square root transformation scenarios. This is a commonly used transformation for ecological data, which typically have a positively skewed distribution. The square root transformation also makes ecological sense in terms of the type of plot samples used in this study, since it slightly damps the influence of dominant species (which might have higher cover in an individual plot than in the community as a whole), and slightly enhances the influence of rare species (which might be under-sampled in a plot compared to the community as a whole).

Continuing with scenario development, we experimented with deleting species that occur in only a small number of plots, in order to reduce statistical noise in the data and enhance relationships between communities. McCune and Grace (2002) recommend deleting species that occur in up to 5% of the sample units. The optimum number to delete can be estimated by

comparing correlation coefficients against the number of species retained. We found the highest correlations and most meaningful groupings when we deleted all species that occurred in only one plot.

We began the evaluation of each scenario by examining statistical summaries of rows (plots) and columns (species) and outlier analysis. Univariate and bivariate plot outliers were identified and carefully evaluated. Some outlier plots were retained if they appeared to represent important but underrepresented community types. Other outlier plots were excluded from subsequent classification runs, either because of placement on an ecotone, excessive anthropogenic disturbance, lack of bryophyte data (in bryophyte-rich communities), or incomplete floristics. These plots still contained much useful information and were set aside for eventual use in determining the range of classified vegetation types.

Hierarchical, polythetic, agglomerative cluster analysis was used on the various scenarios to iteratively define groupings of plots. We used the Sorensen (Bray-Curtis) distance measure with the compatible, space-conserving flexible beta group linkage. Flexible beta was initially set equal to -0.25, but in multiple classification runs this number was varied (as low as -0.5) to “stress” the clusters, i.e., to see if the clusters were robust. Clusters were examined to ensure that excessive chaining did not occur. Multi-response permutation procedure, a multivariate nonparametric test that is well-suited to community data, was used to test the hypothesis of no difference between groups.

Indicator species analysis was used to help choose the optimum number of groups, and to characterize community types. Using an iterative process, the numbers of groups were compared with the number of strong indicator species for each scenario. Scenarios with large numbers of strong indicators were selected as robust groupings. Indicator species are also important descriptors to help differentiate between community types, and are reported in the text of the community descriptions. We calculated indicator values using the method of Dufrene and Legendre (1997). The Monte Carlo significance test of observed maximum indicator value for groups used 4999 permutations for each analysis, with a random number seed based on the time of day. Significance ( $p$ -values) less than 0.05 were used to define indicators.

Once we identified major groups through the clustering process, nonmetric multidimensional scaling (NMS) was used to help understand the relationships between groups, to seek out patterns, and to identify environmental gradients (Kruskal 1964, Mather 1976). NMS is currently considered to be the most effective ordination method for ecological community data (McCune and Grace 2002), allowing interactive views into multi-dimensional “species space.” We used the Sorensen (Bray-Curtis) distance measure with a random starting configuration. For each scenario, we specified 250 runs with real and randomized data, respectively, in two- to six-dimensional configurations. We evaluated the quality of results through stress levels, which at 9-18 were typical of community ecology data, instability levels (generally <0.0001), and the number of iterations (generally <150) required to reach a solution. Scenarios with lowest stress, instability and number of iterations represented the most interpretable solutions.

## Integration into the National Vegetation Classification

The final classification is based on the West Virginia data but is constructed within the hierarchy and context of the U.S. National Vegetation Classification (NVC) (Grossman et al. 1998, NatureServe 2007). Community types are classified and described at the association level. Forty-one associations were identified in West Virginia, including 11 new associations, which were proposed, peer-reviewed, accepted and published in the NVC as a result of this project. The crosswalk to the NVC was done in coordination with NatureServe partners including the Northeastern Ecology office, the Appalachian Trail Coordinator, the New River National River liaison, and state ecologists from Pennsylvania, Virginia, North Carolina, and Maryland.

We wrote detailed descriptions of each community, including floristic data (composition, indicator species, rare species), environmental data, soils data, distribution data, ecological process information, and references from the literature. Animal data was compiled for the high Allegheny wetland system as a whole, and where possible, it was associated with a specific community type or types. A dichotomous key to the high elevation wetland communities was developed (Appendix D). Using the new classification system, additional wetland sites have been identified in the field and added to the Biotics database.

## Conservation Ranking

Each community type was given a global and state conservation ranking based on ecological integrity, rarity, current status, threats, and short- and long-term trends. These factors are summarized and expressed as a brief code, following NatureServe standards (2007). Global ranks, beginning with “G”, reflect an assessment of the condition of the ecological community across its entire range. Ranks beginning with “S” reflect the state rank, i.e., the conservation priority within West Virginia. Definitions of conservation ranks are given in Table 1.

**Table 1. Conservation rank definitions**

<b>Rank</b>	<b>Definition</b>
<b>G1</b> <b>S1</b>	<b>Critically Imperiled</b> —At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
<b>G2</b> <b>S2</b>	<b>Imperiled</b> —At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
<b>G3</b> <b>S3</b>	<b>Vulnerable</b> —At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
<b>G4</b> <b>S4</b>	<b>Apparently Secure</b> —Uncommon but not rare; some cause for long-term concern due to declines or other factors.
<b>G5</b> <b>S5</b>	<b>Secure</b> —Common; widespread and abundant.
<b>G#G#</b> <b>S#S#</b>	<b>Range Rank</b> —A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of G2 or G3 and other ranks are much less likely.
<b>GNR</b> <b>SNR</b>	<b>Unranked</b> —Rank not yet assessed.
<b>G#?</b> <b>S#?</b>	<b>Inexact Numeric Rank</b> —Denotes some uncertainty about the numeric rank (e.g. G3? - Believed most likely a G3, but some chance of either G2 or G4).

This ranking forms an essential basis for management and conservation decisions by public and private land managers. It also provides a meaningful context for monitoring indicators and/or metrics that are currently under development at EPA and NatureServe. The highest quality occurrences of each natural community type are the reference or benchmark to which all degraded or impacted communities should be compared.

## **Mapping and assessing the quality of occurrences**

We delineated and mapped occurrences of rare and exemplary wetland communities in the Biotics conservation database maintained by the Natural Heritage Program. Biotics integrates tabular databases with spatial attributes maintained in a Geographical Information System (GIS). WVDNR acquired the Biotics software during the project, and project personnel were instrumental in assisting with the transition to this new, more powerful spatial analysis tool for tracking species and communities of conservation concern to the state of West Virginia. All community occurrences were rated for quality using standard criteria of size, condition, and landscape context established for each community type. In addition to wetland community occurrences, over 800 rare plant occurrences comprising 72 tracked species were documented during the project.

## ***Dissemination of results***

Results have been shared through meetings, presentations, and data exchanges with government and civil society partners including Canaan Valley National Wildlife Refuge, Canaan Valley Institute, EPA Mid-Atlantic Wetland Workgroup, Monongahela National Forest, Natural Resources Conservation Service, NatureServe, The Nature Conservancy-WV, The Nature Conservancy-MD, West Virginia Academy of Sciences, West Liberty College, West Virginia University, private timber companies, and numerous private landowners. The project leader is currently participating in a national working group coordinated by NatureServe and EPA to develop standard indicators of ecological integrity for wetlands.

The project leader has communicated results to the public through Channel 8 TV, West Virginia Public Radio, the Washington Post, West Virginia Wildlife Magazine, West Virginia Native Plant Society, Maryland Native Plant Society, WVDNR Master Naturalist program, Randolph County Outdoor Program, Appalachian Forest Heritage Association, Joint Northeast Botanical Field Meeting (Torrey Botanical Society, Philadelphia Botanical Club, and Botanical Society of America - Northeastern Section), Oglebay Institute, and WVDNR Wildflower Pilgrimage.

## **Study area**

The project area is defined as wetlands above 730 meters (2400 feet) elevation in the Allegheny Mountain region of West Virginia. A relatively rich literature exists for high elevation wetlands in West Virginia, particularly compared to other vegetation types in the state. We collected and reviewed existing literature, resulting in an annotated bibliographic database (Appendix E) of more than 300 references. A number of papers focused on specific wetland sites within the study area. These are listed by wetland site and county in Table 2.

**Table 2. Site-specific references for high elevation wetlands in West Virginia**

<b>Wetland</b>	<b>County</b>	<b>References</b>
Beaver Creek	Tucker	Balcombe 2003, Balcombe et al. 2005a, Balcombe et al. 2005b, Balcombe et al. 2005c, Diehl 1981, Diehl and Behling 1982, Stephens 2003
Big Run Bog	Tucker	Diehl 1981, Diehl and Behling 1982, Francl 2003, Francl et al. 2003, Francl et al. 2004, Mueller 2003, Muzika et al. 1996, WVNPS 2004, Walbridge 1982, Walbridge 1994, Walbridge and Lang 1982, Wieder 1982, Wieder 1985, Wieder and Lang 1980, Wieder and Lang 1983, Wieder et al. 1981, Wieder et al. 1989
Blister Run Swamp	Randolph	Ceperley 2002, Mueller 2003, Rigg and Strausbaugh 1949, Stephenson and Adams 1986
Blister Swamp	Pocahontas	Ceperley 2002, Clarkson 1957, Clarkson 1966, Stephenson and Adams 1986
Canaan Valley	Tucker	Allard and Leonard 1952, Balcerzak 1999, Bonner 2005, Bonner et al. 2005, Brooks 1910, Brooks 1957, Brown 1959, CVI 2005, Cameron 1970, Ceperley 2002, Clarkson 1964, Clarkson 1966, Diehl 1981, Fortney 1975, Fortney 1993, Fortney 1997, Fortney and Rentch 2003, Fortney et al. 2005, Francl 2003, Francl et al. 2003, Francl et al. 2004, Goudy et al. 1969, Kennedy 2002, Lewis 1746, Ludlam and Arkle 1971, Matchen 1998, Matchen et al. 1999, McClinton 1996, Michael 1993, Mueller 2003, Norris 1997, Rentch 2003, Rentch and Anderson (forthcoming), Rentch et al. 2002, Selders 1917, Snyder et al. 2006, Stephenson and Adams 1986, Strother 1853, Strother 1872, Strother 1873a, Strother 1873b, TNC 1994, Vogelmann 1978, Webb and Samuel 1982, WVNPS 2004
Cranberry Flat	Randolph	Hutton 1941
Cranberry Glades	Pocahontas	Brooks 1910, Brooks 1940, Brown 1982, Clarkson 1966, Core 1949, Core 1955, Crockett 1985, Darlington 1943, Edens 1972, Edens 1973, Edens 1977, Edens and Ash 1969, Kokesh 1988, McNeill 1940, Mueller 2003, Rigg and Strausbaugh 1949, Strausbaugh 1934, Tartar and Hill 1979, Watts 1979, Whitehead 1973
Cranesville Swamp	Preston	Ahrens 1968, Berdine et al. 1991, Cox 1961, Cox 1968, Dale 1965, Diehl 1981, Diehl and Behling 1982, Eli and Rauch 1982, Evans and Rauch 1983, Francl et al. 2004, Fuller and Frank 1974, Fuller et al. 1974, Gilbert 1963, Guthrie 1962, Guthrie 1963, Guthrie 1974, Hotopp 2000, Lang and McDonald 1982, Lang and Topa 1982, Leister 1977, Mansueti 1958, Mueller 2003, Orr 1998, Reger and Behling 1982, Rigg and Strausbaugh 1949, Robinette 1964, Robinette 1965, Robinette 1966, Schwartz 1962, Shea and Athanas 1980, Smith 1993, Snyder no date, TNC 1997, TNC 2001, Venable 1991, Wise 1981
Cupp Run	Preston	Diehl 1981, Diehl and Behling 1982, Eli and Rauch 1982, Evans and Rauch 1983, Reger and Behling 1982, Walbridge 1982, Walbridge 1994, Walbridge and Lang 1982
Dolly Sods	Tucker	Ceperley 2002, Carvell 1994, Clovis 1974, Francl 2003, Francl et al. 2003, Francl et al. 2004, Gibson 1970, Gibson 1982, Lewis 1746, McClinton 1996, Mueller 2003, Strother 1872, Strother 1873a, Strother 1873b, Vogelmann 1978, WVNPS 2004, Webb et al. 1997
Droop Mountain	Pocahontas	Rigg and Strausbaugh 1949

Bog		
Dunmore Springs	Pocahontas	Clarkson 1966, Grafton and Eye 1982
Helmick Run & Stony River	Grant	Diehl 1981, Diehl and Behling 1982, Stephenson and Adams 1986, Walbridge 1982, Walbridge 1994, Walbridge and Lang 1982
Otter Creek	Randolph	Diehl 1981, Francl 2003, Francl et al. 2003, Francl et al. 2004, Mueller 2003, Webb et al. 1997
Roaring Plains	Tucker	Core 1939
Sinks of Gandy	Randolph	Clarkson 1966
Tea Creek	Pocahontas	Mueller 2003
Tub Run	Tucker	Diehl 1981, Diehl and Behling 1982, Walbridge 1982, Walbridge 1994, Walbridge and Lang 1982, Wieder and Lang 1982

### ***Ecoregional context***

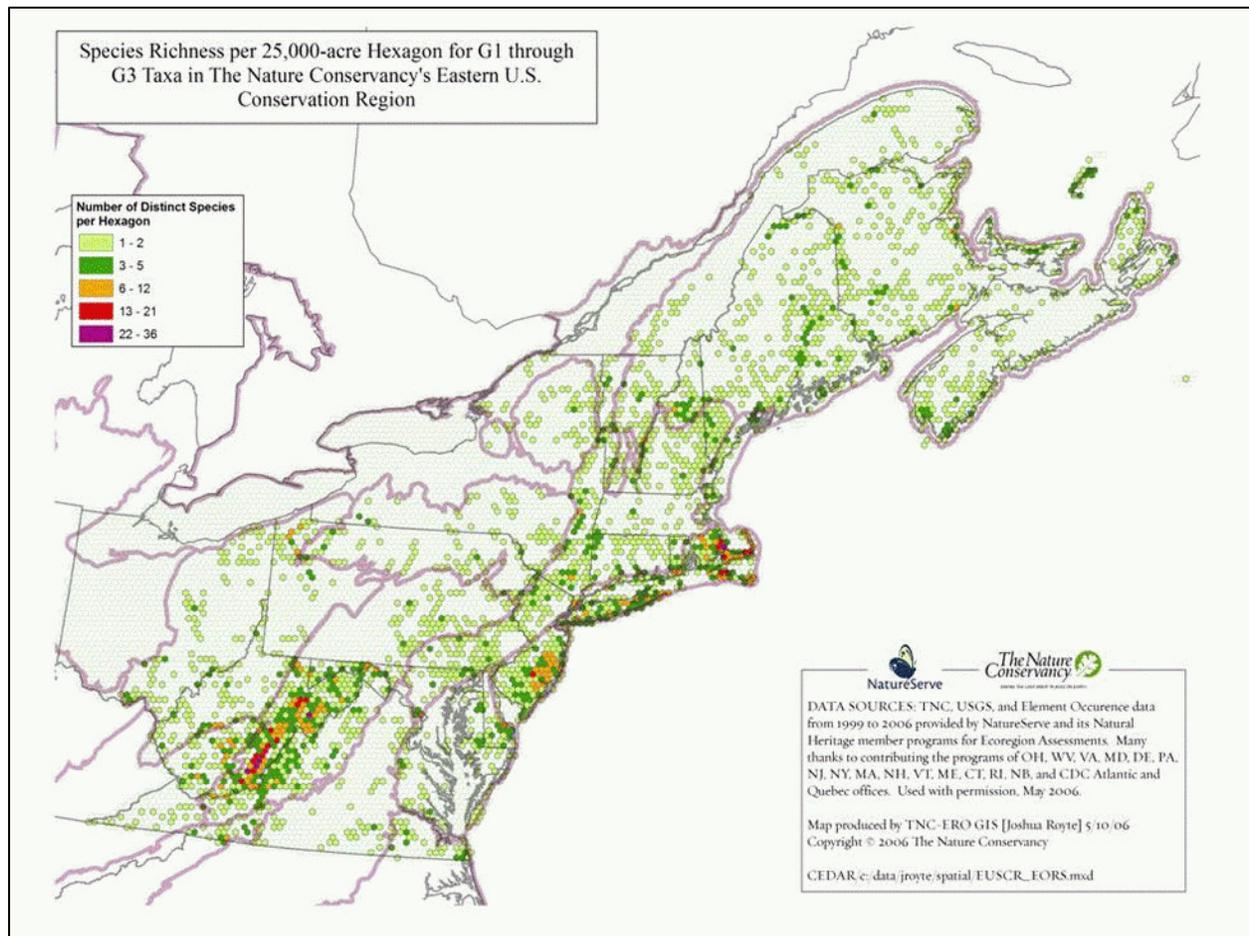
The study area comprises a region of exceptionally high biodiversity value. The Allegheny Mountain region of West Virginia contains some of the highest concentrations of globally rare plant and animal species within the northeastern states (Figure 1). The high conservation value of this region stems from several intrinsic factors, including (a) its location south of the maximum extent of Pleistocene glaciation, (b) its complex topography and geology, and (c) the relatively large remaining tracts of natural vegetation compared to adjacent areas in the northeast.

During more than one million years of Pleistocene glaciations, ice sheets more than a mile thick advanced and retreated over the much of the northern part of North America. The ground was scoured clean of all life with the possible exception of microorganisms. When the ice age ended a mere 10,000 years ago, the northern part of the continent was re-colonized by plants and animals that lived in unglaciated regions. In the unglaciated Central and Southern Appalachians, however, plants and animals had the luxury of adapting slowly to gradual fluctuations in climate over many millions of years. Evolution is a slow process, and this long period of gradual change allowed many species to evolve and occupy a myriad of ecological niches.

The terrain of the Central Appalachians is topographically complex, with dissected plateaus and long ridges rising above steep river valleys. The rapid changes in elevation, slope, and aspect result in a compression of climatic zones and ecological niches, offering a profusion of habitats for potential exploitation by species with slightly differing adaptations. Adding to the diversity of habitats is the folded and jointed geologic substrate, which brings rocks of differing types to the surface in finely patterned mosaics. Each rock type has its own characteristic nutrient bank, permeability, and susceptibility to erosion. The overlay of densely juxtaposed climatic zones over differing rock types results in a complicated array of soil types and growth niches. Combining this intrinsic habitat diversity with the long period available for gradual plant

evolution in the region, it comes as no surprise that the Central and Southern Appalachians are a nationally significant hotspot of biodiversity.

The last piece of the “perfect storm” that gives rise to the exceptionally high conservation importance of the region is its human history. The steep slopes and relative inaccessibility of the Central Appalachians have hindered intensive human development in comparison with many of the surrounding areas. Large tracts of forested private land, and large public landholdings such as the Monongahela National Forest, have conserved relatively unfragmented natural landscapes where native species are able to flourish. The mountains function essentially as islands of biodiversity within a sea of tamed and transformed lowlands.



**Figure 1. Rarity-weighted species richness of the northeastern states**

The project area is entirely contained within the Central Appalachian Forest Ecoregion as defined by The Nature Conservancy (2004). USFS ecoregions within the study area are the Northern High Allegheny Mountains, the Southern High Allegheny Mountains, and a small section of the Western Allegheny Mountains (Bailey 1995). EPA ecoregions that overlap the study area are the Central Appalachians: 69a Forested Hills and Mountains, 69b Uplands and Valleys of Mixed Land Use, and the Ridge and Valley: 67b Northern Shale Valleys, 67d Northern Dissected Ridges (Woods et al. 1999).

Wetlands in the study area are embedded in matrix forest systems, except where the land is kept open by human actions. These surrounding forests provide critical complementary habitat for many animal species. The forests are comprised of two Ecological Systems as defined by NatureServe (2007). The Central and Southern Appalachian Spruce-Fir Forest occurs at the highest elevations of the Southern Blue Ridge and parts of the central Appalachians. The Appalachian (Hemlock)-Northern Hardwood Forest ranges from central New England west to Lake Erie and south to Virginia, continuing down the Appalachians to Georgia in an attenuated fashion.

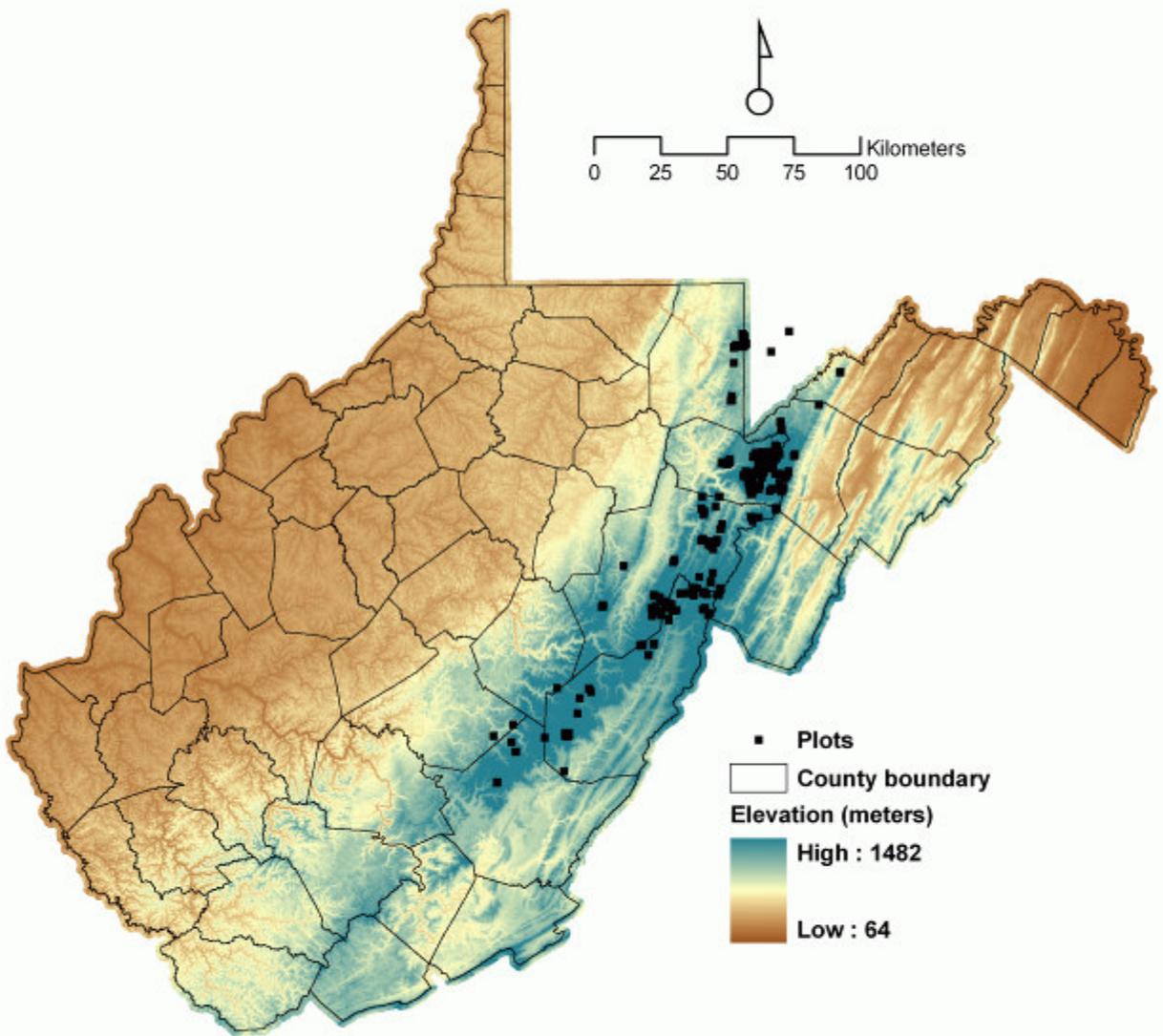
## ***Physical characteristics***

The study area covers approximately 6500 km<sup>2</sup> (2500 mi<sup>2</sup>) in a southwest – northeast trending band along the Allegheny Mountains (Figure 2). Within this band, wetlands occur primarily in flat-lying headwater basins, ranging in size from less than one hectare to 3,000 hectares of contiguous wetland in Canaan Valley. Summed up, the hundreds of individual headwater wetlands comprise just over 80 km<sup>2</sup> (30 mi<sup>2</sup>) in total area (USFWS 1992). Nine West Virginia counties are partly or wholly within the study area, including Grant, Greenbrier, Mineral, Nicholas, Pendleton, Pocahontas, Preston, Randolph, and Tucker. Plot data from Garrett County, Maryland was also included in the study.

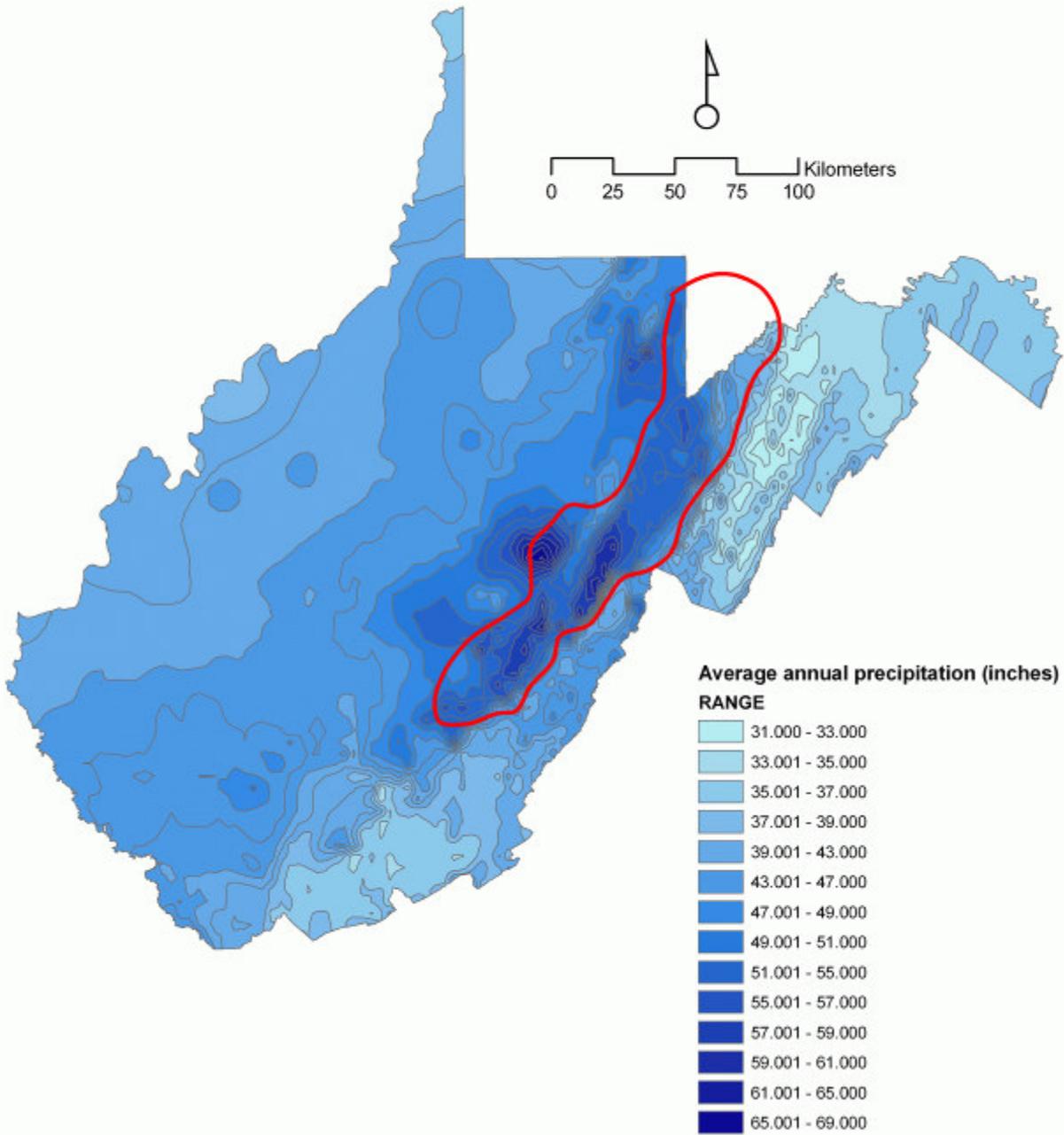
A cool, moist climate characterizes the region (Figure 3). The flat-lying basins where many wetlands occur function as frost pockets, catching and pooling cold air that drains from the surrounding uplands. Rainfall in this region is the highest in the state, with 30-year averages ranging from 1220-1680 mm/yr (48-66 in/yr) (SCAS 2000). Temperatures are low and growing seasons are short compared to the rest of the state. The 30-year mean annual temperature from 1971-2000 was 6.7-9.4 °C (44-49 °F) at four stations in the project area (SRCC 2007). Mean annual soil temperature ranges from 7.2-9.4°C (45-49 °F) (Prescott et al. 2006).

During pre-glacial time, the study area straddled the eastern continental divide between the ancient Erigan River to the north and the ancient Teays River to the west (Jezerinac et al. 1995). Today, the study area still sits on the eastern continental divide, which now lies between the Ohio and Potomac Rivers. Current drainage structures include tributaries of the Tygart and Cheat Rivers (Monongahela River basin), tributaries of the Gauley, Elk, and Greenbrier Rivers (New and Kanawha River basins), and tributaries of the Potomac River basin.

The project area lies along the high plateau of the Allegheny Mountains, immediately west of the Allegheny Front. Topography in this part of the Appalachians is a reflection of lithology and underlying geologic structure. Sandstone tends to form resistant ridges and plateaus, whereas more erodible shale and limestone tend to occur on slopes and valley bottoms. Geologic fractures and joints form zones of weakness in all rock types where erosion occurs, and basins or watergaps are formed. The study area is underlain by gently folded sedimentary rocks of Carboniferous and Devonian age. Drainage is often impounded in high, flat-lying basins by natural dams or “knickpoints” of resistant sandstone (Pennsylvanian Pottsville and Mississippian Price formations, see Figure 4). These sandstone layers come to the surface along the gently dipping axes of breached anticlines or synclines, or occasionally on the gently dipping limb of a fold (Diehl 1981, WVGES 1986, Reger and Behling 1982, Matchen et al. 1999).



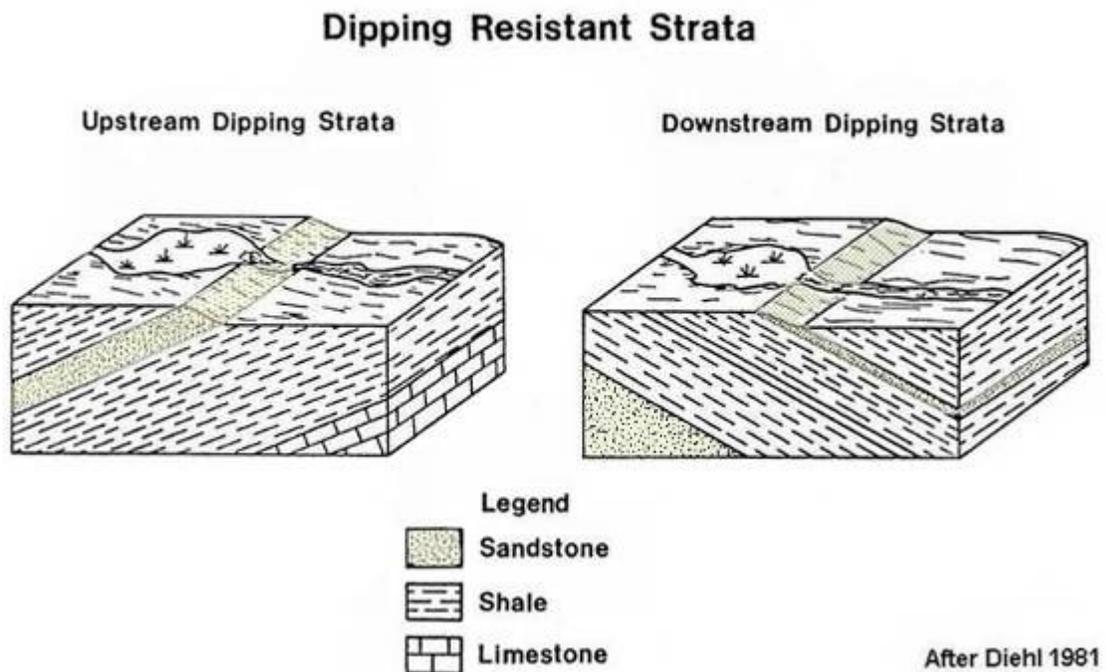
**Figure 2. Elevation map with plot locations**



**Figure 3. 30-year average precipitation map with study area**

Much of the floristic diversity of the project area derives from the underlying sedimentary rocks, which weather to form substrates with a wide variety of nutrient, acidity, and drainage conditions for plant growth. Sandstones tend to be highly acidic, nutrient-poor, and well-drained. Limestones are circumneutral and often highly enriched in nutrients, with variable drainage qualities. Shales are highly variable, ranging from acid to circumneutral, with moderately high nutrient status and poor drainage qualities. Wetlands formed on each of these lithologies are characterized by distinct floristic assemblages.

The most common soil types in plot samples from the study area are peat and muck. In slightly better drained or drier wetlands, mineral soils occur. Silt loams with a high organic component are fairly common, with sandy loam or clay loam occurring less frequently. Rarely, clay or sandy clay forms the wetland substrate. The USDA maps wetland soils in the project area as hemists, udifluvents, and fluvaquents. Hemists are wet organic soils (histisols) in which the organic material is moderately decomposed. Ground water is at or very close to the surface much of the time. Udifluvents are brown to reddish soils with a humid moisture regime that formed in recent water-deposited sediments. They occur in floodplains along streams and rivers and may be flooded at almost any time of year. Fluvaquents are stratified, wet soils on floodplains, reflecting deposition of sediments under changing currents and shifting channels. Specific wetland soil series mapped by USDA in the project area include Andover, Atkins, Cavode, Brinkerton, Lickdale, Macove, Pope, and Sensabaugh (NRCS-USDA 2007, USDA 1999). Soil chemistry data based on plot data for each classified wetland type is presented in Appendix B.



**Figure 4. Geologic profile of dipping resistant strata in high elevation wetlands**

## **Fauna**

The high elevation wetlands of the Allegheny Mountains are productive environments, providing diverse wildlife habitats and supporting complex food chains. Many animals rely on these wetlands for breeding, foraging, and other activities. These wetlands provide the primary breeding grounds for some amphibians, small mammals, songbirds, waterfowl, and invertebrates. For many species, forested areas adjacent to the wetlands provide essential complementary habitat.

## **Mammals**

Relatively few mammals within the study area are considered to be wetland-dependent, although many species benefit from the habitat diversity and productivity of wetlands. Wetland-dependent carnivorous mammals that are known to occur in the study area include mink (*Mustela vison*) and river otter (*Lutra canadensis*). Beaver (*Castor canadensis*) is a keystone species for wetlands in the study area. Its role in wetland formation is discussed in the “Landscape Change” section of this report. Other wetland rodents observed in the study area include muskrat (*Ondatra zibethicus*), southern bog lemming (*Synaptomys cooperi*), meadow vole (*Microtus pennsylvanicus*), southern red-backed vole (*Clethrionomys gapperi*), and meadow jumping mouse (*Zapus hudsonius*). Wetland insectivores known from the study area include star-nosed mole (*Condylura cristata*) and southern water shrew (*Sorex palustris punctulatus*). Smoky shrew (*Sorex fumeus*) and masked shrew (*Sorex cinereus*) are considered wetland insectivores by May (2001), but collections in West Virginia indicate that they are distributed throughout forested habitats in both uplands and wetlands. The star-nosed mole, southern bog lemming, and southern water shrew are rare and imperiled in West Virginia. The meadow jumping mouse is uncommon and vulnerable in West Virginia (CVNWR 2007b, Francl et al. 2003, Marshall University 1994, May 2001, Olcott 2007, Sturm 2007, TNC 2001, Wykle 2005).

The species richness of small wetland mammals increases with wetland size within the high elevation wetlands of the Allegheny Mountains (Francl et al. 2003). Generalists such as meadow vole and masked shrew are among the most common small wetland mammals in the study area, particularly in large open peatlands, sedge meadows, and alder thickets. These two species are able to tolerate some disturbance and can occupy wetland sites adjacent to roads or agricultural land. Southern red-backed voles are common but prefer undisturbed peatlands along the edges of alder thickets or surrounded by mixed coniferous deciduous forests. Less common small wetland mammals include star-nosed mole, smoky shrew, southern bog lemming, and meadow jumping mouse. Star-nosed moles were captured in large, relatively undisturbed peatlands, and also at a few sites adjacent to agricultural land. Smoky shrews show a preference for forested swamps and the edges of alder thickets. Southern bog lemmings are likely to be found in open or shrub peatlands surrounded by a forest buffer. Southern water shrew were noted only at Blister Run Swamp and Cranesville Swamp, where they occupied forested swamp, shrub swamp, wet meadow, bog peatland, and tributary stream habitats. The primary habitat of the southern water shrew is probably along high-gradient streams rather than within swamps or peatlands. Meadow jumping mice were observed in large open peatlands and sedge meadows, sometimes along the edge of an alder thicket (Francl et al. 2003, Marshall University 1994, TNC 2001, Wykle 2005).

Forty-six species of mammals that have been observed using wetland resources or collected from wetlands in the study area are included in Appendix F.

## Birds

The high quality and relatively undisturbed nature of the high Allegheny wetlands provide breeding habitat for 96 bird species. Many more bird species use wetlands at some time during the year, but do not breed there. Breeding bird records from the study area are listed in Appendix F. Although these species have been observed breeding within study area wetlands, relatively few of them actually depend on wetlands for their survival. Within West Virginia, six breeding birds rely primarily on the high elevation wetland habitats of the Allegheny Mountains. Two of these have secure breeding populations in the state, and four are rare. The descriptions below contain brief notes on the specific habitats within the study area that are used by these species.

The swamp sparrow (*Melospiza georgiana*) is a common and typical breeding bird of the high Allegheny wetlands. Alder swamps and other wetlands with low bushes or trees provide nesting habitat, with the nest typically located on a hummock, tussock, or low bush. The olive-sided flycatcher (*Contopus cooperi*) favors bogs, old beaver meadows, and other openings in the red spruce forest, especially where standing snags are present. This rare neotropical migrant is declining throughout its range, and was once more widely distributed in the mountain counties of West Virginia. The alder flycatcher (*Empidonax alnorum*) is a northern wetland bird whose range extends down the Appalachian mountain chain to eastern Tennessee. True to its name, in West Virginia this rare species is found primarily in high elevation alder swamps. The willow flycatcher (*Empidonax traillii*) is not as limited in habitat as the alder flycatcher. While fairly common in high elevation willow or alder swamps, this species is also found in a broader range of habitats. The willow flycatcher may be replacing the alder flycatcher in some habitats. Wilson's snipe (*Gallinago delicata*) reaches its southernmost breeding location in the high Allegheny wetlands of West Virginia. Nests are constructed on hummocks and down logs, but are well-hidden by wetland vegetation, for example in alder or meadowsweet shrub swamps. The sedge wren (*Cistothorus plantensis*) is a rare species that nests in sedge fens and wet graminoid meadows. Its populations may be declining in the eastern United States (Buckelew and Hall 1994, Hall 1983, NatureServe 2007, TNC 2001, WVPIF 2006).

Five additional rare breeding birds are associated with high elevation wetlands in West Virginia, although they are probably not wetland-dependent. The northern waterthrush (*Seiurus noveboracensis*) breeds in cool wooded swamps, bog thickets, and shrub swamps above 1000 meters elevation in the high Alleghenies. It seeks out nest sites in cavities of the root systems of wind-thrown trees. In West Virginia, this species is at the southernmost edge of its breeding range, and may be declining. The northern saw-whet owl (*Aegolius acadicus*) is associated with high elevation conifer forests and sometimes nests in wetlands. The northern harrier (*Circus cyaneus*) favors wet meadows and mountain bogs, although it occasionally nests in fields or reclaimed strip mines. Nest sites are typically on the ground near low shrubs, on boggy hummocks, or on top of low bushes. The white-throated sparrow (*Zonotrichia albicollis*) nests in mountain bogs or thickets on the edge of red spruce or mixed red spruce-hardwood forests. The Nashville warbler (*Vermivora ruficapilla*) reaches its southernmost breeding extent in the

mountains of West Virginia. Although it uses a variety of woodland and edge habitats, it generally nests in forest-bordered bogs near the Allegheny Front. Nest sites are on the ground at base of overhanging vegetation, or in a hollow in moss (Buckelew and Hall 1994, Eaton 1995, Hall 1983, NatureServe 2007, TNC 2001, WVPIF 2006).

A number of wetland birds with broad elevation distribution have been documented within the high elevation study area. These include the great blue heron (*Ardea herodias*), Acadian flycatcher (*Empidonax virescens*), American woodcock (*Scolopax minor*), common yellowthroat (*Geothlypis trichas*), green heron (*Butorides virescens*), Louisiana waterthrush (*Seiurus motacilla*), and wood duck (*Aix sponsa*) (Buckelew and Hall 1994, WVPIF 2006). Two rare breeding birds have been recorded within wetlands in the study area, although they are not specifically associated with wetlands. They are the brown creeper (*Certhia americana*) and golden-winged warbler (*Vermivora chrysoptera*) (TNC 2001, WVPIF 2006).

## **Amphibians and reptiles**

Amphibian and reptile data were provided by Pauley (2006), based on his collections and observations at 38 wetland sites within the study area. Additional data were provided by the Canaan Valley National Wildlife Refuge (CVNWR 2007), Francl (2003), and The Nature Conservancy (TNC 2001).

High elevation wetlands of the Allegheny Mountains contain terrestrial and aquatic habitats which are essential to the biphasal lifecycle of amphibians. Most amphibians spend the first part of their lifecycle in aquatic habitat, and migrate as juveniles to surrounding forests for foraging and hibernation. Many amphibian species, including wood frog (*Rana sylvatica*) and spotted salamander (*Ambystoma maculatum*), are philopatric, and return to natal ponds to breed each year. Amphibian species may travel 200 m or more from wetland habitat into surrounding forested habitat (Semlitsch 2002). Species that require adjacent upland forest to complement their wetland habitat include red-spotted newt (*Notophthalmus v. viridescens*) and Jefferson salamander (*Ambystoma jeffersonianum*) (Gibbs 1993, Porej 2004). Many amphibian species, such as the four-toed salamander (*Hemidactylum scutatum*), use wetland habitat as their primary breeding ground. Adults inhabit surrounding forests, while females migrate to nearby sphagnum bogs to lay their eggs (Green and Pauley 1987). Cope's gray treefrog (*Hyla chrysoscelis*) is a species that appears to have moved into high elevation wetlands over the last 25 years (Pauley 2006). Pauley (2006) observed mountain chorus frog (*Pseudacris brachyphona*) in roadside ditches and marshy areas within upland habitats but not in large wetlands. It could, however, occur in shallow areas of large wetlands where there is an abundance of grasses. Other commonly encountered amphibians of the high Allegheny wetlands include eastern American toad (*Bufo a. americanus*), northern green frog (*Rana clamitans melanota*), northern spring peeper (*Pseudacris c. crucifer*), and northern spring salamander (*Gyrinophilus p. porphyriticus*).

Two rare amphibian species, Jefferson salamander and northern red salamander (*Pseudotriton r. ruber*), could potentially occur in the study area wetlands. These two species are more likely to occur at lower elevations within the study area. The northern red salamander has been observed in Cranesville Swamp, although its typical habitat would be near springs and streams in upland forest.

Garter snake (*Thamnophis sirtalis*) and red-bellied snake (*Storeria occipitomaculata*) are frequently found near high elevation wetlands in West Virginia. Other commonly encountered reptiles are eastern snapping turtle (*Chelydra s. serpentina*) and common watersnake (*Nerodia s. sipedon*). Mountain earthsnake (*Virginia valeriae pulchra*), a rare species in West Virginia, was observed in bog peatland/wet meadow environments at Cranesville Swamp. A list of the 31 species of reptiles and amphibians known from the project area is included in Appendix F.

## **Invertebrates**

### **Land Snails**

Land snails are found throughout West Virginia but their distribution and ecology are poorly known. Most land snails live in the upper leaf litter of forests, old fields, and wetlands, but they are also found in more disturbed habitats. Nine species of land snail have been recorded within wetlands in the project area, including two rare species. The Spruce Knob threetooth (*Triodopsis picea*) is currently considered to be vulnerable throughout its range and imperiled in West Virginia. It is possible that this species has been under-collected and further research may indicate that populations are more abundant. It lives under leaf litter in alder swamps and in wet areas of upland forest, and is often associated with calcium-poor soils. The striped whitelip (*Webbhelix multilineata*) is critically imperiled in West Virginia. It is found in large wetlands and river floodplains, shrub swamps, sedge fens, wet meadows and marshes. It appears to use logs, rocks, and hummocks for cover, to escape high water, and to overwinter. This species is often observed on skunk cabbage (*Symplocarpus foetidus*), which may be part of its diet (Hotopp and Pearce 2006, TNC 2001, WVDNR 2007a). Land snails known from the project area are listed in Appendix F.

### **Crayfish**

Crayfish species distribution in the Central Appalachians is related to both pre-Pleistocene and Pleistocene river basin configurations (Crandall and Templeton 1999, Jezerinac et al. 1995). The headwater streams of the study area have straddled the eastern continental divide since pre-Pleistocene time, allowing for a diversity of crayfish species.

Eight species of crayfish are known from the study area, two of which are rare. Monongahela crayfish (*Cambarus monongalensis*) is ranked as vulnerable in West Virginia, where it is found in the Allegheny Mountain region and northern panhandle. The Monongahela crayfish is distributed throughout the study area. It is a primary burrower, which constructs burrows in seeps, springs, and roadside ditches in deciduous woods. New River crayfish (*Cambarus chasmodactylus*) is also ranked as vulnerable in West Virginia, where it is confined to the New River system. Within the study area, it occurs in the East and West Forks of the Greenbrier River. This species seems to prefer rocky pools in clean, high gradient larger streams (Jezerinac et al. 1995, WVDNR 2007a).

Two species of crayfish are commonly found in the project area. They are the rock crayfish (*Cambarus carinirostris*) and the Allegheny crayfish (*Orconectes obscurus*). The rock crayfish occupies the Allegheny Mountain region and northern panhandle of West Virginia,

where it inhabits small rocky headwater streams, intermittent streams, and seeps. The Allegheny crayfish lives in small rocky headwater streams that are not affected by acid mine drainage or clear-cutting in the northern portion of the state (Jezerinac et al. 1995, WVDNR 2007a).

Four additional species are found only on the periphery of the study area, where their broader ranges overlap slightly with the area covered in this report. These include the Teays River crayfish (*Cambarus sciotensis*) in Little Clear Creek, Cranberry River, and Williams River; the Sanborn crayfish (*Orconectes sanbornii*) in Little Clear Creek, the big water crayfish (*Cambarus robustus*) in the East and West Forks of the Greenbrier, and the Appalachian brook crayfish (*Cambarus bartonii bartonii*) at Cranesville Swamp (TNC 2001, WVDNR 2007a). Crayfish species known from the project area are listed in Appendix F.

## **Dragonflies and Damselflies**

Odonata, or dragonflies and damselflies, have a complex life cycle that is closely linked to water quality and vegetation in wetland and riparian environments. Odonata are excellent indicators of wetland quality. Species richness of odonata is positively correlated with species richness of vegetation, and negatively correlated with wetland stressors such as cattle grazing (Hornung and Rice 2003). The high elevation wetlands of West Virginia's Allegheny Mountains are extremely rich in dragonfly and damselfly species. Many of these wetlands are in excellent environmental condition, with diverse native vegetation and mosaiced wetland habitats. Low-gradient headwater streams that traverse and drain the wetlands are often pristine (with the exception of acid precipitation and localized acid mine drainage sites). Many of the wetlands are fully embedded in forested uplands, which provide a high quality natural hydrologic regime. All of these factors help to explain the diversity of odonata within the study area.

One hundred and seven species, of which 58 are rare in West Virginia, have been recorded in the project area. Twenty-six of the rare species are typically found at high elevations in West Virginia. During the project, opportunistic collections were made with a butterfly net. Most records, however, are from the on-going Odonata Atlas Project at the West Virginia Division of Natural Resources (WVDNR 2007b). Records from Cranesville Swamp were provided by The Nature Conservancy (2001). Dragonfly and damselfly species, along with their corresponding state and global conservation ranks, are listed in Appendix F.

## **Butterflies and Moths**

The high elevation wetlands of the study area are particularly rich in butterfly and moth species. An abundance of native nectar and larval host plants occur in the study area, and the mosaic of open and partly shaded habitats provides excellent habitat for many Lepidoptera. Butterflies and moths were collected on an opportunistic basis during the project, using a mesh butterfly net. Significant additions to the data collected in the field came from The Nature Conservancy's (2001) compilation of records for Cranesville Swamp, and Allen's (1997) work on butterflies of West Virginia.

Six rare species of butterfly are known from the project area. Five of these are northern species with disjunct populations in the high Alleghenies, and one, the Diana fritillary (*Speyeria*

*diana*) is a southern Appalachian species that reaches its northernmost range in West Virginia. The pink-edged sulphur (*Colias interior*), bog copper (*Lycaena epixanthe*), black dash (*Euphyes conspicua*) and Harris' checkerspot (*Chlosyne harrisii*) are imperiled in West Virginia, and populations of Atlantis fritillary (*Speyeria atlantis*) are vulnerable in West Virginia. The pink-edged sulphur is found in the high Alleghenies in open areas and bogs. Blueberry species are its larval host plant, with a preference for lowbush blueberry (*Vaccinium angustifolium*). The bog copper is a northern species with a disjunct population at Cranesville swamp, where it is confined to acidic cranberry peat bogs. Allen (1997) writes that the Cranesville population was probably established during the latest glacial period. Large and small cranberry (*Vaccinium macrocarpon*, *Vaccinium oxycoccos*) serve as the only larval host plants in West Virginia. The black dash is also known only from Cranesville Swamp, although it may occur in other high elevation wetland sites. It inhabits wet meadows and fens, particularly where its preferred larval host sedge (*Carex stricta*) is abundant. Harris' checkerspot is found in wet meadows of the high Alleghenies that support good populations of flat-topped white aster (*Doellingeria umbellata*), its larval host plant. The Atlantis fritillary is found in open meadows, bogs, and woodland edges of the high Alleghenies. The Diana fritillary, which ranges from the southern Appalachians into the southern third of West Virginia, utilizes small openings and woodland edges in moist mountain forests. Both species of fritillary select woodland violets (*Viola* spp.) as larval host plants (Allen 1997, TNC 2001).

Several butterfly and moth species are commonly found in high elevation wetlands. The silver-bordered fritillary (*Boloria selene myrina*) is found in wet meadows and shrub swamps of the high Alleghenies, preferring sites with taller vegetation. Violets, especially those species associated with wetland areas, act as larval host plants. The bronze copper (*Lycaena hyllus*) is commonly found at higher elevations in West Virginia, although it also occurs at lower elevations. It prefers wet areas, and uses dock (*Rumex* spp.) or knotweed (*Polygonum* spp.) as larval host plants. The Appalachian brown (*Satyrodes a. appalachia*) prefers graminoid wet meadows in sparsely wooded areas at both low elevations and on mountaintops in West Virginia. It uses sedges (*Carex lacustris*, *C. stricta*) and fowl mannagrass (*Glyceria striata*) as larval host plants. The Baltimore checkerspot (*Euphydryas phaeton*) is a wetland species occurring in bogs, marshes, and wet meadows, where its primary host is turtlehead (*Chelone glabra*). A species of emerald moth (*Nemoria tuscarora*) favors shrub swamps and appears to be host-specific, feeding on St. Johnswort (*Hypericum* spp.) (Allen 1997, TNC 2001). A total of 67 species of Lepidoptera have been recorded in the study area. They are listed in Appendix F.

## Other Insects and Springtails

Insects and springtails were collected during the project using a mesh butterfly net to sweep vegetation. Specimens were identified by Eric R. Eaton and Laura Miller. Caddisfly records were augmented by data from Stout and Stout (1989). One hundred seventy-two taxa from nine orders were recorded. They include 41 taxa of beetles (Coleoptera), 51 taxa of gnats, mosquitoes, and true flies (Diptera), 51 taxa of true bugs (Hemiptera), 15 taxa of ants, bees, wasps and sawflies (Hymenoptera), five taxa of crickets, grasshoppers, katydids, and locusts (Orthoptera), two taxa of stoneflies (Plecoptera), one taxon of barklice (Psocoptera), five species of caddisflies (Trichoptera), and one taxon of springtails (Collembola).

One of the caddisflies (*Nemotaulius hostilis*) is a boreal species that reaches its southernmost extent in West Virginia, and is closely associated with bur-reed (*Sparganium* spp.) marshes in the study area (Stout and Stout 1989, Roble and Flint 2001). Two exotic invasive species of true bugs pose a serious threat to forested wetlands in the study area. They are the hemlock woolly adelgid (*Adelges tsugae*) and the balsam woolly adelgid (*Adelges piceae*). Specimen identifications are listed in Appendix F.

## Spiders and Harvestmen

Spiders and harvestmen were collected by project biologists using a mesh butterfly net to sweep vegetation. Specimens were identified by James Arnold of the West Virginia Arachnid Survey. Additions to the data collected in the field are from Arnold's (2004) report on spider diversity in West Virginia. Fifty taxa of spiders and four taxa of harvestmen are known from the study area. Four of the spiders are rare. These include an undescribed hahniid spider (*Calymmaria* sp. 21) which is endemic to West Virginia and critically imperiled throughout its range. This species was collected at Cranberry Glades (Heiss 1982). Three pirate wolf spiders (*Pirata insularis*, *Pirata sedentarius*, *Pirata seminolus*) are critically imperiled in West Virginia, but have not yet been assigned global ranks. These rare pirate wolf spiders were collected at several locations in both forested and open wetlands within the study area. A list of spiders and harvestmen known from the project area is presented in Appendix F.

## Flora

As noted in the preceding sections, the study area is particularly rich in habitat niches and supports a diverse flora. More than 900 plant species have been documented within the study area wetlands (Appendix G). Floristic summaries of each wetland type are included in the community descriptions below. Constancy-cover tables for each community type are presented in Appendix H, and floristic descriptions from the National Vegetation Classification are shown in Appendix I.

The flora of the study area is characterized by a generally northern affiliation, not surprising given the high elevation and frost pocket morphology of many wetlands. This unglaciated part of the Appalachians was an important ancestral seed source for many species that migrated northward after the retreat of the glaciers. In fact, there are some typically northern species, such as *Abies balsamea* (balsam fir) that maintain their greatest genetic diversity in the central and southern Appalachians (Eyvind and Barnett 1974, Brown 1999, Clark et al. 2000). Mixed with the northern-affiliated species, and giving a unique character to the study area, are several species that are endemic to the Central Appalachians and a few southern high elevation specialists that reach their northernmost extent in these wetlands.

The most common and characteristic tree species in the study area is *Picea rubens* (red spruce), with common associates *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Where calcareous seepage is present, *Abies balsamea* (balsam fir) and *Fraxinus nigra* (black ash) are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Rhododendron maximum* (great laurel), *Vaccinium myrtilloides* (velvetleaf blueberry), *Alnus*

*incana* ssp. *rugosa* (speckled alder), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (winterberry), *Photinia melanocarpa* (black chokeberry), *Viburnum recognitum* (northern arrowwood), and *Kalmia latifolia* (mountain laurel). Herbaceous species frequently include *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), *Juncus effusus* (common rush), *Eriophorum virginicum* (cottongrass), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), *Leersia oryzoides* (rice cutgrass), *Galium tinctorium* (stiff marsh bedstraw), *Solidago rugosa* (roughleaf goldenrod), *Symplocarpus foetidus* (skunk cabbage), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Scirpus cyperinus* (woolgrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex trisperma* var. *trisperma* (three-seeded sedge), *Carex stipata* (stalk-grain sedge), and *Calamagrostis canadensis* var. *canadensis* (bluejoint grass). *Sphagnum* spp. (peatmoss) and *Polytrichum* spp. (haircap moss) dominate the bryophyte layer.

A number of species within the study area have northern affiliations, including some that are disjunct, e.g., *Abies balsamea* (balsam fir), *Larix laricina* (tamarack), and *Andromeda polifolia* var. *glaucophylla* (bog rosemary). Additional species with primarily northern distributions include *Alnus incana* ssp. *rugosa* (speckled alder), *Amelanchier bartramiana* (oblong-fruit serviceberry), *Carex lacustris* (lake sedge), *Carex lasiocarpa* (woolly-fruit sedge), *Carex pauciflora* (few-flower sedge), *Coptis trifolia* (goldthread), *Dalibarda repens* (star violet), *Fraxinus nigra* (black ash), *Gaultheria hispidula* (creeping snowberry), *Menyanthes trifoliata* (buckbean), *Nemopanthus mucronatus* (catberry), *Polemonium vanbruntiae* (Jacob's ladder), *Scirpus atrocinctus* (blackgirdle bulrush), *Triantha glutinosa* (sticky bog-asphodel), and *Vaccinium oxycoccos* (small cranberry). Characteristic species of the central and southern Appalachians include *Aconitum reclinatum* (white monkshood), *Euphorbia purpurea* (glade spurge), *Ilex collina* (long-stalked holly), *Marshallia grandiflora* (Monongahela Barbara's buttons), *Rhododendron maximum* (great laurel), *Vaccinium erythrocarpum* (southern mountain cranberry), and *Viola appalachiensis* (Appalachian blue violet).

Six globally rare plants have important populations within the study area. They are *Aconitum reclinatum* (white monkshood), *Euphorbia purpurea* (glade spurge), *Ilex collina* (long-stalked holly), *Marshallia grandiflora* (Monongahela Barbara's buttons), *Polemonium vanbruntiae* (Jacob's ladder), and *Viola appalachiensis* (Appalachian blue violet). An additional four globally rare plants have been recorded in the study area, but their known populations are small. They are *Hypericum mitchellianum* (Blue Ridge St. Johnswort), *Poa paludigena* (bog bluegrass), *Potamogeton tennesseensis* (Tennessee pondweed), and *Scutellaria saxatilis* (rock skullcap).

There are 145 state rare plant species, including 60 critically imperiled (S1) species, 56 imperiled (S2) species, and 29 vulnerable (S3) species known from the study area. This represents a remarkable 31% of West Virginia's rare flora. In other words, nearly one-third of the rare plants in the state may be found on 0.1% of its land surface. Or, to put it yet another way, the chance of encountering a rare plant in a high elevation wetland of the Alleghenies is roughly 300 times greater than in West Virginia as a whole. While wetlands statewide make up only 1% of West Virginia's land surface (USFWS 1992), they provide essential habitat to 23% of our flora, and 44% of our rare flora. This analysis considered vascular plant species that are

rated FACW or wetter by the National Wetland Inventory, i.e., plants that have 67-99% probability of occurring in a wetland (USFWS 1996).

## **Landscape change**

Pollen, plant microfossil, and radiocarbon evidence from Cranberry Glades, Cranesville Swamp, Canaan Valley, and Big Run Bog indicate that during the last ice age, treeless sedge tundra comprised the stable vegetation in the higher mountains of central Appalachia. Tundra vegetation persisted until about 12,500 years ago, when climatic warming brought spruce, pine, and fir forests to the area. Within a few hundred years, hemlock appeared in large populations, followed by birch, ash, beech, chestnut, maple, and oak. By 10,000 years ago, the central Appalachians supported extensive mesic forests. The appearance of abundant *Sphagnum* pollen and other wetland plants (*Alnus*, *Osmunda cinnamomea*, *Sparganium*, *Sagittaria*, and *Menyanthes*) between 6-10,000 years ago presumably coincides with the formation of at least some high Allegheny wetlands (Cox, 1968, Darlington 1943, Watts 1979, Whitehead 1973, Wieder 1985).

Human history of the study area begins with Native Americans perhaps 10,000 years ago, concurrent with the retreat of the northern ice sheets and the landscape shift from tundra to early forests. The degree of landscape modification by early hunter-gatherer inhabitants is unknown, but probably consisted of localized, shifting areas of burning and clearing. Permanent settlements have not been found within the high elevation study area, but production sites, where chert and chalcedony were processed into spear points and tools, are known from the Greenbrier limestone within the project area at Spruce Knob and above Blister Swamp. These upland sites have been dated to approximately 2,000 years ago based on the style of the points. Charcoal horizons and a buried podzol in the soil profile at the Blister Swamp site indicates localized burning and conversion of forest to grassland, presumably to enhance hunting opportunities at the production site (Byers 2007, Lesser 2007).

During late Paleolithic time (1000-1200 A.D.), gardening cultures developed in West Virginia based on the “food package” of corns, beans, and squash that arrived from Mesoamerica. The development of agriculture probably led to an increase in population size, with small, shifting settlements and fields concentrated along river bottoms. As in earlier times, the use of the highlands is unknown. Landscape modification probably occurred at seasonal hunting grounds and production sites. Following devastating contact with European diseases in the 16<sup>th</sup> and 17<sup>th</sup> centuries, Native American populations declined significantly, probably 60-90%. Thus, when European settlers began to arrive in the Allegheny highlands, the native residents were few and their landscape modifications would in some cases have been reverting back to natural disturbance regimes (Diamond 1997, Krech 2000, Lesser 2007).

European settlers began to arrive in the 1700s, bringing small-scale clearing and burning impacts on the uplands and wetlands of the Allegheny Mountains; however, the high, cold forest regions experienced less settlement pressure than more hospitable surrounding hill regions and valley bottoms. The forest matrix, with its embedded wetlands, remained largely intact within the study area. During this period, a number of historic accounts mention early wetland habitats in the Allegheny Mountains, including “impenetrable” old-growth swamps, open cranberry

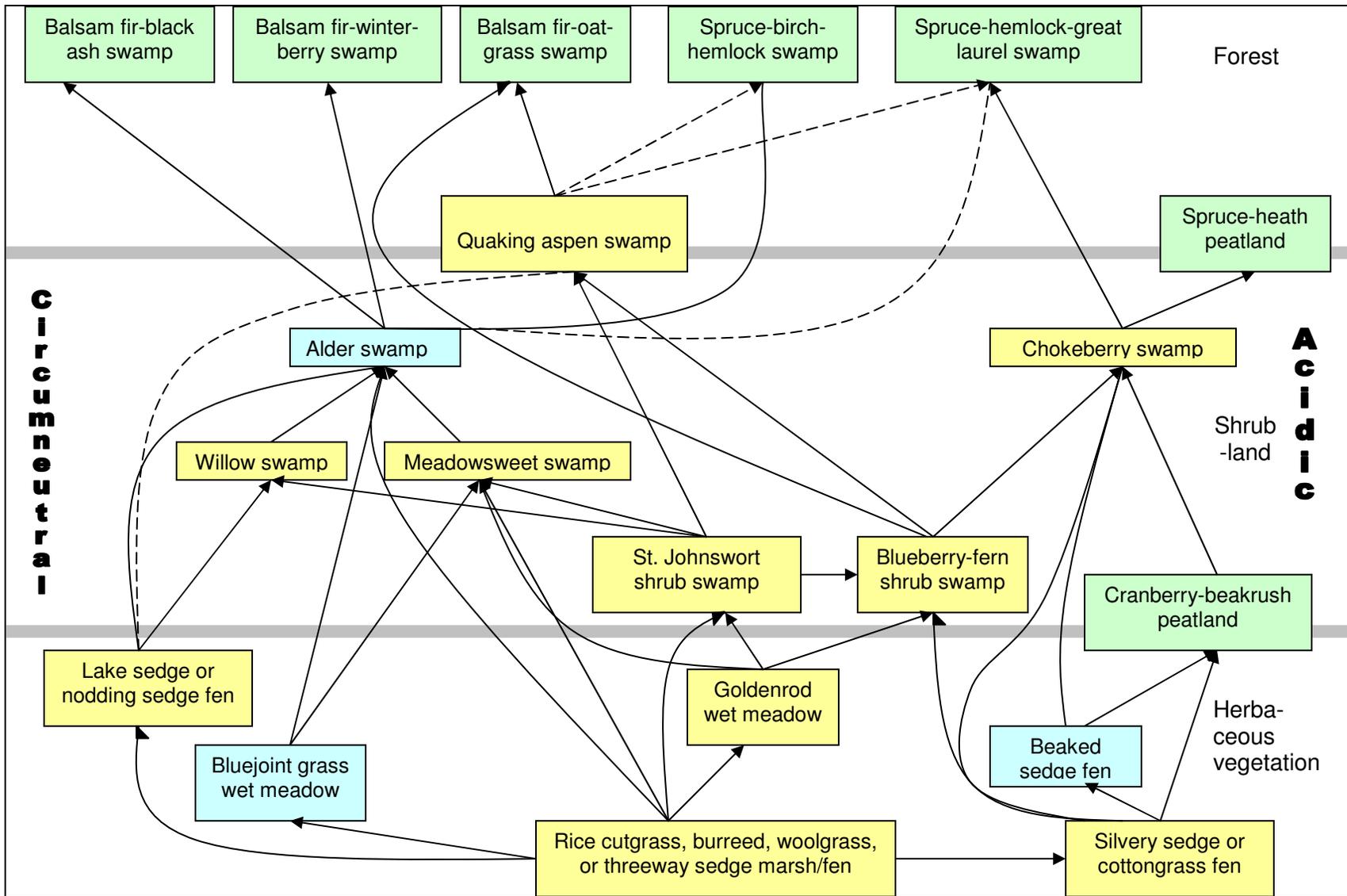
peatlands, and game-filled glades of bluejoint grass along low-gradient streams (Browning 1859, Kennedy 1853, Lewis 1746, Selders 1917, Strother 1853, 1872, 1873a, 1873b).

It was not until the logging boom of 1880-1920 that natural habitats were completely altered. During this period, more than 99% of the forest was harvested or burned. Many areas burned repeatedly, consuming the organic substrate and potentially setting back natural succession by centuries. Erosion of denuded slopes above the wetlands produced a sediment pulse that is visible in some wetland soil profiles. Railroad beds were laid down along almost every high elevation stream in order to take out the timber harvest, resulting in channelization of streambeds and hydrologic alteration of surrounding floodplain basins and their associated wetlands. Large wetlands, for example in Canaan Valley, were overlain by a grid of railroad beds, fragmenting wetland mosaics with multiple hydrologic barriers (Brooks 1910, Clarkson 1964, Selders 1917).

The combination of deforestation, erosion, and channelization must have produced “flashy” runoff conditions, with more water moving quickly through the landscape during heavy rainfall, and drought stress during dry periods. Many streams became entrenched and no longer were connected to their floodplain wetlands. Both of these processes contribute to loss of wetlands. Beavers, which are a keystone species in the maintenance of small alluvial wetlands, were trapped to extinction in the early nineteenth century in West Virginia (Bailey 1954, Hamilton and Whitaker 1998). We see records of this net wetland loss in, for example, Darlington’s (1943) concern that Cranberry Glades was drying up during the first half of the twentieth century.

Today, many of the wetlands in the high Allegheny Mountain region enjoy some degree of protection under public ownership or private stewardship. Upland forests have grown up around the wetlands to buffer runoff, swamps are slowly regaining woody vegetation and beavers have been successfully re-introduced. However, recovery in this cool climate is very slow, and re-establishing a natural disturbance regime can be elusive. Forested swamps occupy a tiny fraction of the land that they covered in pre-settlement time. Formerly forested wetlands have been largely replaced by drained cultural landscapes, open wetlands, or successional shrub swamps. The few remaining tracts of forested swamp are sometimes, ironically, threatened by the keystone beaver species, which in the absence of predators has become locally abundant (Bonner 2005, Fortney and Rentch 2003). An approximate successional model, which includes many of the wetlands in this study, indicates some of the changes over time for wetland communities at the Canaan Valley National Wildlife Refuge (Figure 5).

Today’s high elevation wetlands also face a host of serious new threats: habitat loss and hydrologic alteration from mining activities and second home development, invasive species and aggressive new pathogens, pollution from agricultural and septic inputs, fragmentation and loss of buffer from road construction and logging, excessive deer herbivory which is eradicating palatable species, acid deposition, and global warming. We cannot afford to be complacent about the survival of our beautiful and ecologically rich high elevation wetlands.



**Figure 5. Successional wetland model for Canaan Valley National Wildlife Refuge.** Dashed lines indicate less confidence in pathway. Succession may follow arrows during average/drier years and peat accumulation. Succession may be reversed during wet years, natural flooding, beaver activity, or as a result of human disturbance. Green: late successional. Blue: mid-late successional or flood disclimax. Yellow: beaver/flood/seepage disclimax or early/mid successional.

## Results

A new ecological system for the High Allegheny Wetlands and 41 classified wetland associations were peer-reviewed, accepted, and published in the National Vegetation Classification (NVC). Eleven of these associations represent wetland types that are new to the national system. Twenty of the communities have high global conservation priority, and the remaining 21 types have high state conservation priority. The highest conservation priorities at both the global and state levels are forested conifer and mixed swamps, ancient peatlands, and an ice-scour community. The wetland communities described in this study include 11 forest and woodland swamps, three linear forested seeps, nine shrub swamps, 17 herbaceous wetlands, and one bryophyte wetland. The common and scientific names of the communities, with their corresponding state and global conservation ranks, are listed in Table 3. Detailed state and NVC descriptions of each community, including descriptions of environment, vegetation, noteworthy species, distribution on states and federal lands, classification comments, named plots, conservation status, similar associations, and concept references are included as Appendix I.

**Table 3. High Elevation Wetland Communities and Conservation Ranks**

<u>Common Name</u>	<u>NVC Code and State Scientific Name</u>	<u>State Rank</u>	<u>Global Rank</u>
<b>FOREST AND WOODLAND SWAMPS</b>			
<b>Balsam Fir - Black Ash Swamp</b>	CEGL006003: <i>Fraxinus nigra</i> - <i>Abies balsamea</i> / <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Rhamnus alnifolia</i> / <i>Carex bromoides</i> ssp. <i>bromoides</i> Rich Swamp	S1	G1
<b>Balsam Fir - Oatgrass Swamp</b>	CEGL006592: <i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Danthonia compressa</i> - <i>Lycopodium</i> spp. / <i>Sphagnum</i> spp. Forested Swamp	S2	G2
<b>Balsam Fir - Winterberry Swamp</b>	CEGL006591: <i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Ilex verticillata</i> / <i>Sphagnum</i> spp. Woodland Swamp	S1	G2
<b>Pitch Pine - Heath Peat Woodland</b>	CEGL006587: <i>Pinus rigida</i> - <i>Picea rubens</i> / <i>Nemopanthus mucronata</i> - <i>Kalmia latifolia</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. Peat Woodland	S1	G1G2
<b>Quaking Aspen Swamp</b>	CEGL006594: <i>Populus tremuloides</i> / <i>Vaccinium myrtilloides</i> / <i>Solidago uliginosa</i> Swamp	S3	GNR
<b>Red Spruce – Heath Peat Woodland</b>	CEGL006588: <i>Picea rubens</i> / <i>Rhododendron maximum</i> - <i>Kalmia latifolia</i> / <i>Osmunda cinnamomea</i> var. <i>cinnamomea</i> / <i>Sphagnum</i> spp. Peat Woodland	S2	G2G3
<b>Red Spruce - Hemlock - Great Laurel Swamp</b>	CEGL006277: <i>Picea rubens</i> - <i>Tsuga canadensis</i> / <i>Rhododendron maximum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> Forested Swamp	S2	G2?
<b>Red Spruce - Southern Mtn Cranberry Swamp</b>	CEGL006593: <i>Picea rubens</i> / <i>Vaccinium erythrocarpum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> High Elevation Swamp	S2	G2
<b>Red Spruce - Three-seeded Sedge Peat Woodland</b>	CEGL006590: <i>Picea rubens</i> / <i>Carex trisperma</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. High Elevation Peat Woodland	S2	G2
<b>Red Spruce - Yellow Birch - Mannagrass Swamp</b>	CEGL006556: <i>Picea rubens</i> – <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> – <i>Tsuga canadensis</i> / <i>Glyceria melicaria</i> / <i>Sphagnum</i> spp. Swamp	S2S3	G3

<b>Tamarack Swamp</b>	CEGL002472: <i>Larix laricina</i> / <i>Ilex verticillata</i> / <i>Symplocarpus foetidus</i> – <i>Osmunda cinnamomea</i> / <i>Sphagnum</i> spp. Woodland Swamp	S1	G4
<b>LINEAR FORESTED SEEPS</b>			
<b>Cinnamon Fern Seep</b>	CEGL006132: <i>Acer rubrum</i> / <i>Osmunda cinnamomea</i> var. <i>cinnamomea</i> / <i>Sphagnum</i> spp. Forest Seep	S3	GNR
<b>Golden Saxifrage Seep</b>	CEGL006193: <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> / <i>Impatiens capensis</i> - <i>Chrysosplenium americanum</i> - ( <i>Symplocarpus foetidus</i> ) / <i>Rhizomnium appalachianum</i> Forest Seep	S3	G3G5
<b>Rough Sedge Seep</b>	CEGL006597: <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> / <i>Carex scabrata</i> - <i>Viola cucullata</i> / <i>Plagiomnium ciliare</i> Sloping Forested Seep	S3	G3
<b>SHRUB SWAMPS</b>			
<b>Blueberry - Bracken Fern Shrub Swamp</b>	CEGL006596: <i>Vaccinium myrtilloides</i> / <i>Pteridium aquilinum</i> / <i>Polytrichum</i> spp. Shrub Swamp	S3	GNR
<b>Bushy St. Johnswort Shrub Swamp</b>	CEGL006464: <i>Hypericum densiflorum</i> / <i>Juncus effusus</i> / <i>Sphagnum</i> spp. Shrub Swamp	S3	GNR
<b>Chokeberry - Northern Wild Raisin Shrub Peatland</b>	CEGL006545: <i>Photinia (melanocarpa, pyrifolia)</i> – <i>Viburnum nudum</i> var. <i>cassinoides</i> / <i>Eriophorum virginicum</i> / <i>Sphagnum</i> spp. Shrub Peatland	S3	GNR
<b>Cranberry - Beakrush Peatland</b>	CEGL007856: <i>Vaccinium oxycoccos</i> - ( <i>Vaccinium macrocarpon</i> ) / <i>Rhynchospora alba</i> / <i>Sphagnum</i> spp. Dwarf Shrub Peatland	S2	G2
<b>Meadowsweet Shrub Swamp</b>	CEGL006595: <i>Spiraea alba</i> Shrub Swamp	S3	GNR
<b>Silky Willow Shrub Swamp</b>	CEGL006305: <i>Salix sericea</i> Shrub Swamp	S3	GNR
<b>Speckled Alder Shrub Swamp</b>	CEGL002381: <i>Alnus incana</i> ssp. <i>rugosa</i> Shrub Swamp	S3	GNR
<b>Speckled Alder - Arrowwood Shrub Swamp</b>	CEGL006546: <i>Alnus incana</i> ssp. <i>rugosa</i> – <i>Viburnum recognitum</i> / ( <i>Symplocarpus foetidus</i> ) / <i>Sphagnum</i> spp. Shrub Swamp	S3	GNR
<b>Steeplebush Shrub Swamp</b>	CEGL006571: <i>Spiraea tomentosa</i> / <i>Sphagnum palustre</i> Shrub Peatland	S2	GNR
<b>HERBACEOUS WETLANDS</b>			
<b>American Bur-reed Marsh</b>	CEGL004510: <i>Sparganium (americanum, chlorocarpum)</i> Marsh	S2	G2G3
<b>Monongahela Barbara's-buttons Riverscour Prairie</b>	CEGL006598: <i>Rhododendron arborescens</i> / <i>Marshallia grandiflora</i> - <i>Triantha glutinosa</i> - <i>Platanthera flava</i> var. <i>herbiola</i> Riverscour Prairie	S1	G1
<b>Beaked Sedge Fen</b>	CEGL002257: <i>Carex utriculata</i> / <i>Sphagnum</i> spp. Fen	S2	G4G5
<b>Bluejoint Grass Wet Meadow</b>	CEGL005174: <i>Calamagrostis canadensis</i> Wet Meadow	S2	G4G5
<b>Cottongrass Fen</b>	CEGL006570: <i>Eriophorum virginicum</i> - ( <i>Carex folliculata</i> ) / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. Fen	S3	G3
<b>Goldenrod Wet Meadow</b>	CEGL006568: <i>Solidago rugosa</i> - <i>Euthamia graminifolia</i> var. <i>graminifolia</i> Wet Meadow	S3	GNR
<b>Hairy-fruit Sedge Floodplain Prairie</b>	CEGL006447: <i>Carex trichocarpa</i> Floodplain Prairie	S1	G3

<b>Lake Sedge Fen</b>	CEGL002256: <i>Carex lacustris</i> Fen	S1	G4G5
<b>Nodding Sedge – Prickly Bog Sedge Seep</b>	CEGL007771: <i>Carex gynandra</i> – <i>Carex atlantica</i> / <i>Sphagnum</i> spp. Seep	S2	G2
<b>Rice Cutgrass Marsh</b>	CEGL006461: <i>Leersia oryzoides</i> - <i>Sagittaria latifolia</i> Marsh	S3	GNR
<b>Softstem Bulrush Marsh</b>	CEGL006275: <i>Schoenoplectus tabernaemontani</i> Marsh	S2	GNR
<b>Silvery Sedge Fen</b>	CEGL006549: <i>Carex canescens</i> / <i>Polytrichum</i> spp. - <i>Sphagnum</i> spp. Fen	S2	GNR
<b>Star Sedge Fen</b>	CEGL008534: <i>Carex echinata</i> ssp. <i>echinata</i> / <i>Sphagnum</i> spp. Fen	S2	G2?
<b>Threeway Sedge Fen</b>	CEGL006552: <i>Dulichium arundinaceum</i> / <i>Sphagnum</i> spp. Fen	S3	GNR
<b>Tussock Sedge Wet Meadow</b>	CEGL006412: <i>Carex stricta</i> Wet Meadow	S3	G4G5
<b>Twisted Sedge Riverscour Prairie</b>	CEGL004103: <i>Carex torta</i> Riverscour Prairie	S3	G3G4
<b>Woolgrass Wet Meadow</b>	CEGL006349: <i>Scirpus cyperinus</i> Wet Meadow	S3	GNR
<b>BRYOPHYTE WETLANDS</b>			
<b>Bog-rosemary Peatland</b>	CEGL006589: ( <i>Andromeda polifolia</i> var. <i>glaucophylla</i> ) / <i>Polytrichum strictum</i> - <i>Cladina</i> spp. - <i>Sphagnum</i> spp. Peatland	S1	G1

## ***Ecological systems***

In addition to the new associations, a new *ecological system* for the high Allegheny headwater wetlands was peer-reviewed, accepted, and published in the NVC as a result of the project (NatureServe 2007). Ecological systems are the basis for national-scale mapping efforts such as LandFire. Most of the wetlands in the study area form part of this newly defined High Allegheny Wetland system. However, some wetland types included in the study, in particular the riverscour, flood deposition, and forest seep communities, belong to other ecological systems as defined by NatureServe (2007). Wetland associations may occur in more than one system, and systems generally include many associations. Four ecological systems occur in the project area. They are described below, and the associations within the study area that belong to each of them are listed.

### **High Allegheny Wetland**

The High Allegheny Wetland ecological system occurs in a southwest-northeast trending band about 40 km wide and 200 km long along the high, flat plateau of the Allegheny Mountains in West Virginia and Maryland. The eastern boundary is the Allegheny Front, and the western boundary is the heavily dissected, lower elevation Allegheny Plateau. Minimum elevations range from 730 m in the north (Garrett County, MD) to 940 m in the south (Droop Mountain, WV). The maximum elevation is 1422 m on Mount Porte Crayon, WV.

Wetlands in this system are drained by low-gradient, meandering, intermittent to small streams that form the headwaters of larger (often high-gradient) mountain rivers. The system is underlain by gently folded sedimentary rocks of Carboniferous and Devonian age. Drainage is impounded in high, flat-lying basins by natural dams or “knickpoints” of resistant sandstone (Pottsville and Price formations). These sandstone layers come to the surface along the gently dipping axes of breached anticlines or synclines, or occasionally on the gently dipping limb of a fold. Cold air drains from the surrounding uplands to pool in the flat basins, which function as frost pockets. Rainfall is plentiful, averaging about 1300 mm/year. Communities in this system may have substrates of shallow to deep peat (a few centimeters to up to 3 meters depth), or less commonly, mineral soil. Soils are acid to circumneutral, with pH ranging from 3.1 to 6.5. Compared to upland and wetland soils statewide, soils in the study area exhibit typically high values for soil organic matter, total exchange capacity, estimated nitrogen release, soluble sulphur, and phosphorus. Most soils are low in potassium and in the micronutrients boron, copper, and manganese.

These high Allegheny wetlands form complex mosaics of small patch communities. Forested swamps occupy the less disturbed margins or slightly higher “islands” in the wetland mosaic. Ombrotrophic bogs are rare, but occur in undisturbed portions of a few of the larger wetlands. The more central, flood- or beaver-influenced sections contain shrub swamps, sedge fens, wet meadows, and open marshes. A number of species have northern affiliations, including some that are disjunct, e.g., *Abies balsamea* (balsam fir), *Larix laricina* (tamarack), and *Andromeda polifolia* var. *glaucophylla* (bog-rosemary). The shrub strata include characteristic Central Appalachian species (e.g. *Rhododendron maximum*, great laurel), Appalachian endemic species (e.g. *Ilex collina*, long-stalked holly), and species with a more southern affiliation (e.g. *Vaccinium erythrocarpum*, southern mountain cranberry). Forested swamps are dominated by *Picea rubens* (red spruce), with varying cover by *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Where limestone or calcareous shale influences seepage water, *Abies balsamea* (balsam fir) and *Fraxinus nigra* (black ash) are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Rhododendron maximum* (great laurel), *Vaccinium myrtilloides* (velvetleaf blueberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (common winterberry), *Photinia melanocarpa* (black chokeberry), *Viburnum recognitum* (northern arrowwood), and *Kalmia latifolia* (mountain laurel). Herbaceous species frequently include *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), *Juncus effusus* (common rush), *Eriophorum virginicum* (cottongrass), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), *Leersia oryzoides* (rice cutgrass), *Galium tinctorium* (stiff marsh bedstraw), *Solidago rugosa* (roughleaf goldenrod), *Symplocarpus foetidus* (skunk cabbage), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Scirpus cyperinus* (woolgrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex trisperma* var. *trisperma* (three-seeded sedge), *Carex stipata* (stalk-grain sedge), and *Calamagrostis canadensis* var. *canadensis* (bluejoint grass). *Sphagnum* spp. (peatmoss) and *Polytrichum* spp. (haircap moss) dominate the bryophyte layer.

Globally rare plant species known to occur in this system include: *Aconitum reclinatum* (white monkshood, G3), *Euphorbia purpurea* (glade spurge, G3), *Ilex collina* (long-stalked

holly, G3), *Scutellaria saxatilis* (rock skullcap, G3), *Viola appalachiensis* (Appalachian blue violet, G3), and *Polemonium vanbruntiae* (Jacob's ladder, G3G4).

This system is maintained by a spatially complex mix of seepage, low-energy flooding, beaver activity, and rainfall. Drainage in the flat headwater basins is partly impounded by resistant sandstone at the basin outlet. Low-gradient, meandering headwater streams provide regular low-energy inundation. Seepage from surrounding forests provides nutrients at the margins of the wetland mosaic, and where limestone or calcareous shale is present, circumneutral wetlands are maintained. Beaver activity encourages the cycling of early- to mid-successional types. In the rare ombrotrophic bogs, rainfall is the only source of moisture. Many of the forested swamps in this system were logged during 1880-1920, and some were subsequently burned and/or heavily grazed. Undisturbed examples exist (e.g. Cranberry Glades), where old growth swamp buffers the central peatlands, which have been dated to 10,000 years. In pre-settlement time, some wetland mosaics in this system had significant forested components (e.g. Canaan Valley, Cranesville Swamp), while others (e.g. Cranberry Glades, Big Run Bog) were largely open peatlands with forested swamp only on the margins.

Wetland communities in the study area that form part of this ecological system include the following:

#### Forest and Woodland Swamps

- Balsam Fir - Black Ash Swamp
- Balsam Fir - Oatgrass Swamp
- Balsam Fir - Winterberry Swamp
- Pitch Pine - Heath Peat Woodland
- Quaking Aspen Swamp
- Red Spruce - Heath Peat Woodland
- Red Spruce - Hemlock - Great Laurel Swamp
- Red Spruce - Southern Mountain Cranberry Swamp
- Red Spruce - Three-seeded Sedge Peat Woodland
- Red Spruce - Yellow Birch - Mannagrass Swamp
- Tamarack Swamp

#### Shrub Swamps

- Blueberry - Bracken Fern Shrub Swamp
- Bushy St. Johnswort Shrub Swamp
- Chokeberry - Northern Wild Raisin Shrub Peatland
- Cranberry - Beakrush Peatland
- Meadowsweet Shrub Swamp
- Silky Willow Shrub Swamp
- Speckled Alder - Arrowwood Shrub Swamp
- Speckled Alder Shrub Swamp
- Steeplebush Shrub Swamp

#### Herbaceous Wetlands

- American Bur-reed Marsh
- Beaked Sedge Fen
- Bluejoint Grass Wet Meadow

- Cottongrass Fen
- Goldenrod Wet Meadow
- Lake Sedge Fen
- Nodding Sedge – Prickly Bog Sedge Seep
- Rice Cutgrass Marsh
- Silvery Sedge Fen
- Softstem Bulrush Marsh
- Star Sedge Fen
- Threeway Sedge Fen
- Tussock Sedge Wet Meadow
- Woolgrass Wet Meadow
- Bryophyte Wetlands
- Bog-rosemary Peatland

## Central Appalachian Stream and Riparian

This riparian system ranges from southern New England to Virginia and West Virginia and occurs over a wide range of elevations. It develops on floodplains and shores along river channels that lack a broad flat floodplain due to steeper sideslopes, higher gradient, or both. It may include communities influenced by flooding, erosion, or groundwater seepage. The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra* (sweet birch), *Platanus occidentalis* (sycamore), and *Acer negundo* (box elder). Open, flood-scoured rivershore prairies feature *Panicum virgatum* (switchgrass) and *Andropogon gerardii* (big bluestem), and *Carex torta* (twisted sedge) is typical of wetter areas near the channel.

Wetland communities in the study area that form part of this ecological system include the following:

### Forested Swamps

- Red Spruce - Hemlock - Great Laurel Swamp
- Red Spruce - Yellow Birch - Mannagrass Swamp

### Shrub Swamps

- Silky Willow Shrub Swamp
- Steeplebush Shrub Swamp

### Herbaceous Wetlands

- American Bur-reed Marsh
- Monongahela Barbara's-buttons Riverscour Prairie
- Goldenrod Wet Meadow
- Hairy-fruit Sedge Floodplain Prairie
- Nodding Sedge – Prickly Bog Sedge Seep
- Rice Cutgrass Marsh
- Softstem Bulrush Marsh
- Twisted Sedge Riverscour Prairie
- Woolgrass Wet Meadow

## Central and Southern Appalachian Spruce-Fir Forest

Forested seeps occur as discontinuous linear wetlands in groundwater discharge areas within the Central and Southern Appalachian Spruce-Fir Forest. This system consists of forests in the highest elevation zone of the Southern Blue Ridge and parts of the central Appalachians, generally dominated by *Picea rubens* (red spruce), *Abies fraseri* (Fraser fir), or *Abies balsamea* (balsam fir), or by a mixture of spruce and one of the firs. *Abies fraseri* (Fraser fir) is the constituent fir from Mount Rogers in Virginia southward and is replaced northward by *Abies balsamea* (balsam fir). Examples occur above 1676 m (5500 feet) in the Southern Blue Ridge but as low as 975 m (3200 feet) at the northern range in West Virginia and may range up to the highest peaks. Elevation and orographic effects make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather are periodically important.

Wetland communities in the study area that occur in this ecological system include Cinnamon Fern Seep, Golden Saxifrage Seep, and Rough Sedge Seep.

## Appalachian (Hemlock)-Northern Hardwood Forest

Forested seeps occur as discontinuous linear wetlands in groundwater discharge areas within the Appalachian (Hemlock) – Northern Hardwood Forest. This forested system of the northeastern U.S. ranges from central New England west to Lake Erie and south to Virginia, continuing down the Appalachians to Georgia in a more attenuated fashion. It is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. Northern hardwoods such as *Acer saccharum* (sugar maple), *Betula alleghaniensis* (yellow birch), and *Fagus grandifolia* (American beech) are characteristic, forming a deciduous canopy or mixed with *Tsuga canadensis* (eastern hemlock) or in some cases mixed with *Pinus strobus* (white pine). Other common and sometimes dominant trees include *Quercus* spp. (oak, most commonly *Quercus rubra*, red oak), *Liriodendron tulipifera* (tuliptree), *Prunus serotina* (black cherry), and *Betula lenta* (sweet birch). It is of more limited extent and more ecologically constrained in the southern part of its range (more or less from central Virginia southwards), occurring at a smaller spatial extent.

Wetland communities in the study area that occur in this ecological system are the same as those in the Central and Southern Appalachian Spruce-For Forest, i.e. Cinnamon Fern Seep, Golden Saxifrage Seep, and Rough Sedge Seep.

## Communities with global conservation importance

### Critically imperiled

#### Balsam Fir - Black Ash Swamp



**Scientific Name:** *Fraxinus nigra* - *Abies balsamea* / *Alnus incana* ssp. *rugosa* / *Rhamnus alnifolia* / *Carex bromoides* ssp. *bromoides* Rich Swamp

**Translated Name:** Black Ash - Balsam Fir / Speckled Alder / Alderleaf Buckthorn / Brome-like Sedge Rich Swamp

**NVC Name:** CEG006003: *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* Forest

**Conservation Rank:** S1 / G1

This community is a lush, circumneutral, seepage-fed, mixed woodland or forested swamp of the

Allegheny Mountains region of West Virginia. It is a late-successional, small-patch community limited to frost-pocket wetlands on the Mississippian Greenbrier limestone, at elevations between 960 and 1000 m. The community occurs on temporarily to semi-permanently flooded, flat headwater basins and backswamps along small streams. Microtopography is characterized by irregular hummocks formed over buttressed tree roots, tip-up mounds, nurse logs, and decaying wood. Soils are poorly drained muck or organic-rich silt loam over mottled or gleyed silty clay.

This rich swamp provides habitat for a number of rare shade-tolerant calciphile wetland species. The canopy is open to closed and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir), *Fraxinus nigra* (black ash), and *Tsuga canadensis* (eastern hemlock). The subcanopy is dominated by *Abies balsamea* (balsam fir) with varying amounts of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce), and *Fraxinus nigra* (black ash). The tall-shrub layer is dominated by *Alnus incana* ssp. *rugosa* (speckled alder) with locally abundant *Ilex verticillata* (common winterberry) and sometimes vigorous *Picea rubens* (red spruce) regeneration in this stratum. The short-shrub layer is dominated by *Rhamnus alnifolia* (alderleaf buckthorn) or rarely by *Cornus amomum* (silky dogwood). The herbaceous ground layer is extensive and diverse, typically including over 50 species. The most abundant species are *Carex bromoides* ssp. *bromoides* (bromelike sedge) and *Glyceria striata* (fowl mannagrass). Other common species include *Arisaema triphyllum* (Jack in the pulpit), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Carex gynandra* (nodding sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Maianthemum canadense* (Canada mayflower), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Packera aurea* (golden ragwort), *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus hispidus* (bristly dewberry), and *Solidago rugosa* (wrinkleleaf goldenrod). *Poa alsodes* (grove bluegrass) is locally abundant. Dominant bryophytes are *Sphagnum* spp., *Hypnum imponens*, *Thuidium*

*delicatulum*, and *Bazzania trilobata*. The community has a large number of diagnostic species, including *Carex bromoides* ssp. *bromoides* (bromelike sedge), *Carex crinita* (fringed sedge), *Clematis virginiana* (virgin's bower), *Cornus amomum* (silky dogwood), *Dryopteris cristata* (crested woodfern), *Epilobium coloratum* (purpleleaf willowherb), *Euphorbia purpurea* (Darlington's glade spurge) (G3), *Fraxinus nigra* (black ash), *Galium asprellum* (rough bedstraw), *Geum rivale* (purple avens), *Milium effusum* var. *cisatlanticum* (American milletgrass), *Oxypolis rigidior* (stiff cowbane), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (G3), *Rhamnus alnifolia* (alderleaf buckthorn), and *Smilax tamnoides* (bristly greenbrier). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 70 taxa per 400 square meters.

## Bog-rosemary Peatland



**Scientific Name:** (*Andromeda polifolia* var. *glaucophylla*) / *Polytrichum strictum* - *Cladina* spp. - *Sphagnum* spp. Peatland  
**Translated Name:** (Bog-rosemary) / Haircap Moss- Reindeer Lichen - Peatmoss Peatland  
**NVC Name:** C EGL006589: (*Andromeda polifolia* var. *glaucophylla*) / *Polytrichum strictum* - *Cladina* spp. - *Sphagnum* spp. Nonvascular Vegetation  
**Conservation Rank:** S1 / G1

This ombrotrophic late-successional wetland occurs on slightly domed peat deposits in the Allegheny

Mountains region of West Virginia, at elevations between 960 and 1030 m. It is characterized by well-developed hummocks of mosses and lichens with occasional dominance by clonal patches of *Andromeda polifolia* var. *glaucophylla* (bog rosemary). It is a small-patch type (0.05-10 hectares) that occupies flat-lying headwater basins in the center of wetland mosaics, where it is isolated from seepage inputs. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 25-50 cm in height. The substrate is poorly drained peat, with depths ranging from 2 to 3.5 m. According to carbon dating of peat, this community grows on a site that has been characterized by bog vegetation for about 9500 years.

The short-shrub stratum ranges from 0 to 60% cover and is almost exclusively composed of *Andromeda polifolia* var. *glaucophylla* (bog rosemary), with infrequent very low cover by *Photinia melanocarpa* (black chokeberry) or *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub layer is comprised of *Rubus hispidus* (bristly dewberry) and *Vaccinium oxycoccos* (small cranberry) with an average cover of 12%. The herbaceous layer, with mean 5% cover, is characterized by *Eriophorum virginicum* (tawny cottongrass), which grows on top of the hummocks. *Rhynchospora alba* (white beaksedge) may line the hollows, and very low cover of *Carex trisperma* var. *trisperma* (threeseeded sedge) or *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) may be present. Nonvascular plants average 95% cover, with hummocks dominated by *Polytrichum strictum* and *Cladina* (reindeer lichen) spp. (*Cladina arbuscula*,

*Cladina rangiferina*, *Cladina stygia*), and hollows lined with *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum flexuosum*, *Sphagnum magellanicum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 13 taxa per 400 square meters, with 40% of the diversity in the nonvascular stratum.

### Monongahela Barbara's-buttons Riverscour Prairie



**Scientific Name:** *Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava* var. *herbiola* Riverscour Prairie

**Translated Name:** Smooth Azalea / Monongahela Barbara's-buttons - Sticky Bog-asphodel - Pale-green Orchid Riverscour Prairie

**NVC Name:** C EGL006598:  
*Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava* var. *herbiola*  
Herbaceous Vegetation

**Conservation Rank:** S1 / G1

This herbaceous riverscour prairie occurs on temporarily flooded sand and cobbles in the Allegheny Mountains region of West Virginia, at elevations between 1060 and 1100 m. It is a small-patch type that occupies flat to gently sloping islands, cobble bars, and shorelines along high-gradient streams. Ice-scour and flood deposition/scour keep this community open and prevent accumulation of organic material in the substrate. Flooding can occur at any time of year.

The community is characterized by a remarkable profusion of showy, flowering forbs, which share a tolerance for high-energy flooding and ice-scour. The shrub layer, kept at low stature and cover by frequent ice-scour, averages 12% cover and includes *Rhododendron arborescens* (smooth azalea), *Hypericum densiflorum* (bushy St. Johnswort), and *Alnus incana* ssp. *rugosa* (speckled alder). The herbaceous layer, averaging 60% cover, includes a large number of species with high constancy, including *Marshallia grandiflora* (Monongahela Barbara's buttons), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Carex haydenii* (Hayden's sedge), *Eleocharis tenuis* (slender spikerush), *Sanguisorba canadensis* (Canadian burnet), *Triantha glutinosa* (sticky bog-asphodel), *Hypericum ellipticum* (pale St. Johnswort), *Solidago rugosa* (wrinkleleaf goldenrod), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Juncus dudleyi* (Dudley's rush), *Potentilla simplex* (common cinquefoil), *Houstonia serpyllifolia* (thymeleaf bluet), *Phlox maculata* (wild sweetwilliam), *Deschampsia caespitosa* (tufted hairgrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Platanthera flava* var. *herbiola* (palegreen orchid). Exotic weeds washed in by the river typically include *Prunella vulgaris* (common selfheal), *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass), and *Daucus carota* (Queen Anne's lace). Cover by nonvascular plants is insignificant. Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the

Allegheny Mountains region include *Marshallia grandiflora* (Monongahela Barbara's buttons), *Juncus dudleyi* (Dudley's rush), *Krigia biflora* var. *biflora* (twoflower dwarfdandelion), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Phlox maculata* (wild sweetwilliam), *Platanthera flava* var. *herbiola* (palegreen orchid), *Rhododendron arborescens* (smooth azalea), *Sanguisorba canadensis* (Canadian burnet), *Triantha glutinosa* (sticky bog-asphodel), and *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane). Mean species richness of vascular plants is 37 taxa per 400 square meters.

## Imperiled

### Balsam Fir - Oatgrass Swamp



**Scientific Name:** *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp.  
Forested Swamp

**Translated Name:** Balsam Fir - Red Spruce / Flattened Oatgrass - Clubmoss / Peatmoss Forested Swamp

**NVC Name:** C EGL006592: *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest

**Conservation Rank:** S2 / G2

This acidic conifer woodland or forested swamp occurs on moist to saturated soils in headwater basins in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1130 m. It is a small-patch community fed by slow seepage and rainfall. It occupies gently sloping land (1- to 10-degree slopes) along small headwater streams and in mixed wetland mosaics, often at the base of upland slopes. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. Soils are moderately to poorly drained loamy soils with mottling in the upper 20 cm and occasional gleyed horizons.

The canopy is open to closed and dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Prunus serotina* var. *serotina* (black cherry). The subcanopy is dominated by *Abies balsamea* (balsam fir) with smaller amounts of *Picea rubens* (red spruce), *Acer rubrum* (red maple), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is also dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce). The short-shrub layer contains regenerating canopy species and locally abundant *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Hypericum densiflorum* (bushy St. Johnswort). The herbaceous ground layer is fairly diverse, typically including 25-50 species. The most abundant species are *Danthonia compressa* (flattened oatgrass), *Lycopodium obscurum* (rare clubmoss), and *Rubus hispidus* (bristly dewberry). Other herbaceous species with high constancy include the regenerating canopy species, *Lycopodium clavatum* (running clubmoss), *Carex folliculata* (northern long sedge), *Dennstaedtia punctilobula* (eastern hayscented fern),

*Pteridium aquilinum* (western brackenfern), and *Oclemena acuminata* (whorled wood aster). Nonvascular plants are dominated by *Sphagnum* species and *Polytrichum* species; *Leucobryum glaucum* is also common. The community is characterized by a number of diagnostic species that highlight the slightly drier habitat of this swamp type and include *Carex debilis* (white edge sedge), *Crataegus* (hawthorn) spp., *Lycopodium clavatum* (running clubmoss), *Lycopodium digitatum* (fan clubmoss), *Mitchella repens* (partridgeberry), *Polytrichum* spp., *Prunus serotina* var. *serotina* (black cherry), and *Pteridium aquilinum* (western brackenfern). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 41 taxa per 400 square meters.

## Balsam Fir - Winterberry Swamp



**Scientific Name:** *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp.  
Woodland Swamp

**Translated Name:** Balsam Fir - Red Spruce / Common Winterberry / Peatmoss Woodland Swamp

**NVC Name:** CEG006591: *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. Forest

**Conservation Rank:** S1 / G2

This acidic conifer woodland swamp occurs on temporarily to semi-permanently flooded soils in frost-pocket

headwater basins in the Allegheny Mountains region of West Virginia, at elevations between 980 and 1120 m. It is a small-patch community fed by seepage, occasional overflow from low-gradient headwater streams, and rainfall. It occupies flat to very gently sloping land (0- to 3-degree slopes) along small headwater streams, often in mixed wetland mosaics.

Microtopography is characterized by interfingering of wetter and drier areas, with irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. The community is influenced by beaver activity, and there is evidence of migration of the balsam fir populations, possibly in response to fluctuating hydrology. Soils are poorly to very poorly drained clayey or mucky soils with mottling in the upper 20 cm and occasional gleyed horizons.

The canopy is open and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) and *Acer rubrum* (red maple). The subcanopy is dominated by *Abies balsamea* (balsam fir) and *Tsuga canadensis* (eastern hemlock) with smaller amounts of *Picea rubens* (red spruce) and *Acer rubrum* (red maple). *Amelanchier* (serviceberry) spp. may be present with very low cover in the subcanopy. The shrub layer is dominated by *Ilex verticillata* (common winterberry), the regenerating canopy species, and *Alnus incana* ssp. *rugosa* (speckled alder). Low cover of *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), and *Vaccinium myrtilloides* (velvetleaf huckleberry) may be present. The herbaceous ground layer is dense and fairly diverse, typically including 30-40 species. The most abundant species are *Carex gynandra* (nodding sedge), *Carex folliculata* (northern long sedge), and *Rubus*

*hispidus* (bristly dewberry). Other herbaceous species with high constancy include regenerating woody species and *Polygonum sagittatum* (arrowleaf tearthumb), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Galium tinctorium* (stiff marsh bedstraw), *Dryopteris cristata* (crested woodfern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Impatiens capensis* (jewelweed), *Viola cucullata* (marsh blue violet), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Juncus effusus* (common rush), *Carex stipata* (owlfruit sedge), *Glyceria striata* (fowl mannagrass), *Polygonum punctatum* (dotted smartweed), *Glyceria grandis* var. *grandis* (American mannagrass), *Oxalis montana* (mountain woodsorrel), *Dryopteris intermedia* (intermediate woodfern), and *Maianthemum canadense* (Canada mayflower). Nonvascular plants are dominated by *Sphagnum* spp. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex canescens* (silvery sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), *Glyceria grandis* var. *grandis* (American mannagrass), and *Triadenum fraseri* (Fraser's marsh St. Johnswort). Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 31-66 (mean = 48) taxa per 400 square meters.

### Cranberry - Beakrush Peatland



**Scientific Name:** *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* / *Sphagnum* spp. Dwarf Shrub Peatland

**Translated Name:** Small Cranberry - (Large Cranberry) / White Beaksedge / Peatmoss Dwarf Shrub Peatland

**NVC Name:** C EGL007856: *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland

**Conservation Rank:** S2 / G2

This dwarf-shrubland occurs on temporarily flooded, semi-permanently flooded, or saturated peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 780 and 1210 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 5-50 cm in height. The substrate is poorly to very poorly drained peat. Peat deposits are greater than one meter deep in late-successional stands. According to carbon dating of peat at Big Run Bog and Cranberry Glades, some sites have been characterized by bog vegetation for more than 10,000 years. Carbon dating of peat at the Virginia site indicates the presence of wetland vegetation for at least 15,000 years. Younger stands often have shallower peat and may contain alluvial lenses of sand or buried clay layers from former beaver ponds. These younger stands sometimes occupy wetter zones within successional shrub peatlands. Mean soil pH is 3.7.

Vegetation is characterized by a hummocky mat of *Vaccinium oxycoccos* (small cranberry) with *Rhynchospora alba* (white beaksedge) in the hollows on an uneven bed of peat-

forming mosses. The sparse short-shrub stratum may include *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub layer is dominated by *Vaccinium oxycoccos* (small cranberry) with occasional dominance or codominance by *Vaccinium macrocarpon* (cranberry). *Rubus hispidus* (bristly dewberry) has high constancy in this stratum. The herbaceous layer is characterized by ombrotrophic bog vegetation with typically northern distribution. Dominant species are *Rhynchospora alba* (white beaksedge) and *Eriophorum virginicum* (tawny cottongrass), with lower cover by *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and *Gentiana linearis* (narrowleaf gentian). Nonvascular plants form a hummocky mat dominated by *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum fallax*, *Sphagnum papillosum*, *Sphagnum flexuosum*, *Sphagnum cuspidatum*, *Sphagnum recurvum*, *Sphagnum magellanicum*) and often including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Indicator species that help to distinguish this community from others within the high-elevation wetlands of the Allegheny Mountains region are *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Rhynchospora alba* (white beaksedge), *Vaccinium macrocarpon* (cranberry), and *Vaccinium oxycoccos* (small cranberry). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 16 taxa per 400 square meters.

### Nodding Sedge – Prickly Bog Sedge Seep



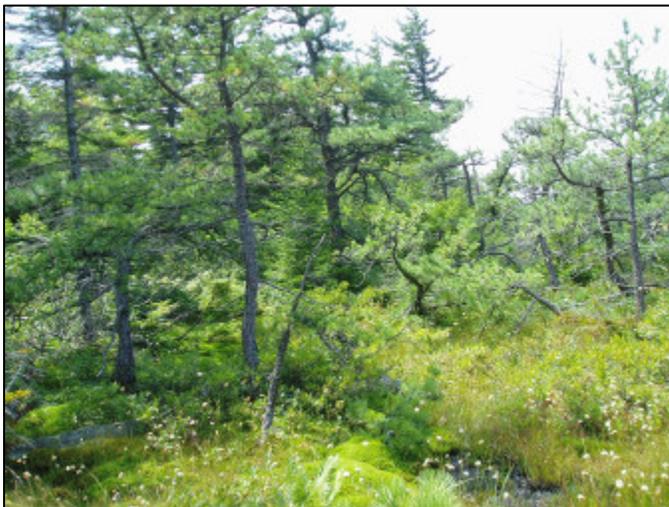
**Scientific Name:** *Carex gynandra* – *Carex atlantica* / *Sphagnum* spp. Seep  
**Translated Name:** Nodding Sedge – Prickly Bog Sedge / Peatmoss Seep  
**NVC Name:** CEG007771: *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation  
**Conservation Rank:** S2 / G2

This herbaceous seepage fen occurs on temporarily flooded and saturated soils in the Allegheny Mountains region of West Virginia, at elevations

between 800 and 1220 m. It is a small-patch type that occupies very gently sloping land (1-2 degrees) in headwater basins. Typically, this community is found on the margins of larger open wetlands, either on toeslopes, alluvial fans, or as fingers of enriched seepage extending into the wetland mosaic. It also occurs as a spring-fed seepage fen in old oxbows along low-gradient meandering streams. Rivulets a few centimeters wide may transect the community. During dry years, or during periods of reduced beaver activity in adjacent wetlands, woody species invade this type; inundation-killed snags are common. Hummock-and-hollow microtopography is fairly well-developed, with rounded peat hummocks 5-40 cm high and irregular mossy hummocks formed over decaying wood. Bedrock is commonly shale and, less frequently, sandstone. Soil texture is variable. Mean soil pH is 4.4.

The shrub layer averages 9% cover and often includes *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Hypericum densiflorum* (bushy St. Johnswort), *Salix sericea* (silky willow), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The herbaceous layer, with mean 80% cover, is typically dominated by *Carex gynandra* (nodding sedge) and *Carex atlantica* (prickly bog sedge); however, this type is susceptible to invasion by *Typha latifolia* (broadleaf cattail), which can attain dominance in some cases. The dwarf-shrub *Rubus hispidus* (bristly dewberry) is often present with moderate cover. Common herbaceous species with lower cover are *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Galium tinctorium* (stiff marsh bedstraw), *Solidago uliginosa* (bog goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Juncus effusus* (common rush), *Dryopteris cristata* (crested woodfern), *Polygonum sagittatum* (arrowleaf tearthumb), *Impatiens capensis* (jewelweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Carex stipata* (owlfruit sedge), *Chelone glabra* (white turtlehead), *Hypericum mutilum* (dwarf St. Johnswort), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Glyceria laxa* (limp mannagrass), *Carex echinata* ssp. *echinata* (star sedge), *Leersia oryzoides* (rice cutgrass), *Carex lurida* (shallow sedge), *Scirpus cyperinus* (woolgrass), *Glyceria striata* (fowl mannagrass), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Eriophorum virginicum* (tawny cottongrass), *Epilobium leptophyllum* (bog willowherb), *Agrostis perennans* (upland bentgrass), and *Platanthera clavellata* (small green wood orchid). Nonvascular plants average 35% cover and are dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum fimbriatum*, *Sphagnum palustre*, *Sphagnum henryense*). Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex atlantica* (prickly bog sedge), *Carex gynandra* (nodding sedge), *Chelone glabra* (white turtlehead), *Platanthera clavellata* (small green wood orchid), *Typha latifolia* (broadleaf cattail), and *Viburnum nudum* var. *cassinoides* (northern wild raisin). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 30 taxa per 400 square meters.

## Pitch Pine - Heath Peat Woodland



**Scientific Name:** *Pinus rigida* - *Picea rubens* / *Nemopanthus mucronata* - *Kalmia latifolia* / *Sphagnum* spp. - *Polytrichum* spp. Peat Woodland  
**Translated Name:** Pitch Pine - Red Spruce / Wild Holly - Mountain Laurel / Peatmoss - Haircap Moss Peat Woodland  
**NVC Name:** CEG006587: *Pinus rigida* - *Picea rubens* / *Viburnum nudum* var. *cassinoides* / *Sphagnum* spp. Woodland  
**Conservation Rank:** S1 / G1G2

This acidic dwarf woodland swamp occurs on saturated and temporarily flooded soils in the Allegheny

Mountains region of West Virginia, at elevations between 1010 and 1220 m. This community occurs in narrow bands (10-200 m wide) immediately west of the Allegheny Front, between the upland forest of the summit ridge and open peatlands. It is a small-patch type that occupies flat-

lying land (less than 1-degree slope). Microtopography is characterized by irregular moss-covered hummocks formed over tree roots, woody stem clusters, tip-up mounds, and decaying wood. Soils are poorly drained peat. The underlying acidic sandstone bedrock (Pennsylvanian Allegheny Formation) is generally encountered at less than 70 cm depth. Depth of organic soil is 20-70 cm, and soil pH averages 3.5.

Vegetation is characterized by an open canopy of *Pinus rigida* (pitch pine) and *Picea rubens* (red spruce), with an understory of ericaceous shrubs over a mat of *Sphagnum* spp. The dwarfed canopy has a mean cover of 35% and is dominated by *Picea rubens* (red spruce) and *Pinus rigida* (pitch pine), with low cover of *Acer rubrum* (red maple) and *Tsuga canadensis* (eastern hemlock). The tall-shrub layer averages 35% cover with abundant *Nemopanthus mucronatus* (catberry) and *Kalmia latifolia* (mountain laurel), and lower cover by *Rhododendron maximum* (great laurel) and the regenerating canopy species. The short-shrub layer, averaging 45% cover, is similar in composition to the tall-shrub layer, with the addition of abundant *Vaccinium myrtilloides* (velvetleaf huckleberry) and low but consistent cover of *Gaylussacia baccata* (black huckleberry), *Photinia melanocarpa* (black chokeberry), *Vaccinium angustifolium* (lowbush blueberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and the dwarf-shrub *Vaccinium oxycoccos* (small cranberry). The herbaceous layer is sparse, with mean 10% cover. Herbaceous species with high constancy include *Rubus hispidus* (bristly dewberry), *Gaultheria procumbens* (eastern teaberry), *Coptis trifolia* (threeleaf goldthread), *Dalibarda repens* (robin runaway), *Eriophorum virginicum* (tawny cottongrass), *Epigaea repens* (trailing arbutus), *Lycopodium obscurum* (rare clubmoss), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Rhynchospora alba* (white beaksedge), *Carex trisperma* var. *trisperma* (threeseeded sedge), and *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew). Nonvascular plants average 75% cover and are dominated by peat-forming *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum magellanicum*, *Sphagnum fallax*, and *Sphagnum papillosum*), *Polytrichum commune*, and *Polytrichum pallidisetum*. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Coptis trifolia* (threeleaf goldthread), *Dalibarda repens* (robin runaway), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Eriophorum virginicum* (tawny cottongrass), *Gaylussacia baccata* (black huckleberry), *Gaultheria procumbens* (eastern teaberry), *Nemopanthus mucronatus* (catberry), *Rhynchospora alba* (white beaksedge), and *Vaccinium oxycoccos* (small cranberry). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 35 taxa per 400 square meters.

## **Red Spruce - Hemlock - Great Laurel Swamp**

**Scientific Name:** *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp.  
- *Bazzania trilobata* Forested Swamp

**Translated Name:** Red Spruce - Eastern Hemlock / Great Laurel / Peatmoss - Bazzania moss  
Forested Swamp

**NVC Name:** CEGLO06277: *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum*  
Saturated Forest

**Conservation Rank:** S2 / G2?

This acidic conifer swamp occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West

Virginia, at elevations between 770 and 1150 m. It occupies flat to very gently sloping land (0- to 1-degree slopes) along small streams, often in mixed wetland mosaics. It is a small-patch type which forms "islands" in open shrublands or peatlands, and occurs in backswamp locations, separated from the adjacent stream by a levee. It is also found along the margins of beaver-influenced wetlands. Microtopography is characterized by interfingering of wetter and drier areas, with irregular mossy hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. Tree roots are often buttressed and may form thick "root rafts" on top of mucky soils. Hollows are typically filled with standing water or muck. Anthropogenic disturbance includes historic logging and fires around the year 1900 and occasionally more recent logging. Soils are poorly drained muck, peat, or organic-rich silt loam, with an average pH of 3.8.



This evergreen swamp is characterized by an open to closed canopy of inundation-stressed trees and a dense *Rhododendron maximum* (great laurel) shrub layer over a sparse herbaceous layer and abundant bryophytes. The canopy is dominated by *Picea rubens* (red spruce) and *Tsuga canadensis* (eastern hemlock) with lower cover of *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), and occasional presence of *Nyssa sylvatica* (blackgum), *Larix laricina* (tamarack), or *Pinus strobus* (eastern white pine). Mean canopy cover is 45%. The subcanopy

averages 30% cover and is dominated by *Tsuga canadensis* (eastern hemlock) with *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Acer rubrum* (red maple), and *Picea rubens* (red spruce). Species that may be present with low cover in the subcanopy include *Fraxinus americana* (white ash), *Betula lenta* (sweet birch), *Nyssa sylvatica* (blackgum), *Magnolia acuminata* (cucumber-tree), *Amelanchier laevis* (Allegheny serviceberry), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), and *Sorbus americana* (American mountain ash). The tall-shrub layer averages 35% cover and is dominated by *Rhododendron maximum* (great laurel). Other commonly occurring species in the tall-shrub layer include *Ilex verticillata* (common winterberry), *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce), and *Sorbus americana* (American mountain ash). Low cover of *Nemopanthus mucronatus* (catberry) and *Kalmia latifolia* (mountain laurel) may be present. The short-shrub layer averages 10% cover, with species composition similar to that of the tall-shrub stratum, and the occasional addition of *Viburnum nudum* var. *cassinoides* (northern wild raisin). The herbaceous ground layer is sparse and variable, with mean 8% cover and often including *Carex trisperma* (threeseeded sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Acer rubrum* (red maple), *Symplocarpus foetidus* (skunk cabbage), *Dennstaedtia punctilobula* (eastern hayscented fern), *Glyceria melicaria* (melic mannagrass), and *Mitchella repens* (partridgeberry). Nonvascular plants average 50% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum fallax*, *Sphagnum girgensohnii*, *Sphagnum recurvum*, *Sphagnum magellanicum*, and *Sphagnum papillosum*), *Bazzania trilobata*, and *Hypnum imponens*. Mean

species richness of all vascular plants and any nonvascular plants with cover >1%, is 26 taxa per 400 square meters, with about 15% of the diversity occurring in the bryophyte layer.

### Red Spruce - Southern Mountain Cranberry Swamp



**Scientific Name:** *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* High Elevation Swamp

**Translated Name:** Red Spruce / Southern Mountain Cranberry / Peatmoss – *Bazzania* Moss High Elevation Swamp

**NVC Name:** CEGL006593: *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest

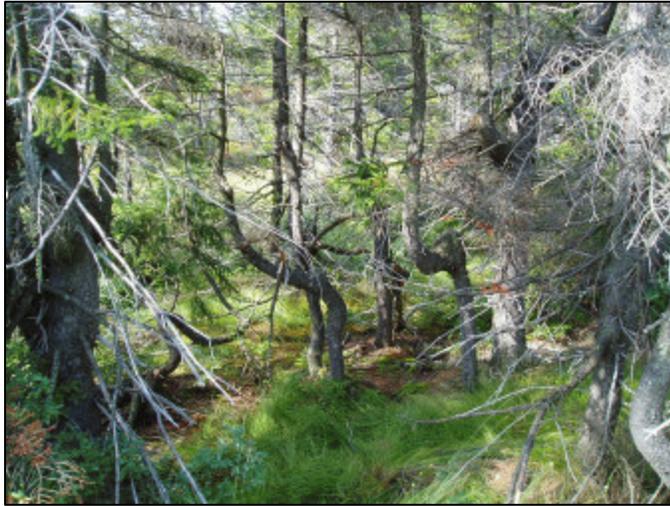
**Conservation Rank:** S2 / G2

This acidic conifer woodland or forested swamp occurs on saturated and temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1140 and 1400 m above sea level. It is a small-patch community maintained by slow seepage, low-energy overflow inundation, and rainfall. It occupies gently sloping land (0- to 6-degree slopes) on the margins between upland spruce forest and open beaver-influenced headwater wetlands, and alluvial bottoms along high-elevation meandering streams. Standing snags are common, the result of inundation stress during wet years and beaver-influenced water table fluctuations. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, decaying wood, and around woody stem clusters. Soils are somewhat poorly to poorly drained peat, muck, or organic-rich mottled silt loam, generally underlain by clay.

The canopy is open to closed and strongly dominated by *Picea rubens* (red spruce). The subcanopy is also dominated by *Picea rubens* (red spruce) with lower cover by *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is similar in composition to the subcanopy, with the occasional low cover by *Ilex montana* (mountain holly), *Rhododendron maximum* (great laurel), or *Sorbus americana* (American mountain ash). The short-shrub layer is dominated by *Vaccinium erythrocarpum* (southern mountain cranberry), with locally abundant *Kalmia latifolia* (mountain laurel). The herbaceous ground layer is variable and sparse; *Dryopteris intermedia* (intermediate woodfern) or *Thelypteris noveboracensis* (New York fern) may be locally abundant. Species with high constancy but low cover include *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Maianthemum canadense* (Canada mayflower), *Clintonia* (bluebead) spp., and *Carex trisperma* var. *trisperma* (threeseeded sedge). Nonvascular plants are dominated by *Bazzania trilobata*, which blankets the abundant downfall, and *Sphagnum* ssp. (*Sphagnum girgensohnii*, *Sphagnum fallax*, *Sphagnum palustre*, and *Sphagnum rubellum*), which carpet the mucky hollows; *Polytrichum* spp. and *Hypnum imponens* are also common. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Vaccinium erythrocarpum*

(southern mountain cranberry), *Bazzania trilobata*, *Maianthemum canadense* (Canada mayflower), and *Clintonia* (bluebead) spp. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 24 taxa per 400 square meters.

## Red Spruce - Three-seeded Sedge Peat Woodland



**Scientific Name:** *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. High Elevation Peat Woodland

**Translated Name:** Red Spruce / Three-seed Sedge / Peatmoss - Haircap Moss  
High Elevation Peat Woodland

**NVC Name:** CEGLO06590: *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest

**Conservation Rank:** S2 / G2

This acidic conifer woodland swamp occurs on saturated and temporarily flooded organic soils in headwater basins of the Allegheny

Mountains region of West Virginia, at elevations between 1000 and 1430 m. It is a small-patch community that occupies flat to very gently sloping land (0- to 2-degree slopes) along the margins of open peatlands, forming narrow "spits," fingers, or islands. It also occurs in peaty depressions within high plateau spruce forests. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, tip-up mounds, nurse logs, and decaying wood. Bedrock is typically sandstone or occasionally shale, and may be encountered at less than 20 cm depth. Soils are poorly drained muck, peat, or organic-rich silt/clay loam. Depth of organic soil varies greatly from 5-120 cm. Soil pH averages 3.5.

The community is characterized by an open canopy of *Picea rubens* (red spruce) and a fairly sparse shrub layer growing on irregular hummocks, with swales and hollows occupied by *Carex trisperma* var. *trisperma* (threeseeded sedge) and peat-forming bryophytes. Additional canopy species that occur occasionally include *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), *Amelanchier laevis* (Allegheny serviceberry), *Pinus rigida* (pitch pine), *Sorbus americana* (American mountain ash), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is also dominated by *Picea rubens* (red spruce) with occasional low cover by *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), and *Photinia melanocarpa* (black chokeberry). The short-shrub layer includes *Picea rubens* (red spruce), *Vaccinium myrtilloides* (velvetleaf huckleberry), and *Vaccinium angustifolium* (lowbush blueberry). The herbaceous layer is dominated by *Carex trisperma* var. *trisperma* (threeseeded sedge) and may include low cover by *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Gaultheria hispidula* (creeping snowberry), *Vaccinium oxycoccos* (small cranberry), and *Carex debilis* (white edge sedge). Nonvascular plants are dominated by *Sphagnum* spp. with lesser amounts of *Polytrichum* spp., *Hypnum imponens*, and *Leucobryum glaucum*. Mean species richness of all vascular plants, and

any nonvascular plants with cover >1%, is 31 taxa per 400 square meters, with about 20% of the diversity occurring in the bryophyte layer.

## Star Sedge Fen



**Scientific Name:** *Carex echinata* ssp. *echinata* / *Sphagnum* spp. Fen

**Translated Name:** Star Sedge / Peatmoss Fen

**NVC Name:** CEGJ008534: *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation

**Conservation Rank:** S2 / G2?

This herbaceous acidic seepage fen occurs on semi-permanently flooded and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 1070 and 1170 m. It is a small-

patch type that occupies flat to gently sloping land (0- to 2.5-degree slopes) in headwater basins. It occurs in open peatland mosaics where there is a barely perceptible seepage component, and is generally found in areas that have been impacted by beaver in the last 5-30 years. Hummock and hollow microtopography is well-developed. Rounded peat hummocks are 10-30 cm high, and irregular mossy hummocks cover roots and decaying wood. Bedrock is commonly sandstone, and less frequently shale or limestone. Soil texture is poorly to very poorly drained peat with occasional layers of silt loam, less than a meter in thickness and underlain by clay or bedrock.

This sedge fen often contains a few scattered, stunted individuals of *Picea rubens* (red spruce) in the canopy or shrub strata. In addition to stunting from inundation stress, most trees have wide "snow skirts," and saplings tend to be heavily branched below the snowpack level. *Vaccinium myrtilloides* (velvetleaf huckleberry) may be present with low cover in the short-shrub layer. The herbaceous layer, with mean 60% cover, is dominated by *Carex echinata* ssp. *echinata* (star sedge). Herbaceous species with high constancy but lower cover are *Solidago uliginosa* (bog goldenrod), *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Carex gynandra* (nodding sedge), *Juncus brevicaudatus* (narrowpanicle rush), and *Lycopus uniflorus* var. *uniflorus* (northern bugleweed). Nonvascular plants average 90% cover and are strongly dominated by *Sphagnum* spp. (*Sphagnum magellanicum*, *Sphagnum rubellum*, *Sphagnum fallax*, and *Sphagnum papillosum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 21 taxa per 400 square meters.

## Vulnerable

### American Bur-reed Marsh



**Scientific Name:** *Sparganium* (*americanum*, *chlorocarpum*) Marsh  
**Translated Name:** (American Bur-reed, Small Bur-reed) Marsh  
**NVC Name:** CEGJ004510: *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation  
**Conservation Rank:** S2 / G2G3

This early-successional marsh occurs on temporarily to permanently flooded soils in West Virginia's Allegheny Mountains region, New River Gorge National River, and Short Mountain, at

elevations between 630 and 1300 m. It probably occurs elsewhere in the state within this approximate altitudinal range. The type occurs in small patches in wetlands influenced by beaver activity. While individual patches may be ephemeral, this community is likely to be present on the landscape as long as a beaver-influenced disturbance regime persists. It occurs in the most poorly drained areas of these wetlands, where standing water and/or saturated soils are usually present throughout the year. There are often dead standing trees in this community which indicate past woodland physiognomy prior to inundation by beaver damming. Soils are variable and may consist of poorly to very poorly drained muck, or organic-rich loamy soils of varying texture, with an average soil pH of 4.4.

This successional herbaceous marsh occurs in beaver-influenced wetlands throughout the state. It is strongly dominated by *Sparganium americanum* (American bur-reed), which is generally replaced by *Sparganium chlorocarpum* (small bur-reed) at elevations above 900 m. A sparse shrub layer (average 7% cover) often includes *Hypericum densiflorum* (bushy St. Johnswort). The herbaceous layer averages 75% cover. In addition to the dominant *Sparganium* (bur-reed) spp., species with high constancy are *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and *Lycopus uniflorus* (northern bugleweed). Additional herbaceous species that commonly occur in this type include *Scirpus cyperinus* (woolgrass) and other *Scirpus* (bulrush) spp. or *Schoenoplectus* (bulrush) spp., *Ludwigia palustris* (marsh seedbox), *Carex lurida* (shallow sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Callitriche heterophylla* ssp. *heterophylla* (twoheaded water-starwort), *Impatiens capensis* (jewelweed), and *Agrostis hyemalis* (winter bentgrass). Nonvascular plants average only 4% cover, typically including *Sphagnum* spp. Species richness ranges from 2 to 45, with the mean species richness of vascular plants and any nonvascular plants with cover >1% equal to 20 taxa per 400 square meters.

## Cottongrass Fen



**Scientific Name:** *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Fen

**Translated Name:** Tawny Cotton-grass - (Northern Long Sedge) / Peatmoss - Haircap Moss Fen

**NVC Name:** CEGL006570: *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation

**Conservation Rank:** S3 / G3

This acidic herbaceous community occurs on temporarily flooded, semi-permanently flooded, or saturated peat in

the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Older stands typically occur over shallow bedrock, where they are kept open by high water tables. Younger stands often occur in beaver-influenced wetland mosaics, often behind breached dams on the site of former beaver ponds. The type also occurs as a successional community on formerly forested peatlands that have been logged and/or burned within the last century. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-30 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale or limestone. The substrate is poorly to very poorly drained peat or muck. Peat deposits are shallow, ranging from 10-75 cm in depth, underlain by clay-rich soils or bedrock. Mean soil pH is 3.8.

Low cover of stunted trees, shrubs, and snags may occupy hummock tops, typically including *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Kalmia latifolia* (mountain laurel), and *Ilex verticillata* (common winterberry). The dwarf-shrub *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The dwarf-shrubs *Vaccinium oxycoccos* (small cranberry) and *Vaccinium macrocarpon* (cranberry) are often present with low cover. The herbaceous layer is dominated by *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Juncus effusus* (common rush). Other common herbaceous species include *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Scirpus cyperinus* (woolgrass), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Agrostis hyemalis* (winter bentgrass), and *Agrostis perennans* (upland bentgrass). Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum fallax*, and others) and generally include moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*).

Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 20 taxa per 400 square meters for 39 plots in West Virginia and Maryland.

## Golden Saxifrage Seep



**Scientific Name:** *Betula alleghaniensis* var. *alleghaniensis* / *Impatiens capensis* - *Chrysosplenium americanum* - (*Symplocarpus foetidus*) / *Rhizomnium appalachianum* Forest Seep

**Translated Name:** Yellow Birch / Jewelweed – Golden Saxifrage – (Skunk Cabbage) / Largeleaf Mniium Forest Seep

**NVC Name:** CEGL006193:

*Chrysosplenium americanum* Herbaceous Vegetation

**Conservation Rank:** S3 / G3G5

This forested seep occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 750 and 1280 m. It generally occupies gently sloping land (0.5-4 degrees), although one occurrence in an old-growth forest has a 13-degree slope. It occurs as concave linear seeps in upland forest, as toeslope seeps at the base of upland forest, and as a combination of toeslope seeps and overflow channels along meandering streams. The latter setting, where a toeslope seep is impounded by a natural stream levee, receives occasional medium-energy overflow during floods. This represents a natural hydrological setting that was probably common in presettlement time but is now rare due to the general channelization of West Virginia's streams by railroads, roads, and constructed levees. Microtopography is characterized by hummocks formed by tip-up mounds, nurse logs, roots, downed wood, tussocks, and woody stem clusters. Bedrock may be shale, sandstone, or occasionally limestone. Soils are poorly to moderately poorly drained with variable texture ranging from muck to silt loam to sandy loam. Soil pH averages 4.4.

The community is characterized by an open canopy of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with an abundant herbaceous layer dominated by *Impatiens capensis* (jewelweed) and with characteristic presence of *Chrysosplenium americanum* (American golden saxifrage) and *Rhizomnium appalachianum* (wooly largeleaf mniium). The canopy also includes lower cover of *Picea rubens* (red spruce) and *Acer rubrum* (red maple), and occasional presence of *Tsuga canadensis* (eastern hemlock), *Prunus serotina* var. *serotina* (black cherry), *Quercus rubra* (northern red oak), *Acer saccharum* var. *saccharum* (sugar maple), *Magnolia acuminata* (cucumber-tree), *Abies balsamea* (balsam fir), *Fraxinus nigra* (black ash), and *Crataegus* (hawthorn) spp. Mean canopy cover is 33%. Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. Trees that are rooted within the seep tend to grow on moss-covered hummocks with buttressed roots. The subcanopy averages 15% cover and has a similar composition to that of the canopy, with the occasional addition of *Fagus grandifolia* (American beech), *Acer spicatum* (mountain maple), *Sorbus americana* (American

mountain ash), and *Amelanchier* (serviceberry) spp. The shrub strata are sparse and variable in composition, with the tall-shrub layer averaging 10% cover and the short-shrub averaging only 2% cover. Many of the canopy species also occur in the shrub strata. Other shrub species may include *Rhododendron maximum* (great laurel), *Alnus incana* ssp. *rugosa* (speckled alder), *Kalmia latifolia* (mountain laurel), *Ilex montana* (mountain holly), *Sambucus canadensis* (common elderberry), *Vaccinium erythrocarpum* (southern mountain cranberry), *Viburnum recognitum* (southern arrowwood), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Ilex verticillata* (common winterberry). The herbaceous layer averages 68% cover and is dominated by *Impatiens capensis* (jewelweed). Other herbaceous species with high constancy include *Dryopteris intermedia* (intermediate woodfern), *Glyceria striata* (fowl mannagrass), *Viola cucullata* (marsh blue violet), *Chelone glabra* (white turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Carex stipata* (owlfruit sedge), *Thelypteris noveboracensis* (New York fern), *Acer rubrum* (red maple), *Glyceria melicaria* (melic mannagrass), *Carex gynandra* (nodding sedge), *Agrostis perennans* (upland bentgrass), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Symphotrichum prenanthoides* (crookedstem aster), *Oxalis montana* (mountain woodsorrel), *Symplocarpus foetidus* (skunk cabbage), *Carex scabrata* (eastern rough sedge), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Juncus effusus* (common rush), and *Carex baileyi* (Bailey's sedge). Nonvascular plants average 25% cover and are dominated by *Rhizomnium appalachianum* and *Plagiomnium ciliare* with lesser amounts of *Thuidium delicatulum* and *Bazzania trilobata*. A variety of bryophyte species characterizes this community, and locally abundant species may include *Trichocolea tomentella*, *Sphagnum recurvum*, *Polytrichum pallidisetum*, *Atrichum undulatum*, *Sphagnum palustre*, and *Sphagnum affine*. Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 42 taxa per 400 square meters, with about 15% of the diversity in the bryophyte layer.

## Hairy-fruit Sedge Floodplain Prairie



**Scientific Name:** *Carex trichocarpa*  
 Floodplain Prairie  
**Translated Name:** Hairy-fruit Sedge  
 Floodplain Prairie  
**NVC Name:** CEGL006447: *Carex*  
*trichocarpa* Herbaceous Vegetation  
**Conservation Rank:** S1 / G3

This herbaceous floodplain prairie occurs on temporarily flooded alluvial deposits in the Allegheny Mountains region of West Virginia, at elevations between 830 and 890 m. It is a small-patch type that occupies flat to gently sloping (0- to 3-degree slopes)

depositional bars along mid- to high-gradient, third- or fourth-order streams. Occasional flood deposition keeps this community open and prevents build-up of organic material in the substrate. Flooding can occur at any time of year. Ice-scour may also affect this community during high winter flows. Bedrock at the 4 sampled sites is Devonian shale (Hampshire Formation). The community occurs on moderately poorly to well-drained sandy loam or silt loam with pH

averaging 4.8 (n=4), underlain by fluvial deposits including stratified sediments, cobbles, and organic inclusions.

The community is characterized by dense rhizomatous stands of *Carex trichocarpa* (hairyfruit sedge), which can tolerate annual sediment deposition and occasional high-energy ice-scour. A trace amount of shrub cover may be present, including *Hypericum densiflorum* (bushy St. Johnswort), *Hypericum prolificum* (shrubby St. Johnswort), or *Salix sericea* (silky willow). The herbaceous layer, averaging 95% cover, is strongly dominated by *Carex trichocarpa* (hairyfruit sedge). This type is susceptible to invasion by *Phalaris arundinacea* (reed canarygrass), which has dominance in one sampled plot. Along the river edge, this community typically abuts a strip of *Carex torta* (twisted sedge). Away from the river, this community may interfinger with drier tall-herb floodplain types. Species with high constancy but low cover include *Dichanthelium clandestinum* (deertongue), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Verbena hastata* var. *hastata* (swamp verbena), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Asclepias syriaca* (common milkweed), *Clematis virginiana* (virgin's bower), *Arisaema triphyllum* (Jack in the pulpit), *Onoclea sensibilis* (sensitive fern), *Lilium superbum* (turk's-cap lily), *Carex projecta* (necklace sedge), *Thalictrum pubescens* (king of the meadow), *Veratrum viride* (green false hellebore), *Elymus riparius* (riverbank wildrye), and *Solidago rugosa* (wrinkleleaf goldenrod). Cover by nonvascular plants is insignificant. Mean species richness of vascular plants is 27 taxa per 400 square meters.

## Rough Sedge Seep



**Scientific Name:** *Betula alleghaniensis* var. *alleghaniensis* / *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare*  
Sloping Forested Seep

**Translated Name:** Yellow Birch / Eastern Rough Sedge - Marsh Blue Violet / Wavy-leaf Moss Sloping Forested Seep

**NVC Name:** CEG006597: *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation

**Conservation Rank:** S3 / G3

This linear, sloping forested seep occurs on saturated, temporarily flooded, and semi-permanently flooded soils in

headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 780 and 1300 m. It occupies gently to steeply sloping drainages (1.5-20 degrees) in upland forest, typically occurring as small, discontinuous patches that repeat across a mountainside. It is fed primarily by seepage and springs from the adjacent upland forest. Microtopography is characterized by a complex of tip-up mounds, buttressed roots, and downed wood over large and small rocks. Bedrock is typically shale or sometimes sandstone. Soils are moderately to poorly drained and stony, with variable texture ranging from muck to silt loam to sandy loam.

The canopy is open and dominated by *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) with an herbaceous layer dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), and the characteristic bryophyte *Plagiomnium ciliare*. The canopy often includes low cover by *Acer saccharum* var. *saccharum* (sugar maple), *Picea rubens* (red spruce), and *Fagus grandifolia* (American beech). Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. The subcanopy and shrub layers are sparse. The herbaceous layer is dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), *Laportea canadensis* (Canadian woodnettle), *Tiarella cordifolia* (heartleaf foamflower), and *Glyceria melicaria* (melic mannagrass). Other herbaceous species with high constancy include *Dryopteris intermedia* (intermediate woodfern), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), *Cardamine diphylla* (crinkleroot), *Chrysosplenium americanum* (American golden saxifrage), *Poa alsodes* (grove bluegrass), *Symphotrichum prenanthoides* (crookedstem aster), *Packera aurea* (golden ragwort), *Thelypteris noveboracensis* (New York fern), *Cardamine pensylvanica* (Pennsylvania bittercress), *Arisaema triphyllum* (Jack in the pulpit), *Monarda didyma* (scarlet beebalm), and *Oxalis montana* (mountain woodsorrel). Nonvascular plants are dominated by *Plagiomnium ciliare* with lesser amounts of *Brachythecium rivulare*, *Thuidium delicatulum*, and *Rhizomnium appalachianum*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 32 taxa per 400 square meters, with about 15% of the diversity in the bryophyte layer.

## Red Spruce – Heath Peat Woodland



**Scientific Name:** *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. Peat Woodland

**Translated Name:** Red Spruce / Great Laurel - Mountain Laurel / Cinnamon Fern / Peatmoss Peat Woodland

**NVC Name:** CEG006588: *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest

**Conservation Rank:** S2 / G2G3

This acidic conifer woodland occurs on saturated soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 860 and 1300 m. It is a small-patch type that occupies flat to very gently sloping land (0- to 1-degree slopes) along the margins of open peatlands and in seepage-fed portions of wetland mosaics. Seepage from adjacent upland forest and the high water table in adjacent open wetlands keep the community wet enough to kill trees during wet years, leaving numerous snags. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, and decaying wood. Bedrock is typically sandstone or shale. Soils are moderately to very poorly drained peat, underlain by clay-rich deposits. Soil pH averages 3.6.

The community is characterized by an open canopy of stunted, inundation-stressed trees with a diverse shrub and herb layer growing on hummock-forming bryophytes. The canopy is dominated by *Tsuga canadensis* (eastern hemlock) and *Picea rubens* (red spruce), occasionally including low cover of *Acer rubrum* (red maple) or *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Mean canopy cover is 25%. Canopy height is less than 15 m and sometimes as low as 5 m, essentially crossing the transition between woodland and shrubland physiognomy. The tall-shrub layer averages 30% cover and includes the canopy species along with *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Nemopanthus mucronatus* (catberry), and *Ilex verticillata* (common winterberry). Other species that occasionally occur with low cover in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Ilex montana* (mountain holly), *Photinia pyrifolia* (red chokeberry), *Acer rubrum* (red maple), *Sorbus americana* (American mountain ash), *Amelanchier laevis* (Allegheny serviceberry), and *Hamamelis virginiana* (American witchhazel). The short-shrub layer averages 15% cover and is similar in composition to the tall-shrub layer. The herbaceous layer, with mean 30% cover, typically includes *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and the regenerating canopy species. Species with lower cover often include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Dennstaedtia punctilobula* (eastern hayscented fern), *Carex gynandra* (nodding sedge), *Glyceria melicaria* (melic mannagrass), *Eriophorum virginicum* (tawny cottongrass), *Oclemena acuminata* (whorled wood aster), and *Juncus effusus* (common rush). Nonvascular plants average 80% cover and are dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum affine*, *Sphagnum capillifolium*) and *Polytrichum commune*. Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 22-54 (mean=31) taxa per 400 square meters, with most of the diversity in the shrub and herb layers.

### Red Spruce - Yellow Birch - Mannagrass Swamp



**Scientific Name:** *Picea rubens* – *Betula alleghaniensis* var. *alleghaniensis* – *Tsuga canadensis* / *Glyceria melicaria* / *Sphagnum* spp. Swamp

**Translated Name:** Red Spruce – Yellow Birch – Hemlock / Melic Mannagrass / Peatmoss Swamp

**NVC Name:** C EGL006556: *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Forest

**Conservation Rank:** S2S3 / G3

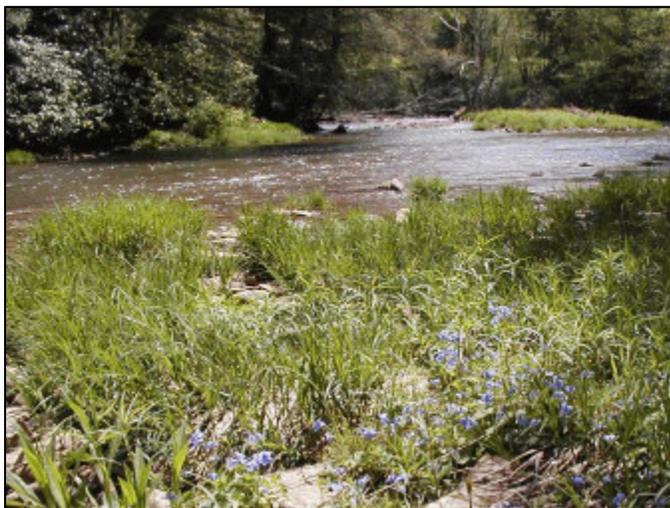
This mixed woodland or forested swamp occurs on saturated and temporarily to semi-permanently flooded soils of the Allegheny Mountains region

of West Virginia, at elevations between 770 and 1220 m. It is a small-patch type that occupies flat to very gently sloping land (0- to 2-degree slopes) in floodplains of streams and on the margins between upland forest and open wetland. When this community occurs in a floodplain

setting, it often is characterized by fluvial morphological features such as backwater sloughs, levees and meander scrolls. Microtopography is characterized by irregular moss-covered hummocks formed over buttressed tree roots, woody stem clusters, tip-up mounds, nurse logs, and decaying wood. Soils are poorly drained muck, peat, or silt/clay loam. Soil pH averages 4.2.

The community is characterized by an open to closed canopy of *Picea rubens* (red spruce), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with occasional additions of *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), *Abies balsamea* (balsam fir), *Pinus strobus* (eastern white pine), or *Nyssa sylvatica* (blackgum). Mean canopy cover is 40%. The subcanopy is similar in composition to the canopy and averages 25% cover. The tall-shrub layer averages 30% cover and is characterized by *Alnus incana* ssp. *rugosa* (speckled alder), *Rhododendron maximum* (great laurel), the regenerating canopy species, and occasionally *Ilex verticillata* (common winterberry). The short-shrub layer is sparse, averaging only 5% cover, with species composition similar to the tall-shrub layer. The herbaceous layer, with mean 45% cover, is diverse and variable, with a number of characteristic seep species. Herbaceous species with high constancy include *Glyceria melicaria* (melic mannagrass), *Impatiens capensis* (jewelweed), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Chrysosplenium americanum* (American golden saxifrage), *Polygonum sagittatum* (arrowleaf tearthumb), *Leersia oryzoides* (rice cutgrass), *Chelone glabra* (white turtlehead), *Symplocarpus foetidus* (skunk cabbage), *Maianthemum canadense* (Canada mayflower), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Onoclea sensibilis* (sensitive fern), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Oxalis montana* (mountain woodsorrel), and *Dryopteris intermedia* (intermediate woodfern). Nonvascular plants average 45% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum fallax*, *Sphagnum squarrosum*, *Sphagnum magellanicum*, *Sphagnum girgensohnii*) carpeting the mucky hollows, *Rhizomnium appalachianum* in the seepy areas, and *Hypnum imponens* and *Dicranum scoparium* blanketing the woody hummocks. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 43 taxa per 400 square meters, with nearly 20% of the diversity in the bryophyte layer.

## Twisted Sedge Riverscour Prairie



**Scientific Name:** *Carex torta* Riverscour Prairie

**Translated Name:** Twisted Sedge Riverscour Prairie

**NVC Name:** CEGJ004103: *Carex torta* Herbaceous Vegetation

**Conservation Rank:** S3 / G3G4

This herbaceous riverscour prairie occurs in small, discontinuous linear patches along streambanks and channel bars in high-gradient streams in the Allegheny Mountains region, the New River, and probably elsewhere in West Virginia. It is known to occur at elevations

from 390 to 1200 m above sea level. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Tough-rooted perennial sedges are rooted in rock crevices and between cobbles, where sediments accumulate during floods. Large floods likely wipe out individual patches from time to time, but the community will persist as long as the natural flood regime is maintained. The community is often partially shaded by overhanging trees. It occurs on temporarily flooded, moderately to poorly drained sand with pH averaging 6.5.

The community is characterized by the tough-rooted herbaceous perennial *Carex torta* (twisted sedge), which is tolerant of high-energy flood-scouring. An overhanging canopy with an average 20% cover typically may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Overhanging shrubs have an average 10% cover and often include *Rhododendron maximum* (great laurel). The herbaceous layer, averaging 53%, is strongly dominated by *Carex torta* (twisted sedge). Species with high constancy but much lower cover include *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Symphyotrichum prenanthoides* (crookedstem aster), *Prunella vulgaris* (common selfheal), *Thalictrum* (meadow-rue) spp., *Hypericum perforatum* (common St. Johnswort), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Solidago rugosa* (wrinkleleaf goldenrod), *Dichanthelium clandestinum* (deertongue), *Verbesina alternifolia* (wingstem), and *Polygonum sagittatum* (arrowleaf tearthumb). Cover by nonvascular plants is insignificant. Mean species richness of vascular plants is 36 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

## **Communities with state conservation importance**

### **Critically imperiled**

#### **Lake Sedge Fen**



**Scientific Name:** *Carex lacustris* Fen

**Translated Name:** Lake Sedge Fen

**NVC Name:** CEG002256: *Carex lacustris* Herbaceous Vegetation

**Conservation Rank:** S1 / G4G5

This herbaceous sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1220 m. It is a small-patch type that occupies flat to gently sloping land (0- to 2-degree slopes) in headwater basins. It typically occurs in dense clonal patches in

seepage areas on the margins of open wetlands or in the floodplain of slow-moving headwater streams. Microtopography is characterized by low rounded tussocks. Bedrock may be shale, limestone, or Quaternary alluvium. Soil texture is poorly to very poorly drained peat or mottled

silt loam, underlain by circumneutral clay-rich layers. The sedge has a deep taproot and can take advantage of the circumneutral soil at depth. Mean surface soil pH is 4.3.

This sedge fen may have a sparse shrub stratum, averaging 3% cover, which may include *Populus tremuloides* (quaking aspen), *Picea rubens* (red spruce), *Spiraea alba* (white meadowsweet), *Alnus incana* ssp. *rugosa* (speckled alder), *Ilex montana* (mountain holly), *Salix sericea* (silky willow), or *Viburnum recognitum* (southern arrowwood). The herbaceous layer, with mean 90% cover, is strongly dominated by dense clonal mats of *Carex lacustris* (lake sedge), which has a bright green-blue aspect. Herbaceous species with high constancy but low cover include *Galium tinctorium* (stiff marsh bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus cyperinus* (woolgrass), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Epilobium leptophyllum* (bog willowherb). Nonvascular plants average 20% cover and may include *Sphagnum recurvum* or *Calliergon cordifolium*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 20 taxa per 400 square meters.

## Tamarack Swamp



**Scientific Name:** *Larix laricina* / *Ilex verticillata* / *Symplocarpus foetidus* – *Osmunda cinnamomea* / *Sphagnum* spp.  
Woodland Swamp

**Translated Name:** Tamarack / Winterberry / Skunk Cabbage – Cinnamon Fern / Peatmoss Woodland Swamp

**NVC Name:** CEG002472: *Larix laricina* / *Photinia melanocarpa* / *Sphagnum* spp. Forest

**Conservation Rank:** S1 / G4

This deciduous woodland swamp occurs on saturated, temporarily flooded, and semi-permanently flooded soils in a

single headwater basin of the Allegheny Mountains region of West Virginia, at elevations between 770 and 785 m. It is a disjunct occurrence of a more northern community type. It is a small-patch type that occupies a flat-lying floodplain along a low-gradient meandering stream with an intact natural flood regime. The community typically occurs as a young woodland with many inundation-killed snags, but approaches forest physiognomy in a few drier patches farther from the active stream channel. Microtopography is characterized by irregular mossy hummocks formed over tree roots, woody stem clusters, and decaying wood. Bedrock is Mississippian age sandstone or limestone, but does not significantly influence the community, due to the depth of organic soil overlying the bedrock. Soils are more than 1 m deep, poorly to very poorly drained muck (partially decomposed peat), containing about 10% decomposing woody fragments. Soil pH averages 4.2.

This swamp is characterized by an open canopy of *Larix laricina* (tamarack) and various woody species growing on hummocks, with hollows occupied by *Symplocarpus foetidus* (skunk cabbage) and peat-forming bryophytes over deep muck soils. The canopy averages 30% cover and is dominated by *Larix laricina* (tamarack), with lower cover by *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). *Pinus rigida* (pitch pine) and *Pinus strobus* (eastern white pine) are sometimes present in the canopy. The subcanopy averages 15% cover and includes the same set of species, with the occasional addition of *Amelanchier arborea* var. *arborea* (common serviceberry), *Sorbus americana* (American mountain ash), or *Tsuga canadensis* (eastern hemlock). The tall-shrub layer averages 30% cover and is dominated by *Ilex verticillata* (common winterberry) with *Rhododendron maximum* (great laurel) and *Nemopanthus mucronatus* (catberry). Other species that often occur with low cover in the tall-shrub layer include *Larix laricina* (tamarack), *Alnus incana* ssp. *rugosa* (speckled alder), and *Viburnum recognitum* (southern arrowwood). The short-shrub layer averages 6% cover. Typical species are *Vaccinium myrtilloides* (velvetleaf huckleberry), *Photinia melanocarpa* (black chokeberry), and *Ilex verticillata* (common winterberry). The herbaceous layer, with mean 45% cover, is dominated by *Symplocarpus foetidus* (skunk cabbage) with *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) and *Rubus hispidus* (bristly dewberry). Nonvascular plants average 35% cover with abundant *Sphagnum fallax*, *Sphagnum palustre*, *Polytrichum juniperinum*, and *Aulacomnium palustre*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 24 taxa per 400 square meters.

## Imperiled

### Beaked Sedge Fen



**Scientific Name:** *Carex utriculata* / *Sphagnum* spp. Fen

**Translated Name:** Beaked Sedge / Peatmoss Fen

**NVC Name:** CEGLO02257: *Carex (rostrata, utriculata) - Carex lacustris - (Carex vesicaria)* Herbaceous Vegetation

**Conservation Rank:** S2 / G4G5

This herbaceous hummocky sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1160 m. It is a small-patch type that

occupies flat to very gently sloping land (0- to 1-degree slopes) in headwater basins. It typically occurs in dense clonal patches on the seepage-fed margins of open bogs and in seepage meadows or oxbows adjacent to the floodplains of slow-moving streams. The water table is usually near the surface for most of the growing season. In certain locations between open bog and undisturbed upland forest, e.g., at Cranberry Glades, this type probably persists on the landscape for many thousands of years. Other stands are much younger and may form part of successional beaver-influenced wetland mosaics. Fortney and Rentch (2003) documented increases in the

areal extent of *Carex utriculata* (beaked sedge) clones in Canaan Valley between 1945 and 2000. Hummock-and-hollow microtopography is well-developed, with moss-covered hummocks 5-50 cm high. Bedrock may be sandstone, shale, or limestone. Soil texture is poorly to very poorly drained peat or muck extending to 10-100 cm depth and underlain by silt loam, sand, or clay-rich layers. Mean soil pH is 3.8.

The short-shrub stratum averages 5% cover and may include *Vaccinium myrtilloides* (velvetleaf huckleberry), *Hypericum densiflorum* (bushy St. Johnswort), *Photinia melanocarpa* (black chokeberry), and *Photinia pyrifolia* (red chokeberry). The dwarf-shrub species *Rubus hispida* (bristly dewberry) has high cover and constancy in this type. The herbaceous layer, with mean 60% cover, is strongly dominated by dense clonal mats of *Carex utriculata* (beaked sedge). Herbaceous species with high constancy but low cover include *Solidago uliginosa* (bog goldenrod), *Symplocarpus foetidus* (skunk cabbage), *Carex folliculata* (northern long sedge), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Juncus effusus* (common rush), and *Eriophorum virginicum* (tawny cottongrass). Locally abundant species may include *Vaccinium macrocarpon* (cranberry), *Hypericum ellipticum* (pale St. Johnswort), *Vaccinium oxycoccos* (small cranberry), *Carex stipata* (owlfruit sedge), and *Menyanthes trifoliata* (buckbean). Nonvascular plants average 70% cover, are dominated by *Sphagnum* spp. (*Sphagnum magellanicum*, *Sphagnum fallax*), and often include moderate to high cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 15 taxa per 400 square meters.

## Bluejoint Grass Wet Meadow



**Scientific Name:** *Calamagrostis canadensis* Wet Meadow

**Translated Name:** Bluejoint Grass Wet Meadow

**NVC Name:** CEGL005174:

*Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation

**Conservation Rank:** S2 / G4G5

This wet meadow occurs on temporarily flooded soils of levees and floodplains of slow-moving headwater streams, and in seepage meadows within level headwater basins of the Allegheny Mountains region of West Virginia, at

elevations of 700-1200 m. This type may have first been described in West Virginia by the pioneer Meshach Browning, who considered it the finest natural pasture and hunting ground in the area, covering "hundreds, if not thousands of acres" in the late 1700s (Browning 1859). It occupies very gently sloping areas (0.5- to 1-degree slopes). Microtopography is characterized by tussocks and low mossy hummocks. Bedrock may be limestone, sandstone, or occasionally shale. Soils are poorly to moderately poorly drained peat or peaty silt loam, often underlain by clay. Soil pH averages 4.3.

Typical vegetation consists of relatively pure stands of *Calamagrostis canadensis* (bluejoint). The shrub strata are sparse and variable in composition, with the tall-shrub layer averaging 6% cover and the short-shrub averaging only 2% cover. Shrub species may include *Spiraea alba* (white meadowsweet), *Viburnum recognitum* (southern arrowwood), *Hypericum densiflorum* (bushy St. Johnswort), *Alnus incana* ssp. *rugosa* (speckled alder), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Sambucus canadensis* (common elderberry), *Populus tremuloides* (quaking aspen), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Ilex verticillata* (common winterberry), *Rhododendron maximum* (great laurel), and others species with very low frequency and cover. The herbaceous layer averages 90% cover and is dominated by *Calamagrostis canadensis* (bluejoint). Other herbaceous species with fairly high constancy but low cover include *Rubus hispidus* (bristly dewberry), *Carex stricta* (tussock sedge), *Carex utriculata* (beaked sedge), *Juncus effusus* (common rush), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus cyperinus* (woolgrass), *Symplocarpus foetidus* (skunk cabbage), *Solidago uliginosa* (bog goldenrod), *Galium tinctorium* (stiff marsh bedstraw), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Glyceria striata* (fowl mannagrass), *Glyceria canadensis* (rattlesnake mannagrass), *Dryopteris cristata* (crested woodfern), *Scirpus microcarpus* (panicled bulrush), *Leersia oryzoides* (rice cutgrass), *Dryopteris intermedia* (intermediate woodfern), and *Verbena hastata* var. *hastata* (swamp verbena). Nonvascular plants average 17% cover and are dominated by *Sphagnum palustre*, *Sphagnum fimbriatum*, *Sphagnum henryense*, *Sphagnum recurvum*, *Polytrichum commune*, and *Polytrichum strictum*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 22 taxa per 400 square meters.

## Silvery Sedge Fen



**Scientific Name:** *Carex canescens* / *Polytrichum* spp. - *Sphagnum* spp. Fen  
**Translated Name:** Silvery Sedge / Haircap Moss - Peatmoss Fen  
**NVC Name:** CEG006549: *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation  
**Conservation Rank:** S2 / GNR

This herbaceous hummocky sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 950 and 1210 m. It is a small-patch type that occupies flat to very gently sloping land (0-0.5 degree) in headwater basins. It includes two subtypes, dominated by either *Sphagnum* or *Polytrichum* moss. The *Sphagnum*-dominated subtype occurs on the margins of active beaver ponds and on top of old beaver pond areas that have been abandoned long enough (often a decade or more) for open water to be replaced by a vegetative mat. The *Polytrichum*-dominated subtype has pronounced hummocky microtopography and occurs on the margins of low-gradient, first-order, meandering headwater streams. Both types form part of successional beaver-influenced wetland mosaics and often

contain dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks about 10 cm high in *Sphagnum*-dominated stands, and 10-70 cm high in *Polytrichum*-dominated stands. Bedrock is commonly sandstone and, less frequently, shale or limestone. Soil texture is poorly to very poorly drained peat, less than half a meter in thickness and underlain by clay-rich layers mixed with silt and sand. Mean soil pH is 3.7.

This sedge fen may have a sparse short-shrub stratum, averaging 3% cover, which may include *Hypericum densiflorum* (bushy St. Johnswort), *Vaccinium myrtilloides* (velvetleaf huckleberry), and *Photinia melanocarpa* (black chokeberry). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high constancy in this type. The herbaceous layer, with mean 40% cover, is dominated by *Carex canescens* (silvery sedge). Herbaceous species with high constancy but low cover include *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Juncus brevicaudatus* (narrowpanicle rush), and *Glyceria canadensis* (rattlesnake mannagrass). Locally abundant species may include *Scirpus cyperinus* (woolgrass), *Carex atlantica* (prickly bog sedge), and *Carex echinata* ssp. *echinata* (star sedge). Nonvascular plants average 90% cover, dominated by either *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum rubellum*, *Sphagnum cuspidatum*, and other species) or by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*, and *Polytrichum pallidisetum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 16 taxa per 400 square meters.

## Softstem Bulrush Marsh



**Scientific Name:** *Schoenoplectus tabernaemontani* Marsh  
**Translated Name:** Softstem Bulrush Marsh  
**NVC Name:** C EGL006275:  
*Schoenoplectus (tabernaemontani, acutus)*  
 Eastern Herbaceous Vegetation  
**Conservation Rank:** S2 / GNR

This herbaceous marsh occurs on semi-permanently flooded soils in the Allegheny Mountains and Great Valley regions of West Virginia, and possibly elsewhere in the state, at elevations between 150 and 1080 m. It is a small-patch type that occupies flat-lying land in headwater basins. Stands occur where circumneutral seepage and overbank flow is impounded in old oxbows or behind natural stream levees. Standing water is present for most of the year. The type occurs on rich flat-lying limestone bedrock, and sites on private land may be impacted by heavy grazing pressure. The substrate is poorly to very poorly drained peat or silt loam.

The community averages 70% herbaceous cover, dominated by *Schoenoplectus tabernaemontani* (softstem bulrush), *Schoenoplectus acutus* (hardstem bulrush), and *Scirpus*

*cyperinus* (woolgrass). Other common herbaceous species include *Leersia oryzoides* (rice cutgrass), *Thelypteris palustris* (eastern marsh fern), *Ludwigia palustris* (marsh seedbox), *Galium tinctorium* (stiff marsh bedstraw), *Carex lurida* (shallow sedge), *Scirpus microcarpus* (panicled bulrush), *Alisma subcordatum* (American water plantain), and *Verbena hastata* var. *hastata* (swamp verbena). This type is vulnerable to invasion by *Iris pseudacorus* (pale yellow iris). Woody species and nonvascular plants do not have significant cover in this community. Mean species richness of vascular plants is 24 taxa per 400 square meters.

## Steeplebush Shrub Swamp



**Scientific Name:** *Spiraea tomentosa* / *Sphagnum palustre* Shrub Peatland

**Translated Name:** Steeplebush / Peatmoss Shrub Peatland

**NVC Name:** C EGL006571: *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland

**Conservation Rank:** S2 / GNR

This shrub peatland occurs on saturated soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1040 and 1220 m. It is a small-patch type that occupies very gently sloping (1-2 degrees)

beaver-influenced wetlands, including old oxbows along meandering streams. It is an early-successional wetland type and patches may be ephemeral, but it is likely to be present on the landscape as long as a beaver-influenced disturbance regime persists. Microtopography is characterized by tussocks and mossy hummocks formed over downed wood. Bedrock is sandstone or shale. Soils are moderately poorly to poorly drained peat or mucky sand. Soil pH averages 4.3.

Vegetation is characterized by an open shrub layer over an abundant herbaceous layer and dense bryophytes. The tall-shrub layer averages 30% cover and is dominated by *Spiraea tomentosa* (steeplebush). Other commonly occurring species in the tall-shrub layer include *Picea rubens* (red spruce) and *Rubus allegheniensis* var. *allegheniensis* (Allegheny blackberry). The short-shrub layer averages 16% cover, with species composition similar to that of the tall-shrub stratum. The herbaceous ground layer is variable, with mean 60% cover, and typically includes *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), and *Carex scoparia* var. *scoparia* (broom sedge). Locally abundant species may include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Carex atlantica* (prickly bog sedge), *Agrostis perennans* (upland bentgrass), *Thelypteris noveboracensis* (New York fern), and *Dichanthelium clandestinum* (deertongue). Nonvascular plants average 90% cover and are dominated by *Sphagnum palustre*, with lesser amounts of *Polytrichum commune*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 20 taxa per 400 square meters.

## Vulnerable

### Blueberry - Bracken Fern Shrub Swamp



**Scientific Name:** *Vaccinium myrtilloides* / *Pteridium aquilinum* / *Polytrichum* spp.

Shrub Swamp

**Translated Name:** Velvetleaf Blueberry / Bracken Fern / Haircap Moss Shrub Swamp

**NVC Name:** C EGL006596: *Vaccinium myrtilloides* / *Pteridium aquilinum* / *Polytrichum* spp. Shrubland

**Conservation Rank:** S3 / GNR

This successional shrubland occurs on temporarily flooded or saturated acidic soils in the Allegheny Mountains region of West Virginia, at elevations between 770

and 1220 m. It is a small-patch type that occupies flat to mildly inclined (0- to 5-degree) slopes in headwater basins. It occupies slightly drier positions in open wetland mosaics, either on the margins of the wetland, as drier lenses in the middle of the wetland, or interfingering with wetter shrub swamps or herbaceous wetlands in an irregular pattern related to moisture availability. This community is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested wetlands that were logged or burned within the last 120 years. Hummock-and-hollow microtopography is moderately developed, with moss-covered hummocks formed over woody stem clusters, decayed wood, and roots. Soil texture is moderately poorly to very poorly drained silt loam or clay loam, with peat developing in some older stands. Mean soil pH is 3.7 (n=9).

The tall-shrub layer typically includes *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Viburnum nudum* var. *cassinoides* (northern wild raisin). Less common species in the tall-shrub layer include *Hypericum densiflorum* (bushy St. Johnswort), *Picea rubens* (red spruce), *Populus tremuloides* (quaking aspen), *Amelanchier* (serviceberry) spp., *Prunus serotina* var. *serotina* (black cherry), *Viburnum recognitum* (southern arrowwood), *Acer rubrum* (red maple), and *Abies balsamea* (balsam fir). The short-shrub stratum is fairly dense and strongly dominated by *Vaccinium myrtilloides* (velvetleaf huckleberry), *Photinia melanocarpa* (black chokeberry), and *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The herbaceous layer typically includes a component of acidophilic upland species. Species with high cover and constancy are *Pteridium aquilinum* (western brackenfern), *Solidago uliginosa* (bog goldenrod), and *Danthonia compressa* (flattened oatgrass). Herbaceous species with high constancy but lower cover include *Lycopodium obscurum* (rare clubmoss), *Juncus effusus* (common rush), and *Carex debilis* (white edge sedge). Species with lower constancy that are sometimes abundant include *Gaultheria procumbens* (eastern teaberry), *Eriophorum virginicum* (tawny cottongrass), *Carex folliculata* (northern long sedge), *Brachyelytrum erectum* (bearded shorthusk), *Solidago rugosa* (wrinkleleaf goldenrod), *Apocynum androsaemifolium* (spreading dogbane), and *Lycopodium clavatum*

(running clubmoss). The nonvascular stratum is dominated by *Polytrichum* spp. (*Polytrichum juniperinum*, *Polytrichum commune*, *Polytrichum strictum*, *Polytrichum pallidisetum*) and often includes moderate cover by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum girgensohnii*, *Sphagnum rubellum*). *Cladonia* spp. are often present with low cover. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 22 taxa per 400 square meters.

## Bushy St. Johnswort Shrub Swamp



**Scientific Name:** *Hypericum densiflorum* / *Juncus effusus* / *Sphagnum* spp. Shrub Swamp

**Translated Name:** Bushy St. Johnswort / Common Rush / Peatmoss Shrub Swamp

**NVC Name:** CEG006464: *Hypericum densiflorum* / *Rubus hispidus* Shrubland

**Conservation Rank:** S3 / GNR

This successional shrub peatland occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region, New River Gorge National River, Meadow River wetlands,

and probably elsewhere in West Virginia, at elevations from 700-1200 m. It is a small-patch type that occupies very gently sloping land (0- to 2-degree slopes) in beaver-influenced wetlands, drying oxbows, and on former pastureland or disturbed ground. It is likely to be present on the landscape as long as natural (beaver or flooding) and man-made disturbance regimes persist. Its present distribution is probably much larger than its presettlement distribution, when disturbances were less widespread. Microtopography may or may not include hummock-and-hollow development, depending on the amount of decaying woody debris and peat formation. Bedrock is highly variable and may consist of sandstone, shale, limestone, or Quaternary alluvium. Soils are variable, including poorly drained peat, clay loam, silt loam, or sandy loam. Soil pH averages 4.2.

Vegetation is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* spp. Cover by *Hypericum densiflorum* (bushy St. Johnswort) in plots ranges from 5 to 80% in the tall-shrub layer (1-2 m tall) and from 5 to 80% cover in the short-shrub layer (<1 m tall). Additional shrub species with relatively high constancy but less cover include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing, trailing vine *Rubus hispidus* (bristly dewberry) has high constancy and cover in the plots. The herbaceous stratum averages 65% cover with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). Locally abundant

herbaceous species include *Carex intumescens* (greater bladder sedge) and *Onoclea sensibilis* (sensitive fern). Nonvascular plants average 50% cover and are typically dominated by *Sphagnum recurvum*, *Sphagnum affine*, *Sphagnum* spp., and *Polytrichum commune*. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 24 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

### Chokeberry - Northern Wild Raisin Shrub Peatland



**Scientific Name:** *Photinia (melanocarpa, pyrifolia) - Viburnum nudum var. cassinoides / Eriophorum virginicum / Sphagnum* spp. Shrub Peatland  
**Translated Name:** Chokeberry - Northern Wild Raisin / Cottongrass / Peatmoss Shrub Peatland  
**NVC Name:** C EGL006545: *Photinia pyrifolia - Ilex verticillata - Nemopanthus mucronatus / Osmunda cinnamomea* Saturated Shrubland  
**Conservation Rank:** S3 / GNR

This successional shrubland occurs on saturated, temporarily flooded, or semi-permanently flooded acidic peatlands in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0-2 degrees) in headwater basins. Where conditions are favorable, for example in Canaan Valley, individual stands may be as large as 12 ha. It is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested peatlands that were logged or burned within the last 120 years. It is probably more widespread now than in the past, when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested peatlands of high conservation value, although the recovery rate is slow (perhaps a century) in these frost-pocket habitats. Hummock and hollow microtopography is well-developed, with rounded peat-covered hummocks formed over woody stem clusters, decayed wood, and roots. Bedrock may be sandstone or, less commonly, limestone. Soil texture is moderately to very poorly drained peat, with a depth greater than one meter, although in earlier successional stands the peat may be only a few centimeters thick. Mean soil pH is 3.8.

Vegetation may be dominated by either tall-shrub or short-shrub physiognomy, depending on the age of the stand. The tall-shrub layer averages 20% cover, growing mostly on hummocks, and typically includes *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (common winterberry), *Nemopanthus mucronatus* (catberry), and *Kalmia latifolia* (mountain laurel). Less frequent, but sometimes locally abundant, shrub species are *Vaccinium corymbosum* (highbush blueberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry). The short-shrub stratum averages 35% cover and is similar in

composition to the tall-shrub layer. Dwarf-shrub species with high constancy include *Rubus hispidus* (bristly dewberry), *Vaccinium oxycoccos* (small cranberry), and *Vaccinium macrocarpon* (cranberry). The herbaceous layer, with mean 60% cover, typically occupies hollows and the sides of hummocks. Species with high cover and constancy are *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Species with lower constancy that are sometimes abundant include *Symplocarpus foetidus* (skunk cabbage), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Juncus effusus* (common rush), *Lycopodium obscurum* (rare clubmoss), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Pteridium aquilinum* (western brackenfern), *Gaultheria procumbens* (eastern teaberry), *Carex canescens* (silvery sedge), *Carex gynandra* (nodding sedge), and *Juncus brevicaudatus* (narrowpanicle rush). Nonvascular plants average 70% cover, dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum fallax*, *Sphagnum magellanicum*, *Sphagnum papillosum*, *Sphagnum capillifolium*, *Sphagnum flexuosum*) and often including high cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum juniperinum*, *Polytrichum strictum*, *Polytrichum ohioense*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 21 taxa per 400 square meters.

## Cinnamon Fern Seep



**Scientific Name:** *Acer rubrum* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. Forest Seep  
**Translated Name:** Red Maple / Cinnamon Fern / Peatmoss Forest Seep  
**NVC Name:** CEG006132: *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest  
**Conservation Rank:** S3 / GNR

This acidic forested seep is known from saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at

elevations of 850-1200 m. It occupies gently sloping concave linear "fingers" (1- to 4-degree slopes) in upland forest, sometimes feeding into mixed wetland mosaics. Microtopography is characterized by *Sphagnum* spp. hummocks and sedge tussocks. Bedrock is typically shale or sandstone. Soils are poorly drained muck or organic-rich sandy loam. Soil pH averages 4.2.

Vegetation is characterized by an open canopy of *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with an abundant herbaceous layer dominated by *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) and sedges, on hummocks of *Sphagnum* spp. Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. The canopy also includes lower cover of *Picea rubens* (red spruce), and occasional presence of *Quercus rubra* (northern red oak), *Magnolia acuminata* (cucumber-tree), *Quercus prinus* (chestnut oak), and

*Amelanchier laevis* (Allegheny serviceberry). Mean canopy cover is 25%. The subcanopy averages 11% cover and is comprised of the same species as the canopy. The tall-shrub layer averages 5% cover, with *Kalmia latifolia* (mountain laurel) and *Ilex verticillata* (common winterberry) typically present. Other species occasionally occurring in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), *Magnolia fraseri* (mountain magnolia), *Picea rubens* (red spruce), *Acer pensylvanicum* (striped maple), *Hamamelis virginiana* (American witchhazel), *Oxydendrum arboreum* (sourwood), and *Ilex montana* (mountain holly). The short-shrub layer is sparse, averaging 3% cover, with variable species composition that may include low cover of *Ilex verticillata* (common winterberry), *Kalmia latifolia* (mountain laurel), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Picea rubens* (red spruce), *Spiraea alba* (white meadowsweet), *Hypericum densiflorum* (bushy St. Johnswort), *Photinia* (chokeberry) spp., *Amelanchier arborea* var. *arborea* (common serviceberry), *Fagus grandifolia* (American beech), *Hamamelis virginiana* (American witchhazel), *Menziesia pilosa* (minniebush), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Salix sericea* (silky willow), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The herbaceous layer averages 47% cover and is dominated by *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Other herbaceous species with high constancy include *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Rubus hispidus* (bristly dewberry), *Acer rubrum* (red maple), *Impatiens* (touch-me-not) spp., *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Carex atlantica* ssp. *atlantica* (prickly bog sedge), *Carex folliculata* (northern long sedge), *Viola cucullata* (marsh blue violet), *Carex echinata* ssp. *echinata* (star sedge), *Maianthemum canadense* (Canada mayflower), *Solidago uliginosa* (bog goldenrod), *Dennstaedtia punctilobula* (eastern hayscented fern), *Oxalis montana* (mountain woodsorrel), *Tiarella cordifolia* (heartleaf foamflower), *Trillium undulatum* (painted trillium), *Chrysosplenium americanum* (American golden saxifrage), *Lycopodium obscurum* (rare clubmoss), and *Parnassia asarifolia* (kidneyleaf grass of Parnassus). Nonvascular plants average 60% cover and are dominated by *Sphagnum palustre*, *Sphagnum recurvum*, and *Sphagnum capillifolium*. Low cover of a variety of bryophyte species may be present, including *Rhizomnium appalachianum*, *Bazzania trilobata*, *Hypnum* spp., *Plagiomnium cuspidatum*, *Plagiothecium denticulatum*, *Thuidium* spp., *Brachythecium rivulare*, *Dicranum* spp., *Hylocomium splendens*, *Leucobryum* spp., and *Philonotis fontana*. Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 33 taxa per 400 square meters.

## Goldenrod Wet Meadow

**Scientific Name:** *Solidago rugosa* - *Euthamia graminifolia* var. *graminifolia* Wet Meadow

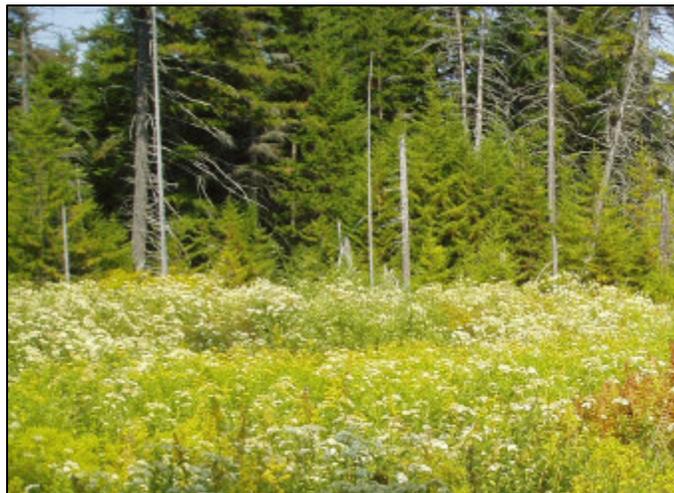
**Translated Name:** Wrinkleleaf Goldenrod - Flat-top Goldentop Wet Meadow

**NVC Name:** C EGL006568: *Solidago rugosa* - *Euthamia graminifolia* Herbaceous Vegetation

**Conservation Rank:** S3 / GNR

This herbaceous tall-herb wet meadow occurs on moist to temporarily flooded floodplains in the Allegheny Mountains region of West Virginia, at elevations between 370 and 1220 m. It is a small-patch type that occupies flat to gently sloping land (0- to 3-degree slopes) adjacent to small streams. Occasional flooding keeps this community open and prevents buildup of organic material in the substrate. Flooding can occur at any time of year. This type is common in beaver-influenced wetlands and on disturbed ground. It is likely to be present on the landscape

as long as natural (beaver and flooding) and man-made disturbance regimes persist. Its present distribution is probably larger than its presettlement distribution, when disturbances were less widespread. Bedrock is mapped as shale, sandstone, or Quaternary alluvium. Soil texture is variable and may include well-drained to poorly drained sandy loam, silt loam, or silty clay, with pH averaging 4.0, underlain by alluvial deposits including stratified sediments, cobbles, and woody debris.



A few percent cover of trees and shrubs may be present, including *Acer rubrum* (red maple), *Cornus amomum* (silky dogwood), *Crataegus* (hawthorn) spp., *Hypericum densiflorum* (bushy St. Johnswort), *Ilex montana* (mountain holly), *Picea rubens* (red spruce), *Prunus serotina* var. *serotina* (black cherry), *Salix sericea* (silky willow), *Sambucus canadensis* (common elderberry), and *Spiraea alba* (white meadowsweet). The herbaceous layer, averaging 85% cover, has a number of species with fairly high constancy and cover, including *Euthamia*

*graminifolia* var. *graminifolia* (flat-top goldentop), *Solidago rugosa* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Dichanthelium clandestinum* (deertongue), *Thelypteris noveboracensis* (New York fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Clematis virginiana* (virgin's bower), *Galium tinctorium* (stiff marsh bedstraw), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Carex scoparia* var. *scoparia* (broom sedge). Other frequent or locally abundant herbaceous species include *Scirpus cyperinus* (woolgrass), *Agrostis perennans* (upland bentgrass), *Impatiens capensis* (jewelweed), *Galium aparine* (stickywilly), *Eupatorium fistulosum* (trumpetweed), *Onoclea sensibilis* (sensitive fern), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Rubus hispidus* (bristly dewberry), *Poa pratensis* ssp. *pratensis* (Kentucky bluegrass), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eleocharis tenuis* (slender spikerush), *Carex atlantica* (prickly bog sedge), *Dichanthelium dichotomum* (cypress panicgrass), *Solidago canadensis* (Canada goldenrod), *Vernonia noveboracensis* (New York ironweed), *Verbesina alternifolia* (wingstem), *Symphotrichum praealtum* (willowleaf aster), *Aconitum uncinatum* (southern blue monkshood), *Stellaria longifolia* var. *longifolia* (longleaf starwort), *Carex squarrosa* (squarrose sedge), and *Carex annectens* (yellowfruit sedge). Cover by nonvascular plants ranges from none to 20% and often includes *Sphagnum* spp. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 28 taxa per 400 square meters.

## Meadowsweet Shrub Swamp

**Scientific Name:** *Spiraea alba* Shrub Swamp

**Translated Name:** Meadowsweet Shrub Swamp

**NVC Name:** CEG006595: *Spiraea alba* Shrubland [Provisional]

**Conservation Rank:** S3 / GNR



This successional shrub swamp occurs on temporarily to semi-permanently flooded soils in the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. It is a small-patch type that occupies flat to gently sloping floodplains (0- to 0.5-degree slopes) with occasional discontinuous fingers extending up tributary streams with slopes as steep as 7 degrees. It occurs on recovering beaver meadows and along low-gradient headwater streams that were logged, grazed, or burned within the last 80 years. Entrenched meandering stream channels

and overflow channels bisect the community. This type persists on the landscape as a result of beaver activity and (to a lesser extent) natural flood regimes. It is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested swamps of high conservation value. Bedrock may be shale, limestone, or sandstone. Soil texture is variable and may consist of moderately to poorly drained silt loam, sandy loam, clay, or shallow peat, underlain by alluvial deposits, including woody debris. Mean soil pH is 4.2.

Vegetation is characterized by a dense tall-shrub layer (mean cover = 75%) strongly dominated by *Spiraea alba* (white meadowsweet) with occasional presence of *Salix sericea* (silky willow), *Viburnum recognitum* (southern arrowwood), *Ilex verticillata* (common winterberry), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Alnus incana* ssp. *rugosa* (speckled alder). The short-shrub layer is sparse or absent. The herbaceous layer, with mean 25% cover, is typically concentrated in small openings. It is variable in composition but often includes *Juncus effusus* (common rush), *Carex scoparia* var. *scoparia* (broom sedge), *Galium tinctorium* (stiff marsh bedstraw), *Dichanthelium clandestinum* (deertongue), *Carex gynandra* (nodding sedge), *Impatiens capensis* (jewelweed), *Hypericum mutilum* (dwarf St. Johnswort), *Hypericum ellipticum* (pale St. Johnswort), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Rubus hispidus* (bristly dewberry), and *Glyceria striata* (fowl mannagrass). Nonvascular plants average only 1% cover, usually including *Sphagnum* spp. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 26 taxa per 400 square meters.

## Quaking Aspen Swamp

**Scientific Name:** *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Swamp

**Translated Name:** Quaking Aspen / Velvetleaf Blueberry / Bog Goldenrod Swamp

**NVC Name:** CEG006594: *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Forest

**Conservation Rank:** S3 / GNR



This successional deciduous forested swamp occurs on moist to temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 950 and 1200 m. This community is an outlier that occurs well south of the primary range of *Populus tremuloides* (quaking aspen) wetlands. It is a small-patch clonal type that occupies flat to very gently sloping land (0- to 1-degree slopes) in larger wetland mosaics, often surrounded by successional shrub swamps or peatlands. It is part of a natural (beaver-influenced) disturbance regime, although

its natural extent would be less than the current extent, which has been enlarged due to extensive logging and burning about 1900, and subsequent grazing. Median stand age ranges from 30-40 years. This type represents important habitat that was once covered by *Picea rubens* (red spruce) swamps and is likely to eventually recover if natural succession is allowed to proceed unhindered. Soils are poorly drained, mottled silt or clay loam, underlain by clay or clay loam. Organic soils are absent, although a few centimeters of litter or duff cover the soil surface.

Vegetation is characterized by an open to closed canopy of clonal *Populus tremuloides* (quaking aspen) with diverse shrub and herb layers. The canopy is strongly dominated by *Populus tremuloides* (quaking aspen), occasionally including very low cover of *Crataegus punctata* (dotted hawthorn), *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), and *Crataegus macrosperma* (bigfruit hawthorn). Canopy height is less than 20 m, and sometimes it is as low as 5 m, essentially crossing the transition between woodland and shrubland physiognomy. The shrub strata are dominated by young *Populus tremuloides* (quaking aspen), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Viburnum recognitum* (southern arrowwood). *Spiraea alba* (white meadowsweet) or *Photinia melanocarpa* (black chokeberry) may be locally abundant. The herbaceous layer is typically diverse, with high cover and constancy by *Solidago uliginosa* (bog goldenrod), *Rubus hispidus* (bristly dewberry), *Danthonia compressa* (flattened oatgrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Potentilla simplex* (common cinquefoil), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), and *Juncus effusus* (common rush). The non-native species *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass) is often present with low cover. Nonvascular plants typically include *Polytrichum commune*, *Sphagnum* spp., and *Callicladium haldanianum*. Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 14-57 (mean=29) taxa per 400 square meters, with most of the diversity in the herb layer.

## Rice Cutgrass Marsh



**Scientific Name:** *Leersia oryzoides* - *Sagittaria latifolia* Marsh

**Translated Name:** Rice Cutgrass - Broadleaf Arrowhead Marsh

**NVC Name:** C EGL006461: *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation

**Conservation Rank:** S3 / GNR

This early-successional marsh has a broad distribution in beaver-influenced wetlands and streamside overflow depressions throughout the state. It occurs on temporarily and semi-permanently

flooded soils in the Allegheny Mountains region, Meadow River, Tygart Valley, Camp Dawson, New River Gorge National River, and Ohio River, at elevations between 170 and 1300 m. It probably also occurs elsewhere in the state. It is a very small-patch type that occupies flat-lying land in inactive beaver ponds, the margins of active beaver ponds, oxbows, streamside sloughs, overflow depressions, and disturbed flat ground. Although individual patches are ephemeral, it is likely to be present on the landscape as long as natural (beaver or flooding) and man-made disturbance regimes persist. Its present distribution is probably larger than its presettlement distribution, when disturbances were less widespread. Soils tend to have a large clay component and may consist of somewhat to very poorly drained clay, clay loam, muck, sandy clay, sandy loam, or silty clay. Soil pH averages 4.0.

Vegetation is dominated by *Leersia oryzoides* (rice cutgrass) in a variable, disturbance-tolerant herbaceous layer. The herbaceous layer averages 95% cover. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover but drops out at the highest elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional herbaceous species with relatively high constancy include *Boehmeria cylindrica* (smallspike false nettle), *Polygonum sagittatum* (arrowleaf tearthumb), *Juncus effusus* (common rush), *Impatiens capensis* (jewelweed), *Galium tinctorium* (stiff marsh bedstraw), *Ludwigia palustris* (marsh seedbox), *Typha latifolia* (broadleaf cattail), *Dulichium arundinaceum* (threeway sedge), *Cephalanthus occidentalis* (common buttonbush), *Carex gynandra* (nodding sedge), *Eupatorium fistulosum* (trumpetweed), and *Lysimachia terrestris* (earth loosestrife). Cover by nonvascular plants is generally insignificant. Mean species richness of vascular plants is 16 taxa per 400 square meters.

## Silky Willow Shrub Swamp

**Scientific Name:** *Salix sericea* Shrub Swamp

**Translated Name:** Silky Willow Shrub Swamp

**NVC Name:** C EGL006305: *Salix sericea* Shrubland

**Conservation Rank:** S3 / GNR

This successional shrub swamp occurs on temporarily to semi-permanently flooded or saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 770

and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0- to 2-degree slopes) along seepage zones in open wetlands and in headwater drainages with intermittent overland flow. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters. This type persists on the landscape as a result of natural flood regimes and beaver activity, although it is probably more widespread now than in the past, when forests covered much of its current habitat. Bedrock may be shale, limestone, or sandstone. Soil texture is variable and may consist of moderately to very poorly drained peat, muck, silt, or silty clay. Organic soils average 20 cm depth and are underlain by alluvial sediments, with a clay-rich layer generally encountered within the top 60 cm. Mean soil pH is 4.2.



Vegetation is characterized by a tall-shrub layer dominated by *Salix sericea* (silky willow) with occasional *Hypericum densiflorum* (bushy St. Johnswort) and *Alnus incana* ssp. *rugosa* (speckled alder). The short-shrub layer averages 8% cover, and in addition to the tall-shrub species, it may include minor cover by *Vaccinium myrtilloides* (velvetleaf huckleberry), *Ilex verticillata* (common winterberry), *Picea rubens* (red spruce), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Populus tremuloides* (quaking aspen), and *Sambucus*

*canadensis* (common elderberry). The herbaceous layer, with mean 70% cover, typically has high cover by *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), and *Polygonum sagittatum* (arrowleaf tearthumb). Other herbaceous species with high constancy include *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Symphyotrichum puniceum* var. *puniceum* (purplestem aster), *Juncus effusus* (common rush), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Dryopteris cristata* (crested woodfern), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Glyceria laxa* (limp mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Glyceria striata* (fowl mannagrass), *Galium tinctorium* (stiff marsh bedstraw), *Carex lurida* (shallow sedge), *Typha latifolia* (broadleaf cattail), *Glyceria canadensis* (rattlesnake mannagrass), and *Leersia oryzoides* (rice cutgrass). Nonvascular plants average 30% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum girgensohnii*, *Sphagnum affine* and *Sphagnum flexuosum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 31 taxa per 400 square meters.

### Speckled Alder Shrub Swamp

**Scientific Name:** *Alnus incana* ssp. *rugosa* Shrub Swamp

**Translated Name:** Speckled Alder Shrub Swamp

**NVC Name:** CEG002381: *Alnus incana* Swamp Shrubland

**Conservation Rank:** S3 / G5

This shrub swamp occurs on temporarily to semi-permanently flooded organic soils in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1040 m, with most occurrences above 950 m. It is a small-patch type that most often occupies flat to very gently sloping floodplains (0- to 1-degree slopes) along meandering, low-gradient streams. It also occurs as a successional type in old beaver meadows and on former forested swamplands that are fed by abundant seepage. The community was probably less widespread in presettlement times prior to clearing of forested swamps and subsequent accelerated beaver activity. Where natural succession is allowed to proceed, some stands will likely return to forested swamps of exceptionally high conservation value. Microtopography is characterized by graminoid tussocks and hummocks formed by woody stem clusters and decaying wood. Bedrock may be sandstone, shale, or limestone. Soils are moderately to very poorly drained muck, peat, or organic-rich silt loam. Organic soil averages 30 cm (n=12) depth, underlain by clay. Average soil pH is 4.3.



Vegetation is characterized by a dense and often diverse tall-shrub layer (mean cover = 65%) dominated by *Alnus incana* ssp. *rugosa* (speckled alder) and *Ilex verticillata* (common winterberry), with occasional lower cover by *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Viburnum recognitum* (southern arrowwood), *Tsuga canadensis* (eastern hemlock), *Sambucus canadensis* (= *Sambucus nigra* ssp. *canadensis*), *Abies balsamea* (balsam fir), *Salix sericea* (silky willow), *Picea rubens* (red spruce), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Rhododendron maximum* (great

laurel), *Amelanchier* (serviceberry) spp., *Photinia melanocarpa* (black chokeberry), *Lindera benzoin* (northern spicebush), and *Sorbus americana* (American mountain ash). At the southern range limit of this type in West Virginia, shrub layers may be dominated or codominated by the central Appalachian endemic *Ilex collina* (longstalk holly). The short-shrub layer averages 5% cover and, in addition to the tall-shrub species, may include *Hypericum densiflorum* (bushy St. Johnswort), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Spiraea alba* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Kalmia latifolia* (mountain laurel), and *Rosa palustris* (swamp rose). In circumneutral, high-elevation stands, clonal patches of *Rhamnus alnifolia* (alderleaf buckthorn) may be locally abundant. The herbaceous layer is diverse, with mean 80% cover. Herbaceous species with high cover and constancy include *Glyceria striata* (fowl mannagrass), *Glyceria melicaria* (melic mannagrass), *Symplocarpus foetidus* (skunk cabbage), *Leersia oryzoides* (rice cutgrass), *Rubus hispida* (bristly dewberry), *Polygonum sagittatum* (arrowleaf tearthumb), and *Impatiens capensis* (jewelweed). Herbaceous species with high constancy but lower cover include *Dryopteris cristata* (crested woodfern), *Galium tinctorium* (stiff marsh bedstraw), *Viola cucullata* (marsh blue violet), *Scutellaria lateriflora* var. *lateriflora* (blue skullcap), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Carex gynandra* (nodding sedge), *Carex echinata* ssp. *echinata* (star sedge), *Carex stipata* (owlfruit sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod),

*Carex folliculata* (northern long sedge), *Solidago uliginosa* (bog goldenrod), *Galium asprellum* (rough bedstraw), *Agrostis perennans* (upland bentgrass), *Juncus effusus* (common rush), *Carex scoparia* var. *scoparia* (broom sedge), and *Dryopteris intermedia* (intermediate woodfern). Nonvascular plants average 10% cover, typically consisting of *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum henryense*, *Sphagnum fimbriatum*, *Sphagnum papillosum*, and *Sphagnum recurvum*) growing on hummocks and woody stem clusters. Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 30 taxa per 400 square meters.

## Speckled Alder - Arrowwood Shrub Swamp



**Scientific Name:** *Alnus incana* ssp. *rugosa* – *Viburnum recognitum* / (*Symplocarpus foetidus*) / *Sphagnum* spp.  
Shrub Swamp

**Translated Name:** Speckled Alder - Northern Arrowwood / (Skunk Cabbage) / Peatmoss Shrub Swamp

**NVC Name:** CEG006546: *Alnus incana* - *Viburnum recognitum* / *Calamagrostis canadensis* Shrubland [Provisional]

**Conservation Rank:** S3 / GNR

This alluvial shrub swamp occurs on temporarily to semi-permanently flooded organic soils the Allegheny

Mountains region of West Virginia, at elevations between 770 and 1030 m. It is a small-patch type that occupies flat-lying floodplains directly adjacent to low-gradient streams. The community is maintained by natural flooding and beaver disturbance regimes. It was probably less widespread in pre-settlement times prior to clearing of forested swamps and subsequent accelerated beaver activity. Where natural succession is allowed to proceed, some stands will likely return to forested swamps of exceptionally high conservation value. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters and decaying wood. Bedrock may be shale, limestone, or sandstone. The substrate in one sampled plot was peat (1 m depth) underlain by clay. Soil pH was 4.3.

This community is a less common variant of the Speckled Alder Shrub Swamp described above. Vegetation is characterized by a dense tall-shrub layer (mean cover = 60%) dominated by *Alnus incana* ssp. *rugosa* (speckled alder) and *Viburnum recognitum* (southern arrowwood), with occasional presence of *Ilex verticillata* (common winterberry), *Sambucus canadensis* (common elderberry), *Rhododendron maximum* (great laurel), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Spiraea alba* (white meadowsweet), *Tsuga canadensis* (eastern hemlock), and *Viburnum nudum* var. *cassinoides* (northern wild raisin). The short-shrub layer is sparse or absent. The herbaceous layer, with mean 70% cover, typically has high cover by *Rubus hispidus* (bristly dewberry), *Symplocarpus foetidus* (skunk cabbage), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Leersia oryzoides* (rice cutgrass). Other herbaceous species with high constancy include *Impatiens capensis* (jewelweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Agrostis*

*perennans* (upland bentgrass), *Dryopteris carthusiana* (spinulose woodfern), *Carex gynandra* (nodding sedge), *Juncus effusus* (common rush), *Carex folliculata* (northern long sedge), *Carex stricta* (tussock sedge), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), and *Dichanthelium clandestinum* (deertongue). *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Carex stipata* var. *stipata* (owlfruit sedge), or *Glyceria laxa* (limp mannagrass) may be locally abundant. Nonvascular plants average 25% cover and are dominated by *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum palustre*, *Sphagnum papillosum*, and *Sphagnum recurvum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 27 taxa per 400 square meters.

## Threeway Sedge Fen



**Scientific Name:** *Dulichium arundinaceum* / *Sphagnum* spp. Fen  
**Translated Name:** Threeway Sedge / Peatmoss Fen  
**NVC Name:** CEGL006552: *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation  
**Conservation Rank:** S3 / GNR

This herbaceous fen occurs on temporarily flooded, semi-permanently flooded, or saturated peat in the Allegheny Mountains and Ridge and Valley regions of West Virginia, at elevations between 620 and 1150 m. It is a small-patch type

that occupies flat-lying land in headwater basins. Many stands occur in beaver-influenced wetlands, either on the margins of active beaver ponds, or on sites that are slowly drying above abandoned beaver dams. The type also occurs on the margins of alluvial wetland mosaics, where seepage is impounded behind natural stream levees. Snags are present and indicate that some sites were formerly forested wetlands, while others are temporarily invaded by woody species during dry years and periods of reduced beaver activity. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-20 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale. The substrate is poorly to very poorly drained peat, varying in depth from 25 cm to more than 120 cm, generally underlain by deposits of sand, silt, or clay loam. Mean soil pH is 4.2.

Vegetation is dominated by *Dulichium arundinaceum* (threeway sedge). A few stunted trees and shrubs may occupy hummock tops, averaging 2% cover and often including *Picea rubens* (red spruce), *Hypericum densiflorum* (bushy St. Johnswort), *Rhododendron maximum* (great laurel), *Ilex verticillata* (common winterberry), *Alnus incana* ssp. *rugosa* (speckled alder), and *Kalmia latifolia* (mountain laurel). The dwarf-shrub *Rubus hispidus* (bristly dewberry) has high constancy and moderate cover in this type. The herbaceous layer, with mean 65% cover, is dominated by *Dulichium arundinaceum* (threeway sedge). Other common herbaceous species include *Eriophorum virginicum* (tawny cottongrass), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass), *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var.

*cinnamomea* (cinnamon fern), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Juncus effusus* (common rush), *Carex canescens* (silvery sedge), *Rhynchospora alba* (white beaksedge), *Agrostis hyemalis* (winter bentgrass), *Carex atlantica* (prickly bog sedge), *Sparganium* (bur-reed) spp., and *Juncus subcaudatus* var. *subcaudatus* (woodland rush). Nonvascular plants average 60% cover, dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum cuspidatum*, and *Sphagnum papillosum*) and generally including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum pallidisetum*). Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 21 taxa per 400 square meters.

## Tussock Sedge Wet Meadow



**Scientific Name:** *Carex stricta* Wet Meadow

**Translated Name:** Tussock Sedge - Inflated Sedge Herbaceous Vegetation

**NVC Name:** CEGL006412: *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation

**Conservation Rank:** S3 / G4G5

This herbaceous sedge meadow occurs on temporarily flooded, semi-permanently flooded, and saturated soils throughout West Virginia, at elevations between 150 and 1020 m. It is a small-patch type that occupies flat to very gently sloping land (0-1 degree) in headwater

basins. It typically occurs in discontinuous, repeating patches along the margins of slow-moving streams and in old, drying impoundments. It is maintained by low-energy inundation and frequently forms part of successional beaver-influenced wetland mosaics. Small seep and tributary channels often cross the community. During dry years, woody vegetation invades the community, and it is common to find blowdown and inundation-killed snags. Microtopography is characterized by well-developed tussocks. Bedrock may be sandstone or shale. Soil texture is moderately poorly to very poorly drained peat, muck, silt loam, or sandy clay loam, underlain by stratified alluvial layers. Mean soil pH is 4.4.

Vegetation is strongly dominated by tussock-forming *Carex stricta* (tussock sedge). The shrub layer averages 6% cover and may include *Viburnum recognitum* (southern arrowwood), *Hypericum densiflorum* (bushy St. Johnswort), *Sambucus canadensis* (common elderberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Alnus serrulata* (hazel alder), *Ilex verticillata* (common winterberry), *Acer rubrum* (red maple), and *Salix sericea* (silky willow). The dwarf-shrub species *Rubus hispida* (bristly dewberry) has high constancy in this type. The herbaceous layer, with mean 90% cover, is strongly dominated by *Carex stricta* (tussock sedge). Common herbaceous species with lower cover include *Juncus effusus* (common rush), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), *Leersia oryzoides* (rice cutgrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Carex atlantica* (prickly bog sedge), *Impatiens capensis* (jewelweed), *Carex scoparia* var. *scoparia* (broom sedge), *Carex*

*folliculata* (northern long sedge), *Juncus brevicaudatus* (narrowpanicle rush), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Sparganium* (bur-reed) spp., *Solidago rugosa* (wrinkleleaf goldenrod), *Hypericum mutilum* (dwarf St. Johnswort), *Glyceria striata* (fowl mannagrass), *Eleocharis obtusa* (blunt spikerush), and *Carex stipata* (owlfruit sedge). Nonvascular plants average 10% cover, generally including *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum fimbriatum*, *Sphagnum recurvum*) and less commonly *Polytrichum commune* and other bryophytes. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 24 taxa per 400 square meters.

## Woolgrass Wet Meadow



**Scientific Name:** *Scirpus cyperinus* Wet Meadow

**Translated Name:** Woolgrass Wet Meadow

**NVC Name:** CEG006349: *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation

**Conservation Rank:** S3 / GNR

This herbaceous community occurs on temporarily flooded, semi-permanently flooded, and saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 830 and 1220 m. It is a small-patch type that

occupies flat to very gently sloping land (0-2 degrees) in headwater basins. It occurs in beaver-influenced wetland mosaics and oxbows. The community often contains dead snags and downed wood, indicating former forested physiognomy prior to inundation by beaver. Microtopography is characterized by dense tussocks of *Scirpus* (bulrush) spp. The community sometimes occurs as a peatland with pronounced hummocks of *Polytrichum* spp. up to 60 cm tall. Bedrock is commonly sandstone or shale and, less frequently, limestone. Soil texture is variable and may be poorly to very poorly drained peat, muck, silt loam, clay loam, or sandy loam. Mean soil pH is 4.0.

Vegetation is dominated by *Scirpus cyperinus* (woolgrass), or, in higher pH settings, by *Scirpus microcarpus* (panicked bulrush). The short-shrub stratum averages 5% cover and often includes *Hypericum densiflorum* (bushy St. Johnswort), with less common species *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Rhododendron maximum* (great laurel), *Photinia pyrifolia* (red chokeberry), *Spiraea tomentosa* (steeplebush), *Viburnum recognitum* (southern arrowwood), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high constancy in this type. The herbaceous layer, with mean 80% cover, is dominated by *Scirpus cyperinus* (woolgrass) or *Scirpus microcarpus* (panicked bulrush). Herbaceous species with high constancy but low cover include *Juncus effusus* (common rush), *Agrostis hyemalis* (winter bentgrass), *Leersia oryzoides* (rice cutgrass), *Carex scoparia* var. *scoparia* (broom sedge), *Agrostis perennans* (upland bentgrass), *Juncus brevicaudatus* (narrowpanicle rush), *Galium tinctorium* (stiff marsh bedstraw), *Polygonum*

*sagittatum* (arrowleaf tearthumb), *Carex lurida* (shallow sedge), *Sparganium chlorocarpum* (small bur-reed), *Eriophorum virginicum* (tawny cottongrass), *Hypericum mutilum* (dwarf St. Johnswort), and *Solidago uliginosa* (bog goldenrod). Nonvascular plants may be absent or abundant. When abundant, they may have up to 80% cover, dominated by *Polytrichum commune* with moderate cover by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum papillosum*). *Aulacomnium palustre* is frequently present with low cover. Mean species richness of all vascular plants, and any nonvascular plants with cover >1%, is 23 taxa per 400 square meters.

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**Appendix A: West Virginia Natural Heritage Program, Vegetation Plot Form**

Revised Dec 2005

**Identifiers**

Plot code \_\_\_\_\_ Location name \_\_\_\_\_  
 County name \_\_\_\_\_ Sublocation \_\_\_\_\_ Quad name \_\_\_\_\_  
 Provisional community name \_\_\_\_\_  
 Survey date \_\_\_\_\_ Time: \_\_\_\_\_ Surveyors \_\_\_\_\_  
 Plot directions: \_\_\_\_\_

X dimension (m) \_\_\_\_\_ Y dimension (m) \_\_\_\_\_ Plot shape \_\_\_\_\_  
 GPS file \_\_\_\_\_ GPS feature \_\_\_\_\_  corrected  raw  map dot  
 Field UTM x \_\_\_\_\_ Field UTM y \_\_\_\_\_  Photos Camera \_\_\_\_\_  
 Corrected UTM x \_\_\_\_\_ Corrected UTM y \_\_\_\_\_ Datum \_\_\_\_\_ Roll # \_\_\_\_\_ Photographer \_\_\_\_\_  
 Frame # \_\_\_\_\_

**Environmental data**

<b>Hydrology evidence</b> <input type="checkbox"/> flood scour <input type="checkbox"/> hydrophytes <input type="checkbox"/> standing water <input type="checkbox"/> saturated soil <input type="checkbox"/> flotsam <input type="checkbox"/> soil features <input type="checkbox"/> other: e.g. crayfish holes		<b>Hydrologic regime</b> <input type="checkbox"/> temporarily flooded <input type="checkbox"/> permanently flooded <input type="checkbox"/> semi-permanently flooded <input type="checkbox"/> seasonally flooded <input type="checkbox"/> intermittently flooded <input type="checkbox"/> saturated <input type="checkbox"/> moist		<input type="checkbox"/> somewhat moist <input type="checkbox"/> dry <input type="checkbox"/> very dry <input type="checkbox"/> extremely dry <input type="checkbox"/> unknown	
<b>Elevation (m)</b> _____ <b>Slope (°)</b> _____ <b>Aspect (°):</b> _____ <b>Slope shape-vert.:</b> <i>concave straight convex undulating</i> <b>Slope shape-horiz.:</b> <i>concave straight convex undul.</i> <b>Landform:</b> _____ <b>Cowardin system:</b> <i>U P R L</i> <b>Geologic unit:</b> _____ <b>Surficial geology:</b> _____		<b>Topographic sketch</b>  <b>Topographic position</b> <input type="checkbox"/> interfluvial <input type="checkbox"/> backslope <input type="checkbox"/> low level <input type="checkbox"/> high slope <input type="checkbox"/> step in slope <input type="checkbox"/> channel wall <input type="checkbox"/> high level <input type="checkbox"/> lowslope <input type="checkbox"/> channel bed <input type="checkbox"/> midslope <input type="checkbox"/> toeslope <input type="checkbox"/> basin floor		<b>Rosgen stream type</b> A B C D DA E F G 1 2 3 4 5 6 a+ a b c c- <b>Hummocks</b> ___% ___% hollow height (cm): _____ <input type="checkbox"/> peat <input type="checkbox"/> tussocks <input type="checkbox"/> roots <input type="checkbox"/> tip mounds <input type="checkbox"/> down wood <input type="checkbox"/> woody stem clusters	
<b>Unvegetated surface (%)</b> _____ litter/duff _____ bedrock _____ lg rocks >10 cm _____ sm rocks .2-10 cm _____ sand .1-2 mm _____ wood >1 cm _____ water _____ bare soil _____ other:		<b>Stoniness</b> <input type="checkbox"/> <.1% <input type="checkbox"/> 15-50% <input type="checkbox"/> .1-3% <input type="checkbox"/> 50-90% <input type="checkbox"/> 3-15% <input type="checkbox"/> >90%		<b>Soil drainage</b> <input type="checkbox"/> rapid <input type="checkbox"/> mod-poor <input type="checkbox"/> well <input type="checkbox"/> poor <input type="checkbox"/> moderate <input type="checkbox"/> very poor	
<b>Soil</b> Depth to water table (cm): _____ Texture (mineral soil): _____ pH (mineral soil): _____ Depth of organic soil (cm): _____ Depth to mottling (cm): _____ Pore water pH: _____ Pore water EC: _____ Pore water T (°C) _____ Soil map unit: _____		<b>Soil profile:</b> <i>indicate depth, horizon, texture, matrix &amp; mottle colors, redoximorphic features, peat decomposition, comments</i> ⇨			
<b>Estimated stand size (ha):</b> _____ <b>Representativeness:</b> _____					
<b>Environmental condition:</b> _____					
<b>Landscape context:</b> _____					
<b>Ranking:</b> size: _____ condition: _____ context: _____ composite: _____		<b>Disturbance:</b> <input type="checkbox"/> fire <input type="checkbox"/> exotic plants <input type="checkbox"/> trails/roads <input type="checkbox"/> deer trails <input type="checkbox"/> clearing <input type="checkbox"/> insects <input type="checkbox"/> grazing <input type="checkbox"/> wind-ice damage <input type="checkbox"/> other <input type="checkbox"/> logging <input type="checkbox"/> disease <input type="checkbox"/> browsing <input type="checkbox"/> ditching/hydro alteration Comments: _____			
<b>Animal use evidence:</b> <input type="checkbox"/> insects collected					



## Appendix B. Soil Chemical Analysis: Average Values by Wetland Type

Common Name of Wetland Type	TEC	pH	SMP Buffer	Organic Matter	ENR	Soluble Sulphur	Al ppm	B ppm	Ca ppm	Cu ppm	Fe ppm	H ppm	K ppm	Mg ppm	Mn ppm	Na ppm	P ppm	Zn ppm	# Samples
American Bur-reed Marsh	18	4.4	5.8	10	108	117	854	0.62	671	0.83	490	76	35	72	39	27	22	5	8
Balsam Fir - Black Ash Swamp	28	5.4	6.0	45	130	53	424	0.67	2837	1.02	259	46	81	165	38	27	31	7	9
Balsam Fir - Oatgrass Swamp	29	4.0	4.8	17	124	31	1046	0.35	293	0.58	334	93	50	44	7	13	26	3	10
Balsam Fir - Winterberry Swamp	25	4.6	5.3	32	121	31	775	0.47	818	0.60	333	79	50	96	32	32	29	5	11
Beaked Sedge Fen	24	3.8	5.2	28	126	58	870	0.29	372	0.89	212	89	32	60	8	19	45	3	6
Blueberry - Bracken Fern Shrub Swamp	29	3.7	4.8	23	119	42	1035	0.41	234	0.46	346	94	43	45	4	15	26	3	9
Bluejoint Grass Wet Meadow	21	4.3	5.7	15	117	146	748	0.46	1162	0.59	306	68	42	93	46	27	50	4	8
Bog-rosemary Peatland	28	3.7	4.8	84	130	37	109	0.47	310	0.62	52	92	43	57	5	24	36	3	3
Bushy St. Johnswort Shrub Swamp	14	4.3	6.0	7	94	46	745	0.54	311	1.61	449	75	45	64	17	31	18	3	7
Chokeberry - Northern Wild Raisin Shrub Peatland	28	3.8	5.0	56	129	63	460	0.26	626	0.38	123	85	20	59	11	23	25	4	7
Cinnamon Fern Seep	16	4.2	5.9	10	101	67	586	0.40	446	0.59	214	81	34	131	28	22	30	3	3
Cottongrass Fen	21	3.8	5.4	24	125	62	806	0.36	339	0.79	268	89	32	60	10	17	35	3	5
Cranberry - Beakrush Peatland	25	3.8	5.1	47	126	61	661	0.27	314	0.54	150	91	21	63	13	19	34	3	11
Golden Saxifrage Seep	16	4.4	6.0	7	107	71	682	0.35	764	0.55	233	73	31	87	142	26	55	4	8
Goldenrod Wet Meadow	20	3.9	5.5	14	117	75	810	0.53	419	0.78	375	83	35	53	66	16	35	4	9
Hairy-fruit Sedge Floodplain Prairie	10	4.8	6.5	4	82	42	483	0.30	755	1.62	234	49	35	68	149	18	29	8	4
Lake Sedge Fen	24	4.2	5.5	35	120	64	600	0.29	1138	0.37	270	75	34	69	24	29	50	4	4
Meadowsweet Shrub Swamp	18	4.2	5.8	17	113	75	697	0.43	685	1.08	311	78	40	69	73	24	46	4	4

Common Name of Wetland Type	TEC	pH	SMP Buffer	Organic Matter	ENR	Soluble Sulphur	Al ppm	B ppm	Ca ppm	Cu ppm	Fe ppm	H ppm	K ppm	Mg ppm	Mn ppm	Na ppm	P ppm	Zn ppm	# Samples
Nodding Sedge – Prickly Bog Sedge Seep	21	4.4	5.8	16	118	88	709	0.35	1222	0.75	304	69	23	109	41	23	47	5	6
Quaking Aspen Swamp	20	4.0	5.7	5	100	53	864	0.40	800	0.99	352	76	79	61	24	17	40	2	2
Red Spruce - Heath Peat Woodland	23	3.7	5.2	21	120	81	827	0.34	260	0.69	261	92	24	53	9	18	44	3	8
Red Spruce - Hemlock - Great Laurel Swamp	22	3.8	5.3	33	127	59	609	0.40	329	0.52	236	89	33	56	8	23	40	3	13
Red Spruce - Southern Mtn Cranberry Swamp	28	3.6	4.8	24	128	67	979	0.55	206	0.66	304	95	15	42	7	16	70	2	5
Red Spruce - Yellow Birch - Mannagrass Swamp	24	4.2	5.4	36	128	82	534	0.53	923	0.45	339	76	45	99	62	25	49	5	16
Rice Cutgrass Marsh	25	3.9	5.0	26	130	49	775	0.49	220	0.32	394	94	28	36	8	19	20	4	1
Rough Sedge Seep	17	4.8	6.2	7	106	97	489	0.57	1221	0.75	321	55	54	161	272	54	43	8	4
Silky Willow Shrub Swamp	21	4.2	5.6	15	119	90	793	0.36	750	0.73	281	77	41	104	34	25	56	3	6
Silvery Sedge Fen	22	3.7	5.3	28	127	71	834	0.36	245	0.59	273	92	21	40	12	18	42	3	6
Softstem Bulrush Marsh	25	4.4	5.7	13	126	197	1010	0.57	1918	0.50	380	59	42	57	163	21	83	9	1
Speckled Alder - Arrowwood Shrub Swamp	13	4.3	6.2	8	114	49	860	0.20	593	1.10	121	71	17	58	8	27	61	2	1
Speckled Alder Shrub Swamp	28	4.3	5.5	31	128	104	648	0.52	1729	0.52	346	67	45	96	73	32	48	6	11
Star Sedge Fen	20	4.0	5.5	11	126	43	525	0.21	376	0.91	194	87	21	78	26	15	19	5	1
Steeplebush Shrub Swamp	10	4.3	6.2	3	84	59	752	0.49	212	0.20	354	86	3	33	8	24	24	2	1
Tamarack Swamp	19	4.2	5.7	53	130	50	535	0.27	598	0.42	150	80	30	87	19	19	21	8	1
Threeway Sedge Fen	20	4.2	5.6	27	117	44	704	0.40	443	0.79	301	85	25	84	21	21	38	27	4
Tussock Sedge Wet Meadow	22	4.4	5.4	7	109	33	1109	0.66	358	0.59	562	86	81	96	13	21	13	2	7
Twisted Sedge Riverscour Prairie	6	5.7	6.9	2	51	28	523	0.51	831	0.86	223	18	27	92	127	17	15	4	3
Woolgrass Wet Meadow	24	4.1	5.5	18	121	205	780	0.43	989	0.94	368	80	25	72	28	26	33	7	8
<b>Average of all types</b>	<b>23</b>	<b>4.2</b>	<b>5.5</b>	<b>25</b>	<b>118</b>	<b>72</b>	<b>725</b>	<b>0.44</b>	<b>737</b>	<b>0.69</b>	<b>302</b>	<b>79</b>	<b>39</b>	<b>78</b>	<b>41</b>	<b>23</b>	<b>37</b>	<b>4</b>	

### **Brookside Labs Soil Analysis Methodologies**

[http://www.blinc.com/worksheet\\_pdf/SoilMethodologies.pdf](http://www.blinc.com/worksheet_pdf/SoilMethodologies.pdf)

**TEC:** Total Exchange Capacity (TEC by summation). Reference: Ross, D. 1995. Recommended soil tests for determining soil cation exchange capacity. P. 62-69 in J. Thomas Sims and A. Wolf (eds.). Recommended soil testing procedures for the northeastern United States. Northeastern Regional Bulletin #493. Ag. Experiment Station, University of Delaware, Newark, DE.

**pH:** 1:1 H<sub>2</sub>O. Reference: Watson and Brown NRC 13 1998. Soil, Plant, and Water Reference Methods for the Western Regions S – 2.20 2003.

**SMP Buffer pH:** Reference: Watson and Brown NRC 13 1998. Soil, Plant, and Water Reference Methods for the Western Regions S – 2.50 2003.

**Organic Matter:** loss of ignition at 360°. Reference: Combs and Nathan NRC 13 1998. Soil, Plant, and Water Reference Methods for the Western Regions S – 9.20 2003.

**ENR:** Estimated Nitrogen Release. This number is a computed estimate of the nitrogen that may be released annually through organic matter decomposition (calculation based on LOI %).

**Al, B, Ca, Cu, Fe, K, Mg, Mn, Na, P, S, Zn:** Mehlich III Extractable Elements. Reference: Soil, Plant, and Water Reference Methods for the Western Regions S – 4.33 2003.

Appendix B in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007. **Classification and Conservation Assessment of High Elevation Wetland Communities in the Allegheny Mountains of West Virginia.** West Virginia Natural Heritage Program, WVDNR. Elkins, WV.

## Appendix C. Samples of Statistical Results used in Community Classification

This appendix includes a sampling of statistical outputs, tables, and graphs using the plot data from linear forested seeps. Graphs and charts represent outputs from PC-Ord, with some data further summarized in Excel.

Outlier Analysis .....	1
Hierarchical Cluster Analysis .....	2
Two-Way Hierarchical Cluster Analysis .....	2
Indicator Species Analysis .....	3
Nonmetric Multidimensional Scaling .....	4
Correlation of Sphagnum sp. with ordination axes .....	5
Correlation of Tiarella cordifolia with ordination axes .....	6
Correlation of sample environmental variables with ordination axes .....	6
Wetland association plot groupings in species space .....	7

### Outlier Analysis

Forested seeps

PC-ORD, 5.01 29 Nov 2007, 10:09

Frequency distribution of average distances N = 21 Plot

Distance*	Frequency (each "X" represents one entity)
0.86901	X RAND.13 <i>(Note that Rand.13 and Rand.7 are weak outliers)</i>
0.85585	X RAND.7
0.84270	
0.82954	
0.81638	X
0.80323	X
0.79007	X
0.77691	X
0.76376	X
0.75060	X
0.73744	X
0.72429	XXXX
0.71113	XXX
0.69797	XXX
0.68482	XX

\* Distances at left are lower end of that bin's range.

Statistics for average distances for each of N = 21 Plot

Distance measure: Relative Sorensen

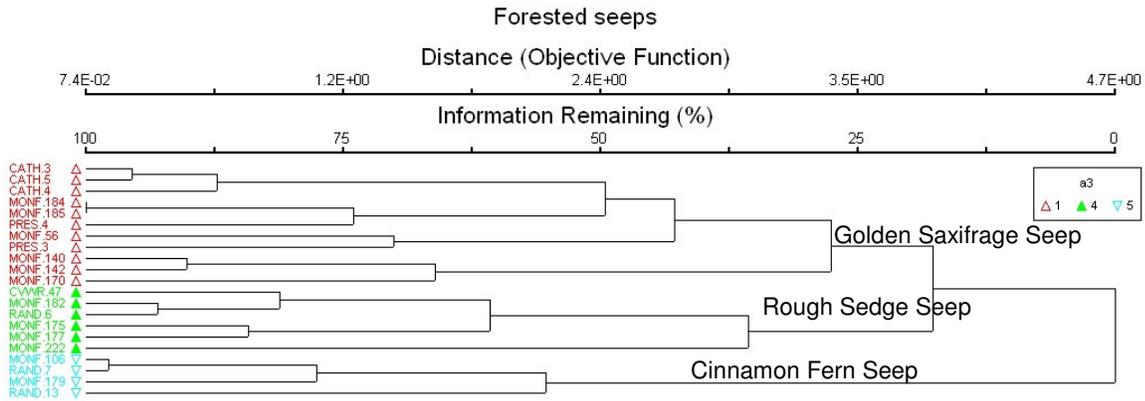
0.75156E+00 = Grand mean

0.55597E-01 = Standard deviation

2.00000 = Cutoff number of standard deviations used to flag outliers

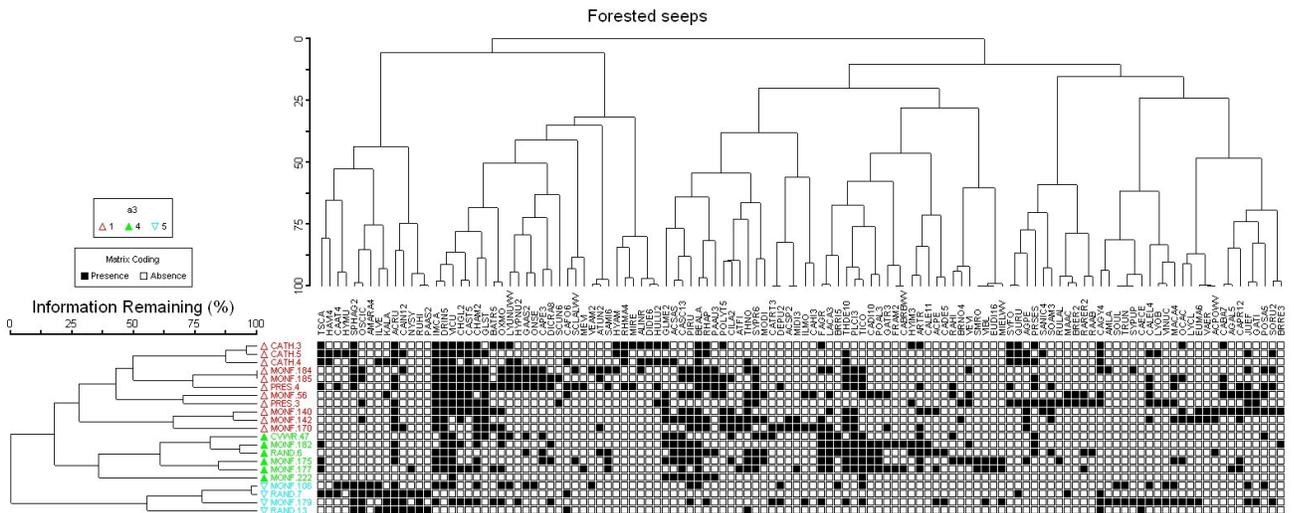
# Hierarchical Cluster Analysis

PC-ORD, 5.01 29 Nov 2007, 12:20  
 Linkage method: FLEXIBLE BETA  
 Distance measure: Sorensen (Bray-Curtis)  
 Flexible beta value selected is -0.250



# Two-Way Hierarchical Cluster Analysis

PC-ORD, 5.01 29 Nov 2007, 12:24  
 Linkage method: FLEXIBLE BETA  
 Distance measure: Sorensen (Bray-Curtis)  
 Flexible beta value selected is -0.250



## Indicator Species Analysis

Forested seeps  
 PC-ORD, 5.01  
 29 Nov 2007, 10:01

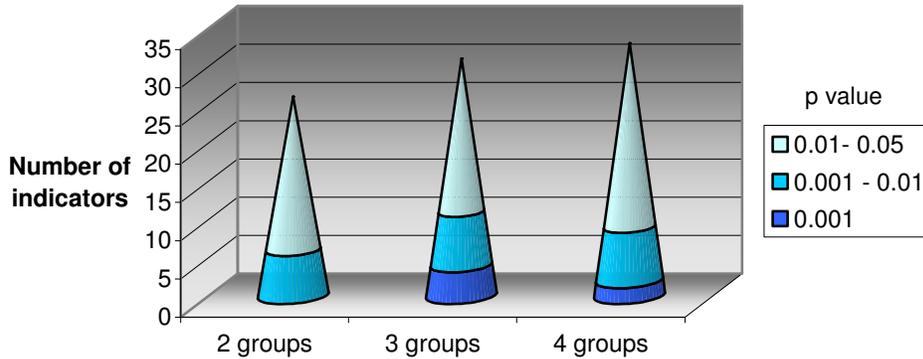
Indicator values calculated with method of Dufrene, M. & P. Legendre. 1997.  
 Species assemblages and indicator species: the need for a flexible  
 asymmetrical approach. Ecological Monographs 67:345-366.

3 Groups  
 Input data has: 21 Plots by 118 Species

Significant indicator species ( $p^* < 0.05$ ) shown, with strong indicators ( $p^* < 0.01$ ) highlighted in yellow.

Species	Group	Observed Indicator Value (IV)	Mean	S.Dev	$p^*$
DRIN5	1	56.3	38.1	5.91	0.001
IMCA	1	60	38	7.46	0.0042
CAST5	1	71.9	33.5	10.84	0.0044
GLST	1	74.2	32.6	11.49	0.008
POLYT5	1	63.6	28	11.71	0.0106
CHGL2	1	59.6	34.5	10.01	0.0248
AGPE	1	52.8	27.1	11.18	0.0358
TICO	4	79	34.9	10.47	0.0004
CASC13	4	80.9	33.7	10.89	0.0008
ACSAS	4	79.6	28.2	12.39	0.004
VICU	4	56.7	38.8	6.76	0.0064
LACA3	4	70.8	31.2	11.7	0.0086
CADI10	4	61.3	23.5	11.71	0.0142
PLCI3	4	63.9	33.5	10.61	0.0172
ARTR	4	59.6	31.3	11.68	0.0236
BRR15	4	49.4	22	11.36	0.027
POAL3	4	55.8	23.6	11.87	0.0272
FAGR	4	56.9	32.3	10.87	0.0286
SPHAG2	5	86.9	32.7	11.22	0.0004
OSCIC	5	89.9	29.5	11.74	0.0006
RUHI	5	75	19.1	10.62	0.0044
ILVE	5	67.8	21.1	10.9	0.0046
CAIN12	5	59.6	26.2	12.01	0.0202
KALA	5	58	23.3	11.5	0.0208
PAAS2	5	50	17.4	7.61	0.024
AMARA4	5	50	17.4	7.91	0.0262
SOUL	5	50	18	9.2	0.031
TRUN	5	50	17.7	9.28	0.031
CAECE	5	50	17.6	8.3	0.0314

Choosing the right number of groups (where to “cut” the clades in cluster analysis) is partly determined by the number and strength of the indicator species at different grouping levels. In the case below, the scenario with three groups, i.e. three wetland associations, has the largest number of strong indicators. The scenario with four groups is a close second.



## Nonmetric Multidimensional Scaling

Forested seeps

PC-ORD, 5.01

29 Nov 2007, 9:39

Ordination of 21 Plots in 118 Species space.

The following options were selected:

ANALYSIS OPTIONS

1. SORENSEN = Distance measure
2. 6 = Number of axes (max. = 6)
3. 500 = Maximum number of iterations
4. RANDOM = Starting coordinates (random or from file)
5. 1 = Reduction in dimensionality at each cycle
6. 0.20 = Step length (rate of movement toward minimum stress)
7. USE TIME = Random number seeds (use time vs. user-supplied)
8. 250 = Number of runs with real data
9. 250 = Number of runs with randomized data
10. YES = Autopilot
11. 0.000000 = Stability criterion, standard deviations in stress over last 10 iterations.
12. THOROUGH = Speed vs. thoroughness

14.96779 = final stress for 2-dimensional solution

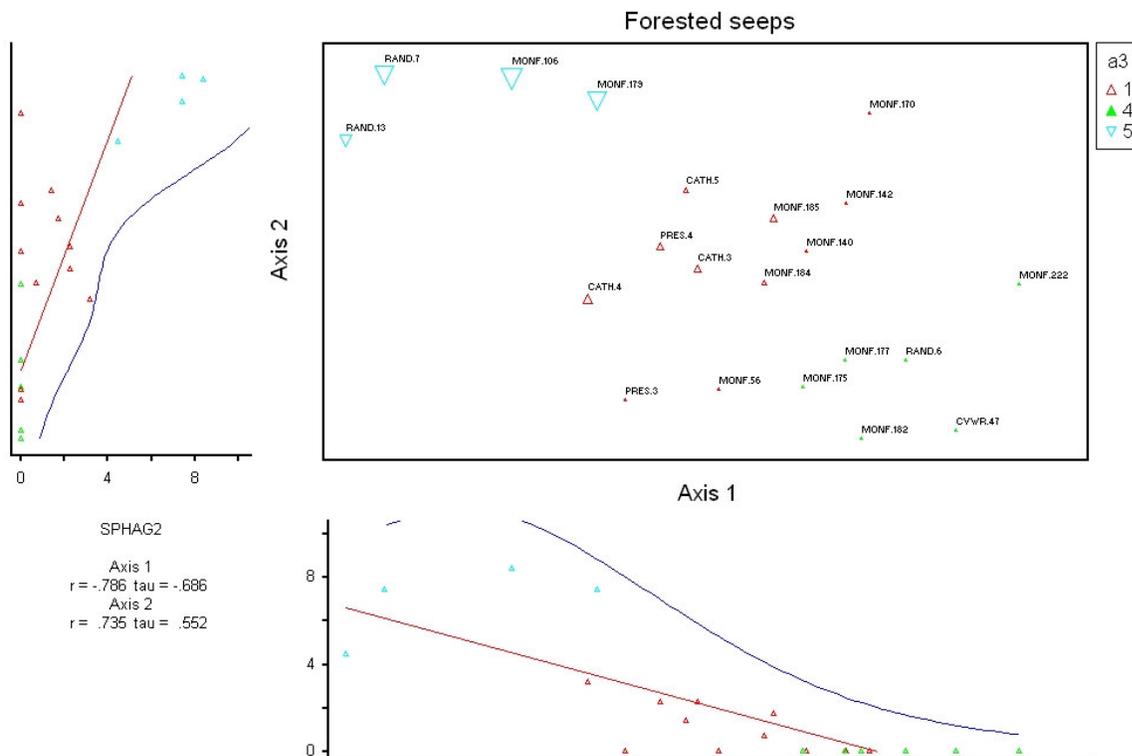
0.00000 = final instability

84 = number of iterations

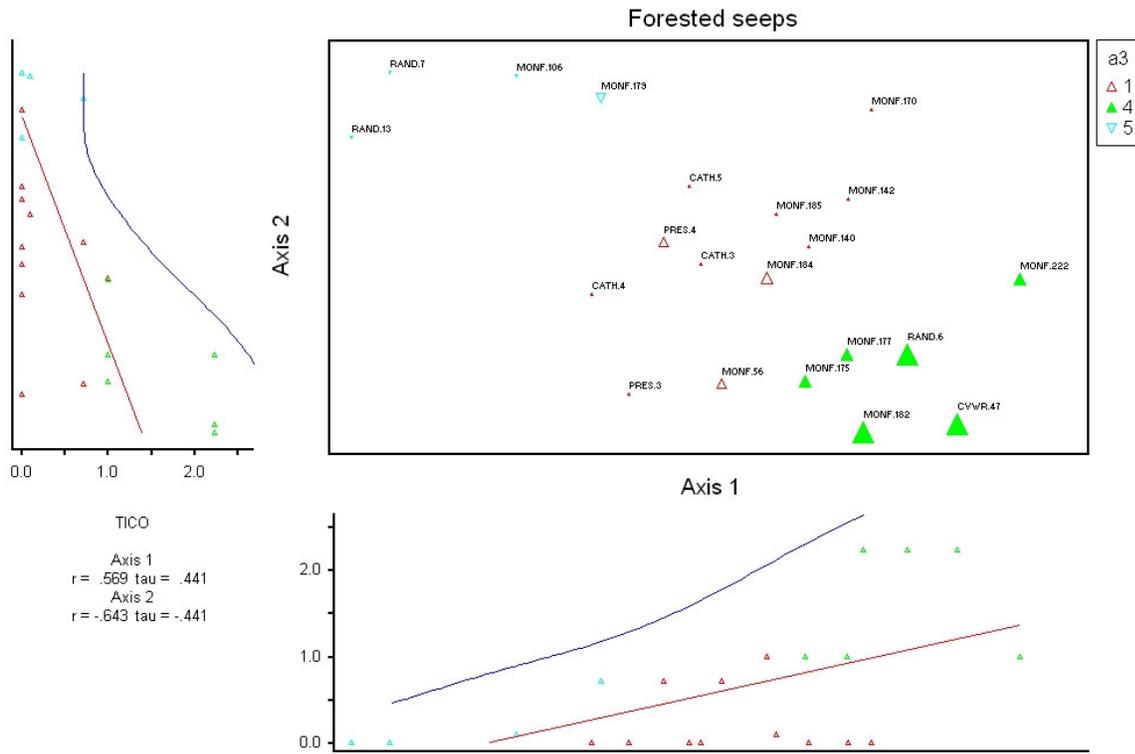
High correlations ( $r^2 > 0.3$  for at least one axis) of species with ordination axes:

Axis:	1		2	
	r-sq	tau	r-sq	tau
ACSAS	0.358	0.495	0.175	0.405
CADI10	0.087	0.265	0.322	0.486
CASC13	0.525	0.702	0.181	0.408
GLME2	0.123	0.248	0.388	0.541
ILVE	0.544	-0.549	0.255	-0.369
KALA	0.356	-0.467	0.052	-0.181
NYSY	0.303	-0.295	0.073	-0.203
OSCIC	0.406	-0.448	0.476	-0.508
PAAS2	0.471	-0.425	0.192	-0.358
PLCI3	0.276	0.502	0.309	0.371
POAL3	0.079	0.289	0.319	0.496
RUHI	0.483	-0.48	0.287	-0.424
SPHAG2	0.618	-0.686	0.54	-0.552
TICO	0.324	0.441	0.414	0.441
VICU	0.172	0.255	0.32	0.384

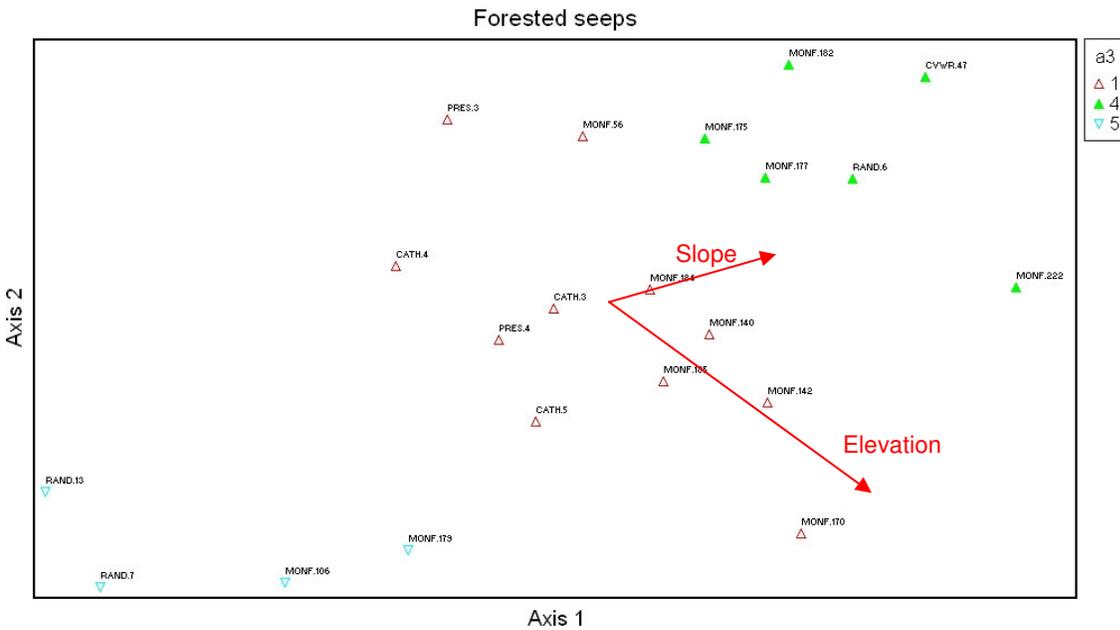
**Correlation of *Sphagnum sp.* with ordination axes**



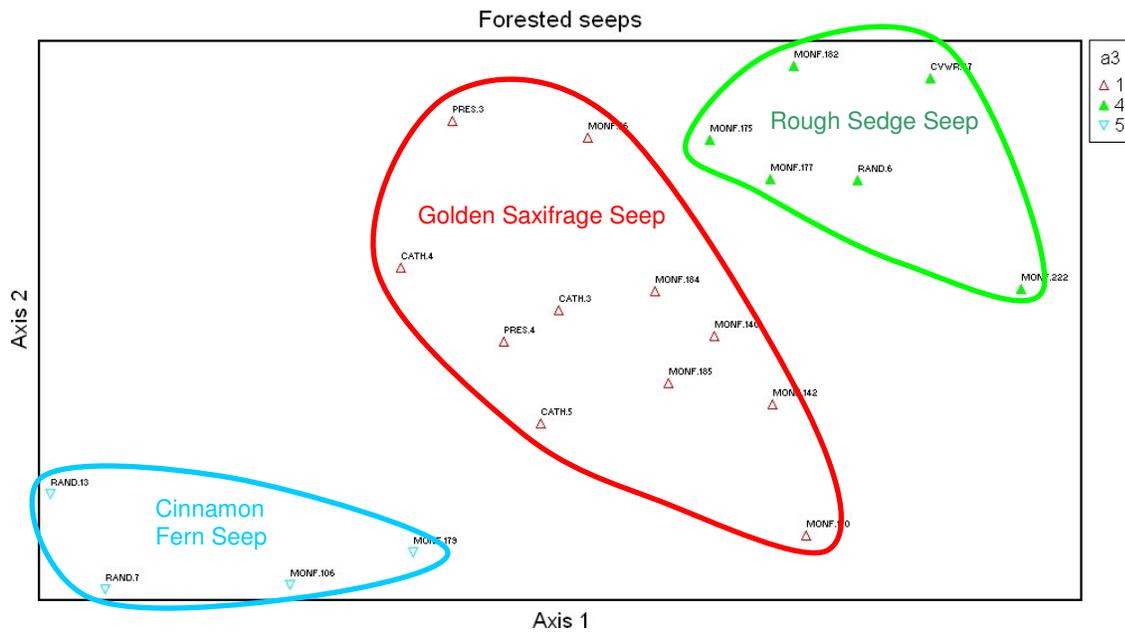
*Correlation of Tiarella cordifolia with ordination axes*



*Correlation of sample environmental variables with ordination axes*



*Wetland association plot groupings in species space*



Appendix C in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007. **Classification and Conservation Assessment of High Elevation Wetland Communities in the Allegheny Mountains of West Virginia.** West Virginia Natural Heritage Program, WVDNR. Elkins, WV.

## Appendix D: Key to the high elevation wetlands of the Allegheny Mountains of West Virginia

Use this key for wetland communities in the Allegheny Mountain region of West Virginia, at elevations above 730 m (2400 ft) elevation. Key breaks are followed by the scientific name of the wetland community, with the abbreviated common name in parentheses.

1. Wetland is a linear forested seep, i.e. a small, narrow, largely herbaceous wetland that is shaded by canopy trees along its edges. Seeps are common in upland forest along drainage depressions, toeslopes, old roadbeds, and railroad grades. 2
1. Wetland is not a forested seep. 4
2. Slope of seep is >5 degrees. Dominant herbs include *Carex scabrata*, *Laporteia canadensis*, and *Tiarella cordifolia*. = *Betula alleghaniensis* var. *alleghaniensis* / *Carex scabrata* – *Viola cucullata* / *Plagiomnium ciliare* sloping linear forest seep (rough sedge seep)
2. Slope of seep is <5 degrees. Dominant herbs are otherwise than above. 3
3. *Acer rubrum* and/or *Nyssa sylvatica* dominant in overhanging canopy. *Osmunda cinnamomea* cover >3%. = *Acer rubrum* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. linear forest seep (cinnamon fern seep)
3. *Acer rubrum* and/or *Nyssa sylvatica* not dominant in overhanging canopy. *Osmunda cinnamomea* cover <3%. Dominant herbs include *Impatiens capensis*, *Chelone glabra*, and *Symplocarpus foetidus*. = *Betula alleghaniensis* var. *alleghaniensis* / *Impatiens capensis* - *Chrysosplenium americanum* - (*Symplocarpus foetidus*) / *Rhizomnium appalachianum* forest seep (golden saxifrage seep)
4. Tree cover > 20% (forest or woodland). 5
4. Tree cover < 20% (shrubland, herbaceous, or bryophyte vegetation). 16
5. Dominant canopy species are deciduous. 6
5. Dominant canopy species are evergreen. 8
6. *Larix laricina* cover >3%. Canopy is dominated by *Larix laricina*, *Acer rubrum*, and *Betula alleghaniensis*. Known only from Cranesville Swamp. = *Larix laricina* / *Ilex verticillata* / *Symplocarpus foetidus* – *Osmunda cinnamomea* / *Sphagnum* spp. swamp (larch swamp)
6. *Larix laricina* cover <3%. 7
7. *Populus tremuloides* cover >10%. It is the dominant canopy species. = *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* successional swamp (aspen swamp)
7. *Populus tremuloides* cover <10%. Canopy dominated by *Fraxinus nigra*, *Abies balsamea*, *Acer rubrum*, and *Tsuga canadensis*. = *Fraxinus nigra* - *Abies balsamea* / *Alnus incana* ssp. *rugosa* / *Rhamnus alnifolia* / *Carex bromoides* ssp. *bromoides* rich swamp (balsam fir-black ash swamp)

8. *Pinus rigida* has >5% cover in the combined canopy and subcanopy. = ***Pinus rigida* - *Picea rubens* / *Nemopanthus mucronata* - *Kalmia latifolia* / *Sphagnum* spp. - *Polytrichum* spp. peat woodland** (pitch pine – heath swamp)
8. *Pinus rigida* has <5% cover in the combined canopy and subcanopy. 9
9. *Abies balsamea* has >5% cover in the combined canopy and subcanopy. 10
9. *Abies balsamea* has <5% cover in the combined canopy and subcanopy. 12
10. *Fraxinus nigra* has at least 1% cover in the combined canopy and subcanopy. Canopy dominated by *Fraxinus nigra*, *Abies balsamea*, *Acer rubrum*, and *Tsuga canadensis*. = ***Fraxinus nigra* - *Abies balsamea* / *Alnus incana* ssp. *rugosa* / *Rhamnus alnifolia* / *Carex bromoides* ssp. *bromoides* rich swamp** (balsam fir – black ash swamp)
10. *Fraxinus nigra* <1% cover in the combined canopy and subcanopy. 11
11. Herb layer has >3% cover of *Carex gynandra*. Abundant herbs include *Osmunda cinnamomea* var. *cinnamomea*, *Dryopteris cristata*, *Impatiens capensis*, and *Viola cucullata*. = ***Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. woodland swamp** (balsam fir – winterberry swamp)
11. Herb layer has <3% cover of *Carex gynandra*. Abundant herbs include *Danthonia compressa*, *Lycopodium obscurum*, *Lycopodium clavatum*, *Dennstaedtia punctilobula*, and *Pteridium aquilinum*. = ***Abies balsamea* - *Picea rubens* / *Danthonia compressa* – *Lycopodium* spp. / *Sphagnum* spp. swamp** (balsam fir – clubmoss swamp)
12. Shrub layer has >3% cover of *Vaccinium erythrocarpum*; bryophyte layer has >5% cover of *Bazzania trilobata*. = ***Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. – *Bazzania trilobata* high elevation swamp** (spruce - southern mountain cranberry swamp)
12. Shrub layer has <3% cover of *Vaccinium erythrocarpum*; bryophyte layer has <5% cover of *Bazzania trilobata*. 13
13. Total combined canopy and subcanopy cover <30%; shrub layer has >5% cover of *Nemopanthus mucronatus*. Shrub cover >30% and dominated by *Rhododendron maximum*, *Kalmia latifolia*, and *Nemopanthus mucronatus*. Open wooded peatland. = ***Picea rubens* / *Rhododendron maximum* – *Kalmia latifolia* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. peat woodland** (spruce – heath woodland)
13. Total combined canopy and subcanopy cover >30% OR shrub layer has <5% cover of *Nemopanthus mucronatus*. 14
14. *Carex trisperma* var. *trisperma* cover >3%; *Tsuga canadensis* generally absent. *Vaccinium myrtilloides*, *Vaccinium angustifolium*, and *Gaultheria hispidula* often present. Wooded peatland at elevations above 1000 meters. = ***Picea rubens* / *Carex trisperma* / *Sphagnum* spp. – *Polytrichum* spp. high elevation peat woodland** (spruce – three-seeded sedge swamp)
14. *Carex trisperma* var. *trisperma* cover <3%; *Tsuga canadensis* generally present. 15
15. *Rhododendron maximum* dominant in the shrub layer; *Glyceria melicaria* cover <1%; herbaceous cover generally <10%. = ***Picea rubens* - *Tsuga canadensis* / *Rhododendron***

- maximum* / *Sphagnum* spp. - **Bazzania trilobata** swamp (spruce – hemlock – great laurel swamp)
15. *Rhododendron maximum* not the dominant shrub species, although it may be present; *Glyceria melicaria* cover >1%; herbaceous cover generally >10%. = ***Picea rubens* – *Betula alleghaniensis* var. *alleghaniensis* – *Tsuga canadensis* / *Glyceria melicaria* / *Sphagnum* spp. moderately rich swamp** (spruce – yellow birch – melic manna grass swamp)
16. Shrub cover >25%. 17
16. Shrub cover <25%. 26
17. *Andromeda polifolia* var. *glaucophylla* is the dominant shrub species. Known only from Cranberry Glades. = (***Andromeda polifolia* var. *glaucophylla* / *Polytrichum strictum* – *Cladonia* spp. – *Sphagnum* spp. Bryophyte Vegetation**) (bog rosemary peatland)
17. *Andromeda polifolia* var. *glaucophylla* is not the dominant shrub species. 18
18. *Vaccinium oxycoccos* or *Vaccinium macrocarpon* are the dominant shrub species. Substrate is peat. = ***Vaccinium oxycoccos* (*Vaccinium macrocarpon*) – *Rhynchospora alba* / *Sphagnum* spp. peatland** (cranberry – beakrush peatland)
18. *Vaccinium oxycoccos* or *Vaccinium macrocarpon* are not the dominant shrub species. Substrate is variable. 19
19. *Alnus incana* ssp. *rugosa* is the dominant shrub species. 20
19. *Alnus incana* ssp. *rugosa* is not the dominant shrub species. 21
20. *Alnus incana* ssp. *rugosa* is co-dominant with *Viburnum recognitum*. = ***Alnus incana* ssp. *rugosa* – *Viburnum recognitum* / (*Symplocarpus foetidus*) / *Sphagnum* shrubland** (speckled alder – northern arrowwood shrub swamp)
20. *Alnus incana* ssp. *rugosa* is not co-dominant with *Viburnum recognitum*. = ***Alnus incana* ssp. *rugosa* shrubland** (speckled alder shrub swamp)
21. *Spiraea alba* is the dominant shrub species. = ***Spiraea alba* successional shrubland** (meadowsweet shrub swamp)
21. *Spiraea alba* is not the dominant shrub species. 22
22. *Salix sericea* is the dominant shrub species. = ***Salix sericea* / *Sphagnum* shrubland** (silky willow shrub swamp)
22. *Salix sericea* is not the dominant shrub species. 23
23. *Spiraea tomentosa* is the dominant shrub species. = ***Spiraea tomentosa* / *Sphagnum palustre* dwarf shrub peatland** (steplebush shrub swamp)
23. *Spiraea tomentosa* is not the dominant shrub species. 24
24. *Hypericum densiflorum* is the dominant shrub species. = ***Hypericum densiflorum* / *Juncus effusus* / *Sphagnum* spp. dwarf shrub peatland** (bushy St. Johnswort shrub swamp)
24. *Hypericum densiflorum* is not the dominant shrub species. 25

25. *Photinia (melanocarpa, pyrifolia)* are the dominant shrub species; bryophyte layer dominated by *Sphagnum* spp. rather than *Polytrichum* spp. = ***Photinia (melanocarpa, pyrifolia) – Viburnum nudum var. cassinoides / Eriophorum virginicum / Sphagnum shrub peatland*** (chokeberry – northern wild raisin shrub swamp)
25. *Photinia (melanocarpa, pyrifolia)* are not the dominant shrub species; bryophyte layer dominated by *Polytrichum* spp. rather than *Sphagnum* spp. = ***Vaccinium myrtilloides / Pteridium aquilinum / Polytrichum spp. shrubland*** (blueberry – bracken fern shrub swamp)
26. Herbaceous cover > 25%. 27
26. Herbaceous cover < 25%. *Polytrichum strictum*, *Cladonia* spp., and *Sphagnum* spp. are co-dominant in the bryophyte layer. = ***(Andromeda polifolia var. glaucophylla) / Polytrichum strictum – Cladonia spp. – Sphagnum spp. Bryophyte Vegetation*** (bog rosemary peatland)
27. Dominant vegetation is broad-leaved herbaceous (not graminoid). 28
27. Dominant vegetation is graminoid (not broad-leaved herbaceous). 29
28. Vegetation characterized by rare riverscour herbs *Marshallia grandiflora*, *Sanguisorba canadensis*, and *Triantha glutinosa*. = ***Rhododendron arborescens / Marshallia grandiflora – Triantha glutinosa - Platanthera flava var. herbiola riverscour prairie*** (Monongahela Barbara's-buttons riverscour prairie)
28. Vegetation not characterized by rare riverscour species. Rather, dominant species are common disturbance-tolerant herbs including *Solidago rugosa* and *Doellingeria umbellata*. = ***Solidago rugosa - Euthamia graminifolia var. graminifolia wet meadow*** (goldenrod wet meadow)
29. Grasses are dominant. 30
29. Grasses are not dominant. 31
30. Dominant species is *Calamagrostis canadensis*. = ***Calamagrostis canadensis wet meadow*** (bluejoint grass wet meadow)
30. Dominant species is not *Calamagrostis canadensis*. Rather, *Leersia oryzoides* is the dominant grass. = ***Leersia oryzoides – Sagittaria latifolia marsh*** (rice cutgrass marsh)
31. *Schoenoplectus tabernaemontani* is co-dominant or dominant. = ***Schoenoplectus tabernaemontani marsh*** (great bulrush marsh)
31. *Schoenoplectus tabernaemontani* is neither co-dominant nor dominant. 32
32. *Scirpus cyperinus* is the dominant species. = ***Scirpus cyperinus wet meadow*** (woolgrass wet meadow)
32. *Scirpus cyperinus* is not the dominant species. 33
33. *Sparganium (americanum, chlorocarpum)* are the dominant species. = ***Sparganium (americanum, chlorocarpum) marsh*** (bur-reed marsh)

33. *Sparganium (americanum, chlorocarpum)* are not the dominant species. **34**
34. *Carex lacustris* is the dominant species. = ***Carex lacustris* fen** (lake sedge fen)
34. *Carex lacustris* is not the dominant species. **35**
35. *Carex stricta* is the dominant species. = ***Carex stricta* wet meadow** (upright sedge wet meadow)
35. *Carex stricta* is not the dominant species. **36**
36. *Carex torta* is the dominant species. = ***Carex torta* riverscour prairie** (twisted sedge riverscour prairie)
36. *Carex torta* is not the dominant species. **37**
37. *Carex trichocarpa* is the dominant species. = ***Carex trichocarpa* floodplain prairie** (hairy-fruit sedge floodplain prairie)
37. *Carex trichocarpa* is not the dominant species. **38**
38. *Carex utriculata* is the dominant species. = ***Carex utriculata* – *Sphagnum* spp. fen** (beaked sedge fen)
38. *Carex utriculata* is not the dominant species. **39**
39. *Dulichium arundinaceum* is the dominant species. = ***Dulichium arundinaceum* / *Sphagnum* spp. peatland** (threeway sedge fen)
39. *Dulichium arundinaceum* is not the dominant species. **40**
40. *Carex canescens* is the dominant species. = ***Carex canescens* / *Polytrichum* spp. – *Sphagnum* spp. herbaceous peatland** (silvery sedge fen)
40. *Carex canescens* is not the dominant species. **41**
41. *Carex echinata* ssp. *echinata* is the dominant species. = ***Carex echinata* ssp. *echinata* / *Sphagnum* spp. herbaceous peatland** (star sedge fen)
41. *Carex echinata* ssp. *echinata* is the dominant species. **42**
42. Vegetation dominated by a combination of *Carex gynandra*, *Carex atlantica*, or invading *Typha latifolia*. = ***Carex gynandra* – *Carex atlantica* / *Sphagnum* spp. herbaceous seep** (nodding sedge – prickly bog sedge seep)
42. Vegetation not dominated by a combination of *Carex gynandra*, *Carex atlantica*, or invading *Typha latifolia*. Rather, dominant species are *Eriophorum virginicum*, *Solidago uliginosa*, *Carex folliculata*, and *Juncus effusus*. = ***Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. herbaceous peatland** (cottongrass fen)

Appendix D in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007.  
**Classification and Conservation Assessment of High Elevation Wetland  
Communities in the Allegheny Mountains of West Virginia.** West Virginia  
Natural Heritage Program, WVDNR. Elkins, WV.

## **Appendix E: Annotated Bibliography of High Elevation Wetlands in the Allegheny Mountain Region of West Virginia**

**Abrams, M. D., C. A. Copenheaver, B. A. Black, and S. van de Gevel. 2001.**

**Dendrochronology and climatic impacts for a relict, old-growth bog forest in the Ridge and Valley Province of central Pennsylvania, USA. *Canadian Journal of Botany* 79:58-69.**

The authors report on the 440-year dendrochronological history of a relict, bog forest in the Ridge and Valley Province of central Pennsylvania that contains extreme southern, disjunct populations of *Picea mariana* and *Abies balsamea*. The forest is dominated by *Tsuga canadensis* (49% relative importance value), *Picea mariana* (16%), and *Acer rubrum* (15%). The few remaining *Abies balsamea* trees are in an advanced state of decline. Many *Nyssa sylvatica* and *T. canadensis* trees recruited from 1560 and 1700, respectively, until 1890. However, the majority of the other tree species recruited during a 40-year period following selective logging of the forest in the 1890s and fires in about 1900 and 1914. A scarcity of tree saplings were found and no evidence of recruitment into the tree-size class for any species after 1950. The master tree-ring chronology for both *N. sylvatica* and *T. canadensis* exhibits a marked increase after the 1890s logging and a decrease after a 1900 fire. In addition, a large number of releases in individual tree chronologies occurred over the last 400 years, indicating the frequent occurrence of small-scale disturbances. Tree-ring growth during the 20th century was reduced by droughts and cool temperatures in the 1920s and in the early to middle 1960s. *Abies balsamea* cores exhibit a marked growth decline in 1986. *Tsuga canadensis* growth was very low between 1970 and 1998, despite a generally warm and wet climate during that time. *Picea mariana* had a dramatic increase in growth during very warm and wet climate between 1995 and 1998. Most *Abies balsamea* trees have reached their pathological age of 50-85 years and have active *Armillaria* root rot, insect infestations, and very poorly developed crowns. It appears that the 10,000 year history of *Abies balsamea* presence at Bear Meadows will end soon, with no opportunity to reestablish itself because of the lack of a local seed source. The results of this study suggest that relict tree populations in the eastern United States may be particularly sensitive to direct and indirect anthropogenic impacts and climatic variations, and represent important benchmarks for comparisons with future studies.

**Ahrens, C. 1968. A list of Odonata taken in the Cranesville Swamp in 1966. West Virginia University Arboretum Newsletter 17 (4).**

Dragonfly and damselfly collections. Cited in TNC 2001, Site Conservation Plan for Cranesville Swamp.

**Allard, H. A. and E. C. Leonard. 1952. The Canaan and Stony River Valleys of West Virginia, Their former Magnificent Spruce Forests, Their vegetation and Floristics today. *Castanea* 17 (1):1-60. WVU, Morgantown.**

Description of the flora and ecological history of Canaan Valley and Stony River based on field visits and interviews with elderly lumbermen. Allard maintains that Canaan Valley and the hills surrounding it may have represented "the finest climax spruce forests [spruce-hemlock/rhododendron/sphagnum] developed in the eastern United States, and perhaps even in the world." He cites evidence including large hemlock and spruce stumps on the periphery of the valley, with root structures indicating that they had grown on deep humus (they are now sitting on unvegetated rocks). Vegetation in 1952 was largely open prairie and bog, depending on

moisture conditions. Common communities included exotic grasslands, Eriophorum/Polytrichum-Sphagnum peatlands, and Scirpus cyperinus meadows. A very small number of stunted remnant conifers occupied the wettest alluvial areas, where they presumably escaped logging and fire (but many are recently destroyed by beaver flooding). Upland areas are dominated by Danthonia sp. grasslands, Carex sp. sods, Pteridium aquilinum uplands, Dennstaedtia punctilobula rocky slopes, and weedy plants. Cattle grazing was heavy at this time. Young spruce and large areas of fringing alder had been destroyed by high water levels from the activity of introduced beaver.

**Allen, T. J. 1997. The Butterflies of West Virginia and Their Caterpillars. University of Pittsburgh Press, Pittsburgh, PA. 388 pp.**

Includes color plates and information on identification, distribution, habitat, life history, nectar sources, and larval plant host for butterflies in West Virginia.

**Arnold, J. 2004. Spider Diversity in West Virginia, 2004. West Virginia Arachnid Survey. Unpublished report submitted to the WVDNR, Elkins, WV.**

Spider collections from West Virginia, with location information.

**Bailey, R. G. 1995. Ecoregions of the United States. USDA Forest Service, Ft. Collins, CO.** Map/study that provided the basis for forest service ecoregion designations.

**Bailey, R. W. 1954. Status of Beaver in West Virginia. The Journal of Wildlife Management 18 (2) 184-190.**

Original beaver population of WV exterminated by 1825. First colony found in Hampshire County in 1922. Re-stocking occurred 1933-1940. Increase was rapid and hunting/trapping reinstated in 1948.

**Balcerzak, M. 1999. West Virginia's Wetlands: An analysis of wetland areas in Tucker County, West Virginia using GIS. Resource Management 391, West Virginia University.**

GIS class paper by WVU student, taking existing NWI and Canaan Valley soil shapefiles to estimate wetland loss. Limited utility.

**Balcombe, C. K. 2003. An evaluation of vegetation and wildlife communities in mitigation and natural wetlands of West Virginia. M.S. thesis, WVU.**

Interesting work, but of limited utility due to selection of "reference" wetlands in disturbed areas.

**Balcombe, C. K., J. T. Anderson, and R. H. Fortney. 2001. An Evaluation of Vegetation Communities, Wildlife Habitat Use, and Wildlife Habitat Suitability in Mitigated and Natural Wetlands in West Virginia. Progress report to WVDNR.**

Preliminary evaluation shows that plants species richness and diversity were significantly higher in mitigated wetlands than in natural wetlands. Species evenness was similar. Anuran surveys, avian surveys, and habitat suitability index parameters also showed equivocal results. Analysis is flawed due to selection of "reference" wetlands in highly disturbed areas.

**Balcombe, C. K., J. T. Anderson, R. H. Fortney, and W. S. Kordek. 2005. Vegetation, invertebrate, and wildlife community rankings and habitat analysis of mitigation wetlands in West Virginia. *Wetlands Ecology and Management* 13:517-530.**

Authors report that mitigated and created wetlands score consistently better than reference wetlands based on plant and animal indices. Choice of reference wetlands is the problem, since at least two of the "reference" wetlands are heavily impacted by man.

**Balcombe, C. K., J. T. Anderson, R. H. Fortney, and W. S. Kordek. 2005. Wildlife use of mitigation and reference wetlands in West Virginia. *Ecological Engineering* 25: 85-99.**

Interesting work, but of limited utility due to selection of "reference" wetlands in disturbed areas.

**Balcombe, C. K., J. T. Anderson, R. H. Fortney, J. S. Rentch, W. N. Grafton, and W. S. Kordek. 2005. A Comparison of plant communities in mitigation and reference wetlands in the mid-Appalachians. *Wetlands* 25 (1) 130-142.**

Interesting work, but of limited utility due to selection of "reference" wetlands in disturbed areas.

**Bartgis, R. L. 1984. Marl Wetlands in Eastern West Virginia: Distribution, Rare Plant Species, and Recent History. *Castanea* 49:17-25.**

Ten wetlands, each at least 1 ha in size, are associated with marl deposits in eastern West Virginia. These wetlands contain a predominantly herbaceous, calciphile flora which includes 27 species of vascular plants considered to be rare in the State. Disturbances, including drainage, impoundment, and grazing, have been widespread and may have led to a reduction in the number of rare species that occur within a wetland.

**Bartgis, R. L. 1985. Tentative State Ranks of Natural Communities in West Virginia.**

Provisional state ranks with brief provisional community descriptions and maps of extent in the state.

**Bedford, B. L. and K. S. Godwin. 2003. Fens of the United States: Distribution, Characteristics, and Scientific Connection versus Legal Isolation. *Wetlands* 23 (3): 608-629.**

The common denominator among all types of fens is recognition of the importance of ground-water discharge, especially mineral-rich ground water, in determining fen hydrology, chemistry, and vegetation, in contrast to wetlands whose characteristics are determined primarily by precipitation or surface-water inputs. Thus, fens tend to occur where climate and hydrogeologic setting sustain flows to the plant-rooting zone of mineral-rich ground water. In the United States, these areas include the glaciated Midwest and Northeast, as well as portions of the Appalachian Mountains and mountainous West. Individually and collectively, fens are among the most floristically diverse of all wetland types, supporting a large number of rare and uncommon bryophytes and vascular plant species, as well as uncommon animals including mammals, reptiles, land snails, butterflies, skippers, and dragonflies. Fens also help maintain stream water quality through denitrification and phosphorus sorption. Few estimates of loss and current extent exist, but where estimates are available, they indicate extensive loss, fragmentation, and degradation. Cultural eutrophication threatens the biological and functional integrity of remaining fens because, along with mineral-rich water, low availability of nitrogen and phosphorus controls many of their distinctive characteristics. Because they occur where ground water discharges to the surface, fens are isolated from neither ground water nor surface water.

**Berdine, M. A., E. L. Thompson, R. Bartgis, and D. D. Boone. 1991. The Wetlands of Maryland's Allegheny Plateau. Maryland Natural Heritage Program, Maryland Department of Natural Resources, Annapolis, MD. 568 pp.**

Maps, rare species, significant communities, site description, ecological significance, and management recommendations for 148 wetlands on Maryland's Allegheny Plateau.

**Boetsch, J.R. and E. Nielsen. 2003. Notes on the Distribution of the Southern Appalachian Endemic, *Ilex collina* Alexander. *Castanea* 68(3): 232-235.**

This rare, endemic species is known from 12 counties in four states (WV, VA, NC, and TN). It is confined to the mountainous areas of the central and southern Appalachians and associated with seepages, bogs, moist exposed slopes, and the banks of cold stream at moderate to high elevations (1100-1800m). CG--New specimen documentation for *Ilex collina* in Tennessee (first records from Tennessee) and North Carolina. It appears to prefer boggy habitat, but is not dispersed along migratory routes like many *Ilex* sp.

**Bonner, J. L. 2005. The Influence of beaver impoundments on vegetative composition, and modeling habitat suitability as a tool for management and conservation. MS Thesis. West Virginia University, Morgantown, WV.**

Beaver (*Castor canadensis*) are influential in wetland development.

**Bonner, J. L., J. T. Anderson, J. S. Rentch, and W. N. Grafton. 2005. Vegetation associated with beaver ponds in Canaan Valley, West Virginia. West Virginia Academy of Sciences Abstracts, April 2005, Morgantown, WV.**

Pond-dwelling beavers (*Castor canadensis*) cause significant changes in the local landscape with flooding and foraging activities. The vegetative composition of these areas also will dramatically shift once beavers create or abandon a pond. We hypothesized that the size and age of these ponds may be an indicator of their importance to rare plants, specifically that older ponds may provide valuable microhabitat for some species. Our objectives included establishing plant communities and species supported by this habitat, as well as evaluating the diversity of plant assemblages found there. We surveyed vegetative communities on ponds in Canaan Valley National Wildlife Refuge, West Virginia, using belt transects. The most common species of plants included *Juncus effusus*, *Carex scoparia*, and *Triadenum virginicum*. We located 13 rare species including *Carex atherodes* and *Campanula aparinoides*. ANOVA and Duncan's Multiple Range Test were used to analyze potential differences in species richness and diversity.

Preliminary results indicate that beaver ponds have significantly higher species richness ( $F=1.84$ ,  $pr>0.0012$ ) and diversity ( $F=4.25$ ,  $pr>0.044$ ) than areas outside their influence. Analysis also indicates that species richness varies with pond age ( $F=4.96$ ,  $pr>0.0085$ ), with oldest ponds having significantly greater species in general. However, no relationship was shown for size or age for rare plant species occurrence. We are developing strategies to balance the rare plant communities and species with the beaver population in Canaan Valley.

**Brande, J. 1980. Worthless, valuable or what? An appraisal of wetlands. *Journal of Soil and Water Conservation* 35(1): 12-16.**

General appraisal of wetlands values, cited in West 1982.

**Brant, A. E. 1988. Flora and Vegetation of the Meadow River Wetlands, Greenbrier County, West Virginia. M.S. thesis, Marshall University.**

Six spring seeps, with slightly generalized plot information, are described.

**Braun, E. L. 1950. Deciduous forests of eastern North America. McGraw-Hill Book Co., Inc. New York. 596 pp.**

Discussion of old growth stands and forest types in our area, including comments on the possibly minor role of fire prior to European settlement.

**Brooks, A. B. 1910. Forestry and Wood Industries, West Virginia. Volume 5. West Virginia Geological and Economic Survey. Acme Pub. Co., Morgantown, WV. 481 pp.**

Fire, p. 51; Composition of spruce-hardwood forest, p.101-104; Yew pine = red spruce, p. 148; Spruce Knob, p. 227-232; Cranberry Glades, p. 245 (photo of lichen beds), 247-249, 332 (photo of Big Glade), 380; Cranesville Swamp, p. 250-251, 369 (*Pinus strobus*); Cranberry, Whitman, Mingo Flats in Randolph County, p.263; Canaan Valley, p. 283-286; Yew Mountains in Webster County, p. 304; Belt of red spruce 2-6 miles wide in SE Webster County, p. 307; Balsam fir on margin of McDonald Glade, p. 356 (photo); Native trees of WV, p. 367; Wooded tributary of Blackwater River, p. 421 (photo); see also County Descriptions.

**Brooks, M. 1944. Cranberry Glades--fact and fancy. West Virginia Review 21: 14-16 and 27, 28.**

Lists birds of Cranberry Glades which are found at their southernmost breeding station in eastern North America. Cited in: Clarkson, R. B. 1966. The Vascular Flora of the Monongahela National Forest, West Virginia. *Castanea* 31:1-119.

**Brooks, M. G. 1957. Canaan Valley, West Virginia Conservancy. 21:7-10**

Canaan Valley wetlands once supported extensive coniferous forests dominated by *Picea rubens*, with varying mixtures of *Abies balsamea*, *Betula alleghaniensis*, and *Acer rubrum*. Cited in *Castanea* (Rentch and Fortney 2003).

**Brooks, M. G. 1963. Forests and Forest Research. West Virginia Geologic and Economic Survey 23:171-190.**

"Exceptional stands [of red spruce forest] in Canaan Valley, Tucker County, sawed 80,000 to 100,000 board feet per acre". This would be the highest spruce yield in the state. Cited in Clarkson 1964.

**Brown, J. H. 1999. West Virginia Seed Sources of Balsam Fir. The Ohio State University Research Bulletin 1191-99.**

Some taxonomists have recognized two varieties of balsam fir, *A. balsamea* var. *balsamea*, the "typical" balsam fir and a "bracted" variety, *A. balsamea* var. *phanerolepis*, which is distinguished from var. *balsamea* on the basis of the relative length of the bract and awn to length of the cone scale and by a slight variation in cone size. The range of var. *phanerolepis* has been identified as occurring within the range of var. *balsamea* at higher elevations in the mountains of the northeast, at lower elevations in Maine and the maritime provinces of Canada, as well as the small, isolated stands in the mountains of northern Virginia and West Virginia (Perry 1931,

Fernald 1950, Little 1953). Classification of the small populations of fir at higher elevations in northern West Virginia and Virginia has been particularly confusing

**Brown, M. 1959. Annals of Blackwater and the Land of Canaan, 1746-1880. Chesapeake Book Company, Berryville Virginia. 42 pp., with sketches by Porte Crayon.**

In pre-settlement times, *Picea rubens* was the dominant species in Canaan Valley. Cited in *Castanea* (Rentch and Fortney 2003).

**Brown, M. 1982. The floristics of Cranberry Swamp, Finzel, Maryland. In: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 117-121.**

Survey of Cranberry Swamp vegetation, identification of 281 species. Includes floristic list of plants found.

**Browning, M. 1859. Forty-Four Years of the Life of a Hunter; being reminiscences of Meshach Browning, a Maryland hunter, roughly written down by himself. Ill. E. Stabler. J.B. Lippincott Company, Philadelphia. Reprinted by Appalachian Background, Oakland, 2003. 400 p.**

Autobiography with reminiscences from 1795 through 1839 from MD and WV; Hunting stories related to bear, deer, turkey, and mountain lion. Descriptions of pioneer life. Chapter XV describes the glades between Backbone mountain and the western hills of the Youghiogheny River, an "area of ten or twelve miles". "The glades, are, or then were, clear, level meadows, covered with high grass, which was altogether different from what is there produced now, being of a much better character, growing nearly as high as rye, with a blue tassel at the top. The blades were set very thick on the stalk, to the height of three or four feet. [ . . . ] There were then hundreds, if not thousands, of acres of this grass growing where there is now nothing but bushes, and a rough and very inferior kind of grass, which serves very well for early pasture, but is of little worth for hay. [ . . . ] It was a grand sight to watch the tall grass, rolling in beautiful waves with every breeze which passed over its smooth surface, as well as the herds of deer [ . . . ]." Browning also noted abundant turkey, grasshoppers, bear, and an occasional wolf in the glades. During his lifetime, these glades were overrun by cattle "eating, trampling, and running over every place in the glade county", and cattle herders who hunted out the game. Settlers resented the out-of-state herders and violence sometimes ensued. The cattle herds and herders "resulted in the almost entire destruction of all the grass and game in the country." Page. 334-5: Bee trees: "average was generally two to three gallons [ . . . ] I have often discovered two or three bee trees, and on one occasion five, in one day." Browning notes that "the quantity has much diminished in recent years." His best find was a tree that yielded twelve gallons, and during his life he found four other trees that yielded at least eight gallons.

**Buckelew, A. R., Jr. and G. A. Hall. 1994. The West Virginia Breeding Bird Atlas. University of Pittsburgh Press, Pittsburgh.**

Habitat information and geographic distribution of breeding birds statewide.

**Bullock, J. F. and M. P. Rowe. 2006. The use of southern Appalachian wetlands by breeding birds, with a focus on neotropical migratory species. The Wilson Journal of Ornithology 118(3): 399-410.**

Assessment of bird use of 18 different types of habitat.

**Burns, R. M., and B. H. Honkala. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. 877 pp.**

Habitat, life history, special uses, genetics, and literature cited for tree species of North America. Genetic variability of *Abies balsamea* is discussed, indicating suggested varieties *Abies balsamea* var. *balsamea*, *Abies balsamea* var. *phanerolepis*, and *Abies balsamea* var. *fraseri*.

**Bush, E. M. 1988. A floristic study of a wet meadow in Barbour County, West Virginia. Castanea 53:89-109.**

Floristic list, abundance values over entire meadow, minimal community description. Communities: wet meadow, old field.

**Cameron, C. C. 1970. Peat resources of the unglaciated uplands along the Allegheny structural front in West Virginia, Maryland, and Pennsylvania. U.S. Geological Survey, 700-D, D153-16.**

Canaan Valley notable deposits of peat.

**Carvell, K. L. 1994. The story of Dolly Sods. Wild West Virginia, April, 1994. p.16-22**

Canaan Valley wetlands once supported extensive coniferous forests dominated by *Picea rubens*, with varying mixtures of *Abies balsamea*, *Betula alleghaniensis*, and *Acer rubrum*. Cited in Castanea (Rentch and Fortney 2003).

**Ceperley, L. 2002. Classification of West Virginia and Virginia *Abies balsamea* communities affected by balsam woolly adelgid (*Adelges piceae*) infestation, M.S. thesis, Antioch University.**

32 plots entered in Plots2-WV database; Methods (Virginia NH methodology), community descriptions, adelgid infestation assessment, statistics, maps, soil data, plot data. Communities: 3 balsam fir seepage wetlands and 2 balsam fir hummock woodlands.

**Christy, J. A. 2004. Native Freshwater Plant Associations of Northwestern Oregon, Oregon Natural Heritage Information Center, Oregon State University, Portland, OR.**

Methods, classification, key. 200 communities classified.

**Clark, C. M., T. R. Wentworth, D. M. O'Malley. 2000. Genetic discontinuity revealed by chloroplast microsatellites in northeastern North America *Abies* (Pinaceae). American Journal of Botany 87(6):774-782.**

Development of conservation strategies for Fraser fir (*Abies fraseri*) in the southern Appalachian Mountains depends in part on recognition of the extent to which Fraser fir is genetically distinct from the closely related balsam (*A. balsamea*) and intermediate (*A. balsamea* var. *phanerolepis*) fir. These sibling species have exhibited intergrading, clinal variation in morphological, chemical, and genetic characteristics in prior research. Chloroplast microsatellite markers were polymerase chain reaction amplified from genomic DNA samples of 78 individuals representing the geographic ranges of Fraser, balsam, and intermediate fir. Gene diversity levels at two loci ranged among taxa from 0.65 to 0.84. Allele frequencies demonstrated significant differentiation

among taxa, with RST values of 0.36 and 0.10. Haplotype diversity and D2SH were highest for balsam fir and lowest for intermediate fir. A haplotype network analysis based on allele size distribution for the two loci revealed two distinct clusters of haplotypes and population-specific haplotypes. Ninety-two percent of the haplotypes in one cluster were from balsam fir and intermediate fir, and 84% of the haplotypes in the other cluster were from Fraser fir and intermediate fir. The genetic differentiation of chloroplast DNA markers provides justification for the recognition of Fraser fir as a distinct Management Unit for conservation purposes, regardless of its taxonomic classification.

**Clarkson, R. B. 1957. Blister Swamp, West Virginia. *Castanea* 22:137-138.**

Descriptive data. *Abies balsamea*; *Sphagnum/Coptis groenlandica*; *Rhamnus alnifolia*; *Alnus rugosa* (*incana*)

**Clarkson, R. B. 1964. Tumult on the Mountains: Lumbering in West Virginia 1770-1920. McClain Printing Company, Parsons, WV. 410 pp.**

Excellent account of early lumbering, including good bibliography and 250 pages of historic photographs. Spruce forests apparently covered nearly half a million acres and were particularly noteworthy on level, poorly drained plateaus. Exceptional stands occurred in Canaan Valley and sawed 80-100,000 board feet per acre, the highest yield in the state.

**Clarkson, R. B. 1966. The Vascular Flora of the Monongahela National Forest, West Virginia. *Castanea* 31:1-119**

List of vascular flora of the Monongahela National Forest. Includes habitat and climate descriptions.

**Clements, S. E. 1990. Juncaceae (Rush Family) of New York State. Bulletin No. 475, New York State Museum. Albany, NY.**

Good supplementary key to the Juncaceae including many of our WV high elevation species.

**Clovis, J. F. 1974. Evaluation of Fisher Spring Run, Tucker County, West Virginia for eligibility as a registered natural landmark. WVU, Morgantown.**

Clovis considers Fisher Spring Run to be "an excellent high altitude *Sphagnum* - red spruce swamp.[..] easily one of the best in the state or even in the east.[..] it has a nearly perfect array of ecological zones characterizing a northern type sphagnum swamp" Clovis notes that lack of stumps would indicate that large trees probably were not present over much of the area. He considers live plant collection by nurseries and home gardeners to be the greatest threat, along with off-road vehicles and a possible small amount of cattle grazing. It has large areas of open sphagnum with sundew, *Zigadenus*, *Dalibarda repens*, *Gentiana linearis*, *Vaccinium oxycoccus*. Clovis writes: "Around the upper edges of the sphagnum, a *Menziesia*-mountain holly-mountain laurel zone leads into a typical (but small in stature) red spruce forest, containing many *Vaccinium* spp. At the lower and side borders of the sphagnum, zones of *Carex folliculata* and *Zigadenus leimanthoides* occur with speckled alder thickets lining streams and rivulets. These thickets are quite extensive at the lower (SW) end of the swamp. [..] The center of the swamp is occupied by several beaver ponds, which continue down both streams below the swamp. [..]" Maurice Brooks says, "This is one of the state's finest areas for summer thrush choruses in season. [..] Cheat Mountain Salamanders have been collected."

**CNHP [Colorado Natural Heritage Program]. 2003. Field Guide to the Wetland and Riparian Plant Associations of Colorado. Fort Collins, CO. 466 pp.**

Key and descriptions of communities, with photos, statistics, and ecological processes.

Community names reminiscent of those in WV include *Calamagrostis canadensis* (mid-seral, drier), *Carex utriculata* (early seral, wet), *Phalaris arundinacea* (invading, wet organic soils), and *Typha* (early colonizer, deeper water).

**Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.**

Description of ecological systems in the US as they existed in 2003.

**Comer, P., K. Goodin, A. Tomaino, G. Hammerson, G. Kittel, S. Menard, C. Nordman, M. Pyne, M. Reid, L. Sneddon, and K. Snow. 2005. Biodiversity Values of Geographically Isolated Wetlands in the United States. NatureServe. Arlington.**

The term “isolated wetland” appears to apply to a very limited group of wetlands within West Virginia, including the black ponds (Ridge and Valley), and possibly a few other wetlands, e.g. isolated seepage wetlands on Roaring Plains, and possibly others. If any surface water stream, even a few ml per sec, connects a wetland to a drainage system, then it will not be considered “isolated” according to the criteria in this publication. As a result of a 2001 Supreme Court decision (*Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers*, 2001), some wetlands and other waters that are considered “geographically isolated” from navigable waters no longer fall under the jurisdiction of the Clean Water Act. Through review of scientific literature, input from regional experts, and compilation of existing location data for at-risk species, this report identifies those at-risk species and plant communities that are supported by isolated wetland types throughout the United States.

**Conway, V. M. 1949. The bogs of Central Minnesota. Ecological Monographs 19(2): 173-206.**

Description of bogs including plant species and pH.

**Core, E. L. 1929. Plant ecology of Spruce Mountain, WV. Ecology 10:1-13.**

Species lists for loosely described communities. Communities: valley bottom, herbaceous wetland, moist grasslands, upland grasslands, ruderal habitats, hay fields, fencelines, thickets, *Fagus-Acer*, *Quercus/Carya*, *Picea-Betula*; successional communities on top (fire system) *Dennstaedtia punctilobula* --> *Rubus* spp - heath; (*Menziesia pilosa*, *Vaccinium erythrocarpum*) (*Danthonia spicata* in disturbed patches) ; -->*Crataegus* --> *Picea*; sandstone flatrock; *Danthonia spicata/Poa compressa*.

**Core, E. L. 1939. The Flora of the Roaring Plains, West Virginia. The West Virginia University Bulletin, Proceedings of the West Virginia Academy of Science. Volume 12: 33-35**

Includes list of species, description from writing of Hu Maxwell.

**Core, E. L. 1949. Original treeless areas in West Virginia. Journal Elisha Mitchell Sci. Soc. 65: 306-310.**

Bogs were one of the few treeless areas in West Virginia prior to European settlement. Cited in Ogle 1982 and Venable 1996.

**Core, E. L. 1955. Cranberry Glades Natural Area. Wild Flower 31:65-81.**

Description of Cranberry Glades, history, climate, geology, soil, natural history, and vegetation.

**Cowardin, L. M., V. Carter, F. C. Golet and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. US Department of Interior; Fish and Wildlife Service.**

Standard classification used by National Wetlands Inventory.

**Cox, D. D. 1961. A Pollen Profile from Cranesville Swamp (date uncertain, sampling done in 1960). Preliminary report (typed carbon).**

Samples collected with Hiller peat sampler to a depth of 3.5 meters in 1960. Most of the sediment column was apparently deposited in open water. Brown woods peat is underlain by fibrous sedge peat. Below 1 meter this level lake gyttja grades into sandy clay at 2.4 meters then into clay at 3.0 meters. Pollen results indicate presence of open wetland at Cranesville dating to between 2000-5000 years ago. Before that, the area was likely covered by a lake.

**Cox, D. D. 1968. A Late-Glacial Pollen Record From The West Virginia-Maryland Border. Castanea 33: 137-149.**

Pollen samples to 3.5 m depth indicate that the swamp was a lake during the advance of the Wisconsin ice (~13,500 years B.P), with slope wash from an incomplete cover of subarctic vegetation consisting of open boreal woodland (spruce, fir, jack pine) with grasses, sedges and herbs. The transition from boreal woodland to deciduous forest was very rapid, possibly about 9500 years B.P., and from this point to the present the swamp has persisted as a shallow lake or marsh with periodic flooding and drying. This more recent forest consisted of spruce, hemlock, birch, oak, beech, chestnut and abundant mosses.

**Craig, A. J. 1969. Vegetational history of the Shenandoah Valley, Virginia. Geological Society of America Special Paper 123: 283-296.**

Gary Fleming cites this paper for the 16,000 year old peat deposits under a cranberry bog on the eastern edge of the Great Valley in Virginia

**Crandall, K. A. and A. R. Templeton. 1999. The Zoogeography and Centers of Origin of the Crayfish Subgenus Procericambarus (Decapoda: Cambaridae). Evolution 53 (1): 123-134.**

The Central Highlands region in the central United States is a taxonomically diverse region with a high incidence of stream endemism. Based on the distributions of the diverse ichthyofauna in the region, a pre-Pleistocene pattern of diversity due to vicariant events has been proposed to explain high levels of endemism and species richness. The authors conclude that both pre-Pleistocene and Pleistocene hypotheses are compatible with the crayfish distributions and these distributions are likely due to a combination of both vicariant and dispersal events. They suggest a Pleistocene center of origin for the crayfish subgenus Procericambarus within the Ozark region

and a pre-Pleistocene center of origin for the genus *Orconectes* within the Eastern Highlands region.

**Crockett, M. 1985. Doing Time on Kennison Mountain: Pocahontas County's Forgotten Prison. Goldenseal 11(1): 38-45. With notes from Houston E. Simmons (History of Pocahontas County, WV, 1981)**

Prison operated for 300 inmates from 1938-1959. Logging was the main prison industry but inmates also planted 22,000 spruce trees. One inmate was a naturalist whose work won him recognition at WVU and the Carnegie Museum in Pittsburgh. The five-acre "victory garden" was located just east of the present boardwalk at Cranberry Glades.

**Crowe, E. A., B. L. Kovalchik and M. Kerr. 2004. Riparian and Wetland Vegetation of Central and Eastern Oregon, Oregon State University, Portland, OR. 474 pp plus appendices.**

Well-presented methods, classification, key. 100+ communities classified.

**Curtis, J. T. 1959. The vegetation of Wisconsin: An ordination of plant communities. University of Wisconsin Press, Madison. 657 pp. [reprinted in 1987].**

Flora, environment, plant communities, and distribution of vegetation in Wisconsin. Study methods presented.

**CVI [Canaan Valley Institute]. 2005. Wetland Assessment (unpublished report).**

This report accompanies plot data (in our Plots2-WV database) for 47 plots laid out along transects. Metrics were calculated for wetland species as part of a test of methods for IBI development.

**CVNWR [Canaan Valley National Wildlife Refuge]. 2007a. Plant species records from Canaan Valley National Wildlife Refuge, contributed by Leah Ceperley to Joint Botanical Field Meeting, , June 17-21, 2007.**

Additions by Leah Ceperley to species list for Canaan Valley NWR, prepared for Joint Botanical Field Meeting.

**CVNWR [Canaan Valley National Wildlife Refuge]. 2007b. Drift fence field study data. Unpublished database.**

MS-Access database of drift fence specimens (small mammals and amphibians) collected in 2007 by Marquette Crockett with a volunteer youth team.

**Dale, E.M. 1965. Cranesville Swamp, Remarks (unpublished report).**

Remarks made by E.M. Dale for the presentation of National Natural History Landmark designation for Cranesville Swamp, with inspiring words about its biological and educational value.

**Damman, A. W. H., and T. W. French. 1987. The ecology of peat bogs of the glaciated northeastern United States: A community profile. USDI Fish & Wildlife Service Biological Report 85(7.16). 100 pp.**

Floristic and ecological description of peat bogs of the glaciated northeast.

**Darlington, H. C. 1943. Vegetation and Substrate of Cranberry Glades, West Virginia. Botanical Gazette, 104:371-393.**

Climate, physiography, geology, soils including soil profiles, pollen, vegetation. Radiocarbon date ~9500 years B.P. for level at which pollen profile shows birch and pine dominant with spruce, fir, hemlock and oak. Communities: *Picea rubens* (*Tsuga canadensis*)/*Sphagnum* spp.; *Alnus incana* spp *rugosa*-*Sambucus canadensis*; *Alnus incana* spp *rugosa*-*Viburnum cassinoides*; *Carex* spp-*Sphagnum* spp; *Sphagnum* spp-*Vaccinium oxycoccos* - *Rhynchospora alba*; *Polytrichum*-*Cladonia*.

**Daubenmire, R. 1968. Plant Communities: A Textbook of Plant Synecology. Harper & Row. New York, Evanston, and London. 300 pp.**

Excellent reference on plant succession with some examples from wetland seres.

**Davis, A. M. 1979. Wetland Succession, Fire and the Pollen Record: A Midwestern Example. The American Midland Naturalist 102 (1): 86-94.**

Pollen record documents succession in a nonacid wetland environment subject to a high frequency of natural fire. In northern Wisconsin, the bog sere sequence begins with sedge meadow, then an intermediate *Sphagnum* phase, followed by a *Picea-Larix* community. In southern Wisconsin, the hydrosere generally end in sedge meadow or shrub-carr. This site is intermediate: the sedge meadow is replaced by shrub communities without the intermediate *Sphagnum*. *Larix* has expanded into many wetland sites only in the last 1-2,000 years. Sedge meadows are particularly dependent on fire for inhibiting the growth of shrub and tree communities. With the elimination of natural fire, sedge communities are being invaded by shrubs.

**Davis, R. B. and D. S. Anderson. 2001. Classification and Distribution of Freshwater Peatlands in Maine. Northeastern Naturalist 8(1):1-50.**

Abstract: This classification of Maine's freshwater organic wetlands (peatlands) uses nutrient source, geomorphic-hydrologic setting, gross topography of the peat mass, microtopographic pattern, and presence of pools for distinguishing peatland types. We apply these primarily hydro-geomorphological criteria to landscape units called peatland complexes. Vegetation, while important at lower levels of classification and for the description of individual peatlands, is not used in this classification because, typically, all but the smallest peatland complexes in Maine have major areas of differing vegetational physiognomies and types. This classification resembles the peatland division of Canada's current wetland classification more than the classification in most common use in the United States because a large percentage of Maine peatlands are northern in character. Our classification contains eight peatland types. Two of these are divided into two subtypes. Only one of the types has unique floristic and vegetational elements: plateau (coastal) bog. Large Maine peatlands typically contain multiple complexes, commonly of more than one type. We use the term multiple-unit peatland for these multiple complexes. Our classification and survey of the distribution of peatland types in Maine is based on a large representative sample of peatlands. We conducted an air photo survey of ~1100 peatlands throughout the state, observed a representative subset of 171 of these from aircraft at low altitude, and studied a representative subset of 100 of the 171 on the ground. However, to classify a peatland using our system, only air photo study or aerial observation is needed. The

distribution of peatland types in Maine is controlled by gradients of topography, geological substrate, climate, and hydrology. Peatlands are least abundant in the well-drained western uplands. Unpatterned fens occur throughout Maine; hundreds of the smaller ones (~<10 ha) occur in ice-block depressions (kettles). Five types, all of which also occur in Canada, reach their eastern North American southern limits in Maine: ribbed (string) fens at 45°~30'N, eccentric bogs at 45°~10'N, domed bogs with concentric pattern at 44°~45'N, plateau bogs at 44°~15'N, and gently convex bogs at 43°~20'N. These latitudinal limits exclude individual southern outliers). Distributions of peatland types in adjacent areas of New Hampshire and Canada are consistent with those in Maine. We propose that the geographic position of Maine along a steep south (coastal) to north (inland) climatic gradient and a less-steep west-southwest to east-northeast climatic gradient paralleling the coast are the major factors accounting for the diverse representation of peatland types in so limited an area.

**Davis, R. H. 1880. By-Paths in the Mountains - I. Harper's New Monthly Magazine 61: 167-185.**

Early traveler's account from the Allegheny Mountains.

**Deacon, S. 2007. A study of West Virginia high elevation fens and their stressors. Research proposal for M.S. thesis. West Virginia University, Morgantown, WV.**

Methods, study area description, and literature review of high elevation fens above 800 m elevation in Tucker and Randolph Counties.

**Demchik, M. and K. Garbutt. 1999. Growth of woolgrass in acid mine drainage. Journal of Environmental Quality 28(1): 243-249.**

Two populations of woolgrass (*Scirpus cyperinus*) examined for response to acid mine drainage (AMD). Suggest potential for certain genotypes of woolgrass for increased performance in presence of AMD.

**DeMeo, T., D. McCay, D. Walton, and J. Concannon. 1998. Terrestrial ecological classification of the Monongahela National Forest. USDA Forest Service, Elkins, WV.**

Description of plant communities; raw data from plots and transects supporting this report were obtained from USFS via diskette and photocopies, and entered into the Plots2-WV database.

**Diamond, J. 1997. Guns, Germs and Steel: The Fate of Human Societies. W.W. Norton and Company. New York. 480 pp.**

Traces the pre-history of human settlement/societies and their impacts on landscapes and ecology, with emphasis on the importance of the availability of food crops.

**Diehl, J. W. 1981. Geologic factors affecting the formation and presence of wetlands in the north central section of the Appalachian plateaus province of West Virginia. M.S. thesis. WVU, Morgantown.**

Good graphical depiction of dipping resistant strata and explanation of their role in creating high elevation wetlands in WV and MD.

**Diehl, J. W. and R. E. Behling. 1982. Geologic factors affecting formation and presence of wetlands in the north central section of the Appalachian Plateaus province of West**

**Virginia. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region , B.R. McDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 3-9.**

Geologic or geomorphic setting will determine presence of a wetland, but not the type of wetland.

**Drobney, R. B. and L. H. Fredrickson. 1979. Food selection by wood ducks in relation to breeding status. Journal of Wildlife Management 43(1): 109-120.**

Food analysis was conducted on 155 wood ducks relative to breeding status.

**Eaton, S. W. 1995. Northern Waterthrush (*Sciurus noveboracensis*). In The Birds of North America, No. 182. (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.**

The Northern Waterthrush breeds in cool wooded swamps, bog thickets, and shrub swamps, where it seeks out nest sites in cavities of root systems of wind-blown trees. This state-rare species is at the southern edge of its breeding range in West Virginia .

**Edens, D. L. 1972. A Correction in the naming of the Cranberry Glades in West Virginia. Castanea 37: 229-234.**

8-acre Round Glade is south of 20-acre Flag Glade.

**Edens, D. L. 1973. The ecology and succession of Cranberry Glades, WV. Ph.D. dissertation, North Carolina State University, Raleigh.**

Good discussion and delineation of changing natural communities at Cranberry Glades.

**Edens, D. L. 1977. Cranberry Glades, a unique series of boreal bogs in the Appalachian Mountains of West Virginia, p. 19-37. In H. G. Adkins, S. Ewing, and C.E. Ziimolzak (eds.). West Virginia and Appalachia: selected readings. Kendall/Hunt Publishing Co., Dubuque, Iowa.**

Copy unavailable; Presumably this is a re-cap of Edens' 1973 thesis?

**Edens, D. L. and S.W. Ash. 1969. The development of a white pine stand in a bog environment at Cranberry Glades, West Virginia. Castanea 34:204-210.**

Detailed description of white pine stand development from a single tree.

**Eli, R. N. and H. W. Rauch. 1982. Fluvial hydrology of wetlands in Preston County, West Virginia. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region , B.R. McDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 11-28.**

Used 12 months of data from 14 storm events to analyze wetland hydrology.

**ESA [Ecological Society of America]. 2004. Guidelines for describing associations and alliances of the U.S. National Vegetation Classification. Version 4.0.**

Standards for sampling techniques and data collection used in the high elevation wetlands project.

**Evans, D. K. 1988. Vegetation of the upper Greenbrier River Marlinton to Cass, West Virginia. US Army Corps of Engineers, Huntington, WV. 141 pp plus map insert**  
Quantitative plot data, % cover, frequency, relative values, importance values. Floristic similarity among types. Communities: Upland forest: *Quercus alba*/*Hamamelis virginiana* (young 2o); *Betula lenta*/*Tilia americana*/*Acer saccharum*. Bottomland hardwood: *Liriodendron tulipifera*/*Carpinus caroliniana*; *Quercus alba*/*Acer rubrum*-*Liriodendron*-*Pinus strobus*; *Aesculus octandra*-*Acer saccharum*; *Pinus strobus*. Bottomland oldfield: *Solidago juncea*/*Poa pratensis*. Upland oldfield: *Andropogon virginicus*. Palustrine shrub: *Alnus serrulata*. Herbaceous cobble: *Carex torta*; *Justicia americana*. Open water: *Vallisneria americana*-*Elodea canadensis*. Emergent: *Scirpus expansus*-*Sparganium americanum*; *Nuphar advena*. Cliff face, trailside, agricultural land

**Evans, J. and S. Wilson. 1982. Wildlife value of wetlands in West Virginia. In: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 213-220.**

Wetlands in WV provide habitat for a rich diversity of game and non-game wildlife that contributes recreation and tourism in the state.

**Evans, J. E., S. A. Wilson, and R. L. Hall. 1982. West Virginia Wetlands Inventory. Bulletin No.10. West Virginia Department of Natural Resources.**

Early inventory of general wetland types statewide. Cited in Balcerzak 1999

**Evans, R. S. and H. W. Rauch. 1983. Hydrogeology of Appalachian Wetlands in Preston County, West Virginia. WVU.**

Deep groundwater discharge from bedrock aquifers underlying the wetlands most likely plays an important role (along with topography and the relatively impermeable deeper sediments) in sustaining water tables during drought; however, deep groundwater beneath the wetland does not appear to contribute to runoff. Rather, runoff is probably fed by groundwater from the uplands which crosses the wetlands to reach the streams.

**Eyvind, T. and P. E. Barnett. 1974. Taxonomy of *Abies* in the Southern Appalachians: Variation in Balsam Monoterpenes and Wood Properties. *Forest Science* 20(1):32-40.**

Gas-liquid chromatographic analysis of terpenes taken directly from bark blisters was used to determine variation in Southern Appalachian *Abies*. The monoterpene analysis indicates a clinal variation pattern among balsam fir, intermediate fir, and Fraser fir. A similar variation pattern was observed for wood extractives, which increased gradually from south to north. No regional variation pattern was evident for wood specific gravity or tracheid length and no evidence was found to support the hypothesis of hybrid origin of the intermediate fir in West Virginia and Virginia. The scattered fir stands in the Southern Appalachians are probably remnants of a continuous fir forest, and the authors propose that only one species with three varieties be recognized: *Abies balsamea* (L.) Mill. var. *balsamea* in Pennsylvania and southern New York; *A. balsamea* (L.) Mill. var. *phanerolepis* Fern. in West Virginia and Shenandoah National Park in Virginia; and *A. balsamea* (L.) Mill. var. *fraseri* Spach. in the southern part of the species range. *Forest Sci.* 20:32-40.

**Fernald, M. L. 1970. Gray's Manual of Botany, Eighth Edition. D. Van Nostrand Company, New York.**

Floristic keys, descriptions, distribution. Used for project specimen identification.

**FGDC [Federal Geographic Data Committee]. 2006 National Vegetation Classification Standard, Version 2, Working Draft. Vegetation Subcommittee, Federal Geographic Data Committee. FGDC-STD-5 (Version 2).**

Federal standard for National Vegetation Classification, upper levels of the hierarchy.

**Fike, J. 1999. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Natural Diversity Inventory. Pennsylvania Department of Conservation and Recreation. Bureau of Forestry. Harrisburg, PA. 86 pp.**

State vegetation classification for Pennsylvania.

**Finnamore, A. T. and S. A. Marshall (Eds.). 1994. Terrestrial Arthropods of Peatlands, with Particular Reference to Canada. Memoirs of the Entomological Society of Canada. No. 169. 289 pp.**

Overview of peatland arthropods and peatland development in Canada, with a collection of articles on specific localities and species groups. This project follows on the "Aquatic Insects of Peatlands" project, in which it was shown that less than 1% of the 458 aquatic arthropod species recorded from peatlands are restricted to the peatland habitat. This study shows that the total arthropod fauna of peatlands is at least 10 times as large as the aquatic fauna, and that the overall level of habitat restriction is closer to 10%. This volume reports about 3600 terrestrial species, with estimates suggesting as many as 6000 could occur in rich fens. A large species component, especially that of macroarthropods, may be influenced by physical factors such as vegetation architecture. Peatland faunas demonstrate strong boreal and Holarctic affinities. Some groups show an apparent pattern of endemism along the postglacial fringe. Some arthropod taxa are closely associated with North American peatlands, suggesting that this habitat has been an important component of Nearctic biogeography since before the Pleistocene.

ORIBATIDA (beetle mites, moss mites): assemblages of species may be useful in characterizing peatlands. ODONATA: 20% of 40 typical peatland species are peatland obligates. Differences between bog and fen fauna were not apparent – dragonflies seem to respond to the habitat's form and structure rather than to its acidity or nutrient levels. HOMOPTERA (leafhoppers):

Limotettix genus evolved in New World from swale and fen-inhabiting specialists that fed on spike-rush. Food sources evolved to include Carex, Juncus, Rhynchospora, and Scirpus, and eventually ericaceous plants. The latter allowed invasion of drier habitats, with subsequent radiation to meadows and Asteraceae, Symphoricarpos, and other semi-woody plants. Little speciation occurred after the Pliocene, indicating that peatlands and especially bogs were important component of North American biogeography since before the Pleistocene.

CARABIDAE (carabid beetles) use damp Sphagnum lawns for summer activities and migrate to drier hummocks for overwintering. The development of an indigenous bog carabid fauna is closely related to the presence of a hummock-hollow mosaic (food is not a limiting factor)"

**Fitzhugh, R. D., T. Furman, J. R. Webb, B. J. Cosby, and C. T. Driscoll. 1999. Longitudinal and seasonal patterns of stream acidity in a headwater catchment on the Appalachian Plateau, West Virginia, U.S.A. Biogeochemistry 17(1):39-62.**

The chemical composition during baseflow was used to elucidate the fundamental processes controlling longitudinal and seasonal patterns of stream acidity in Yellow Creek, a chronically acidic headwater (pH range 3.7–4.2) on the Appalachian Plateau in northeastern West Virginia. Sulfate concentrations controlled the variability of stream acidity within the Yellow Creek catchment. Decreases in stream free H<sup>+</sup> acidity with decreasing elevation likely resulted from SO<sub>4</sub><sup>2-</sup> retention in riparian wetland areas as well as spatial variation in dominant tree species. Baseflow stream discharge, as well as H<sup>+</sup> and Aln<sup>+</sup> acidity, gradually declined during the growing season (June through October), likely reflecting microbial SO<sub>4</sub><sup>2-</sup> reduction in saturated anaerobic environments within riparian wetlands. A marked pulse of stream H<sup>+</sup>, Aln<sup>+</sup>, and SO<sub>4</sub><sup>2-</sup> coincided with an abrupt increase in baseflow discharge resulting from the cessation of transpiration after leaf-fall in November. This seasonal pattern suggests that autumn may be a critical period for eastern brook trout in streams draining wetlands on the Appalachian Plateau.

**Fleming, G. P., P. P. Coulling, K.D. Patterson, and K.M. McCoy. 2004. The natural communities of Virginia: classification of ecological community groups. Second approximation. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA.**  
State classification for VA.

**Flenniken, D. G. 1999. The Macrolichens in West Virginia. Carlisle Printing. Sugar Creek, Ohio. 231 pp. plus plates.**  
Reference for macrolichens in the project area.

**Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford.**  
Reference for identification of vascular plants collected during the project.

**Fortney, R. H. 1975. The Vegetation of Canaan Valley, West Virginia: a taxonomic and ecological study. Ph.D. dissertation, University of West Virginia, Morgantown.**  
Natural history, physiography, geology, climate, methods, communities, succession, vegetation cover maps. Communities: fir-spruce evergreen and hardwood forest, aspen groves, Spiraea alba thicket, Alnus thicket, Hypericum thicket, Vaccinium thicket, Calamagrostis wet meadow, Carex-Leersia-Calamagrostis-Glyceria wet meadow, Carex-Scirpus-Solidago-Aster sedge-forb, Scirpus marsh, Juncus marsh, Typha marsh, Carex marsh, Sphagnum-Carex bog, Sphagnum-Glyceria-Carex bog, Sphagnum-Eriophorum bog, Sphagnum-Typha bog, Polytrichum hummock bog, Polytrichum-Rubus hummock bog, Polytrichum-Solidago hummock bog, Polytrichum-Solidago-Rubus hummock bog, Polytrichum-Eriophorum hummock bog, Polytrichum-Glyceria hummock bog, Polytrichum-Juncus hummock bog, Polytrichum-Juncus-Carex hummock bog, Polytrichum-Carex hummock bog, Polytrichum-Pyrus-Vaccinium hummock bog

**Fortney, R. H. 1993. Canaan Valley - an area of special interest in the upland forest region. In Upland Forests of West Virginia. S.L. Stephenson (ed.). McClain Printing, Parsons, WV.**

**Fortney, R. H. 1997. A chronology of post logging plant succession in Canaan Valley through the development of a series of vegetation maps from 1945 to present. Unpubl. Report to the U.S. Environmental Protection Agency. Contract no. X-993402-01.**  
Description of community types and lists dominant species. Plant succession is described for well-drained and poorly drained (wetland) areas.

**Fortney, R. H. and J. S. Rentch. 2003. Post logging era plant successional trends and geospatial vegetation patterns in Canaan Valley, West Virginia, 1945 to 2000. *Castanea* 68 (4):317-334.**

Abstract: Canaan Valley, WV, contains one of the largest inland freshwater wetland ecosystems of bogs, marshes, wet meadows, and shrub and forested wetlands in the eastern US. This study uses aerial photography and ground truthing activities to produce GIS-based vegetation maps for 1945, 1975, and 1997, in order to track changes in plant community types and to construct plant successional models. Between 1945 and 1997, there was an increase in the area covered by northern hardwood forests and *Spiraea alba* and *Hypericum densiflorum* shrub thickets, but only a limited increase of *Picea rubens* dominated forests. Beaver activity along waterways became an important factor in determining successional trends, causing shrub swamps to be converted to wet meadows and marshes. The least successional change occurred in bogs and old fields located at the base of surrounding slopes. Overall, successional trends appear to follow rather predictable patterns for uplands and lowland habitats. However, there is little evidence to suggest that *Picea rubens* will replace hardwood species on the uplands.

**Fortney, R. H., S. L. Stephenson, and J. S. Rentch. 2005. Rare Plant Communities of Canaan Valley, West Virginia, USA. Unpublished manuscript.**  
Description of natural communities.

**Francl, K. E. 2003. Community Characterization of High Elevation Central Appalachian Wetlands. Ph.D. dissertation. University of Georgia.**  
Description and statistical analysis of natural communities with a focus on small mammal use.

**Francl, K. E., S. B. Castleberry and W. M. Ford. 2003. Small Mammal Communities of High Elevation Central Appalachian Wetlands. *The American Midland Naturalist*: Vol. 151, No. 2, pp. 388.**

Small mammal species richness increased with wetland size and was negatively correlated with trail density. Landscape features explained <20% of total variation at any spatial scale. Other factors, such as land use history or competition, likely have exerted a greater influence in small mammal abundance and distribution at these sites.

**Francl, K. E., W. M. Ford, and S. B. Castleberry. 2004. Characterization of high elevation central Appalachian wetlands. Res. Pap. NE-725. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station, 26 pp.**

Principle components analysis of vegetation, soils, hydrology and geology of 20 wetlands. Plot data not included in publication; however, data for all 133 plots were obtained via email from Karen Francl. 100 m<sup>2</sup> plots with subplots were used. I think the data sets are too small for the vegetation classification analysis to be meaningful. The hydrology data is quite interesting, showing seasonal variation more strongly correlated with rainfall events than with vegetation

use/evapotranspiration. Soil chemistry and hydrology data, limited geologic analysis. Value of small, isolated wetlands highlighted. Some literature review. Vegetation surveys to determine wetland index (based on obligates).

**Fuller, K. B. and P. S. Frank, Jr. 1974. Cranesville Pine Swamp. *Atlantic Naturalist* 29(3):101-105.**

Overview of human history and ecology of Cranesville Swamp.

**Fuller, K. B., P. S. Frank, Jr. and D. B. Fuller. 1974. The Cranesville Pine Swamp: A leader's handbook. Natural Resources Institute, University of Maryland, College Park, MD. 25 pp.**

Ecology and human history, plant communities, animal life, species lists, and nature walks in Cranesville Swamp.

**Gibbs, J. P. 1993. Importance of small wetlands for the persistence of local populations of wetland-associated animals. *Wetlands* 13 (1): 25-31.**

**Gibson, J. R. 1970. The flora of Alder Run Bog, Tucker County, WV. *Castanea* 35:81-98.**  
Data: zone dominants and associated ~ qualitative only. Communities: *Picea rubens*, grass balds, heath barrens, bogs, *Callitriche heterophylla* (*Potamogeton epihydrus*) aquatic. *Glyceria stricta*, *Alnus rugosa*, *Juncus brevicaudatus*, *Juncus effusus*, *Agrostis hyemalis*, *Polytrichum/Sphagnum*, *Carex folliculata*/(*Rubus hispidus*), *Eriophorum virginicum*, *Sphagnum palustre*, *Rhynchospora alba*, Mixed emergent, *Sphagnum/Vaccinium oxycoccus/Drosera rotundifolia*, *Vaccinium myrtilloides/V. angustifolium*, *Nemopanthus mucronata/Viburnum cassinoides/Aronia arbutifolia*

**Gibson, J. R. 1982. Alder run Bog, Tucker county, West Virginia: Its history and vegetation. Pp. 101-106 in: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, ed. B.R. McDonald. West Virginia University, Morgantown, 253 pp.**

**Gilbert, B. 1963. Minks, Shrews and Men in a Winter Swamp. *Sports Illustrated*, March 18, 1963.**

Popular article about trapping small mammals for research at Cranesville Swamp.

**Gleason, H. A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, Second Edition. The New York Botanical Garden, Bronx.**  
Floristic keys, descriptions, distribution.

**Gore, A. J. P. 1968. The supply of six elements by rain to an upland peat area. *Journal of Ecology* 56: 483-495.**

Measurements were made of nutrient elements supplied by rain to ombrogenic bogs (excluding effects of birds, smoke, and other pollution) at about 1700 feet elevation in the North Pennine uplands of England. Results showed the following averages in kg/ha/year: inorganic nitrogen=6.89, organic nitrogen=1.27, phosphorus=0.27, sodium=32.1, potassium=2.27, calcium=9.53, magnesium=4.48.

**Gorham, E. 1950. Variation in some chemical conditions along the borders of a *Carex lasiocarpa* fen community. *Oikos* 2(2): 217-240.**

pH and conductivity in a mire. Found no correlation at Kalltorpsberget in those factors where *Carex lasiocarpa* was present. However at Ryggmossen mire, factors were related. Site: Ryggmossen mire, near Uppsala and Kalltorpsberget, south-east of Stockholm.

**Gorham, E. 1957. The development of peat lands. *Quarterly Review of Biology* 32: 145-166.**

**Goudy, W.H., R.C. Kletzly, and J.C. Rieffenberger. 1969. American Woodcock and Common Snipe Research and Management. WVDNR. Elkins, WV.**

"Seven articles: Effects of Hunting on Woodcock Populations in the Canaan Valley of West Virginia; Characteristics Associated with "Resident" Woodcock Populations in the Canaan Valley of West Virginia; Population status of woodcock in West Virginia as determined from randomly distributed singing-ground routes; Local movement of "resident" woodcock in the Canaan Valley of West Virginia; Woodcock identification (a problem associated with interpreting results of mail questionnaire surveys); A Nightlighting technique for capturing woodcock and snipe; Woodcock banding on the Cape May peninsula, New Jersey."

**Grafton, W. N. and O. L. Eye. 1982. Vascular flora of eight selected West Virginia wetlands with special reference to rare species, in *Proc. Of the Symposium on Wetlands of the Unglaciaded Appalachian Region*.**

Dominant spp in Cowardin classes AQUATIC (1) *Polygonum hydropiperoides/Rumex verticillatus* (2) *Utricularia gibba/Lemna valdiviana* (3) *Lemna minor* (4) *Potamogeton amplifolius/P. diversifolius* (5) *Nuphar advena/Polygonum hydropiperoides*; (6) *Utricularia vulgaris*. EMERGENT (1) *Typha latifolia/T. angustifolia*, (2) *Sparganium americanum/Sagittaria latifolia*, (3) *Scirpus purshianus/Eleocharis obtusa/Panicum clandestinum*, (4) *Juncus effuses/Agrostis perennans/Holcus lanatus/Solidago rugosa*, (5) *Carex incompta/Agrostis alba/Panicum microcarpon*, (6) *Typha latifolia/Juncus effuses/Sag. lat. spa. and.*, (7) *Calamagrostis cinnoides/Cinna arundinacea/Juncus effusus*, (8) *Leersia oryzoides/Polygonum sag.*, (9) *Scirpus atrovirens/Carex interior/Carex lurida/Carex gynandra/Juncus effusus*. SCRUB/SHRUB: (1) *Cephalanthus occidentalis/Cornus amomum/Rhus vernix*, (3) *Alnus serrulata*, (4) *A. serrulata/Rhododendron nudiflorum/Hypericum prolificum/Ilex verticillata*, (5) *Cephalanthus*, (6) *Cornus amomum/A. serrulata/A. rugosa/Cephalanthus*, (7) *A. serrulata/Rosa palustris/Cornus amomum/Cephalanthus*, (8) *Hypericum densiflorum/Viburnum cassinoides/Viburnum recognitum*. FORESTED: (1) *Acer saccharinum/Salix nigra/S. alba*, (2)

**Green, N. B., and T. K. Pauley. 1987. Amphibians and reptiles in West Virginia. University of Pittsburg Press, Pittsburg, Pennsylvania. xi + 241 pp.**

There are currently 87 species of amphibians and reptiles in West Virginia. There are 34 salamander species, 14 frog and toad species, 13 turtle species, 6 lizard species, and 20 species of snakes. Two species are endemic to West Virginia: the Cheat Mountain salamander (*Plethodon nettingi*) and the West Virginia spring salamander (*Gyrinophilus subterraneus*).

**Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L.**

**Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume 1. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, VA.**  
Guiding principles, structure, and applications of the National Vegetation Classification.

**Guthrie, R. L. 1962. The Preservation of Cranesville Swamp. Proceedings of the WV Academy of Sciences 34:13-15.**

Establishment of Cranesville Swamp discussed. Highlights include northern affiliations of species and relict colonies that persist far south of their principal range.

**Guthrie, R. L. 1963. The Cranesville Swamp Nature Sanctuary. Wildflower 39(1): 1-10. The Wild Flower Preservation Society, Inc. Washington, DC.**

Documentation of the establishment of Cranesville Swamp. Discussion of northern affiliated species, relict communities, and floristic highlights.

**Guthrie, R. L. 1974. A Living Museum: Cranesville Swamp Nature Sanctuary. Arboretum Newsletter 22(1): 1-8.**

Brief description of the history, ecology and floristics of Cranesville Swamp.

**Hall, G. A. 1983. West Virginia Birds: Distribution and Ecology. Carnegie Museum of Natural History, Special Publication No. 7. Pittsburgh.**

Status, ecology, migration, and records for birds of West Virginia.

**Hall, M. E. 2005. Classification and Gradient Analysis of Plant Communities at Short Mountain Wildlife Management Area, Hampshire County, West Virginia. M.S. Thesis, Western Carolina University.**

Community classification of upland and wetland vegetation at Short Mountain WMA.

**Hamilton, Jr., W. J. 1931. Habits of the star-nosed mole, Condylura cristata. Journal of Mammology 12(4): 345-355.**

Habits of the star-nosed mole.

**Hamilton, W. J. and J. O. Whitaker. 1998. Mammals of the Eastern United States. Cornell University Press, 3rd Edition. Ithaca, NY.**

Extinction data for beavers.

**Hansen, H. J. and E. D. Michael. 1982. Bird use of spring seeps in northern West Virginia. In: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 167-174.**

Highest number of birds observed near seep with high shrub cover, possibly because this supported higher insect populations. Around managed seeps where overstory was removed, fewer birds were seen.

**Harmon, P. J., D. Ford-Werntz, W. Grafton. 2006. Checklist and Atlas of the Vascular Flora of West Virginia. West Virginia Division of Natural Resources, Wildlife Resources Section, Elkins, WV. 381 pp.**

Standard used by the project for plant names.

**Harris, A. G., McMurray, S. C., Uhlig, P. W. C., Jeglum, J. K., Foster, R. F., and Racey, G. D. 1996. Field guide to the wetland ecosystem classification for northwestern Ontario. Ontario Ministry of Natural Resources, Northwest Science & Technology, Thunder Bay, Ontario. Field Guide FG-01. 74 pp. + appendices.**

recommended by Lesley Sneddon and Pat Swain in Mass. Can fax inquiry to FAX 1-705-755-1677 [http://www.mnr.gov.on.ca/mrn/forests/forestdoc/guidelines/order\\_docs.htm](http://www.mnr.gov.on.ca/mrn/forests/forestdoc/guidelines/order_docs.htm), or \$19.95 from Lakehead University Bookstore, 955 Oliver Road, Thunder Bay, Ontario P7B 5E1, Telephone: (807) 343-8589, Facsimile: (807) 343-8158, E-mail: [bookstr@lakeheadu.ca](mailto:bookstr@lakeheadu.ca), Web: [www.lakeheadu.ca/~bookstor/home.html](http://www.lakeheadu.ca/~bookstor/home.html)

**Heiss, John. 1982. Systematic Study of the Spider Genus Calymmaria (Araneae: Agelenidae). Ph.D. dissertation at University of Arkansas.**

Collection of hahniid spider (*Calymmaria* sp. 21) at Cranberry Glades. This species is endemic to West Virginia and critically imperiled throughout its range (cited by Arnold 2004).

**Hornung, J. P. and C. L. Rice. 2003. Odonata and wetland quality in southern Alberta, Canada: a preliminary study. Odonatologica 32 (2): 119-129.**

Sixteen study sites visited seven times each May-Sept 1999. Data on odonates, aquatic macroinvertebrates, environmental parameters, vegetation, water quality, and beef cattle grazing were collected. Significant negative correlation between odonate species richness and % grazed stems was found. Species richness of odonates and species richness of vegetation were positively correlated.

**Hotopp, K. 2000. Land snails at four Nature Conservancy preserves in West Virginia. Report to the WV Chapter of The Nature Conservancy. Frostburg, MD. 35 pp.**

Land snail collections at Cranesville Swamp and other sites; cited in TNC 2001, Site Conservation Plan for Cranesville Swamp

**Hotopp, K.P., and T.A. Pearce. 2006. Land Snails of Pennsylvania. Carnegie Museum of Natural History, Pittsburgh, PA.**

Habitat and other information for land snails, including species shared with West Virginia.

**Hough, A. F. 1945. Frost pocket and other microclimates in forests of the northern Allegheny Plateau. Ecology 26: 235-250.**

Discussion of effects of climate and browsing on regeneration in frost pockets of western Pennsylvania; Cited in Wieder 1985.

**Hubricht, L. 1985. The distributions of the native land mollusks of the eastern United States. Fieldiana: Zoology, New Series, No. 24: 1-191.**

The land snail *Anguispira alternata* (Flamed disc), known from Cranberry Glades (WVNHP) has wide habitat tolerance.

**Hunter, M. L. and A. S. White. 1997. Ecological thresholds and the definition of old-growth forest stands. *Natural Areas Journal* 17:292-296.**

Current working definitions of old growth are arbitrary, lacking stepwise ecological thresholds.

**Hurst, D. M. 1994. Ecological Classification and Gradient Analysis in the Monongahela National Forest, West Virginia. M.S. thesis, Pennsylvania State University.**

Accompanies CD with plot data from 329 plots; perhaps a dozen of the plots are in the HEW project area. JV notes: discussion of *Quercus* spp. Successional status. Oak regen. in understory associated with ericaceous shrubs. Oak climax will be restricted to severe sites (dry, rocky, acid). *Acer rubrum* sited as climax spp. Climax species have restricted distribution (dominance) in successional forests while seral spp. have broad dominance.

**Hutton, E. E. 1941. The Bog of Cranberry Flat, West Virginia. *Castanea* 6(1):18.**

10 first records from Randolph County; Predominantly *Osmunda cinnamomea*, *Viburnum*, *Lyonia*, *Ilex*, *Parnassia*, *Amelanchier*, *Eupatorium*, *Habenaria*

**Hutton, E. E., Jr. 1962. Representatives of the circumpolar arctic flora in West Virginia, with special attention to Randolph County. *Wildflower* 38(3):31-41.**

Native vascular plants of WV known to reach the true arctic number 57 species. There are also 44 species introduced to WV that are also found in the Arctic, of which 29 were introduced to both environments.

**Ingram, H. A. P. 1982. Size and shape in raised mire ecosystems: a geophysical model. Dundee University, UK. *Nature* 297: 300-303.**

Raised mires are ecosystems in which waterlogged peat accumulates above the level of the surrounding stream system. It has been suggested that waterlogging is maintained by matric forces, but a model involving impeded drainage is in better accord with the structure of the peat and with basic tenets of soil physics. At one site from which enough hydrological and soil physical data are available to conduct a preliminary test, the elliptical shape and proportions of the mire surface profile are in agreement with this model.

**Jeglum, J. K. 1971. Plant indicators of pH and water level in peatlands at Candle Lake, Saskatchewan. *Can. J. Bot.* 49: 1661-1676.**

pH and water depth were studied as factors contribute to species dist. and pattern of vegetation in peatlands. Plant indicators for these factors were examined, and techniques are suggested by using species as indicators of these factors.

**Jeglum, J. K. 1973. Boreal forest wetlands, near Candle Lake, Central Saskatchewan. Part II-Relationships of vegetational variation to major environmental gradients. *The Musk-Ox* 12: 32-48.**

Emphasis throughout analysis is on proportional influence of the main complex gradients -- moisture, nutrient and disturbance regimes on principle lines of vegetational variation and on observed vegetational patterns in the landscape. PCA and environmental ordination used to look at vegetational variation and types of stands.

**Jezerinac, R. F., G. W. Stocker, and D. C. Tarter. 1995. The Crayfishes (Decapoda: Cambaridae) of West Virginia. Bulletin of the Ohio Biological Survey 10 (1). Columbus, Ohio. 198 pp.**

Distribution and ecology of crayfish species in West Virginia.

**KCDWLR [King County Department of Water and Land Resources]. 2001. Characteristics of the low-elevation Sphagnum-dominated peatlands of western Washington: a community profile. USEPA.**

Describes ecological amplitude of Sphagnum species and gives a good synthesis of bog classification schemes. Three gradients characterize the continuum from bog to fen, which are both peat-accumulating systems. These are vegetation (Sphagnum vs. sedge-dominated), chemistry (acidic vs. circumneutral), and source of water (rainfall vs. groundwater). Frequently used categories along this continuum are bog, poor fen, and rich fen.

**Kennedy, P. P. (edited by T. Sweet). 2002. The Blackwater Chronicle. West Virginia University Press, Morgantown. First edition published 1853 by J.S. Redfield, New York. Illustrated by David Hunter Strother.**

Account of 1851 fishing trip to the North Fork of the Blackwater River. Includes brief descriptions of grassy glades, *Rhododendron maximum* wetlands, and old growth forest.

**Knight, K. B., L. B. McArthur and R. J. Anderson. 1982a. Bird surveys in wetland and upland habitats, Greenbrier County, West Virginia.**

7 habitat types (3 upland types, 4 wetland types). Differences found between birds of wetlands and uplands, more species found in wetlands, many were obligate species.

**Knight, K. B., R. J. Anderson, R. H. Fortney. 1982. Meadow River/I-64 Wetland Study. Pre-construction study report: Volume 1. West Virginia Department of Natural Resources, Elkins, WV. (Contract: I-64-4(13)139).**

Results of first stage in two phase investigation. Documents existing wildlife after construction and compares to pre-construction study. Impacts to diversity, abundance, and structure of biotic resources of wetlands will be described and documented.

**Koerner, C., E. Spehn, and B. Messerli. 2001. Mountain Biodiversity Matters. Executive Summary of the Global Mountain Biodiversity Assessment Conference 2000. Rigi-Kaltbad, Switzerland. Swiss Academy of Sciences, Bern, Switzerland and The United Nations University, Tokyo, Japan.**

Synthesis of the important characteristics of mountain biodiversity and the elements needed to conserve biodiversity in the mountain ranges of the world.

**Kokesh, A. C. 1988. The Bog Forest Community of Cranberry Glades. M.S. thesis, Marshall University.**

The bog forest community at Cranberry Glades has a canopy dominance of *Tsuga canadensis*, *Betula alleghaniensis*, *Prunus serotina*, and *Picea rubens* with *Rhododendron maximum* dominating the understory in thickets along the interior boundary of the bog forest. Herbaceous species were affiliated with the northern coniferous forest with a smaller number of mixed mesophytic species. Non-vascular species are also northern affiliates with hummocks and fallen

logs carpeted by *Bazzania*, *Dicranum*, *Hypnum* and *Thuidium*. Rare species include *Corallorhiza trifida*, *Ilex collina*, *Listera cordata*, *L. smallii*, and *Polemonium vanbruntiae*. In comparison with accounts of Darlington and Edens (1930s-1970s), the bog forest seems to be experiencing retrograde succession west of Long Glade (--> *Carex* meadow) and along the floodplain of the Cranberry River (-->*Alnus-Viburnum* thicket). The bog forest is encroaching on the western margin of Flag Glade and Round Glade. *Prunus serotina* and *Rhododendron maximum* appear to have increased in importance within the bog forest. In a phone conversation with Amy Kokesh on Feb 3, 2005, she notes that Long Glade is disappearing (becoming covered with thickets and forest).

**Koryak, M. 1982. Wetland regulation in Appalachia. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 233-238.**

Discusses importance of wetlands in unglaciaded region of Appalachia, regulations involved, scientific research and importance of wetlands.

**Krech, S. III. 2000. The Ecological Indian. W.W. Norton and Company. New York. 320 pp.**

Good compendium of available evidence regarding ecological and landscape change prior to European settlement.

**Kruskal, J. B. 1964. Nonmetric multidimensional scaling: a numerical method. Psychometrika 29:115-129.**

PC-Ord reference for method of nonmetric multidimensional scaling (ordination).

**Kumar, M. 2007. New U.S. Wetland Protection Guidance Issued. EOS 88(25):263.**

New guidance from the U.S. Supreme Court determines whether wetlands fall under the protection of the Clean Water Act. One of the following two tests must be met: (a) hydrology must show a continuous surface connection to either navigable waters or their seasonal but relatively permanent tributaries, or (b) waters or wetlands can be shown to significantly affect chemical physical, or biological properties of downstream navigable water (these need not physically abut navigable waters).

**Lang, G. E. and B. R. McDonald. 1982. Loss of mass and elemental changes in decomposing sedge and alder leaves. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region , B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 31-41.**

Decomposition of sedge and alder, also chemical analysis of composition changes.

**Lang, G. E. and M. A. Topa. 1982. Solution chemistry of stream and surface waters in Cranesville Swamp. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region , B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 55-62.**

Three community types studied: mixed coniferous-deciduous swamp forest, spruce-hemlock swamp forest, and sphagnum-mixed sedge community. Chemical concentration values are given for rain, stream and surface water at the swamp.

**Lange, B. 1982. Key to the northern boreal and arctic species of Sphagnum, based on characteristics of the stem leaves. Lindbergia 8: 1-29. Copenhagen.**  
Bryophytes folder in Plants drawer of Natural Heritage workroom. This paper has excellent illustrations of Sphagnum leaves (mostly at microscopic magnifications).

**Levy, S. 2006. A Plague of Deer. Bioscience 56 (9): 718-721.**  
Over-browsing by deer is causing a decline in forest diversity.

**Lewis, R. L. 1998. Transforming the Appalachian Countryside: Railroads, Deforestation, and Social Change in West Virginia, 1880-1920. University of North Carolina, Chapel Hill. 348 pp.**  
Social history of the logging era in WV. Contains an interesting map showing the extent virgin forests (spruce, white pine, hardwood) in 1882, based on data from the U.S. Bureau of the Census. Note that white oaks were the largest trees in the forest prior to logging.

**Lewis, T. 1746. The Fairfax Line. In McClinton, A. T. (ed.). 1996. The Fairfax Line: A Historic Landmark, including a replication of Thomas Lewis's Journal of 1746. Shenandoah County Historical Society. Edinburg, VA.**  
Fascinating early (1746) account of open cranberry wetlands at Dolly Sods and spruce-rhododendron swamps in Canaan Valley.

**Losche., C .K. and W. W. Beverage. 1967. Soil Survey of Tucker County and part of Northern Randolph County, West Virginia. USDA Soil Conservation Service. U.S. Gov. Printing Office. Washington, D.C.**  
Soil survey maps and text.

**Ludlam, J. C. and T. Arkle, Jr. 1971. Blackwater Falls State Park and Canaan Valley State Park - resources, geology and recreation. State Park Series Bulletin No. 6. West Virginia Geological and Economic Survey. Morgantown, WV.**  
Differential erosion formed Canaan Valley, following breaching of the resistant Pottsville sandstone along the Blackwater anticline. Erosion of the Mauch Chunk shale and Greenbrier limestone was fairly rapid, then slowed as the Price (Pocono) sandstone was encountered. The central sandstone ridge is flanked by a series of generally co-linear streams.

**Lugo, A. E. 1995. Fire and wetland management. Pages 1-9 in Susan I. Cerulean and R. Todd Engstrom, eds. Fire in wetlands: a management perspective. Proceedings of the Tall Timbers Fire Ecology Conference, No 19. Tall Timbers Research Station, Tallahassee, FL.**  
Discussion of wetlands response to fire.

**Mack, J. J. 2001. Ohio Rapid Assessment Method for Wetlands v.5.0. Users' Manual and Scoring Forms. Ohio EPA Technical Report WET/2001-1. Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, Columbus, Ohio.**  
Rapid assessment method using narrative metrics customized for wetland classes.

**Mack, J. J. 2004. Integrated Wetland Assessment Program. Part 2: an ordination and classification of wetlands in the Till and Lake Plains and Allegheny Plateau regions. Ohio EPA Technical Report WET/2004-2. Ohio Environmental Protection Agency, Wetland Ecology Group, Division of Surface Water, Columbus, Ohio.**

A priori classification developed and subsequently evaluated using DCA and Cluster Analysis. 156 plots and 647 species in 5 ecological regions. Two main divisions are 8 landscape positions (depression, impoundment, riverine, slope, fringing, coastal, bog) and 3 plant community divisions (forest, shrub, emergent). Plant subclasses include several types of forest and shrub-dominated wetlands and marshes, sedge-grass dominated wetlands including fens, and various types of bogs. Ordination confirmed most a priori separations and also detected differences between undisturbed natural, disturbed natural, and created/restored wetlands.

**Mack, J. J. 2004. Integrated Wetland Assessment Program. Part 4: Vegetation Index of Biotic Integrity (VIBI) and Tiered Aquatic Life Uses (TALUs) for Ohio wetlands. Ohio EPA Technical Report WET/2004-4.**

4th iteration of vegetation-based wetland assessment tools for Ohio. VIBI is actually three IBIs for use with emergent, forest, or shrub-dominated wetlands. Forest communities experienced the most serious metric problems, with a previously unseen forest metric sensitivity to disturbance-induced increase in diversity. Forest metrics were refined to include only shade, facultative shade, and hydrophyte species. Significant differences were also observed for VIBI between different ecoregions, landscape positions (hydrogeomorphic class), dominant plant communities, and combinations of these variables. Tiered aquatic life uses (TALUs) for wetlands are proposed with differing biological expectations based on ecological variables.

**MacKenzie, W. H. and J. R. Moran. 2004. Wetland of British Columbia: a guide to identification. Research Branch, B.C. Ministry of Forests, Victoria. Land Management Handbook No. 52. 295 pp.**

Key based on hydrology (with icons), substrate, physiognomy. Descriptions include photos, edatopic grids, and statistics.

**Malmer, N. 1962. Studies on mire vegetation in the Archaen area of southwestern Gotland (South Sweden) I. Vegetation and habitat conditions on the Akhult mire. Opera botanica 7: 1-322**

Available through page 67 only. Excerpts: A feature characteristic of bog areas is the lack of zonation in the vegetation except that which depends on differences in slope, wetness etc. The bog vegetation is a monotonous repetition of the same hummock and hollow communities over large areas.

**Mansueti, R. 1958. The Cranesville Pine Swamp. Atlantic Naturalist 13(2): 72-84.**

Natural history of Cranesville Swamp, including species lists of plants, amphibians, reptiles, birds, and mammals.

**Marshall University. 1994. Marshall University Mammal Collection. Unpublished spreadsheet. West Virginia Mammal Survey, N.B. Green Vertebrate Collections, Marshall University.**

Mammal collections database.

**Matchen, D. L. 1998. Geology of the Canaan Valley region. p.50. In: Geological Society of America, Southeastern Section, 47th annual meeting Charleston, West Virginia.**  
Blackwater anticline and geologic descriptions of Canaan Valley.

**Matchen, D. L., Fedorko, N., Blake, Jr., B.M. 1999. Matchen, D.L., Fedorko, N., Blake, Jr., B.M. 1999. OF9902 - Geology of Canaan Valley, West Virginia Geologic Survey Open File Map (Digital Data).**

Three GIS coverages comprise the geologic map of Canaan Valley. A brief explanation of each coverage, including stratigraphy, is in an accompanying Word file entitled "Canaan-Valley-Geology". Cypoly: This polygon coverage documents the extent of each formation within the mapped area from the Mississippian Price Formation up to the Pennsylvanian Monongahela Group. Coals2: This vector coverage is the outcrop line of the Bakerstown coal bed of the Glenshaw Formation. Cvfault: This vector coverage is the trace of a fault located in the southern end of Canaan Valley.

**Maury, W. F. and W. M. Fontaine. 1876. Resources of West Virginia. The Register Co., Wheeling, WV. 430 pp.**

Topography, climate, agriculture, geology, forests (timber, shrubs, medicinal plants), minerals, transportation, county descriptions.

**May, H. L. 2001. Wetland mammals. Fish and Wildlife Habitat Leaflet, USDA 21: 1-20.**  
Describes range and habits of wetland mammals in U. S.

**McClinton, A. T. (ed.). 1996. The Fairfax Line: A Historic Landmark, including a replication of Thomas Lewis's Journal of 1746. Shenandoah County Historical Society. Edinburg, VA.**  
see Lewis 1746

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

Primary reference for multivariate statistical analysis of ecological data for this project.

**McCune, B. and M. J. Mefford. 1999. PC-ORD. Multivariate analysis of ecological data, version 5.01. MjM Software Design, Gleneden Beach, OR.**

Primary software used for multivariate statistical analysis of plot data for this project.

**McDonald, B. R. (ed.). 1982. Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, May 26-28, 1982. West Virginia University, Morgantown.**

Twenty-six articles on geology, hydrology, biogeochemistry, ecology, vegetation, floristics, wildlife, evaluation, and regulation of wetlands

**McNeill, G. D. 1940. The Last Forest: Tales of the Allegheny Woods. (Reprinted with a preface by Louise McNeill, Parsons, WV: McClain Printing Company, 1989.)**

This collection of short stories chronicles the people and landscapes near Marlinton, WV before, during, and after the logging era. “The First Camp Fire” is set in what is now the Cranberry Wilderness in 1889. McNeill, as a young boy on a fishing expedition, travels over Black Mountain to the North Fork of the Cranberry River. McNeill mentions an alder glade at the head of the South Prong of the Cranberry River. On Black Mountain, he “forged down into a deep cove where the hemlock forest was densely overgrown with laurel.” The camp was under giant hemlocks over level, moss-covered floor, with a fallen spruce as a backlog for the fire. Beech with dense undergrowth grew along the stream. An injured foot was bound with tough thongs peeled from leatherwood (*Dirca palustris*). On the return trip, the party “shoved through thick laurel, [. . .] clambered over beds of loose shale [. . .], worked cat-like over a network of spruce roots overgrown with moss, through which we might unwittingly plunge to disaster. We traversed open areas of timber land where there was little impeding undergrowth. Always there was the thrilling thought 'Maybe for thousands of years, no man has come this way before us'.” G. D. McNeill lived from 1877 to 1964.

**McQueen, C. B. 1985. Macroscopic key to the Sphagnaceae of the northeastern United States. *Evansia* 2 (2) 14-22.**

This field key allows identification of many Sphagnum species with a 15x to 20x hand lens, mostly based on stem leaves. The paper is in the Bryophytes folder of the Plants drawer in the Natural Heritage workroom at DRN.

**McQueen, C. B. 1990. Field Guide to the Peat Mosses of Boreal North America. University Press of New England; 1st edition. 163 pages .**

Sphagnum: common wet-to-dry sequence in boreal North American bogs is *S. cuspidatum*, *S. majus*, *S. fallax*, *S. angustifolium*, *S. magellanicum*, *S. capillifolium*, *S. fuscum*. Morphological trends for wet habitats include green color, weak stemmed, broadly spaced branch fascicles, and flat relatively undeveloped capitulum. For drier habitats, Sphagnum may exhibit bright colors, rigid stems, fascicles more closely spaced, and rounded more developed capitulum.

**Michael, E. D. and L. S. Smith. 1982. Values of wetlands in the unglaciated Appalachian region. West Virginia University, Division of Forestry, Morgantown, WV. Prepared for U.S. Army Corps of Engineers, Huntington, WV. Contract: DAWC69-M-2908.**

Discusses values of unglaciated Appalachian wetlands, including hydrologic, water quality modification, productivity and visual-cultural importance. Suggestions for future research.

**Michael, E. D. 1993. An evaluation of the wetland and upland habitats and associated wildlife resources in the southern Canaan Valley. Unpubl. Report, submitted to the Canaan Valley Task Force, Davis West Virginia.**

Wetland and upland habitats of Canaan Valley are distinctive and important.

**MIDNR [Michigan Department of Natural Resources]. 2006. Michigan's Wildlife Action Plan: Land Snails. Michigan DNR. Lansing, MI.**

Habitat notes for land snails; some species are shared with West Virginia.

**Moorhead, K. K. and L. M. Rossell. 1998. Southern mountain fens. p. 379-403. In: Messina, M.G. and W.H. Conner (eds.). Southern forested wetlands. Lewis Publishers, Boca Raton, Florida.**

“Southern mountain fens” have mosaic rather than “northern” concentric zonal wetland communities”; cited in Francl 2003.

**Mueller, R. F. 2003. Forests of the Central Appalachians Project: Inventories to Protect. <http://asecular.com/forests/>**

Notes from walks with Robert Hunsucker in 1997-2000, including floristics and ecology.

**Muzika, R-M., R. Hunsucker, and T. DeMeo. 1996. Botanical reconnaissance of Big Run Bog candidate research natural area. U.S.D.A General Technical Report NE-223.**

Botanical survey and literature review in 1993-94 identified 193 species in 188 genera in Big Run Bog. Six rare plants were found, five of them along the eastern border of the wetland (could they have been planted? -EB)

**NatureServe. 2007. NatureServe Explorer website: Ecological Systems and Associations of the USA and Canada. <http://www.natureserve.org/explorer>**

On-line reference, updated quarterly, of the ecological systems and associations of the International Vegetation Classification for the USA and Canada.

**Nekola, J. C. 1999. Paleoreugia and neoreugia: The influence of colonization history pattern process. Ecology.**

Two types of biological refugia (habitats that support populations not able to live elsewhere in a landscape) can be defined from relative refugium age as compared to surrounding matrix age; paleoreugia are now-fragmented relicts of a formerly widespread matrix community, whereas neoreugia have formed more recently than the matrix. This difference should make extinction a relatively more important process in determining species occurrence in paleoreugia, whereas immigration should be relatively more important in neoreugia. Based on these differences, a series of eight a priori predictions relating to the diversity and distribution patterns for the biota of such sites can be generated: (1) the slope of the species-area relationship, and amount of variance explained by it, should be greater in paleoreugia as compared to neoreugia; (2) the negative relationship between habitat isolation and species richness should be stronger in neoreugia as compared to paleoreugia; (3) species richness should be expected to decrease over time in paleoreugia, but to increase over time in neoreugia; (4) the inverse correlation between site distance and community similarity (distance decay) should be stronger in neoreugia as compared to paleoreugia; (5) neoreugia should be enriched in highly vagile species relative to paleoreugia, whereas paleoreugia should be rich in less vagile species relative to neoreugia; (6) geographic factors should be more important predictors of species occurrence for neoreugia than for paleoreugia; (7) paleoreugia sites should possess more and stronger correlations between community composition and environmental covariables (such as soil chemistry, climate, etc.) as compared to neoreugia sites; and (8) the number of competitive co-equivalents held within a system of neoreugia should be greater than the number held within a series of paleoreugia. The most readily testable predictions (numbers 1, 2, 4, and 5) were evaluated by comparing species-richness and community-composition patterns within two northeastern Iowa refugia: algific talus slopes (paleoreugia) and fens (neoreugia). Results from these tests were

consistent with predictions. These results illustrate that colonization history may influence contemporaneous species diversity and community-composition patterns. They also suggest that (1) equilibrium has yet to be achieved in the example systems after 5000-10000 yr, (2) the ecological-biogeographic debate centered on the mutual exclusivity of vicariance and dispersal is intrinsically flawed, and (3) optimum reserve-design strategies for biodiversity protection within paleoregion and neoregion systems will differ.

**Newbould, P. J. and E. Gorham. 1956. Acidity and specific conductivity measurements in some plant communities of the new forest valley bogs. *Journal of Ecology* 44(1): 118-128.** pH and conductivity of New Forest valley bogs, near southern coast of England.

**Norris, S. J. 1997. Vegetation Study of the Grasslands of Canaan Valley National Wildlife Refuge.**

Floristic study of hay fields, old fields, and moist old fields on the Freeland Road tract, Beall tract, and Cortland Road tract. Twenty nested 20x50m plots (modified Whittaker) were sampled. These plots are drier and weedier than the communities being sampled by the HEW project. A number of rare species were noted.

**NRCS-USDA [Natural Resources Conservation Service, United States Department of Agriculture]. 2007. Official Soil Series Descriptions.** <http://soils.usda.gov/technical/classification/osd/index.html> (Accessed 20 August 2007). Descriptions of soil series nationwide.

**Orr, R. 1998. The Dragonflies and damselflies (Insecta: Odonata) of Cranesville Swamp, Garrett County, Maryland and Preston County, West Virginia. *The Maryland Naturalist* 42(3-4):52-59.**

Field work in 1996-1997 for Maryland DNR. Sixty-five species of odonata were documented.

**Parker, R. E. 1962. Factors limiting tree growth on peat soils. *Society of Irish Foresters* 19 (1).**

Nutrient mobilization and moisture/inundation stress are among factors limited tree growth on peat soils.

**Pauley, T. K. 2006. Upland Wetlands: Amphibians and Reptiles. Unpublished report to WVDNR, 14 April 2006.**

Collections and observations of amphibians and reptiles from 62 high elevation wetlands in the Allegheny Mountain region of West Virginia.

**Pennak, R. W. 1963. Ecological and radiocarbon correlations in some Colorado Mountain lake and bog deposits. *Ecology* 44(1): 1-15.**

Ecological observations at Muskee Lake, Redrock Lake, Silver Lake Gate Bog, Albion Bog, Boulder Co. Colorado

**Perkins, C. L. 1929. The Monongahela National Forest, the Nation's tribute to a deserving people. *WV Wild Life* 7:5-7;18-19;23.**

“Spruce...was found on steep mountain slopes where the rocks were covered with a dense humus and in places on the level, poorly-drained plateaus at higher elevations. The headwaters of Stony River, Blackwater River, Red Creek, Red Run and the East Fork of the Greenbrier River were examples of excellent stands of red spruce found on the high plateaus.” Cited in Clarkson 1964.

**Pittillo, J. D. 1994. Vegetation of three high elevation Southern Appalachian bogs and implications of their vegetational history. *Water, Air, & Soil Pollution* 77 (3-4): 333-348.**

Vegetation change during the Pleistocene Period was assessed in three high elevation southern Appalachian bogs in North Carolina via pollen and paleoecological analysis.

Existing vegetation was sampled by transects of 10×10 m plot relevés that crossed a section of forest and open bog areas. While each site included a characteristic southern Appalachian bog, each differed: Flat Laurel Gap is predominately a heath community with interfingerings of open grassy glades which grade into a mixture of northern hardwoods and spruce; Boone Fork bog is a disturbed mixture of northern hardwoods which grades into a mixture of scattered shrubs and open glades predominated by Sphagnum; and Long Hope Menyanthes bog is an open herbaceous and grassy glade with scattered shrubs which grades abruptly into northern hardwoods and old-growth spruce. As might be expected, the more northern Long Hope Valley site had more northern taxa, such as *Menyanthes trifoliata*, *Lonicera canadensis*, and *Vaccinium macrocarpon*. The southern site also had a few boreal taxa such as *Eriophorum virginicum*. These long-established southern Appalachian bogs have provided continuously suitable habitats for relict northern species since the peak of the glacial ice advance 18,000 years ago.

**Porej, D. 2004. Faunal aspects of wetland creation and restoration. Dissertation, Ohio State University, Columbus, OH.**

Study of factors which influence wetland faunal communities.

**Prescott, T. M., J. Thompson, J. Sencindiver, W.J. Waltman, S.G. Carpenter, and S. W. Waltman. 2006. Soil Climate Regimes of West Virginia. 18th World Congress of Soil Science, Philadelphia, PA.**

Equation given to calculate mean annual soil temperature for sites in WV:  $MAST = 90.3 - 1.36 (\text{Latitude}) - 0.246 (\text{Longitude}) - 0.00271 (\text{Elevation})$ ; latlong in decimal degrees, elevation in feet; used for HEW report.

**Putnam, N. J. 1995. Plant Communities of the Meadow River Wetlands. WVDNR. 17 pp.**

Communities were classified based on data from 180 plots using two-way indicator species analysis (TWINSPAN). Communities included sub-types of riverine floodplain forest (6), shrub swamp (5), and herbaceous marsh (7 natural, 2 cultural). Many communities are impacted by off-road vehicles, beaver and cattle. Ranking is presented for size, condition, and defensibility.

**Pyle, R. E., W.W. Beverage, T. Yoakum, D.P. Amick, W.F. Hatfield, D.E. McKinney. 1982. Soil Survey of Randolph County area main part, West Virginia. USDA Soil Conservation Service. U.S. Gov. Printing Office. Washington, D.C.**

Soil maps and data for Randolph County.

**Rawinski, T. J. 1992. A classification of Virginia's indigenous biotic communities: Vegetated terrestrial, palustrine, and estuarine community classes. Unpublished document.**

**Virginia Department of Conservation and Recreation, Division of Natural Heritage.  
Natural Heritage Tech**

Earlier version of state classification for VA.

**Rawson, J. W. 1980. Meadow River habitat evaluation. West Virginia Division of Natural Resources, Wildlife Resources Division. Elkins, WV.**

Report on habitat evaluations done to evaluate impacts of proposed I-64 construction on wetland system near Meadow River.

**Reger, J. P. and R. E. Behling 1982. Geology of Three Appalachian Wetlands (date uncertain - 1982+) draft report.**

In the Allegheny Mountain section of the Allegheny Plateau, three wetlands were studied. Sandstone knickpoints below non-resistant shale create temporary base levels with ponding upstream where alluvial plains form. Low-permeability silty loams and clays develop on the alluvial plain, and wetlands form. It does not appear to matter whether the resistant strata dip upstream or downstream, but they often occur on or near synclinal or anticlinal axes. At Cupp Run, the knickpoint is in the Mississippi Price sandstone and the base level lies in the Devonian Hampshire shales, along the axis of the partially breached Briery Mountain anticline. At Cranesville Swamp, the knickpoint is in the Pennsylvanian Pottsville sandstone and the base level lies in the Mississippian Greenbrier limestone and Mauch Chunk shale, on the east limb of Briery Mountain anticline. At "The Glades" in MD, the knickpoint is in Pennsylvanian Glenshaw (Mahoning sandstone) and the base level lies atop the Glenshaw shales, near the axis of the Berlin syncline. Radiocarbon dating of a 258 cm profile at Buckle's Bog in "The Glades" show that fibrous peat was deposited rapidly (10-20 years/cm) from 12-10,000 B.P. During the last 10,000 years, peat accumulation was much slower, about 200 yrs/cm. Before 12,000 B.P., clayey lacustrine deposits of uncertain age were deposited.

**Rentch, J. S. 2003. *Alnus incana* shrubland, unpublished plot data. West Virginia University.**

Unpublished releve data from Canaan Valley, used in classification of high elevation wetlands for this report.

**Rentch, J. S. and J. T. Anderson. A Floristic quality index for West Virginia wetland and riparian plant communities. West Virginia Agricultural and Forestry Experiment Station Bulletin 730. West Virginia University, Morgantown, WV.**

Floristic quality index and coefficient of conservatism for wetland and riparian flora

**Rentch, J. S., and J. T. Anderson. 2008 (forthcoming). Stand development of trembling aspen in Canaan Valley, West Virginia. In Proceedings, 16th Central Hardwood Forest Conference. USDA Forest Service.**

In wetlands of Canaan Valley, *Populus tremuloides* occurs as a disjunct population well south of its primary natural range. Based on interpretation of aerial photographs, the number of stands decreased slightly between 1945 and 2000 (148-142, respectively), while the median stand size slightly increased (0.06-0.10 ha). Based on median stand size and sample data from 14 stands, aspen usually occurs as pure stands or clones. Standing dead aspens comprised 21% and 22% of live basal area and trees. Four stands showed evidence of stand decline, using the ratio of dead to

live basal area. Ten of 14 stands had median ages between 32 and 38 years. Stand initiation may have been related to changes in land use and reductions in herbivory pressures in the valley after the 1950s. Only one stand showed evidence of expansion, and only one stand showed a significant declining age trend.

**Rentch, J. S. and R. H. Fortney. 2003. Post Logging Era Plant Successional Trends and Geospatial Vegetation Patterns in Canaan Valley, West Virginia, 1945 to 2000. *Castanea* 68(4):317-334.**

Canaan Valley, West Virginia, contains one of the largest inland freshwater wetland ecosystems of bogs, marshes, wet meadows, and shrub and forested wetlands in the eastern United States. This study uses aerial photography and ground truthing activities to produce GIS-based vegetation maps for 1945, 1975, and 1997, in order to track changes in plant community types and to construct plant successional models. Between 1945 and 1997, there was an increase in the area covered by northern hardwood forests and *Spiraea alba* and *Hypericum densiflorum* shrub thickets, but only a limited increase of *Picea rubens* dominated forests. The activities of beavers are the principal factors influencing the vegetation patterns along water courses. They will continue to exercise influence. Deer browsing also appears to be strongly influencing plant successional trends. The rate of change of plant succession in the valley varies widely. Along stream courses and on well-drained slopes, change has been rapid. Conversely, changes in many old fields and in bogs have been slow. The importance of such temporary species as *Populus tremuloides* and *P. grandidentata* has diminished since 1945, as recruitment of these species appears limited. With continued fire suppression, their importance will continue to decline.

**Rentch, J. S., R. H. Fortney, J. T. Anderson, and W. N. Grafton. 2002. Plant Communities of Abe's Run Wetland, Canaan Valley State Park. Unpublished report.**

Transect sampling of balsam fir swamp and other plant communities in the circumneutral wetland at Abe Run in Canaan Valley.

**Rigg, G. B. 1916. A summary of bog theories. *The Plant World*. 19:310-325**

Early treatments of sphagnum wetlands grouped all sphagnum-dominated systems as bogs, although today some might be separated out as poor fens.

**Rigg, G. B. 1940. The Development of Sphagnum Bogs of North America. *Botanical Review* 6: 666-693**

General reference on sphagnum bogs of North America.

**Rigg, G. B. and P. D. Strausbaugh. 1949. Some stages in the development of Sphagnum bogs in West Virginia. *Castanea* 4: 129-148.**

Brief description of sites and species; comments: depends heavily on conjecture, quotes extensively Darlington 1943 concerning bog development. Sphagnum bogs, glades.

**Rives, W. C. 1898. The summer birds of the West Virginia spruce belt. *The Auk* 15: 131-137.**

“The forests around Davis, Tucker County, at the turn of the century.. .consist principally of black [red] spruce, hemlock and birch.. . They are very dense and contain trees of magnificent proportions, while they are rendered practically impassable where it occurs, but the laurel

(*Rhododendron maximum*), which covers abundantly the extremely rough and uneven surface of the ground and forms continuous 'brakes' of great extent. The earth beneath is often carpeted with moss and *Lycopodium*, but with the exceptions of the *Oxalis acetosella* and an occasional trillium, no great variety of flowering plants was observed." Cited in Clarkson 1964.

**Robinette, S. L. 1964. Plant ecology of an Allegheny mountain swamp. M.S. thesis, WVU, Morgantown.**

History, geology, soils, topography, climate, water drainage, community classification, discussion of succession and ecological relationships. Cranesville Swamp supports boreal forests, sphagnum bog communities, and the southern-most natural stand of *Larix laricina*. It has an acid and on-acid side, and is heavily impacted by beaver activity. Plot data (27 wetland, 7 upland) entered in Plots2-WV database.

**Robinette, S. L. 1965. A Brief History of the Cranesville Swamp. West Virginia University Arboretum Newsletter 15(4): 2-4.**

Human history of Cranesville Swamp from about 1800 until 1965, including accounts of early hunters and foresters.

**Robinette, S. L. 1966. Major Plant Communities of Cranesville Swamp, West Virginia Arboretum Newsletter 16(1): 1-7.**

Descriptions and map of major plant communities in Cranesville Swamp, including open water, streambank, cattail, Sphagnum-beakrush, Sphagnum-cranberry, sedge-wet meadow, Glyceria-wet meadow, *Pyrus-Vaccinium* low shrub, *Pyrus-Pteridium* low shrub, tall shrub, larch-sedge meadow, *Fraxinus-Betula* forest, *Acer-Prunus* forest, mixed northern swamp forest, hemlock-hardwood forest, spruce forest, bog-swamp forest ecotone, and pine plantation.

**Roble, S. M. and O. S. Flint, Jr. 2001. *Nemotaulius hostilis* (Trichoptera: Limniphilidae), a boreal caddisfly new to the Virginia fauna. *Banisteria* 18 (35-37).**

The boreal caddisfly *Nemotaulius hostilis* reaches its southernmost extent in West Virginia's Allegheny Mountain wetlands. It is the lone Nearctic representative of a small Holarctic genus of limniphilid caddisflies. Larvae are restricted to permanent ponds, especially small ponds with dense growth of aquatic plants. Larvae are typically associated with the emergent macrophyte genus *Sparganium*.

**Salo, K. 1979. Mushrooms and mushroom yield on transitional peatlands in central Finland. *Ann. Bot. Fennici* 16: 181-192.**

Fungi are important for peatlands, as they form mycorrhiza with plants and trees. A survey of the fungi and mushrooms in Finland. 107 species found on drained, fertilized and virgin wetlands in this survey.

**Schafale, M. 1998. Fourth approximation guide. Mountain wetlands. February 1998 draft. North Carolina Natural Heritage Program, Raleigh.**

Community classification of high elevation wetlands of the southern Appalachians in North Carolina.

**Schwartz, F. J. 1962. Fishes of the Cranesville Swamp, West Virginia and Maryland. Arboretum Newsletter 11 (4). WVU, Morgantown.**

14 fish species were observed in Cranesville Swamp in surveys done in 1958-1960. Human impacts on fish populations from the early 1800's to 1960 are discussed.

**Schwintzer, C. R. 1978. Nutrient and water levels in a small Michigan bog with high tree mortality. The American Midland Naturalist 100(2): 441-451.**

Bog nutrients and water levels. Variations in water levels are most probable cause of tree mortality and differences in vegetation of free floating and grounded mat bogs.

**Schwintzer, C. R. 1978. Vegetation and nutrient status of northern Michigan fens. Canadian Journal of Botany 56(24): 3044-3051.**

Presence of plant species in different fens, relationship between pH, alkalinity, Ca and Mg.

**Sears, P. B. and E. Janson. 1933. The rate of peat growth in the Erie basin. Ecology 14(4): 348-355.**

Peat accumulation rates linked to microfossils as a key to post-Pleistocene climate.

**Selders, V. 1917. A Pioneer's Memoir, 1849-1917.**

Colorful and interesting unpublished manuscript detailing pioneer life (farming and deer and fox hunting/trapping) in Preston County, WV from 1849-1917. Many references to laurel swamps and laurel thickets. On p. 32, Selders notes a "[bob]cat lying in the laurel.. . The large hemlock trees were standing very close together." On p. 72, on a trip to Canaan Valley, Selders notes that "When that country was wilderness there was some of the finest timber there that I ever saw, but it is all gone now."

**Semlitsch, R. D. 2002. Critical elements for biologically based recovery plans of aquatic-breeding amphibians. Conservation Biology 16 (3):619-629.**

Overview of critical population and landscape processes to maintain amphibian species, habitat management, and measures of success for recovery plans.

**Shaw, A. J., C. J. Cox, and S. B. Boles. 2005. Phylogeny, species delimitation, and recombination in Sphagnum section Acutifolia. Systematic Botany 30(1): 16-33.**

Genetic analysis of Acutifolia group of Sphagnum. Phylogenetic tables given.

**Shea, G. B. and L. C. Athanas. 1980. Hydrological and Biological Studies of Cranesville Swamp. Western Eco-systems Technology, submitted to TNC.**

Water drainage and beaver study indicate general good health of the swamp. It is not clear whether beaver activity is detrimental or not.

**Sjors, H. 1950. On the relation between vegetation and electrolytes in north Swedish mire waters. Oikos 2(2): 241-258.**

Describes correlation of pH and conductivity on quality of fen and bog vegetation.

**Smith, L. S. and E. D. Michael. 1982. Values of wetlands in the unglaciated Appalachian Region. In: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian**

**Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 239-253.**

Describes how wetlands help to buffer floodwaters, and low flows. Wetlands displace millions of gallons of waters during floods, which helps prevent worsened flooding around populated areas when compared to areas with no wetlands, or previously filled wetlands. Estimated monetary value saved because of natural flood control.

**Smith, R. H. 1993. Disjunct Populations of Northern United States Butterflies in Garrett County, Maryland. The Maryland Naturalist 37:46-48.**

Butterfly records for Cranesville Swamp; cited in TNC 2001, Site Conservation Plan for Cranesville Swamp.

**Smith, S. G. 2000. Typhaceae (Cat-tail Family), in Flora of North America 22:278-285. Oxford University Press. New York.**

Typha is ecologically important in many fresh to slightly brackish wetlands, often emergent in up to 1.5 m of water. Each spike may produce hundreds of thousands seeds, which are efficiently wind-dispersed and germinate on bare wet soils or under very shallow water. The seedlings rapidly form clones by means of rhizomes in the first season, flower the second season (R. R. Yeo 1964), and often form very large, persistent, often monospecific stands. [..] The larger Typha species and *T. x glauca* can be serious weeds in managed aquatic systems worldwide, where they can invade canals, ditches, reservoirs, cultivated fields, and farm ponds; they can be a nuisance in recreational lakes; and they can reduce biodiversity and displace species more desirable for certain kinds of wildlife (J. B. Grace and J. S. Harrison 1986; J. F. Morton 1975; J. W. Thieret and J. O. Luken 1996). Hybrid seedlings are likely wherever two species form mixed stands and bare wet soil is available for seed germination and seedling establishment. 1) *T. latifolia* x *T. angustifolia* (= *T. x glauca* Godr., pro sp.), often called “hybrid cattail,” is abundant throughout most of the region of sympatry of the parents except along the southeast coast, where it is uncommon. [..] In spite of its sterility, *T. x glauca* is remarkably successful ecologically. It often spreads by means of rhizomes to form often very large clones and out-competes the parental species, especially in eutrophic, disturbed habitats with unstable water levels (S. W. Harris and W. H. Marshall 1963; S. G. Smith 1987).

**Sneddon, L. 1994. Field form instructions for the descriptions of sites and terrestrial, palustrine, and vegetated estuarine communities, Spring 1994. The Nature Conservancy, Eastern Regional Office, Boston, MA.**

Basis for field form development for the West Virginia Natural Heritage Program and the high elevation wetlands project.

**Snyder, C. D., J. A. Young, and B. M. Stout. 2006. Aquatic habitats of Canaan Valley, West Virginia: Diversity and Environmental Threats. Northeastern Naturalist 13 (3):333-352.**

Acid rain limits aquatic and semi-aquatic species in the headwater portions of the Blackwater River, affecting 56 km of stream (46%). Beaver activity has transformed 4.7 km (17%) of stream to pond habitat, and has eliminated an undetermined amount of forested riparian area.

**Snyder, R. E. 1969? (date unknown). A Floristics Study of Cranesville Swamp.**

Herbarium specimens deposited at The Ohio State University Lima Campus from Cranesville Swamp include 71 families, 195 genera, and 340 species. Specimen locations are verbally described in the report.

**Sorrie, B. A. 1997. Notes on *Lycopus cokeri* (Lamiaceae), in *Castanea* 62(2):119-126.** Good descriptions of technical characters of *Lycopus uniflorus* and *L. virginicus* (these two species seems to have intermediate forms in the HEW project area).

**SRCC [Southern Regional Climate Center]. 2007. National Climatic Data Center 1971-2000 Monthly Normals. Website accessed Nov 27, 2007.**

Historical climate records for WV and other southeastern states, including monthly temperature and precipitation normals.

**Stephens, K. 2003. Characterization of wetland soils in the Beaver Creek watershed. M.S. Thesis. West Virginia University.**

Wetlands receiving acid mine drainage generally contained higher levels of total sulfur, and the sulfur in these wetlands was more likely to be in the form of acid volatile sulfides, and/or chromium reducible sulfides. In non-impacted wetlands, over 90% of the sulfur was in the organic form. Total iron ranged from 3 to 385 mol - in non-impacted wetlands and 17 to 1356 umol g-1 in acid mine drainage-impacted wetlands. Total nitrogen, cation exchange capacity, and total carbon in wetlands receiving acid mine drainage was generally lower than in the non-impacted wetlands. This was caused by an influx of sediments from mine spoils and decreased plant productivity. Electrical conductivity, particle size, extractable aluminum, pH, and extractable bases were highly variable among acid mine drainage-impacted and non-impacted wetland soils. In wetlands receiving acid mine drainage, values for redox potential indicated conditions were present that would favor iron and sulfate reduction. The presence of acid volatile sulfide, coupled with high total sulfur and low sulfate indicated that in some acid mine drainage-impacted wetlands sulfur was being reduced and retained or never completely oxidized.

**Stephenson, S. L. and H. S. Adams. 1986. An ecological study of balsam fir communities in WV. Bulletin of the Torrey Botanical Club. 133: 372-381.**

Bibliography, relative basal area, density, cover, frequency; --> importance values trees, shrubs, herbs; ring count of large representative trees; soils data." Community info: *Abies balsamea* present (dominant in all sampled stands); *Abies balsamea* dominant in seedling. Some stands may never have been logged. Fir may be decreasing at Blister Swamp, Canaan Valley. Most stable at Blister Run. *Abies-Picea-Tsuga-Betula allegheniensis* / Sphagnum. Closely related to *Picea rubens* communities; less *Dryopteris intermedia*; higher forb diversity.

**Stockwell, S. S. 1985. Distribution and abundance of amphibians, reptiles, and small mammals in eight types of Maine peatland vegetation. Master's Thesis. University of Maine at Orono, Orono, Maine.**

A survey of amphibians, reptiles and small mammals in peatlands of Maine. Eight vegetation types were surveyed, representing minerotrophic, ombrotrophic and transitional types.

**Stout, B. M. III, and J. S. Stout. 1989. Northern caddisfly (Trichoptera) fauna in remnant boreal wetlands of West Virginia. Entomological News 100:37-40.**

Collections of five species of caddisfly (*Banksiola dossuaria*, *Nemotaulius hostilis*, *Oligostomis pardalis*, *Platycentropus radiatus*, *Ptilostomis ocellifera*) from WV's high Allegheny wetlands have been deposited in the American National Museum.

**Stout, Ben M. III, Kathy K. Stout, and Craig W. Stihler. 1992. Predation by the caddisfly *Banksiola dossuaria* on eggs of the spotted salamander *Ambystoma maculatum*. American Midland Naturalist 127: 368-372.**

The caddisfly *Banksiola dossuaria* preys on egg masses of the spotted salamander *Ambystoma maculatum*. Sampling was done at Odey Run Bog on the Upper Shavers Fork.

**Strausbaugh, P. D. 1934. Cranberry Glades. Forests 40:362-383.**

Overview of the ecology of Cranberry Glades.

**Strausbaugh, P. D. and E. L. Core. 1978. Flora of West Virginia, Second Edition. Seneca Books, Morgantown.**

Floristic keys, descriptions, distribution, illustrations. One of the references used for plant identification by this project.

**Strother, D. H. 1853. The Virginian Canaan. Harpers Magazine. 8:16-36 (Reprinted in Supplement #20 to the West Virginia Heritage Encyclopedia, 1974)**

Strother's account contains some vivid descriptions of old growth spruce-hemlock-rhododendron forest, including trees of 100-150 feet in height/length (fallen) and 12-18 feet in girth. Fallen, decaying giant trees were ubiquitous. Dense laurel (rhododendron) brakes grew over knee-deep mud and water. "Fir" trees rose above the laurel, but I am not sure if "fir" refers to *Abies*, *Picea*, or *Tsuga*. It may be equivalent to spruce, since Strother's party stripped the bark from "fir" to build a shelter. Strother mentions two grassy glades - one on a headwater stream of the Potomac, and another on a source of the Blackwater. At times, though, the party had to cut down young birch as browse for their horses. Wildlife encountered include woods-robin, otter, owl, deer, bear and trout. David Hunter Strother (Porte Crayon) was born in Martinsburg in 1816 and died in Jefferson County in 1888. He received early education from Samuel Morse who later invented the telegraph. He spent 1842 to 1844 studying art in Rome. Returning to the U.S., he became an illustrator and writer for N.Y. magazines. Around 1850 he returned to Virginia (West Virginia) and began writing for Harper's Magazine beginning a series of travel articles, the first being "The Virginia Canaan."

**Strother, D. H. 1872-1873. The Mountains. Harper's New Monthly Magazine 43-47.**

Travelogue of the Allegheny mountains, written and illustrated by Porte Crayon (David Hunter Strother).

**Studlar, S. M., S. L. Stephenson, P. J. Harmon. 2002. Annotated Checklist of the Hornworts, Liverworts, and Mosses of West Virginia. West Virginia Division of Natural Resources, Wildlife Resources Technical Document 02-3, Elkins, WV.**

Primary bryophyte reference used for the high elevation wetlands project.

**Tallis, J. H. 1964. Studies on Southern Pennine Peats: III. The Behaviour of Sphagnum. Journal of Ecology. 52(2): 345-353.**

The stratigraphy of southern Pennine peats is outlined and the occurrence of periodic horizontal bands of unhumified Sphagnum in the peat described. It is possible that these Sphagnum bands are true recurrence surfaces, dateable to 1200 B.C., 600 B.C., A.D. 400 and A.D. 1300. Striking peaks in Sphagnum spore counts in the peat are shown to correspond closely with the Sphagnum bands, and these peaks can be subdivided into separate peaks for the different Sphagnum species; typically a peak of spores of *S. acutifolium* s.l. occurs at the lower edge of a Sphagnum band and one of *S. cuspidatum* at the upper edge. The status of *S. imbricatum* as a peat-former in the southern Pennines in the past is discussed. Recent vegetation changes are examined in the light of documentary and palynological evidence, and it is concluded that *Eriophorum vaginatum* assumed dominance some time after the fourteenth century as a result of human interference with the vegetation. The modifications produced resulted in a decline in the frequency of Sphagnum in the vegetation, but the almost total absence of Sphagnum at the present day can probably be ascribed to the atmospheric pollution of the last 150 years.

**Tartar, D. C. and P. L. Hill. 1979. Caddisflies (Trichoptera) of the Cranberry Glades in West Virginia. Entomological News 90(4):205-206.**

Records of caddisflies for Cranberry Glades; cited in Kokesh 1988.

**Tiner, R. W. 1996. Current status of West Virginia's wetlands: results of the National Wetlands Inventory. U.S. Fish and Wildlife Service, Ecological Services, Region 5, Hadley, MA. 44 pp. plus Appendices.**

Summary of all wetlands in WV, includes a plant list in appendix of wetland species.

**Tiner, R. W. 1996. West Virginia's wetlands. Uncommon, valuable wildlands. U.S. Fish and Wildlife Service, Ecological Services, Northeast Region, Hadley, MA. 20 pp.**

DNR publication that describes wetlands in WV, distribution and importance.

**Tiner, R. W., H. C. Bergquist, G. P. DeAlessio, and M. J. Starr. 2002. Geographically Isolated Wetlands: A Preliminary Assessment of their Characteristics and Status in Selected Areas of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Northeast Region, Hadley, MA.**

In the Rainelle quad of WV, isolated wetlands comprise about 40% (by area) or 65% (by count) of total wetlands.

**TNC [The Nature Conservancy]. 1994. Rare plant communities of the conterminous United States: an initial survey. Arlington, VA. 620 pp.**

Community descriptions: *Fraxinus nigra*-*Abies balsamea*/*Rhamnus alnifolia* woodland (would make one EO); *Juniperus virginiana* -*Ostrya virginiana*/*Bouteloua curtipendula* sparse woodland (references Bargtis 1985, 1993); *Pinus rigida*/*Quercus ilicifolia*-*Rhododendron canadense* sparse woodland (questionable occurrence in WV)

**TNC [The Nature Conservancy]. 1997. Rare Insects Discovered at Cranesville. The Nature Conservancy, Maryland.**

Rare insect records for Cranesville Swamp; cited in TNC 2001, Site Conservation Plan for Cranesville Swamp.

**TNC [The Nature Conservancy]. 2001. Cranesville Swamp Site Conservation Plan. Elkins, WV.**

This plan includes conservation targets, threat assessment, physical context, history, rare species, composite community descriptions, and regional context. The full text (including many color fold-out maps) is available at the TNC office in Elkins.

**Trianosky, P. 1994. A classification of the terrestrial plant communities of West Virginia. West Virginia Natural Heritage Program Technical Report 94-2, First Draft. West Virginia Division of Natural Resources, Elkins, WV.**

First draft, preliminary classification of WV plant communities.

**Tyrrell, L. E., G. J. Nowacki, T. R. Crow, D. S. Buckley, E. A. Nauertz, J. N. Niese, J. L. Rollinger, and J. C. Zasada. 1998. Information about old growth for selected forest type groups in the eastern United States. General Technical Report NC-197, USDA North Central Forest Experiment Station. St. Paul, MN. 507 pp.**

Compiles information about old-growth attributes for nine forest type groups that occur in the eastern United States. A range of values for each old-growth attribute for each forest type is summarized regionally from published and unpublished sources. Key words: old growth, old-growth forest, forest structure, coarse woody debris.

**Udevitz, M. S. and E. D. Michael. 1982. Wildlife use of wetlands in north central West Virginia. In: Proceedings of the Symposium on Wetlands of the Unglaciated Appalachian Region, B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 189-197.**

Survey of animal use of wetlands, includes bird and small mammal information.

**USDA [U.S. Department of Agriculture]. 1998. Field indicators of hydric soils in the United States. Hurt, G.W., P.M. Whited, and R.F. Pringle. (eds.). Version 4.0. USDA, NRCS, Ft. Worth, TX**

Primary reference used to by this project to identify hydric soils in the field.

**USDA [United State Department of Agriculture]. 1999. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. Agriculture Handbook 436, second edition. USDA Natural Resources Conservation Service. U.S. Government Printing Office. Washinton, D.C. 871 pp.**

The USDA maps wetland soils in the HEW project area as Hemists, Udifluvents, and Fluvaquents. Hemists are wet organic soils in which the organic material is moderately decomposed. Ground water is at or very close to the surface much of the time. Udifluvents are brown to reddish soils with a humid moisture regime that formed in recent water-deposited sediments. They occur in floodplains along streams and rivers and may be flooded at almost any time of year. Fluvaquents are stratified, wet soils on floodplains, reflecting deposition of sediments under changing currents and shifting channels.

**USDA and NRCS [U.S. Department of Agriculture and National Resource Conservation Service]. 2007. The PLANTS Database (<http://plants.usda.gov>, accessed 2005-2007). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.**  
Standard used for Plots2-WV database names.

**USEPA [U.S. Environmental Protection Agency]. 2002. Methods for evaluating wetland condition: Using vegetation to assess environmental conditions in wetlands. Office of Water, U. S. Environmental Protection Agency, Washington D.C. EPA-822-R-02-020.**  
Presentation of vegetation-based biological metrics to assess the environmental integrity of wetlands.

**USFWS [U. S. Fish and Wildlife Service]. 1992. National Wetland Inventory - West Virginia. Digital data files.**  
Digital/spatial data files of National Wetland Inventory for West Virginia.

**USFWS [U. S. Fish and Wildlife Service]. 1996. Draft national list of plant species that occur in wetlands: 1996 national summary.**  
Codes developed by the National Wetland Inventory to describe frequency of occurrence of vascular plant species in wetlands.

**Vanderhorst, J. P., J. Jeuck, and S. C. Gawler. 2007. Vegetation classification and mapping of New River Gorge National River, West Virginia. Technical Report NPS/NER/NRTR-2007/092. USDI National Park Service. Philadelphia, PA.**  
Community classification and mapping of uplands and wetlands at the New River Gorge National River.

**Venable, N. J. 1991. Cranesville Swamp. West Virginia University Extension Service Unique Areas Series 815. Morgantown, WV. 32 pp.**  
Natural history of the swamp, written for a popular audience.

**Venable, N. J. 1996. Dolly Sods. West Virginia University Extension Service Unique Areas Series 813. Morgantown, WV. 32 pp.**  
Natural history of Dolly Sods, written for a popular audience.

**Viti, D. H., P. Achuff and R. E. Andrus. 1975. The vegetation and chemical properties of patterned fens in the Swan Hills, north central Alberta. *Can. J. Bot.* 53: 2776-2795.**  
Three patterned fens in north central Alberta were analyzed to elucidate vegetation patterns in vascular plants and bryophytes. Two flark associations dominated by *Menyanthes trifoliata* and *Carex limosa*, both of which had *Sphagnum jensnii* and *Drepanocladus exannulatus* phases were recognized. The strings consist of two associations: one is dominated by *Betula glandulosa*, *Tomenthypnum falcifolium* and *Aulacomnium palustre*; the second is dominated by *Picea mariana*, *Sphagnum magellanicum* and *Ledum groenlandicum*. An intensive analysis of one fen reveals that these mires are 'poor fens' with a mean pH of 5.2 and Ca<sup>2+</sup> concentrations of 2.3 ppm. The fens occur on low drainage divides and Ca<sup>2+</sup> is depleted as water flows through the fens. An ecological series of bryophytes is described in the transitions between flarks and strings.

**Vogelmann, H. W. 1978. Evaluation of the Canaan Valley-Cabin Mountain wetland, Tucker County, W. Va. U. S. Army Corps of Engineers, Pittsburg Dist., Pittsburg, Pa.** Most watersheds in WV have <15% of their area in wetlands. However, the largest wetland complex in the central Appalachian region, Canaan Valley, has about 17% of its total watershed (35,000 acres) in wetlands (6,746 acres).

**Walbridge, M. R. 1982. Vegetation patterning and community distribution in four high-elevation headwater wetlands in West Virginia. Thesis. WVU, Morgantown.** 74 plots entered into Plots2-WV database. Data analysis indicate the presence of a large number of individual community types four wetlands, which can be grouped into forest, shrub, herbaceous and bryophyte physiognomic.

**Walbridge, M. R. 1994. Plant community composition and surface water chemistry of fen peatlands in West Virginia's Appalachian Plateau. *Water, Air, & Soil Pollution* 77 (3-4): 247-269.**

Walbridge analyzed plant community composition, surface water chemistry, soil saturation, landscape position, and disturbance history in 4 small peatlands in WV's Allegheny Plateau, to determine vegetational differences among communities and identify environmental variables associated with community patterning. Thirty-four plant communities were identified, representing 5 physiognomic types: forest, tall and low shrub, herbaceous, and bryophyte. Of 138 species, only 34 were common to all sites; 56 were unique to single sites. Principal components analysis identified a major physiognomic separation between forest and tall shrub communities with less acid surface waters (pH 4.6–5.0) dominated by base cations (Ca<sup>++</sup>, Mg<sup>++</sup>, Na<sup>+</sup>, K<sup>+</sup>), vs. low shrub and bryophyte communities with more acidic surface waters (pH 4.0–4.4). Much of the variation in community composition resulted from changes in the distributions of *Hypericum densiflorum*, *Rubus hispidus*, *Polytrichum commune*, and *Sphagnum fallax*, with changes in soil saturation. Community distribution reflected an underlying pattern of basin geomorphology modified by beaver disturbance.

**Walbridge, M. R. and G. E. Lang. 1982. Major plant communities and patterns of community distribution in four wetlands of the unglaciated Appalachian Region. In: B.R. McDonald (ed.), *Symposium on Wetlands of the Unglaciated Appalachian Region*. WVU, Morgantown. Pp 131-142.**

36 distinct community types within 4 wetlands based on variations in species and dominance were found using cluster analysis of percent cover. Community list is included. Communities were based upon dominant species, and separated by category based on physiognomic type. PCA used in analysis.

**Walker, P. C. and R. T. Hartman. 1960. The forest sequence of the Hartstown Bog area in Western Pennsylvania. *Ecology* 41: 461-474.**

The forest sequence of northwestern Pennsylvania is interpreted through the pollen stratigraphy of glaciated bogs.

**Walton, D. P., C. M. Jesse, and N. J. Putnam. 1996. Plant communities of the Ohio River riparian zone. Natural Heritage Program, West Virginia Division of Natural Resources, Elkins.**

Aerial photography and topo maps used to locate physiognomic vegetation classes (forest, woodland, shrubland, herbaceous) along Gauley River floodplain. Total of 37 plots ranging in size from 40-100 square meters. TWINSpan used to summarize vegetation classes. Canonical correspondence analysis was used to relate vegetation patterns to set of environmental factors. CANOCO showed that the variables most highly correlated with differences in vegetation pattern were elevation and soil stoniness. Forest and woodland community types included: 1) *Betula nigra*-*Platanus occidentalis* / *Xanthorhiza simplicissima* woodland 2) *Liquidambar styraciflua*-*Carpinus caroliniana* woodland 3) *Tsuga canadensis*-*Betula nigra* / *Rhododendron maximum* woodland; Herbaceous communities included: 1) *Andropogon gerardii*-*Sorghastrum nutans*-*Euphorbia corollata* cobble grassland 3) *Justicia americana*-*Andropogon gerardii* herbaceous channel bed.

**Walton, D., N. Putnam, and P. Trianosky. 1997. A classification of terrestrial plant communities of West Virginia, 2nd draft. Nongame Wildlife and Natural Heritage Program, Wildlife Section, Division of Natural Resources, Elkins, WV.**

Preliminary community classification for West Virginia.

**Watts, W. A. 1979. Late Quaternary Vegetation of Central Appalachia and the New Jersey Coastal Plain. Ecological Monographs 49(4):427-469.**

Stable vegetation in the higher mountains of central Appalachia was sedge tundra while the Wisconsin ice sheet was at its outer limit. Lower elevation were characterized by conifer forests of spruce, pine, and dwarf birch. With climatic warming about 13,000 years B.P., *Abies balsamea*, *Pinus banksiana* and *Alnus cf. rugosa* invaded together with diverse tree and shrub species. *Picea rubens* is noted about 11,500 years B.P., along with *Pinus strobus*, *Larix laricina*, *Betula papyrifera*, and *Pinus rigida*. Tamarack seems to have migrated eastward from a glacial refuge south of the Great Lakes region. As the ice withdrew *Tsuga* appeared in large populations in central Appalachia. *Castanea*, a slow migrant, took 5000 years to reach southern New England from central Appalachia. Climatically, the periglacial region was cold, dry, and windy. From 10,000-6,000 years B.P. the climate became warmer and wetter (warmer and drier than the present). In this period *Pinus* expanded, and bogs and swamps were formed.

**Weakley, A. S. 2005. Flora of the Carolinas, Virginia, and Georgia. University of North Carolina Herbarium.**

Draft June 10, 2005. Floristic keys. One of the references used for identification of vascular plant collections of the high elevation wetlands project.

**Webb, L. O. and D. E. Samuel. 1982. Woodcock habitat inventory and wetlands in northern West Virginia. Unpublished report.**

Best sites for woodcock sightings included areas with dense shrub cover, 10-20 ft in height, on mostly level ground with moist soils.

**Whitaker, Jr., J. O. 2004. *Sorex cinereus*. Mammalian Species (743): 1-9.**

Information and species account of the masked shrew.

**Whitehead, D. R. 1973. Late Wisconsin vegetational changes in unglaciated eastern North America. Quaternary Research 3: 621-631.**

Full-glacial vegetation at Round Glade (Cranberry Glades) is shown as “Tundra and Taiga” in a tentative reconstruction.

**Wieder, R. K. 1982. Biogeochemical relationships in Sphagnum-dominated wetlands in West Virginia. Dissertation. West Virginia University, Morgantown.**  
Cited in Wieder 1985.

**Wieder, R. K. 1985. Peat and water chemistry at Big Run Bog, a peatland in the Appalachian mountains of West Virginia, USA. Biogeochemistry 1:277-302.**  
Bulk density, organic matter, water content of peat. pH, cations. Conclusion that Big Run bog is physiographically a minerotrophic fen (receives inflows from uplands), but chemically similar to an ombrotrophic bog. Deepest basal peat was radio-carbon dated to 13,080±420 yr B.P. (Wieder 1982), so thinness of peat is more likely due to high decomposition than to low production or young age.

**Wieder, R. K. and G. E. Lang. 1980. Vegetation and Water Chemistry in as Sphagnum-dominated Wetland in West Virginia. Preliminary report, Dept of Biology, WVU.**  
Earlier draft of Wieder et al 1981 Castanea paper, this draft has more data. Communities: 4 added to community data spreadsheet.

**Wieder, R. K. and G. E. Lang. 1982. Modification of acid mine drainage in a freshwater wetland. In: Proceedings of the Symposium on Wetlands of the Unglaciaded Appalachian Region , B.R. MacDonald, ed. West Virginia University, Morgantown, May 26-28, 1982. pp. 43-53.**  
Decline of hydrogen and sulfate ions with increasing distance from surface mine, wetland (due to sulfur reducing bacteria) may help buffer pH from surface mine runoff.

**Wieder, R. K. and G. E. Lang. 1983. Net primary production of the dominant bryophytes in a Sphagnum-dominated wetland in West Virginia. The Bryologist 86:278-284.**  
Measurements of annual net primary production of Sphagnum magellanicum, Sphagnum recurvum, and Polytrichum commune were 5.4, 6.1, and 7.9g dry mass dm<sup>-2</sup>, respectively, at Big Run Bog-a wetland in the unglaciaded Appalachian Plateau of West Virginia. Production values for these three species were greater than other reported values in the literature. A general increase in annual production of Sphagnum spp. with decreasing latitude was documented. This trend is contrary to the progressive declines in the depths and sizes of inland peat deposits with decreasing latitude, suggesting that annual production is less important than annual decomposition in determining peat accumulation.

**Wieder, R. K., A. M. McCormick and G. E. Lang. 1981. Vegetational analysis of Big Run Bog, a nonglaciaded Sphagnum bog in West Virginia. Castanea 46:16-29.**  
Data from 126 nested plots were collected in 1977 and assessed using minimum variance cluster analysis to delineate 4 community types in the bryophyte-sedge portion of the wetland. A total of 36 taxa were noted. Elizabeth Byers spoke to Kelman Wieder on the phone on February 3, 2005. Dr. Wieder has continued to visit Big Run Bog and notes that it seems to be drying. Sphagnum cover has diminished since 1977, despite localized flooding by beaver.

**Wieder, R. K., J. Canadell, J. Limpens, T. Moore, N. Roulet, G. Schaepman-Strub. 2007. Peatlands and the Carbon Cycle: from local processes to global implications. EOS 88(29):295.**

Boreal and subarctic peatlands cover 3% of the Earth's land surface and store 15-30% of the world's soil carbon (200-400 petagrams) as peat. Peatlands are a major historical carbon sink, contributing to global cooling on millennial scales. Human influences (water table drawdown, enhanced atmospheric N deposition, and fire) are converting some peatlands to net sources of carbon.

**Wieder, R. K., J. Yavitt, G. Lane, and C. Bennett. 1989. Aboveground net primary production at Big Run Bog, West Virginia. Castanea 54:209-216**

Big Run Bog dominated by bryophyte coverage of 67.6%. This contributes 43% to total NPP (1045 g/m<sup>2</sup>). Three bryophyte species measured were *Sphagnum fallax*, *S. magellanicum*, and *Polytrichum commune*. These species account for 87% of bryo. cover and 88% of total bryo. production.

**Wise, D. 1981. Small Mammal Population Study for Cranesville Swamp. Math/Science and Technology Division. Observations. Garrett Community College, McHenry, MD 2(1):16-19.**

Small mammal records for Cranesville Swamp; cited in TNC 2001, Site Conservation Plan for Cranesville Swamp.

**WVDNR [West Virginia Division of Natural Resources]. 2007a. Unpublished data maintained by the West Virginia Natural Heritage Program, WVDNR, Elkins, WV. Natural Heritage databases, unpublished data.**

**WVDNR [West Virginia Division of Natural Resources]. 2007b. Odonata Atlas Project, unpublished data. WVDNR, Elkins, WV.**

Collection records with location and some habitat data for odonata in West Virginia.

**WVDNR [West Virginia Division of Natural Resources]. 2007c. Plots2-WV database of community ecology plots. West Virginia Natural Heritage Program, WVDNR, Elkins, WV. Natural Heritage community ecology plots database.**

**WVDNR [West Virginia Division of Natural Resources]. 2007d. Biotics database.records of rare species and natural communities. West Virginia Natural Heritage Program. WVDNR. Elkins, WV.**

Biotics database records for West Virginia plant species, animal species, and natural communities, ranked for conservation purposes.

**WVDNR [West Virginia Division of Natural Resources]. 2007e. WV Curatorial Database System maintained by West Virginia Natural Heritage Program. Label database of herbarium specimens from West Virginia University Herbarium, Youngstown State University Herbarium, Marshall University Herbarium, West Virginia Natural Heritage Program Herbarium, Davis and Elkins College Herbarium, Carnegie Museum of Natural History Herbarium, Virginia Polytechnic Institute and State University, University of**

**South Carolina Herbarium, and the private collections of Paul J. Harmon, Scott Shriver, Al Shriver, Clete Smith, and James P. Vanderhorst. West Virginia Natural Heritage Program, WVDNR, Elkins, WV.**

Label data for WV herbarium records from several herbaria and private collectors.

**WVGES [West Virginia Geological and Economic Survey]. 1986. Geologic Map of West Virginia. West Virginia Geological and Economic Survey, Morgantown, WV.**

Geologic map of West Virginia.

**WVNPS [West Virginia Native Plant Society]. 2004. Botanical Bonanzas of West Virginia. Native Notes 12 (2). West Virginia Native Plant Society, New Haven, WV.**

Includes approximate locations of some rare wetland plants. Very brief history of Canaan Valley.

**WVPIF [West Virginia Partners in Flight]. 2006. Bird point counts and associated habitat database. West Virginia Division of Natural Resources, Wildlife Resources Section, Wildlife Diversity Unit. Elkins, WV.**

Bird point count data and habitat data for the high elevation wetlands project area.

**WVSBA [West Virginia State Board of Agriculture]. 1908. Quarterly Reports**

“The spruce region, at the time of the Civil War.. .was one of the most impenetrable forests in the United States. The soil over most of it was composed of moss and humus often a foot, occasionally two feet thick.” Cited in Clarkson 1964.

**WVSOS [West Virginia Save Our Streams]. 2004. West Virginia Wetland Walk Manual. Charleston, WV (adapted from US EPA Region 10 Wetland Walk Manual).**

Volunteer guide to wetland monitoring in West Virginia.

**Wykle, J. 2005. Small mammal collections from Cranberry Glades. West Virginia Natural Heritage Program, WVDNR, Elkins, WV. Unpublished spreadsheet.**

Small mammal collections made in 2004-2005 as part of the high elevation wetland classification project at WVDNR.

**Yabe, K. and S. Uemura. 2001. Variation in size and shape of Sphagnum hummocks in relation to climatic conditions in Hokkaido Island, northern Japan. Can. J. Bot./Rev. Can. Bot. 79(11): 1318-1326.**

Community: Sphagnum hummocks. Regional variation in size and shape of Sphagnum hummocks of eight lowland mires throughout Hokkaido Island, northern Japan, was examined in relation to climatic factors. Multiple regression analysis revealed that the mean and maximum heights and height/basal area of hummocks were negatively correlated with evapotranspiration rate (E<sub>0</sub>) in summer, duration of sunshine, and air temperature. Because the regional difference of the hummock form was not related to the difference in nutrient conditions, the effects of evapotranspiration and precipitation prevailed over edaphic conditions. Consequently, lower and flat hummocks were a result of the higher E<sub>0</sub> in summer, moderately raised and conical hummocks of the medium E<sub>0</sub> and high precipitation, and extremely raised and cylindrical hummocks of a lower E<sub>0</sub> due to prolonged foggy days.

**Yavitt, J. B. 1994. Carbon dynamics in Appalachian peatlands of West Virginia and western Maryland. *Water, Air, and Soil Pollution* 77:271-290.**

Abundant production of organic matter that decomposes slowly under anaerobic conditions can result in substantial accumulation of soil organic matter in wetlands. The study amends typical estimates for both production and decomposition of organic matter by measuring net flux of carbon dioxide (CO<sub>2</sub>) over the peat surface within a conifer swamp, a sedge-dominated marsh, and a bog in the Appalachian Mountain region of West Virginia and western Maryland, USA. The sites are relatively productive, with net primary production of 30 to 82.5 mol C m<sup>-2</sup> yr<sup>-1</sup>, but peat deposits are shallow with an average depth of about 1 m. In summer, all three sites showed net CO<sub>2</sub> flux from the atmosphere to the peat during the daytime, supported by net photosynthesis, which was less than net CO<sub>2</sub> flux from the peat into the atmosphere at nighttime, supported by ecosystem respiration. The imbalance between these estimates suggests a net loss of carbon from these ecosystems. The positive net CO<sub>2</sub> flux seems to be so high because organic matter decomposition occurs throughout the peat deposit. As a result concentrations of dissolved inorganic carbon in peat pore waters reached 4,000 mol L<sup>-1</sup> by late November, and concentrations of dissolved organic carbon in peat pore waters reached 12,000 mol L<sup>-1</sup>. Comparing different approaches revealed several features of organic matter dynamics: (i) peat accretion in the top 30 cm of the peat deposit results in a C accumulation rate of about 15 mmol m<sup>-2</sup> d<sup>-1</sup>; however, (ii) the entire peat deposit has a negative C balance losing about 20 mmol m<sup>-2</sup> d<sup>-1</sup>.

Appendix E in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007.  
**Classification and Conservation Assessment of High Elevation Wetland  
Communities in the Allegheny Mountains of West Virginia.** West Virginia  
Natural Heritage Program, WVDNR. Elkins, WV.

## Appendix F. Animal Species Records and Conservation Ranks

<b>Vertebrates .....</b>	<b>1</b>
Mammals .....	1
Breeding Birds .....	5
Reptiles and Amphibians .....	10
<b>Invertebrates.....</b>	<b>12</b>
Snails .....	12
Crayfish .....	13
Dragonflies and Damselflies.....	14
Butterflies and Moths.....	20
Beetles.....	23
Gnats, Mosquitoes, and True Flies .....	25
True Bugs.....	28
Ants, Bees, Wasps and Sawflies.....	31
Crickets, Grasshoppers, Katydid, and Locusts .....	32
Stoneflies .....	32
Barklice .....	32
Caddisflies .....	33
Springtails.....	33
Spiders .....	33
Harvestmen .....	36
<b>Sources:.....</b>	<b>36</b>

### Vertebrates

#### Mammals

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Blarina brevicauda</i>	Northern Short-Tailed Shrew			Francl et al. 2003, Wykle 2005, CVNWR 2007b, Marshall U. 1994, TNC 2001	wet meadows, shrub swamps, sedge fens, and cranberry bogs throughout the high Allegheny wetlands
<i>Canis latrans</i>	Coyote			Marshall U. 1994, TNC 2001	Sinks of Gandy, Cranesville Swamp
<i>Castor canadensis</i>	Beaver			Marshall U. 1994, TNC 2001	throughout the high Allegheny wetlands

<i>Clethrionomys gapperi</i>	Southern Red-Backed Vole			Francl et al. 2003, Wykle 2005, WVDNR 2007a, Marshall U. 1994, TNC 2001	wetland species; shrub peatlands, spruce swamps, sedge fens, cranberry bogs, and seeps throughout the high Allegheny wetlands
<i>Condylura cristata</i>	Star-Nosed Mole	S2	G5	Marshall U. 1994, TNC 2001	wetland species; Cranberry Glades, Canaan Valley, Cranesville Swamp
<i>Didelphis virginiana</i>	Virginia Opossum			Marshall U. 1994, TNC 2001	Cranberry Glades, Cranesville Swamp
<i>Felis rufus</i>	Bobcat			Marshall U. 1994, TNC 2001	Beaverdam Run, Cranesville Swamp
<i>Glaucomys sabrinus</i>	Northern Flying Squirrel			Marshall U. 1994	Cranberry Glades
<i>Glaucomys sabrinus fuscus</i>	WV northern flying squirrel	S2	G5T2 LE	Marshall U. 1994	Blister Run Swamp, Cranberry Glades
<i>Glaucomys volans</i>	Southern Flying Squirrel			Marshall U. 1994	Cranberry Glades
<i>Lepus americanus</i>	Snowshoe Hare			Marshall U. 1994, TNC 2001	Cranberry Glades, Dolly Sods, historic at Cranesville Swamp
<i>Lutra canadensis</i>	River Otter			TNC 2001	wetland species; Cranesville Swamp
<i>Lynx rufus</i>	Bobcat			Marshall U. 1994	Upper Shavers Fork
<i>Marmota monax</i>	Groundhog			Marshall U. 1994, TNC 2001	Cranberry Glades, Cranesville Swamp
<i>Martes pennanti</i>	Fisher	S3	G5	TNC 2001	Cranesville Swamp
<i>Mephitis mephitis</i>	Striped Skunk			TNC 2001	Cranesville Swamp
<i>Microtus chrotorrhinus</i>	Rock Vole			Marshall U. 1994	Cranberry Glades, Dolly Sods
<i>Microtus pennsylvanicus</i>	Meadow Vole			Francl et al. 2003, Wykle 2005, Marshall U. 1994, TNC 2001	wetland species; spruce swamps, shrub swamps, sedge fens, wet meadows, and cranberry bogs throughout the high Allegheny wetlands
<i>Microtus pinetorum</i>	Woodland Vole			Marshall U. 1994	Canaan Valley (Glade Run)
<i>Mustela frenata</i>	Long-Tailed Weasel			Marshall U. 1994, TNC 2001	Cranberry Glades, Dolly Sods, Cranesville Swamp

<i>Mustela vison</i>	Mink			Marshall U. 1994, TNC 2001	wetland species; Cranberry Glades, Canaan Valley, Cranesville Swamp
<i>Myotis lucifugus</i>	Little Brown Bat			Marshall U. 1994, TNC 2001	Dolly Sods, Sinks of Gandy, Cranesville Swamp
<i>Napaeozapus insignis</i>	Woodland Jumping Mouse			Francl et al. 2003, CVNWR 2007b, Marshall U. 1994, TNC 2001	throughout the high Allegheny wetlands
<i>Neotoma floridana</i>	Eastern Woodrat			Marshall U. 1994	Cranberry Glades, Dolly Sods
<i>Odocoileus virginianus</i>	Whitetail Deer			TNC 2001	Cranesville Swamp
<i>Ondatra zibethicus</i>	Muskrat			Marshall U. 1994, TNC 2001	wetland species: Beaverdam Run, Glady Fork, Cranesville Swamp
<i>Parascalops breweri</i>	Hairy-tailed Mole			Marshall U. 1994, TNC 2001	Cranberry Glades, Cranesville Swamp
<i>Peromyscus leucopus</i>	White-footed Mouse			Wykle 2005, Marshall U. 1994	throughout the high Allegheny wetlands
<i>Peromyscus leucopus noveboracensis</i>	Northern White-footed Mouse			TNC 2001	Cranesville Swamp
<i>Peromyscus maniculatus</i>	Deer Mouse			Francl et al. 2003, Wykle 2005, WVDNR 2007a, Marshall U. 1994	bogs, shrub swamps, and seeps throughout the high Allegheny wetlands
<i>Peromyscus maniculatus nubiterrae</i>	Cloudland Deer Mouse			TNC 2001	Cranesville Swamp
<i>Procyon lotor</i>	Raccoon			TNC 2001	Cranesville Swamp
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel			Marshall U. 1994, TNC 2001	Cranberry Glades, Cranesville Swamp
<i>Sciurus niger</i>	Fox Squirrel			TNC 2001	Cranesville Swamp

<i>Sorex cinereus</i>	Masked Shrew			CVNWR 2007b, Francl et al. 2003, Marshall U. 1994, TNC 2001	wetland species; shrub peatlands and bogs throughout the high Allegheny wetlands
<i>Sorex fumeus</i>	Smoky Shrew			Wykle 2005, CVNWR 2007b, Marshall U. 1994, TNC 2001	wetland species; spruce swamps, shrub swamps, sedge fens, cranberry bogs, and wet meadows throughout the high Allegheny wetlands
<i>Sorex hoyi</i>	Pygmy Shrew			CVNWR 2007b, Marshall U. 1994	Canaan Valley
<i>Sorex palustris punctulatus</i>	Southern Water Shrew	S1	G5T3	Marshall U. 1994, TNC 2001	wetland species; Cranesville Swamp: conifer swamp, hardwood swamp, shrub swamp, bog peatland/wet meadow; Blister Run Swamp
<i>Sylvilagus floridanus</i>	Eastern Cottontail			Marshall U. 1994, TNC 2001	Cranesville Swamp, Cranberry Glades, Dolly Sods
<i>Synaptomys cooperi</i>	Southern Bog Lemming	S2	G5	Francl et al. 2003, Wykle 2005, Marshall U. 1994	wetland species; open sedge fens, wet meadows, and shrub peatlands throughout the high Allegheny wetlands
<i>Tamias striatus</i>	Eastern Chipmunk			Marshall U. 1994, TNC 2001	throughout the high Allegheny wetlands
<i>Tamiasciurus hudsonicus</i>	Red Squirrel			Marshall U. 1994, TNC 2001	Cranesville Swamp, Red Run NW of Cheat Bridge
<i>Urocyon cinereoargenteus</i>	Gray Fox			Marshall U. 1994, TNC 2001	Glady Fork, Cranesville Swamp
<i>Ursus americanus</i>	American Black Bear			Marshall U. 1994, TNC 2001	Cranberry Glades, Cranesville Swamp
<i>Vulpes vulpes</i>	Red Fox			Marshall U. 1994, TNC 2001	Cranberry Glades, Beaverdam Run, Cranesville Swamp

<i>Zapus hudsonius</i>	Meadow Jumping Mouse	S3	G5	Francl et al. 2003, Wykle 2005, CVNWR 2007b, Marshall U. 1994, TNC 2001	wetland species; forested swamps, shrub swamps, sedge fens, and wet meadows throughout the high Allegheny wetlands
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### Breeding Birds

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Accipiter striatus</i>	Sharp-shinned Hawk	S3B,S4N	G5	Buckelew and Hall 1994, TNC 2001	broad distribution in WV; may be declining; known from conifer swamps at Cranesville
<i>Aegolius acadicus</i>	Northern Saw-Whet Owl	S2B, S3N	G5	WVPIF 2006, TNC 2001	typical of spruce forests in WV; sometimes nests in wetlands; known from conifer swamps at Cranesville
<i>Agelaius phoeniceus</i>	Red-winged Blackbird			WVPIF 2006	broad distribution in WV
<i>Aix sponsa</i>	Wood Duck			WVPIF 2006	broad distribution in WV wetlands
<i>Archilochus colubris</i>	Ruby-throated Hummingbird			WVPIF 2006	broad distribution in WV
<i>Ardea herodias</i>	Great Blue Heron	S2B,S4N	G5	WVPIF 2006	broad distribution in WV wetlands
<i>Bombycilla cedorum</i>	Cedar Waxwing			WVPIF 2006	broad distribution in WV
<i>Bonasa umbellus</i>	Ruffed Grouse			WVPIF 2006	broad distribution in WV
<i>Branta canadensis</i>	Canada Goose			WVPIF 2006	broad distribution in WV
<i>Buteo jamaicensis</i>	Red-tailed Hawk			WVPIF 2006	broad distribution in WV
<i>Buteo lineatus</i>	Red-shouldered hawk			WVPIF 2006	broad distribution in WV
<i>Butorides virescens</i>	Green Heron			WVPIF 2006	broad distribution in WV wetlands
<i>Cardinalis cardinalis</i>	Northern Cardinal			WVPIF 2006	broad distribution in WV
<i>Carduelis tristis</i>	American Goldfinch			WVPIF 2006, TNC 2001	broad distribution in WV?
<i>Carpodacus purpureus</i>	Purple Finch			TNC 2001	typical of higher elevations in WV; known from Cranesville Swamp
<i>Cathartes aura</i>	Turkey Vulture			WVPIF 2006	broad distribution in WV

<i>Catharus fuscescens</i>	Veery			WVPIF 2006	typical of higher elevations in WV
<i>Catharus guttatus</i>	Hermit Thrush			Francl 2003, WVPIF 2006, TNC 2001	typical of higher elevations in WV
<i>Certhia americana</i>	Brown Creeper	S3B,S4N	G5	WVPIF 2006, TNC 2001	broad distribution in WV, with most records from the Allegheny Mountains
<i>Ceryle alcyon</i>	Belted Kingfisher			WVPIF 2006	broad distribution in WV
<i>Circus cyaneus</i>	Northern Harrier	S1B, S3N	G5	Buckelew and Hall 1994, TNC 2001	favors wet meadows and mountain bogs, and also nests in fields or reclaimed strip mines; known from conifer swamp and bog peatland/wet meadow at Cranesville
<i>Cistothorus plantensis</i>	Sedge Wren	S1B	G5	Buckelew and Hall 1994	known from high Allegheny wetlands in WV; populations may be declining in eastern USA; nests in sedge fens and wet graminoid meadows
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo			WVPIF 2006	broad distribution in WV
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo			TNC 2001, Buckelew and Hall 1994	broad distribution in WV, mostly lower elevations
<i>Colaptes auratus</i>	Northern Flicker			WVPIF 2006	broad distribution in WV
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S1B	G4	WVPIF 2006	known from spruce forests and high Allegheny wetlands in WV; declining neotropical migrant, favors bogs, old beaver meadows, and other openings in red spruce forests, especially where standing snags are present
<i>Contopus virens</i>	Eastern Wood Pewee			WVPIF 2006	broad distribution in WV
<i>Corvus brachyrhynchos</i>	American Crow			WVPIF 2006	broad distribution in WV
<i>Corvus corax</i>	Common Raven			WVPIF 2006	broad distribution in WV
<i>Cyanocitta cristata</i>	Blue Jay			WVPIF 2006	broad distribution in WV
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler			WVPIF 2006	typical of higher elevations and spruce forests in WV
<i>Dendroica discolor</i>	Prairie Warbler			WVPIF 2006	broad distribution in WV

<i>Dendroica dominica</i>	Yellow-throated Warbler			WVPIF 2006	broad distribution in WV
<i>Dendroica fusca</i>	Blackburnian Warbler	S3B	G5	WVPIF 2006	typical of spruce forests and adjacent high Allegheny wetlands in WV
<i>Dendroica magnolia</i>	Magnolia Warbler			WVPIF 2006	typical of spruce forests in WV
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler			WVPIF 2006	typical of higher elevations in WV
<i>Dendroica petechia</i>	Yellow Warbler			WVPIF 2006	broad distribution in WV
<i>Dendroica virens</i>	Black-throated Green Warbler			WVPIF 2006	broad distribution in WV
<i>Dryocopus pileatus</i>	Pileated Woodpecker			WVPIF 2006	broad distribution in WV
<i>Dumetella carolinensis</i>	Gray Catbird			WVPIF 2006	broad distribution in WV
<i>Empidonax alorum</i>	Alder Flycatcher	S3B,S4N	G5	WVPIF 2006, TNC 2001	typical of high Allegheny wetlands in WV; northern wetland bird, often found in alder swamps; known from shrub swamp and bog peatland/wet meadow at Cranestown
<i>Empidonax minimus</i>	Least Flycatcher			WVPIF 2006	broad distribution in WV
<i>Empidonax traillii</i>	Willow Flycatcher			WVPIF 2006	broad distribution in WV; fairly common in high elevation willow or alder swamps; may be replacing alder flycatcher in some habitats
<i>Empidonax virescens</i>	Acadian Flycatcher			WVPIF 2006	broad distribution in WV wetlands
<i>Gallinago delicata</i>	Wilson's Snipe	S1B,S1N	G5	Buckelew and Hall 1994	typical of high Allegheny wetlands in WV, its southernmost breeding ground in USA
<i>Geothlypis trichas</i>	Common Yellowthroat			WVPIF 2006	broad distribution in WV wetlands, common in high Allegheny wetlands
<i>Hylocichla mustelina</i>	Wood Thrush			WVPIF 2006	broad distribution in WV
<i>Icteria virens</i>	Yellow-breasted Chat			WVPIF 2006	broad distribution in WV, mostly lower elevations
<i>Junco hyemalis</i>	Dark-eyed Junco			Francl 2003, WVPIF 2006, TNC 2001	typical of higher elevations and spruce forests in WV; known from conifer and hardwood swamps at Cranestown

<i>Melanerpes carolinus</i>	Red-bellied Woodpecker			WVPIF 2006	broad distribution in WV
<i>Meleagris gallopavo</i>	Wild Turkey			WVPIF 2006	broad distribution in WV
<i>Melospiza georgiana</i>	Swamp Sparrow			WVPIF 2006	common and typical of high Allegheny wetlands in WV; favors alder swamps and other wetlands with low bushes or trees
<i>Melospiza melodia</i>	Song Sparrow			WVPIF 2006	broad distribution in WV
<i>Mniotilta varia</i>	Black and White Warbler			WVPIF 2006	broad distribution in WV
<i>Molothru ater</i>	Brown-headed Cowbird			WVPIF 2006	broad distribution in WV
<i>Myiarchus crinitus</i>	Great-crested Flycatcher			WVPIF 2006	broad distribution in WV
<i>Oporornis philadelphia</i>	Mourning Warbler			WVPIF 2006, TNC 2001	typical of higher elevations in WV, in gaps
<i>Oporornis formosus</i>	Kentucky Warbler			WVPIF 2006	broad distribution in WV
<i>Parula americana</i>	Northern Parula			WVPIF 2006	broad distribution in WV
<i>Parus bicolor</i>	Tufted Titmouse			WVPIF 2006	broad distribution in WV
<i>Passerina cyanea</i>	Indigo Bunting			WVPIF 2006	broad distribution in WV
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak			WVPIF 2006	broad distribution in WV
<i>Picoides pubescens</i>	Downy Woodpecker			WVPIF 2006	broad distribution in WV
<i>Picoides villosus</i>	Hairy Woodpecker			WVPIF 2006	broad distribution in WV
<i>Pipilo erythrophthalmus</i>	Rufous-sided Towhee			WVPIF 2006	broad distribution in WV
<i>Piranga olivacea</i>	Scarlet Tanager			WVPIF 2006	broad distribution in WV
<i>Poecile atricapillus</i>	Black-capped Chickadee			WVPIF 2006, TNC 2001	typical of higher elevations in WV
<i>Quiscalus quiscula</i>	Common Grackle			WVPIF 2006	broad distribution in WV
<i>Regulus satrapa</i>	Golden-crowned Kinglet			WVPIF 2006, TNC 2001	typical of spruce forests in WV; known from conifer swamp at Cranesville
<i>Sayornis phoebe</i>	Eastern Phoebe			WVPIF 2006	broad distribution in WV
<i>Scolopax minor</i>	American Woodcock			WVPIF 2006	broad distribution in WV wetlands
<i>Seiurus aurocapillus</i>	Ovenbird			WVPIF	broad distribution in WV

				2006	
<i>Seiurus motacilla</i>	Louisiana Waterthrush			WVPIF 2006, TNC 2001	broad distribution in WV, streamsides; known from Cranesville Swamp
<i>Seiurus noveboracensis</i>	Northern Waterthrush	S2B	G5	WVPIF 2006	typical of high Allegheny wetlands in WV; breeds in cool wooded swamps, bog thickets, and shrub swamps above 1000 meters elevation in the Alleghenies; may be declining, WV is southernmost breeding population.
<i>Setophaga ruticilla</i>	American Redstart			WVPIF 2006	broad distribution in WV
<i>Sitta canadensis</i>	Red-breasted Nuthatch			WVPIF 2006, TNC 2001	typical of spruce forests in WV; known from conifer swamp at Cranesville
<i>Sitta carolinensis</i>	White-breasted Nuthatch			WVPIF 2006	broad distribution in WV
<i>Spizella passerina</i>	Chipping Sparrow			WVPIF 2006	broad distribution in WV
<i>Spizella pusilla</i>	Field Sparrow			WVPIF 2006	broad distribution in WV, open habitats
<i>Strix varia</i>	Barred Owl			WVPIF 2006	broad distribution in WV
<i>Thryothorus ludovicianus</i>	Carolina Wren			WVPIF 2006	broad distribution in WV
<i>Toxostoma rufum</i>	Brown Thrasher			WVPIF 2006	broad distribution in WV
<i>Troglodytes aedon</i>	House Wren			WVPIF 2006	broad distribution in WV
<i>Troglodytes troglodytes</i>	Winter Wren			WVPIF 2006	typical of higher elevations and spruce forests in WV
<i>Turdus migratorius</i>	American Robin			WVPIF 2006	broad distribution in WV
<i>Tyrannus tyrannus</i>	Eastern Kingbird			WVPIF 2006	broad distribution in WV
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	S2B	G4	WVPIF 2006	broad distribution in WV
<i>Vermivora pinus</i>	Blue-winged Warbler			WVPIF 2006	broad distribution in WV
<i>Vermivora ruficapilla</i>	Nashville Warbler	S1B	G5	WVPIF 2006, TNC 2001	typical of higher elevations in WV; uses a variety of woodland and edge habitats, but generally nests in forest-bordered bogs near the Allegheny Front; known from Cranesville Swamp, especially along boggy margins of conifer swamp.

<i>Vireo griseus</i>	White-eyed Vireo			WVPIF 2006	broad distribution in WV
<i>Vireo olivaceus</i>	Red-eyed Vireo			WVPIF 2006	broad distribution in WV
<i>Vireo solitarius</i>	Blue-headed Vireo			WVPIF 2006	broad distribution in WV
<i>Wilsonia canadensis</i>	Canada Warbler			WVPIF 2006	typical of higher elevations in WV
<i>Wilsonia citrina</i>	Hooded Warbler			WVPIF 2006	broad distribution in WV
<i>Zenaidura macroura</i>	Mourning Dove			WVPIF 2006	broad distribution in WV
<i>Zonotrichia albicollis</i>	White-throated Sparrow			Buckelew and Hall 1994	known from high Allegheny wetlands in WV; nests in mountain bogs or thickets on the edge of spruce or spruce-hardwood forests

### ***Reptiles and Amphibians***

<b><u>Scientific Name</u></b>	<b><u>Common Name</u></b>	<b><u>State Rank</u></b>	<b><u>Global Rank</u></b>	<b><u>Source</u></b>	<b><u>Comment</u></b>
<i>Ambystoma jeffersonianum</i>	Jefferson's Salamander	S3	G4	Pauley 2006	Probable
<i>Ambystoma maculatum</i>	Spotted Salamander			Pauley 2006	Numerous locations throughout the high Allegheny wetlands
<i>Bufo americanus americanus</i>	Eastern American Toad			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands
<i>Chelydra serpentina serpentina</i>	Eastern Snapping Turtle			Pauley 2006	Numerous locations throughout the high Allegheny wetlands
<i>Coluber constrictor</i>	Black Racer			TNC 2001	Cranesville Swamp
<i>Desmognathus fuscus</i>	Northern Dusky Salamander			TNC 2001, CVNWR 2007b	Cranesville Swamp, Canaan Valley
<i>Desmognathus ochrophaeus</i>	Allegheny Mountain Salamander			TNC 2001, CVNWR 2007b	Cranesville Swamp, Canaan Valley
<i>Diadophis punctatus edwardsii</i>	Northern Ringneck Snake			TNC 2001	Cranesville Swamp
<i>Elaphe obsoleta</i>	Black Rat Snake			TNC 2001	Cranesville Swamp
<i>Eurycea longicauda</i>	Long-tailed Salamander			TNC 2001	Cranesville Swamp

<i>Gyrinophilus porphyriticus porphyriticus</i>	Northern Spring Salamander			Pauley 2006, TNC 2001, Francl 2003	Numerous locations throughout the high Allegheny wetlands
<i>Hemidactylium scutatum</i>	Four-toed Salamander			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands
<i>Hyla chrysoscelis</i>	Cope's Gray Treefrog			Pauley 2006	Numerous locations throughout the high Allegheny wetlands
<i>Hyla versicolor</i>	Gray Treefrog			Pauley 2006	Probable
<i>Lampropeltis triangulum</i>	Milksnake			TNC 2001	Cranesville Swamp
<i>Liochlorophis vernalis</i>	Smooth Green Snake			TNC 2001	Cranesville Swamp
<i>Nerodia sipedon sipedon</i>	Common Watersnake			Pauley 2006, TNC 2001	Numerous locations throughout the high Allegheny wetlands
<i>Notophthalmus viridescens viridescens</i>	Red-spotted Newt, Red Eft			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands
<i>Plethodon glutinosus</i>	Slimy Salamander			TNC 2001	Cranesville Swamp
<i>Plethodon nettingi</i>	Cheat Mountain Salamander	S2	G2 / LT	Francl 2003	Canaan Loop Road bog (emergent vegetation)
<i>Plethodon cinereus</i>	Red-backed Salamander			TNC 2001	Cranesville Swamp
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands
<i>Pseudotriton ruber ruber</i>	Northern Red Salamander	S3	G5	Pauley 2006, TNC 2001	Cranesville Swamp
<i>Rana clamitans melanota</i>	Northern Green Frog			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands

<i>Rana palustris</i>	Pickerel Frog			Pauley 2006, TNC 2001, CVNWR 2007b, Francl 2003	Numerous locations throughout the high Allegheny wetlands
<i>Rana sylvatica</i>	Wood Frog			Pauley 2006, TNC 2001, CVNWR 2007b	Numerous locations throughout the high Allegheny wetlands
<i>Regina septemvittata</i>	Queen Snake			Francl 2003	Canaan Valley: wet meadow
<i>Storeria dekayi</i>	Brownsnake			TNC 2001	Cranesville Swamp
<i>Storeria occipitomaculata occipitomaculata</i>	Red-bellied Snake			TNC 2001	Cranesville Swamp
<i>Thamnophis sirtalis sirtalis</i>	Garter Snake			TNC 2001, CVNWR 2007b	Cranesville Swamp, Canaan Valley
<i>Virginia valeriae puchra</i>	Mountain Earthsnake	S2	G5T3T4	TNC 2001	Cranesville Swamp: bog peatland/wet meadow

## Invertebrates

### Snails

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Anguispira alternata</i>	Flamed Disc		G5	WVDNR 2007a, Hubricht 1985	Cranberry Glades; wide habitat tolerance
<i>Appalachina sayana</i>	Spike-lip Crater		G5	WVDNR 2007a; MIDNR 2006	Cranberry Glades; in Michigan, known from hardwood and conifer forest, bog, swamp, riparian, and cliff habitats
<i>Mesodon zaletus</i>	Toothed Globe		G5	WVDNR 2007a	Cranberry Glades
<i>Mesomphix inornatus</i>	Plain Button		G5	WVDNR 2007a, Hotopp 2006	Cranberry Glades; tolerates a variety of leaf litter habitats
<i>Novisuccinea ovalis</i>	Oval Ambersnail		G5	WVDNR 2007a	Cranberry Glades; in Ontario prefers deciduous forest
<i>Neohelix albolabris</i>	Whitelip		G5	WVDNR 2007a	Cranberry Glades

<i>Neohelix dentifera</i>	Big-tooth Whitelip		G5	WVDNR 2007a	Cranberry Glades; in North-East USA in humid dead leaves.
<i>Triodopsis picea</i>	Spruce Knob Threetooth	S2	G3	TNC 2001	Cranesville: alder shrub swamp and upland forest, lives under leaf litter, prefers wet habitats and often found on calcium-poor soils
<i>Webbhelix multilineata</i>	Striped Whitelip	S1	G5	TNC 2001, Hotopp 2006	Cranesville: shrub swamp and bog peatland/wet meadow; inhabits large wetlands and river floodplains, semi-open sedge and shrub swamp habitat, wet meadows and marshes; often on skunk cabbage, which it may eat. It appears to use logs, rocks, moss hummocks and hillocks that develop around the foot of wetland shrubs for cover, to escape high water, and to overwinter.

## Crayfish

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Cambarus bartonii bartonii</i>	Appalachian Brook Crayfish			TNC 2001	Cranesville Swamp; small (2 m) to moderately wide (10 m) streams with high gradient having cobble and boulder substrates. In West Virginia, this subspecies is only found in the mountainous streams of the Potomac River drainage in the eastern panhandle.
<i>Cambarus carinirostris</i>	Rock Crayfish			Jezerinac et al. 1995, WVDNR 2007a	type locality is Gandy Creek at Osceola; occupies Allegheny Mtn province & northern panhandle; inhabits small streams to 10 m wide with cobble and boulder substrates; also in intermittent streams and seeps.
<i>Cambarus chasmodactylus</i>	New River Crayfish	S3	G4	WVDNR 2007a	East Fork Greenbrier, West Fork Greenbrier
<i>Cambarus monongalensis</i>	Monongahela Crayfish	S3	G5	Jezerinac et al. 1995, WVDNR 2007a	Allegheny Mtn region and northern panhandle; primary burrower - constructs burrows in seeps, springs, and roadside ditches. Presence of deciduous

					woods is important component of habitat.
<i>Cambarus robustus</i>	Big Water Crayfish			WVDNR 2007a	East Fork Greenbrier, West Fork Greenbrier
<i>Cambarus sciotensis</i>	Teays River Crayfish			WVDNR 2007a	Little Clear Creek, Cranberry River, Williams River
<i>Orconectes obscurus</i>	Allegheny Crayfish			Jezerinac et al. 1995, WVDNR 2007a	headwater streams (up to 10 m wide) with cobble and boulder substrates, that are not affected by acid mine drainage or clear-cutting in northern portion of state
<i>Orconectes sanbornii</i>	Sanborn Crayfish			WVDNR 2007a	Little Clear Creek

### ***Dragonflies and Damselflies***

<b><u>Scientific Name</u></b>	<b><u>Common Name</u></b>	<b><u>State Rank</u></b>	<b><u>Global Rank</u></b>	<b><u>Source</u></b>	<b><u>Comment</u></b>
<i>Aeshna canadensis</i>	Canada Darner	S1	G5	TNC 2001, WVDNR 2007b	high elevation; vegetated and boggy ponds and pools
<i>Aeshna tuberculifera</i>	Black-tipped Darner	S2	G4	TNC 2001, WVDNR 2007b	acidic vegetated and boggy ponds
<i>Aeshna umbrosa umbrosa</i>	Shadow Darner	S3		WVDNR 2007b	pond species widespread and common
<i>Aeshna verticalis</i>	Green-striped Darner	S2	G5	TNC 2001, WVDNR 2007b	high elevation; vegetated and marshy ponds and pools, may be spring-fed
<i>Amphiagrion saucium</i>	Eastern Red Damsel	S3		WVDNR 2007b	seep and ditch species widespread and fairly common
<i>Anax junius</i>	Green Darner	S5		WVDNR 2007b	pond species widespread and common
<i>Archilestes grandis</i>	Great Spreadwing	S3		TNC 2001, WVDNR 2007b	forested small streams, ditches, ponds often along forest edges
<i>Argia fumipennis violacea</i>	Variable Dancer	S5		TNC 2001, WVDNR 2007b	all habitats widespread and common
<i>Argia moesta</i>	Powdered Dancer	S5		WVDNR 2007b	common stream species

<i>Argia sedula</i>	Blue-ringed Dancer	S4		WVDNR 2007b	common stream species
<i>Argia tibialis</i>	Blue-tipped Dancer	S5		TNC 2001, WVDNR 2007b	stream species fairly common
<i>Argia translata</i>	Dusky Dancer	S5		WVDNR 2007b	common stream species
<i>Argomphus villosipes</i>	Unicorn Clubtail	S4		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Basiaeschna janata</i>	Springtime Darner	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Boyeria grafiana</i>	Oscellated Darner	S4		WVDNR 2007b	larger streams & rivers
<i>Boyeria vinosa</i>	Fawn Darner	S5		TNC 2001, WVDNR 2007b	river species widespread and common
<i>Calopteryx amata</i>	Superb Jewelwing	S2	G4	TNC 2001, WVDNR 2007b	high elevation; clear streams and rivers with rocky rapids
<i>Calopteryx angustipennis</i>	Appalachian Jewelwing	S2		WVDNR 2007b	clean larger streams, mostly E. Panhandle
<i>Calypteryx maculata</i>	Ebony Jewelwing	S5		WVDNR 2007b	stream and vegetated pond species widespread and common
<i>Celithemis elisa</i>	Calico Pennant	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Celithemis eponina</i>	Halloween Pennant	S3S4		WVDNR 2007b	ponds and pools statewide
<i>Chromagrion conditum</i>	Aurora Damsel	S4		TNC 2001, WVDNR 2007b	pond and bog species fairly common
<i>Cordulegaster bilineata</i>	Brown Spiketail	S3		WVDNR 2007b	high elevation; mostly ponds & pools in mountain counties
<i>Cordulegaster diastatops</i>	Delta-spotted Spiketail	S2	G5	WVDNR 2007b	high elevation; sunny springfed seeps and small trickles
<i>Cordulegaster maculata</i>	Twin-spotted Spiketail	S4		WVDNR 2007b	clear forest streams and rivers
<i>Cordulegaster obliqua</i>	Arrowhead Spiketail	S3S4		WVDNR 2007b	streamlets and trickles mostly west of mts
<i>Cordulia shurtleffii</i>	American Emerald	S3	G5	WVDNR 2007b	high elevation; clean vegetated ponds

<i>Didympos transversa</i>	Stream Cruiser	S4		WVDNR 2007b	probably statewide in streams
<i>Dorocordulia lepida</i>	Petite Emerald	SR (SH)		WVDNR 2007b	high elevation; two 30 yr old records in WV
<i>Dromogomphus spinosus</i>	Black-shouldered Spinyleg	S5		WVDNR 2007b	statewide in pools, large rivers and lakes
<i>Enallagma annexum</i>	Northern Bluet	S2		WVDNR 2007b	high elevation; marshy ponds, bogs in mts.
<i>Enallagma antennatum</i>	Rainbow Bluet	S2	G5	TNC 2001, WVDNR 2007b	low elevation; ponds, slow small streams, inflows, with mud substrate
<i>Enallagma aspersum</i>	Azure Bluet	S4		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Enallagma basidens</i>	Double-striped Bluet	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Enallagma boreale</i>	Boreal Bluet	S1		WVDNR 2007b	high elevation; marshy ponds, bogs in mts.
<i>Enallagma civile</i>	Familiar Bluet	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Enallagma divigans</i>	Turquoise Bluet	S4		WVDNR 2007b	mostly mountain counties
<i>Enallagma exsulans</i>	Stream Bluet	S5		TNC 2001, WVDNR 2007b	stream species widespread and common
<i>Enallagma geminatum</i>	Skimming Bluet	S4		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Enallagma hageni</i>	Hagen's Bluet	S3S4		WVDNR 2007b	pond species widespread and common
<i>Enallagma signatum</i>	Orange Bluet	S5		TNC 2001, WVDNR 2007b	pond and river species widespread and common
<i>Enallagma traviatum</i>	Slender Bluet	S4		WVDNR 2007b	mostly lower elevation
<i>Enallagma vesperum</i>	Vesper Bluet	SH (S1)		WVDNR 2007b	vegetated ponds higher elevations active at dusk
<i>Epiaeschna heros</i>	Swamp Darner	S3	G5	TNC 2001, WVDNR 2007b	shady wooded ponds and pools, swamps

<i>Epitheca canis</i>	Beaverpond Baskettail	S1S2	G5	TNC 2001, WVDNR 2007b	high elevation; boggy and marshy ponds, acidic infertile water
<i>Epitheca cynosura</i>	Common Baskettail	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Epitheca princeps</i>	Prince Baskettail	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Erythemis simplicicollis</i>	Eastern Pondhawk, Green Clearwing	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Erythrodiplax miniscula</i>	Little Blue Dragonlet	S1		WVDNR 2007b	2 records in WV
<i>Gomphus descriptus</i>	Harpoon Clubtail	S3		WVDNR 2007b	high elevation (mostly); near clean streams
<i>Gomphus exilis</i>	Lancet Clubtail	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Gomphus fraternus</i>	Midland Clubtail	S1		WVDNR 2007b	clean larger streams and rivers
<i>Gomphus lividus</i>	Ashy Clubtail	S5		TNC 2001, WVDNR 2007b	pond and river species widespread and common
<i>Gomphus quadricolor</i>	Rapids Clubtail	S2S3		WVDNR 2007b	high energy streams with pools
<i>Gomphus rogersi</i>	Sable Clubtail	S1S2	G4	TNC 2001, WVDNR 2007b	clear forest streams w/ moderate flow, rocky w/ silt/sand obstruction pools
<i>Gomphus viridifrons</i>	Green-faces Clubtail	S2		WVDNR 2007b	mostly Greenbrier & SB Potomac
<i>Gomphus adelphus</i>	Moustached Clubtail	S2		WVDNR 2007b	high elevation; all records in mts. - medium to large streams
<i>Hagenius brevistylus</i>	Dragonhunter	S4		TNC 2001, WVDNR 2007b	forested large streams and rivers with moderate to fast flow
<i>Helocordulia uhleri</i>	Uhler's Sundragon	S3S4		WVDNR 2007b	high elevation (mostly); larger streams and rivers, mostly mt counties
<i>Hetaerina americana</i>	American Rubyspot	S5		WVDNR 2007b	mostly lower elevation, only 1 high elevation record
<i>Ischnura hastata</i>	Citrine Forktail	S4		TNC 2001, WVDNR	ditch and vegetated pond species widespread and common

				2007b	
<i>Ischnura posita</i>	Fragile Forktail	S5		TNC 2001, WVDNR 2007b	ditch and vegetated pond species widespread and common
<i>Ischnura verticalis</i>	Common Forktail	S5		WVDNR 2007b	ditch and vegetated pond species widespread and common
<i>Ladona julia</i>	Chalk-fronted Skimmer	S2	G5	TNC 2001, WVDNR 2007b	forested boggy, marshy, swampy ponds, acidic water
<i>Lanthus parvulus</i>	Northern Pygmy Clubtail	S2		WVDNR 2007b	high elevation; small shady streams in mts.
<i>Lanthus vernalis</i>	Southern Pygmy Clubtail	S1	G4	TNC 2001, WVDNR 2007b	high elevation; shady clean forested streams and rivers, often mud substrate
<i>Lestes australis</i>	Southern Spreadwing	S3S4		WVDNR 2007b	similar to <i>L. disjunctus</i> but more southern
<i>Lestes congener</i>	Spotted Spreadwing	S3	G5	TNC 2001, WVDNR 2007b	vegetated ponds and sluggish backwaters
<i>Lestes disjunctus</i>	Northern Spreadwing	S2S3	G5T5	WVDNR 2007b	marshes, bogs, vegetated ponds
<i>Lestes dryas</i>	Emerald Spreadwing	S3		WVDNR 2007b	pools and ponds, only 2 WV records
<i>Lestes eurinus</i>	Amber-winged Spreadwing	S3S4		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Lestes forcipatus</i>	Sweetflag Spreadwing	SH (S1)		WVDNR 2007b	pools, ponds, bogs
<i>Lestes inaequalis</i>	Elegant Spreadwing	S2		WVDNR 2007b	lower elevation; forested boggy/marshy ponds, slow vegetated streams
<i>Lestes rectangularis</i>	Slender Spreadwing	S5		TNC 2001, WVDNR 2007b	pond and ditch species widespread and common
<i>Lestes vigilax</i>	Swamp Spreadwing	S2		WVDNR 2007b	ponds likely statewide
<i>Leucorrhinia glacialis</i>	Crimson-ringed Whiteface	S1		WVDNR 2007b	high elevation; bogs - 5 records all Fisher Run Bog
<i>Leucorrhinia hudsonica</i>	Hudsonian Whiteface	S1	G5	WVDNR 2007b	high elevation; bogs, marshy boggy ponds

<i>Leucorrhinia intacta</i>	Dot-tailed Whiteface	S3		TNC 2001, WVDNR 2007b	pond and bog species widespread and common
<i>Libellula auripennis</i>	Golden-winged Skimmer	S1	G5	TNC 2001, WVDNR 2007b	high elevation; mostly grassy ponds & lakes, also ditches & slow streams
<i>Libellula axilena</i>	Bar-winged Skimmer	SR (S1)		WVDNR 2007b	high elevation; 1 record 2005 - Dolly Sods
<i>Libellula cyanea</i>	Spangled Skimmer	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Libellula flavida</i>	Yellow-sided Skimmer	SH	G5	TNC 2001, WVDNR 2007b	partly sunny mucky or boggy seeps
<i>Libellula incesta</i>	Slaty Skimmer	S4		WVDNR 2007b	vegetated pools, ponds likely statewide
<i>Libellula luctuosa</i>	Widow Skimmer	S5		TNC 2001, WVDNR 2007b	pond species widespread and common
<i>Libellula pulchella</i>	Twelve-Spotted Skimmer	S5		WVDNR 2007b	pond species widespread and common
<i>Libellula semifasciata</i>	Painted Skimmer	S4		TNC 2001, WVDNR 2007b	forested marshy ponds, also bogs and slow streams, acid tolerant
<i>Macromia illinoensis</i>	Swift River Cruiser	S5		TNC 2001, WVDNR 2007b	low elevation; streams and small rivers, with moderate flow and riffles
<i>Nehalennia gracilis</i>	Sphagnum Sprite	S2		WVDNR 2007b	high elevation; marshy pools - 3 records in WV
<i>Nehalennia irene</i>	Sedge Sprite	S3	G5	WVDNR 2007b	pond and bog species higher elevation and common
<i>Ophiogomphus mainensis fastigus</i>	Maine Snaketail	S2		WVDNR 2007b	high elevation; clear medium streams & rivers
<i>Pachydiplax longipennis</i>	Blue Dasher	S5		WVDNR 2007b	pond species widespread and common
<i>Pantala flavescens</i>	Wandering Glider	S4		WVDNR 2007b	temporary pools, sediment ponds, world wide
<i>Pantala hymenaea</i>	Spot-winged Glider	S4		TNC 2001, WVDNR 2007b	widespread migratory species
<i>Perithemis tenera</i>	Eastern Amberwing	S5		TNC 2001, WVDNR 2007b	pond species widespread and common

<i>Plathemis lydia</i>	Common Whitetail	S5		WVDNR 2007b	pond species widespread and common
<i>Somatochlora elongata</i>	Ski-tipped Emerald	S2	G5	TNC 2001, WVDNR 2007b	high elevation; small streams, marshy/boggy ponds
<i>Somatochlora forcipata</i>	Forcinate Emerald	S1		WVDNR 2007b	high elevation; boggy streams & shrub swamps
<i>Somatochlora linearis</i>	Mocha Emerald	SH (S1)		WVDNR 2007b	small often ephemeral forest streams
<i>Somatochlora tenebrosa</i>	Clamp-tipped Emerald	S3		WVDNR 2007b	widespread stream species
<i>Stylogomphus albistylus</i>	Eastern Least Clubtail	S3S4		TNC 2001, WVDNR 2007b	widespread river species
<i>Stylurus plagitus</i>	Russet-tipped Clubtail	SH		WVDNR 2007b	high elevation; 1 WV record from 1930
<i>Sympetrum intenum</i>	Cherry-faced Meadowhawk	S2		WVDNR 2007b	vegetated ponds and pools, 2 WV records
<i>Sympetrum obtrusum</i>	White-faced Meadowhawk	S2		WVDNR 2007b	high elevation; vegetated ponds, lakes, marshes, bogs
<i>Sympetrum rubicundulum</i>	Ruby Meadowhawk	S5		WVDNR 2007b	common statewide
<i>Sympetrum semicinctum</i>	Band-winged Meadowhawk	S3	G5	TNC 2001, WVDNR 2007b	high elevation (mostly); marshes and bogs
<i>Sympetrum vicinum</i>	Autumn Meadowhawk	S5		TNC 2001	marshes, lakes, ponds, slow-moving streams
<i>Tramea lacerata</i>	Black Saddlebags	S5		TNC 2001	stagnant or slow moving bodies of water

### **Butterflies and Moths**

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Acronicta dactylina</i>	Fingered Dagger Moth	-	-	TNC 2001	Cranesville Swamp
<i>Acronicta grisea</i>	Gray Dagger Moth	-	-	TNC 2001	Cranesville Swamp
<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper	-	-	TNC 2001	Cranesville Swamp
<i>Anatrytone logan</i>	Delaware Skipper			WVDNR 2007a	Cranesville Swamp
<i>Ancyloxypha numitor</i>	Least Skipper	-	-	TNC 2001	Cranesville Swamp
<i>Atrytonopsis hianna</i>	Dusted Skipper	-	-	TNC 2001	Cranesville Swamp
<i>Battus philenor</i>	Pipevine Swallowtail			WVDNR 2007a	Canaan Valley

<i>Boloria bellona</i>	Meadow Fritillary			TNC 2001	Cranesville Swamp
<i>Boloria selene myrina</i>	Silver-bordered Fritillary			WVDNR 2007a	Upper Shavers Fork: spruce swamp
<i>Celastrina ladon</i>	Spring Azure			WVDNR 2007a, TNC 2001	Cranesville Swamp
<i>Celastrina neglecta</i>	Appalachian Azure			WVDNR 2007a	Spruce Knob
<i>Cercyonis pegala</i>	Common Wood Nymph			TNC 2001	Cranesville Swamp
<i>Chlosyne harrisii liggetti</i>	Harris' Checkerspot	S2	G4	WVDNR 2007a	Canaan Valley, Gandy Creek, Pigs Ear
<i>Chlosyne nycteis</i>	Silvery Checkerspot			WVDNR 2007a	Cranesville Swamp
<i>Colias eurytheme</i>	Orange Sulphur			TNC 2001	Cranesville Swamp
<i>Colias interior</i>	Pink-edged Sulphur	S1	G5T1T2Q	WVDNR 2007a, TNC 2001	sedge fens, shrub peatlands, cranberry bogs throughout high Allegheny wetlands
<i>Colias philodice</i>	Clouded Sulphur			WVDNR 2007a	cranberry bogs, sedge fens, spruce swamps throughout high Allegheny wetlands
<i>Danaus plexippus</i>	Monarch			WVDNR 2007a, TNC 2001	Canaan Valley: wet meadow; and Cranesville Swamp
<i>Dasychira dorsipennata</i>	Sharp-lined Tussock Moth			TNC 2001	Cranesville Swamp
<i>Dasychira plagiata</i>	Northern Pine Tussock Moth			TNC 2001	Cranesville Swamp
<i>Epargyreus clarus</i>	Silver-spotted Skipper			TNC 2001	Cranesville Swamp
<i>Erynnis icelus</i>	Dreamy Dusky Wing			TNC 2001	Cranesville Swamp
<i>Euphydryas phaeton</i>	Baltimore Checkerspot			Allen 1997	Blackwater Falls State Park
<i>Euphyes conspicua</i>	Black Dash	S1	G4	WVDNR 2007a	Cranesville Swamp
<i>Eurema lisa</i>	Little Yellow			WVDNR 2007a	Canaan Valley
<i>Everes comyntas</i>	Eastern Tailed Blue			TNC 2001	Cranesville Swamp
<i>Hesperia sassacus</i>	Indian Skipper			TNC 2001	Cranesville Swamp
<i>Limenitis archippus</i>	Viceroy			TNC 2001	Cranesville Swamp
<i>Limenitis arthemis astyanax</i>	Red-spotted Purple			WVDNR 2007a, TNC 2001	spruce swamps and wet meadows, throughout high Allegheny wetlands
<i>Lycaena epixanthe</i>	Bog Copper	S1	G4G5	TNC 2001	Cranesville Swamp: bog peatland/wet meadow

<i>Lycaena hyllus</i>	Bronze Copper			TNC 2001	Cranesville Swamp
<i>Lycaena phlaeas</i>	Little Copper			TNC 2001	Cranesville Swamp
<i>Metarranthis duaria</i>	Ruddy Metarranthis			TNC 2001	Cranesville Swamp
<i>Metarranthis obfirmaria</i>	Yellow-washed Metarranthis			TNC 2001	Cranesville Swamp
<i>Nemoria tuscarora</i>	Moth			TNC 2001	Cranesville Swamp
<i>Nymphalis antiopa</i>	Morning Cloak			TNC 2001	Cranesville Swamp
<i>Oecophoridae</i>	Oecophorid Moths			WVDNR 2007a	Canaan Valley: hemlock swamp
<i>Orthofidonia exornata</i>	Moth			TNC 2001	Cranesville Swamp
<i>Papilio canadensis</i>	Canada Tiger Swallowtail			WVDNR 2007a	Spruce Knob
<i>Papilio glaucus</i>	Eastern Tiger Swallowtail			WVDNR 2007a, TNC 2001	Blister Swamp: shrub swamp; and Cranenville Swamp
<i>Papilio polyxenes</i>	Black Swallowtail			TNC 2001	Cranesville Swamp
<i>Papilio troilus</i>	Spicebush Swallowtail			TNC 2001	Cranesville Swamp
<i>Phragmatobia assimilans</i>	Tiger Moth			TNC 2001	Cranesville Swamp
<i>Phyciodes tharos</i>	Pearl Crescent			TNC 2001	Cranesville Swamp
<i>Pieris rapae</i>	Cabbage Butterfly			TNC 2001	Cranesville Swamp
<i>Poanes hobomok</i>	Hobomok Skipper			TNC 2001	Cranesville Swamp
<i>Polia nimbosa</i>	Stormy Arches			TNC 2001	Cranesville Swamp
<i>Polites mystic</i>	Long Dash			TNC 2001	Cranesville Swamp
<i>Polites origenes</i>	Crossline Skipper			WVDNR 2007a	Cranesville Swamp
<i>Polites peckius</i>	Peck's Skipper			TNC 2001	Cranesville Swamp
<i>Polygonia comma</i>	Eastern Comma			WVDNR 2007a, TNC 2001	Cranberry Glades: beaked sedge fen; and Cranenville Swamp
<i>Polygonia interrogationis</i>	Question Mark			WVDNR 2007a	Canaan Valley, Glady Fork
<i>Pompeius verna</i>	Little Glassywing			TNC 2001	Cranesville Swamp
<i>Pyralidae</i>	Pyralid Moths			WVDNR 2007a	forested swamps and forested seeps; numerous occurrences throughout the high Allegheny wetlands

<i>Satyrium liparops strigosum</i>	Striped Hairstreak			WVDNR 2007a	Cranesville Swamp
<i>Satyrodes appalachia appalachia</i>	Appalachian Brown			WVDNR 2007a	Cranesville Swamp
<i>Speyeria aphrodite aphrodite</i>	Aphrodite Fritillary			TNC 2001	Cranesville Swamp
<i>Speyeria atlantis</i>	Atlantis Fritillary	S3	G5	TNC 2001	Cranesville Swamp: shrub swamp, bog peatland/wet meadow
<i>Speyeria cybele cybele</i>	Great Spangled Fritillary			WVDNR 2007a, TNC 2001	Roaring Plains: spruce swamp; and Cranesville Swamp
<i>Speyeria diana</i>	Diana Fritillary	S2S3	G5	WVDNR 2007a	Cranberry Glades
<i>Thymelicus lineola</i>	European Skipper			WVDNR 2007a	Canaan Valley, Glady Fork, Pigs Ear, Spruce Knob
<i>Vanessa atalanta</i>	Red Admiral			TNC 2001	Cranesville Swamp
<i>Vanessa cardui</i>	Painted Lady			WVDNR 2007a	Glady Fork, Pigs Ear, Spruce Knob
<i>Vanessa virginiensis</i>	American Painted Lady			WVDNR 2007a	Glady Fork, Spruce Knob
<i>Wallengrenia egeremet</i>	Northern Broken Dash			TNC 2001	Cranesville Swamp
<i>Zale bethunei</i>	Bethune's Zale			TNC 2001	Cranesville Swamp
<i>Zale duplicata</i>	Pine False Looper			TNC 2001	Cranesville Swamp

## Beetles

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Anisosticta bitriangularis</i>	Ladybird Beetle			WVDNR 2007a	Canaan Valley: bluejoint wet meadow
<i>Anthophylax attenuatus</i>	Long-horned Beetle			TNC 2001	Cranesville Swamp
Baridinae Subfamily	Weevil			WVDNR 2007a	Kumbrabow: goldenrod wet meadow
<i>Cantharis sp.</i>	Soldier Beetle			WVDNR 2007a	wet meadows, shrub swamps, and forested seeps; several locations in high Allegheny wetlands
<i>Capraita quercata</i>	Spotted Cucumber Beetle			WVDNR 2007a	Greenbrier River: Carex torta overflow channel forest seep
<i>Carabus vinctus</i>	Ground Beetle			TNC 2001	Cranesville Swamp: forested swamp and peatmoss bog
<i>Cicindela sexguttata</i>	Six-spotted Tiger Beetle			WVDNR 2007a	Beaverdam Run: forested seep
Curculioninae Subfamily	Weevil			WVDNR 2007a	Canaan Valley: chokeberry shrub peatland

<i>Cycloneda sp.</i>	Ladybird Beetle			WVDNR 2007a	Kumbrabow: goldenrod wet meadow and steeblebush shrubland
<i>Cylindrocopturus sp.</i>	Weevil			WVDNR 2007a	Greenbrier River: Carex torta overflow channel forest seep
<i>Cyphon sp.</i>	Marsh Beetle			WVDNR 2007a	spruce swamps, forested seeps, shrub swamps, burreed marsh; several locations in high Allegheny wetlands
<i>Denticollis denticornis</i>	Click Beetle			WVDNR 2007a	Laurel Fork: forested seep
<i>Diabrotica undecimpunctata howardi</i>	Spotted Cucumber Beetle			WVDNR 2007a	Kumbrabow: goldenrod wet meadow
<i>Donacia sp.</i>	Leaf Beetle			WVDNR 2007a	Canaan Valley: burreed marsh
<i>Ellychnia sp.</i>	Firefly			WVDNR 2007a	Greenbrier River: spruce swamp
<i>Harmonia axyridis</i>	Asian Lady Beetle			WVDNR 2007a	Laurel Fork: spruce swamp
<i>Isomira sp.</i>	Darkling Beetle (Comb-clawed Beetle)			WVDNR 2007a	Greenbrier River: Carex torta overflow channel forest seep
<i>Lexiphanes saponatus</i>	Leaf Beetle			WVDNR 2007a	Greenbrier River: forested seep
<i>Loricera pilicornis</i>	Ground Beetle			TNC 2001	Cranesville Swamp: southern edge of known range in eastern USA
<i>Luperaltica senilis</i>	Leaf Beetle			WVDNR 2007a	Kumbrabow: steeblebush shrubland
<i>Microrhopala vittata</i>	Leaf Beetle			WVDNR 2007a	Blister Swamp: Carex lasiocarpa fen
<i>Microrhopala xerene</i>	Leaf Beetle			WVDNR 2007a	Upper Shavers: Carex gynandra seep
<i>Nicrophorus vespilloides</i>	Burying Beetle			TNC 2001	Cranesville Swamp: boreal relic
<i>Olibrus semistriatus</i>	Shining Mold Beetle			WVDNR 2007a	Kumbrabow: goldenrod wet meadow
<i>Oxytelus sp.</i>	Rove Beetle			WVDNR 2007a	Mt. Porte Crayon: Carex scabrata forested seep
<i>Pidonia aurata</i>	Long-horned Beetle			WVDNR 2007a	Big Run south of Spruce Knob Lake: cinnamon fern seep
<i>Plateros sp.</i>	Net-winged Beetle			WVDNR 2007a	Cranesville: chokeberry shrub peatland
<i>Plateumaris sp.</i>	Leaf Beetle			WVDNR 2007a	spruce swamps, forested seeps; numerous locations in high Allegheny wetlands
<i>Platynus "indecentis"</i>	Ground Beetle			TNC 2001	Cranesville Swamp; southern edge of known range in USA

<i>Prionocyphon sp.</i>	Marsh Beetle			WVDNR 2007a	Shavers Fork: spruce swamp
<i>Pterostichus superciliosus</i>	Ground Beetle			TNC 2001	Cranesville Swamp: rare and localized species ranging from PA to GA.
<i>Ptilodactyla sp.</i>	Ptilodactylid Beetle			WVDNR 2007a	Laurel Fork: forested seep
<i>Pyropyga sp.</i>	Firefly			WVDNR 2007a	Canaan Valley: balsam fir-black ash swamp
<i>Rhagonycha sp.</i>	Soldier Beetle			WVDNR 2007a	Canaan Valley and Craneshville Swamp: spruce-fir swamp and silky willow shrub swamp
<i>Scelolyperus meracus</i>	Leaf Beetle			WVDNR 2007a	forested seeps; several locations throughout high Allegheny wetlands
<i>Scirtes orbiculatus</i>	Marsh Beetle			WVDNR 2007a	Craneshville: larch swamp
Staphylininae Subfamily	Rove Beetle			WVDNR 2007a	Kumbrabow: bulrush wet meadow
<i>Sumitrosis sp.</i>	Leaf Beetle			WVDNR 2007a	Kumbrabow: goldenrod wet meadow, and Mt. Porte Crayon: <i>Carex scabrata</i> seep
<i>Trachysida aspera brevifrons</i>	Long-horned Beetle			TNC 2001	Craneshville Swamp
<i>Tricholochmaea sp.</i>	Leaf Beetle			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Trirhabda sp.</i>	Leaf Beetle			WVDNR 2007a	Kumbrabow: goldenrod wet meadow

### ***Gnats, Mosquitoes, and True Flies***

<b><u>Scientific Name</u></b>	<b><u>Common Name</u></b>	<b><u>State Rank</u></b>	<b><u>Global Rank</u></b>	<b><u>Source</u></b>	<b><u>Comment</u></b>
<i>Apotropina sp.</i>	Chloropid Fly			WVDNR 2007a	Desert Branch: hemlock-rhododendron swamp
Asilidae Family	Robber Fly			WVDNR 2007a	Greenbrier River: <i>Carex trichocarpa</i> wet meadow
Ceratopogonidae Family	Biting Midge, No-see-um			WVDNR 2007a	Canaan Valley and Craneshville Swamp: forested swamp and shrub swamp
<i>Cetema sp.</i>	Chloropid Fly			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Chaetopsis sp.</i>	Picture-winged Fly			WVDNR 2007a	Canaan Valley: <i>Carex lacustris</i> fen; and Desert Branch: bulrush wet meadow
Chironominae Subfamily	Midge			WVDNR 2007a	Piney Swamp: hemlock-birch-rhododendron swamp
<i>Chlorops sp.</i>	Chloropid Fly			WVDNR 2007a	Canaan Valley: spruce-fir swamp; and Mt. Porte Crayon: <i>Carex scabrata</i>

					forested seep
<i>Chrysops sp.</i>	Deer Fly			WVDNR 2007a	Canaan Valley: chokeberry shrub peatland
<i>Clusia lateralis</i>	Clusiid Fly			WVDNR 2007a	Cathedral State Forest: skunk cabbage seep
<i>Condylostylus sp.</i>	Long-legged Fly			WVDNR 2007a	Greenbrier River: <i>Carex trichocarpa</i> wet meadow
<i>Copromyza sp.</i>	Small Dung Fly			WVDNR 2007a	Big Run south of Spruce Knob Lake: spruce swamp
<i>Cordilura sp.</i>	Dung Fly			WVDNR 2007a	Big Run south of Spruce Knob Lake: spruce swamp; and Greenbrier River: <i>Carex torta</i> overflow channel forest seep
<i>Diastata sp.</i>	Diastatid Fly			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Diploptoxa sp.</i>	Chloropid Fly			WVDNR 2007a	Red Creek Plains: pitch pine-heath swamp; Blister Swamp: <i>Carex lasiocarpa</i> fen; Dolly Sods: cattail-peatmoss fen
Drosophilidae Family	Pomace Fly			WVDNR 2007a	forested swamps, shrub swamps, wet meadows; several locations at elevations <3400 ft. within the high Allegheny wetlands
<i>Ectecephala sp.</i>	Chloropid Fly			WVDNR 2007a	shrub swamps, wet meadows, and seeps; several locations throughout the high Allegheny wetlands
<i>Elachiptera costata</i>	Chloropid Fly			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Erioptera sp.</i>	Crane Fly			WVDNR 2007a	Difficult Creek: hemlock-black ash swamp
<i>Euaresta sp.</i>	Fruit Fly			WVDNR 2007a	Desert Branch: hemlock-rhododendron swamp
Fanniidae Family	Lesser House Fly, etc.			WVDNR 2007a	spruce swamps, shrub swamps, and sedge fens; numerous locations throughout the high Allegheny wetlands
Fucelliinae Subfamily	Leafmining Fly			WVDNR 2007a	Canaan Valley: bluejoint wet meadow; and Greenbrier River: <i>Carex torta</i> overflow channel forested seep
<i>Hybomitra zonalis</i>	Horse Fly			TNC 2001	Cranesville Swamp: sphagnum bogs; previously unknown south of Finger Lakes region of NY

<i>Hybos reversus</i>	Dance Fly			WVDNR 2007a	forested swamps and shrub swamps; numerous locations throughout the high Allegheny wetlands
<i>Ischnomyia sp.</i>	Leafmining Fly			WVDNR 2007a	Desert Branch: hemlock-rhododendron swamp
<i>Leucopis sp.</i>	Chamaemyiid Fly			WVDNR 2007a	Canaan Valley: bluejoint grass wet meadow
<i>Limnophila sp.</i>	Crane Fly			WVDNR 2007a	Cranesville Swamp: silky willow swamp
<i>Lonchoptera sp.</i>	Spear-winged Fly			WVDNR 2007a	wet meadows; numerous locations in high Allegheny wetlands
<i>Meromyza sp.</i>	Chloropid Fly			WVDNR 2007a	Canaan Valley: bluejoint grass wet meadow
<i>Minettia sp.</i>	Lauxaniid Fly			WVDNR 2007a	forested swamps, forested seeps, and shrub swamps; several locations throughout the high Allegheny wetlands
<i>Mycetophila sp.</i>	Fungus Gnat			WVDNR 2007a	Glade Run below Gaudineer: spruce swamp
<i>Mycomya sp.</i>	Fungus Gnat			WVDNR 2007a	spruce swamps and forested seeps; several locations throughout high Allegheny wetlands
<i>Ochthera sp.</i>	Shore Fly			WVDNR 2007a	Canaan Valley: pale mannagrass marsh
<i>Phalacrocer a tipulina</i>	Crane Fly			TNC 2001	Cranesville Swamp: sphagnum bogs; widespread in the northern USA, ranging into MI and WI
<i>Pipunculus sp.</i>	Big-headed Fly			WVDNR 2007a	Canaan Valley: hemlock-alder swamp
<i>Platycheirus sp.</i>	Flower Fly			WVDNR 2007a	Laurel Fork: spruce swamp
<i>Polietes sp.</i>	House Fly, etc.			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Pseudolimnophila inornata</i>	Crane Fly			TNC 2001	Cranesville Swamp: Species recorded from NY, MD, and westward into IN and MI. Locally abundant at Cranestville.
<i>Psorophora sp.</i>	Mosquito			WVDNR 2007a	Cranberry Glades: yellow birch-hemlock swamp
Psychodidae Family	Moth Fly			WVDNR 2007a	Cranesville Swamp: black ash-hemlock swamp
<i>Ptychoptera sp.</i>	Phantom Crane Fly			WVDNR 2007a	Cranesville Swamp: larch swamp
<i>Sargus sp.</i>	Soldier Fly			WVDNR 2007a	forested swamps and forested seeps; several locations throughout high Allegheny wetlands

<i>Scathophaga sp.</i>	Dung Fly			WVDNR 2007a	forested seeps; several locations throughout high Allegheny wetlands
<i>Sciara sp.</i>	Dark-winged Fungus Gnat			WVDNR 2007a	Canaan Valley: spruce-fir swamp
Sciomyzidae Family	Marsh Fly			WVDNR 2007a	Canaan Valley: alder swamp and <i>Carex lacustris</i> fen; Cranesville: willow swamp
Sepsidae Family	Black Scavenger Fly			WVDNR 2007a	Canaan Valley: meadowsweet shrub swamp
<i>Suillia sp.</i>	Heleomyzid Fly			WVDNR 2007a	Greenbrier River: <i>Carex torta</i> overflow channel forest seep
<i>Syrphus sp.</i>	Flower Fly			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Tachina sp.</i>	Tachinid Fly			WVDNR 2007a	Dolly Sods: silky willow peatland
<i>Thaumatomyia sp.</i>	Chloropid Fly			WVDNR 2007a	Cranesville Swamp: larch swamp
<i>Toxomerus sp.</i>	Flower Fly			WVDNR 2007a	shrub swamps, wet meadows, and sedge fens; several locations throughout the high Allegheny wetlands
<i>Toxorhina sp.</i>	Crane Fly			WVDNR 2007a	forested swamps and sedge fens; several locations throughout the high Allegheny wetlands

### True Bugs

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Adelges tsugae</i>	Hemlock Woolly Adelgid			WVDNR 2007a	forested swamps; numerous locations throughout the high Allegheny wetlands
<i>Adelges piceae</i>	Balsam Woolly Adelgid			WVDNR 2007a	Canaan Valley, Blister Swamp, Blister Run Swamp: balsam fir swamps
<i>Aphelonema histrionica</i>	Weevil-like Planthopper			WVDNR 2007a	Blister Swamp: <i>Carex lasiocarpa</i> fen
Aphididae Family	Aphid			WVDNR 2007a	Big Run south of Spruce Knob Lake: Cinnamon fern seep
<i>Balclutha sp.</i>	Leafhoppers			WVDNR 2007a	spruce swamps and forested seeps; several locations throughout high Allegheny wetlands
Cicadellinae Subfamily	Leafhopper			WVDNR 2007a	Cathedral State Forest: forested seep
<i>Cicadula sp.</i>	Leafhoppers			WVDNR 2007a	Canaan Valley: <i>Carex lacustris</i> fen; and Dolly Sods: spruce swamp

<i>Cixius sp.</i>	Cixiid Planthopper			WVDNR 2007a	Greenbrier River: forested seep
<i>Clastoptera sp.</i>	Spittle Bug			WVDNR 2007a	Dolly Sods: spruce swamp; and Desert Branch: hemlock-rhododendron swamp
<i>Coelidia olitoria</i>	Leafhoppers			WVDNR 2007a	Kumbrabow: steeplebush shrubland
<i>Collaria meilleurii</i>	Plant Bug			WVDNR 2007a	Canaan Valley: bluejoint wet meadow; and Cranesville Swamp: silky willow shrub swamp
<i>Collaria oculata</i>	Plant Bug			WVDNR 2007a	Kumbrabow: steeplebush shrubland
<i>Corythucha sp.</i>	Lace Bug			WVDNR 2007a	Canaan Valley: balsam fir swamp
<i>Cymus sp.</i>	Cymid			WVDNR 2007a	bulrush wet meadows; numerous locations throughout high Allegheny wetlands
<i>Delphacodes sp.</i>	Delphacid			WVDNR 2007a	Shavers Fork: spruce swamp; and Greenbrier River: Carex torta overflow channel forest seep
<i>Deltocephalus sp.</i>	Leafhoppers			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Draeculacephala angulifera</i>	Leafhoppers			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Draeculacephala mollipes</i>	Watercress Sharpshooter			WVDNR 2007a	Dolly Sods: goldenrod wet meadow; and Shavers Fork: spruce swamp
<i>Draeculacephala noveboracensis</i>	Leafhopper			WVDNR 2007a	spruce swamps, seeps, and sedge fens: several locations throughout high Allegheny wetlands
<i>Eucanthus acuminatus</i>	Leafhopper			WVDNR 2007a	Canaan Valley: balsam fir swamp
<i>Euschistus tristigmus</i>	Dusky Stink Bug			WVDNR 2007a	Laurel Fork: spruce swamp
<i>Graphocephala sp.</i>	Leafhopper			WVDNR 2007a	Red Creek Plains: pitch pine-heath swamp
<i>Helochara communis</i>	Leafhopper			WVDNR 2007a	bulrush and mannagrass marshes; several locations throughout high Allegheny wetlands
<i>Homaemus aeneifrons</i>	Shield-backed Bug			WVDNR 2007a	Dolly Sods: bulrush fen
<i>Hoplistocelis sordidus</i>	Damsel Bug			WVDNR 2007a	Kumbrabow: steeplebush shrubland; and Greenbrier River: Carex torta overflow channel
Lassinae Subfamily	Leafhopper			WVDNR 2007a	Cranesville Swamp: silky willow swamp

<i>Lepyronia quadrangularis</i>	Diamondbacked Spittlebug			WVDNR 2007a	bulrush and common rush wet meadows; several locations throughout high Allegheny wetlands
<i>Ligyrocoris sp.</i>	Rhyparochromid			WVDNR 2007a	Dolly Sods: spruce swamps, pitch pine-heath swamp, bulrush fen
<i>Livia sp.</i>	Jumping Plantlice			WVDNR 2007a	Red Creek Plains: pitch pine-heath swamp
<i>Lygus sp.</i>	Plant Bug			WVDNR 2007a	forested swamps and wet meadows; several locations throughout the high Allegheny wetlands
Membracidae Family	Treehopper			WVDNR 2007a	Kumbrabow: goldenrod wet meadow
<i>Nabis sp.</i>	Damsel Bug			WVDNR 2007a	Kumbrabow: goldenrod wet meadow; and Canaan Valley: winterberry shrub swamp
<i>Oedancala dorsalis</i>	Pachygronthid			WVDNR 2007a	forested swamps and wet meadows; several locations throughout the high Allegheny wetlands
<i>Oliarus sp.</i>	Cixiid Planthopper			WVDNR 2007a	forested swamps, shrub swamps, and wet meadows; numerous locations throughout the high Allegheny wetlands
<i>Paraulacizes irrorata</i>	Brown Speckled Leafhopper			WVDNR 2007a	Kumbrabow: steeplebush shrub swamp
<i>Philaenus spumarius</i>	Meadow Spittlebug			WVDNR 2007a	shrub swamps, marshes, and wet meadows; several locations throughout the high Allegheny wetlands
<i>Phlepsius sp.</i>	Leafhopper			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Phylloplecta sp.</i>	Jumping Plantlice			WVDNR 2007a	Piney Swamp: hemlock-birch-rhododendron swamp
<i>Phytocoris sp.</i>	Plant Bug			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Pissonotus dorsalis</i>	Delphacid			WVDNR 2007a	Blister Swamp: Carex lasiocarpa fen
<i>Platymetopius acutus</i>	Leafhopper			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Ponana sp.</i>	Leafhopper			WVDNR 2007a	Dolly Sods: silky willow peatland
<i>Protenor belfragei</i>	Broad-headed Bug			WVDNR 2007a	Canaan Valley: balsam fir swamp and bluejoint wet meadow
<i>Psyllia sp.</i>	Jumping Plantlice			WVDNR 2007a	Glade Run below Gaudineer: spruce swamp; and Desert Branch: hemlock swamp

<i>Scaphoideus sp.</i>	Leafhopper			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Sinea diadema</i>	Spined Assassin Bug			WVDNR 2007a	Canaan Valley: chokeberry shrub peatland
<i>Slaterocoris sp.</i>	Plant Bug			WVDNR 2007a	Blister Swamp: Rhamnus alnifolia shrub swamp
<i>Stenocranus dorsalis</i>	Delphacid			WVDNR 2007a	Mt. Porte Crayon: Carex scabrata forested seep
<i>Stobaera sp.</i>	Delphacid			WVDNR 2007a	spruce swamps and bulrush wet meadows; several locations throughout high Allegheny wetlands
<i>Trigonotylus sp.</i>	Plant Bug			WVDNR 2007a	Canaan Valley: pale mannagrass marsh
Typhlocybinae Subfamily	Leafhopper			WVDNR 2007a	forested swamps, forested seeps, and shrub swamps; numerous locations throughout the high Allegheny wetlands

### ***Ants, Bees, Wasps and Sawflies***

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Arge sp.</i>	Argid Sawfly			WVDNR 2007a	Laurel Fork: forested seep
<i>Augochlorella sp.</i>	Sweat Bee			WVDNR 2007a	Canaan Valley: common rush wet meadow
<i>Bombus sp.</i>	Bumblebee			WVDNR 2007a	goldenrod wet meadows and chokeberry shrub swamp; several locations throughout the high Allegheny wetlands
<i>Camponotus sp.</i>	Carpenter Ant			WVDNR 2007a	Kumbrabow: goldenrod wet meadow and steplebush shrubland
Cheloninae Subfamily	Braconid Wasp			WVDNR 2007a	Dolly Sods: spruce swamp
<i>Dolichoderus pustulatus</i>	Odorous Ant			WVDNR 2007a	forested swamps, wet meadows, and sedge fens: several locations throughout the high Allegheny wetlands
<i>Dolichovespula arenaria</i>	Yellowjacket, etc.			WVDNR 2007a	Canaan Valley: common rush wet meadow
<i>Formica sp.</i>	Ant			WVDNR 2007a	Red Creek Plains: pitch pine-heath swamp
Ichneumonidae Family	Ichneumon Wasp			WVDNR 2007a	forested swamps, wet meadows, and sedge fens: several locations throughout the high Allegheny wetlands
<i>Lasioglossum sp.</i>	Sweat Bee			WVDNR 2007a	Canaan Valley: pale mannagrass marsh

<i>Lasius alienus</i>	Cornfield Ant			WVDNR 2007a	Cranberry Flats: cinnamon fern seep
<i>Myrmica sp.</i>	Ant			WVDNR 2007a	Canaan Valley: chokeberry shrub peatland
<i>Nomada sp.</i>	Cuckoo Bee			WVDNR 2007a	Middle Mountain: forested seep
<i>Tapinoma sessile</i>	Odorous House Ant			WVDNR 2007a	Dolly Sods: spruce swamp
Tenthredinidae Family	Common Sawfly			WVDNR 2007a	Laurel Fork: forested seep

### ***Crickets, Grasshoppers, Katydid, and Locusts***

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Chorthippus curtipennis</i>	Short-horned Grasshopper			WVDNR 2007a	Blister Swamp: Carex lasiocarpa fen
<i>Conocephalus brevipennis</i>	Katydid			WVDNR 2007a	Laurel Fork: spruce swamp
<i>Conocephalus fasciatus</i>	Katydid			WVDNR 2007a	Canaan Valley: burreed marsh
<i>Conocephalus sp.</i>	Katydid			WVDNR 2007a	forested swamps, shrub swamps, wet meadows; several locations within the high Allegheny wetlands
<i>Melanoplus sp.</i>	Grasshopper			WVDNR 2007a	Canaan Valley: balsam fir swamp and winterberry swamp

### ***Stoneflies***

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
Leuctridae Family	Rolled-winged Stonefly			WVDNR 2007a	forested swamps, shrub swamps, forested seeps, wet meadows; numerous locations throughout the high Allegheny wetlands
Nemouridae Family	Spring Stonefly			WVDNR 2007a	Mt. Porte Crayon: Carex scabrata forested seep; and Greenbrier River: spruce swamp

### ***Barklice***

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
Psocoptera Order	Barklice			WVDNR 2007a	forested swamps, shrub swamps, and wet meadows; several locations throughout the high Allegheny wetlands

## Caddisflies

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Banksiola dossuaria</i>	Caddisfly			WVDNR 2007a, Stout and Stout 1989	forested seeps; several locations throughout high Allegheny wetlands
<i>Nemotaulius hostilis</i>	Caddisfly			Stout and Stout 1989	Canaan Valley
<i>Oligostomis pardalis</i>	Caddisfly			Stout and Stout 1989	Canaan Valley
<i>Platycentropus radiatus</i>	Caddisfly			WVDNR 2007a, Stout and Stout 1989	forested seeps; several locations throughout high Allegheny wetlands
<i>Ptilostomis ocellifera</i>	Caddisfly			Stout and Stout 1989	Canaan Valley

## Springtails

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
Entomobryidae Family	Springtail			WVDNR 2007a	forested seeps; several locations throughout high Allegheny wetlands

## Spiders

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Acanthepeira stellata</i>	starbellied orbweaver			WVDNR 2007a	Carex lasiocarpa fen
<i>Araneus pratensis</i>	angulate & roundshouldered orbweaver			WVDNR 2007a	Red spruce woodland swamp and sedge fens
<i>Araniella displicata</i>	six-spotted orbweaver			WVDNR 2007a	Chokeberry and meadowsweet shrub swamps
<i>Argiope aurantia</i>	yellow garden spider			WVDNR 2007a	Red spruce woodland swamp
<i>Argiope trifasciata</i>	banded garden spider			WVDNR 2007a	Red spruce & pitch pine swamps, meadowsweet shrub swamps, open peatland
<i>Bathyphantes pullatus</i>	dwarf & sheetweb weaver			WVDNR 2007a	Pitch pine-heath swamp

<i>Calymmaria</i> sp. 21	hahniid spider	S1	G1	Heiss 1982	Endemic to WV. Undescribed species. Cranberry Glades. Two females collected 20 May 1967.
<i>Ceraticelus fissiceps</i>	dwarf & sheetweb weaver			WVDNR 2007a	Red spruce woodland swamp
<i>Clubiona abboti</i>	leafcurling sac spider			WVDNR 2007a	Circumneutral swamps
<i>Clubionoides excepta</i>	sac spider			WVDNR 2007a	Carex canescens fen
<i>Cyclosa turbinata</i>	trashline orbweaver			WVDNR 2007a	Bulrush-sedge peatland
<i>Dictyna</i> sp.	meshweaver			WVDNR 2007a	Red spruce woodland swamp
<i>Dolomedes striatus</i>	fishing spider			WVDNR 2007a	Carex utriculata fen
<i>Elaver excepta</i>	sac spider			WVDNR 2007a	Hoary sedge and 3-way sedge fens
<i>Erigone brevidentata</i>	dwarf & sheetweb weaver			WVDNR 2007a	Cranberry-huckleberry shrub swamps
<i>Erigone</i> sp.	dwarf & sheetweb weaver			WVDNR 2007a	Red spruce swamp
<i>Eris militaris</i>	bronze jumper			WVDNR 2007a	new state record; Red spruce woodland swamp
<i>Frontinella pyramitela</i>	weaver spider			WVDNR 2007a	Red spruce swamps and blueberry peatlands
<i>Glenognatha foxi</i>	longjawed orbweaver			WVDNR 2007a	Red spruce swamp
Gnaphosidae family	ground spider			WVDNR 2007a	hemlock-rhododendron swamp
<i>Helophora insignis</i>	dwarf & sheetweb weaver			WVDNR 2007a	Red spruce swamps
<i>Larina borealis</i>	orbweaver			WVDNR 2007a	St. Johnswort shrub swamp
<i>Leucauge venusta</i>	orchard orbweaver			WVDNR 2007a	forested and open wetlands
<i>Mangora gibberosa</i>	lined orbweaver			WVDNR 2007a	Chokeberry shrub swamp
<i>Mangora placida</i>	tuftlegged orbweaver			WVDNR 2007a	Alder shrub swamp
<i>Misumenoides formosipes</i>	whitebanded crab spider			WVDNR 2007a	Wooded and open peatlands, shrub swamps
<i>Misumenops</i> sp.	flower crab spider			WVDNR 2007a	forested and open wetlands

<i>Naphrys pulex</i>	jumping spider			WVDNR 2007a	Red spruce woodland swamp, steeplebush swamp, bulrush wet meadow
<i>Neoscona arabesca</i>	arabesque orbweaver			WVDNR 2007a	most commonly collected spider in High Allegheny wetlands (both forested and open types); also in Ohio Valley
<i>Nereine radiata</i>	filmy dome spider			WVDNR 2007a	Red spruce swamps
<i>Oxyopes sp.</i>	lynx spider			WVDNR 2007a	Carex lasiocarpa fen
<i>Pachygnatha tristriata</i>	thickjawed orbweaver			WVDNR 2007a	Chokeberry shrub swamp
<i>Pardosa moesta</i>	thinlegged wolf spider			WVDNR 2007a	Red spruce woodland swamp, silky willow shrub peatland
<i>Pirata insularis</i>	pirate wolf spider	S1	GNR	WVDNR 2007a	forested and open wetlands
<i>Pirata sedentarius</i>	pirate wolf spider	S1	GNR	WVDNR 2007a	Cattail fen
<i>Pirata seminolus</i>	pirate wolf spider	S1	GNR	WVDNR 2007a	Hemlock-black ash swamp
<i>Pityohyphantes sp.</i>	hammock spider			WVDNR 2007a	Red spruce swamps
<i>Sitticus palustris</i>	jumping spider			WVDNR 2007a	new state record; Red spruce woodland swamp
<i>Sitticus pubescens</i>	jumping spider			WVDNR 2007a	Common rush-mannagrass oxbow
<i>Synema parvulum</i>	crab spider			WVDNR 2007a	Chokeberry shrub swamp
<i>Tetragnatha guatemalensis</i>	longjawed orbweaver			WVDNR 2007a	Cinnamon fern seep
<i>Tetragnatha laboriosa</i>	silver longjawed orbweaver			WVDNR 2007a	forested and open wetlands
<i>Tetragnatha sp.</i>	longjawed orbweaver			WVDNR 2007a	forested and open wetlands
<i>Tetragnatha versicolor</i>	longjawed orbweaver			WVDNR 2007a	forested and open wetlands
<i>Theridion frondeum</i>	cobweb weaver			WVDNR 2007a	Red spruce and hemlock swamps
<i>Theridiosoma gemmosum</i>	ray orbweaver			WVDNR 2007a	Red spruce swamps and forested seeps
<i>Tibellus sp.</i>	slender crab spider			WVDNR 2007a	new genus for WV; web on grass stem in bluejoint grass wet meadow
<i>Trochosa terricola</i>	wolf spider			WVDNR 2007a	burreed marsh
<i>Xysticus sp.</i>	ground crab spider			WVDNR 2007a	forested and open wetlands

<i>Zygoballus bettini</i>	jumping spider			WVDNR 2007a	forested and open wetlands
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## Harvestmen

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Rank</u>	<u>Global Rank</u>	<u>Source</u>	<u>Comment</u>
<i>Leiobunum calcar</i>	harvestmen			WVDNR 2007a	new state record; Red spruce woodland swamp
<i>Leiobunum sp.</i>	harvestmen			WVDNR 2007a	Red spruce, hemlock, winterberry, and chokeberry swamps
<i>Odiellus pictus</i>	harvestmen			WVDNR 2007a	new state record; Red spruce woodland swamp
<i>Oligolophus tridens</i>	harvestmen			WVDNR 2007a	Yellow birch-hemlock swamp

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## Appendix G. Plant Species Records and Conservation Ranks

Note: Lichens and fungi are also included in this table. Floristic records were selected from each of the database sources based on location and habitat data indicating that the specimen was collected or observed in a wetland environment above 730 m (2400 ft) in the Allegheny Mountain region of West Virginia.

Scientific Name	Common Name	State Rank	Global Rank	NWI	FQI	Ori - gin	Source
<i>Abies balsamea</i>	Balsam Fir	S3	G5	FAC	8.3	N	WVDNR 2007c, WVDNR 2007e
<i>Acer pensylvanicum</i>	Striped Maple			FACU	3.6	N	WVDNR 2007c, WVDNR 2007e
<i>Acer rubrum</i>	Red Maple			FAC	2.9	N	WVDNR 2007c, WVDNR 2007e
<i>Acer rubrum var. rubrum</i>	Red Maple			FAC	2.5	N	WVDNR 2007c, WVDNR 2007e
<i>Acer rubrum var. trilobum</i>	Carolina Red Maple			FACW +	4.0	N	WVDNR 2007c
<i>Acer saccharum var. saccharum</i>	Sugar Maple			FACU-	5.4	N	WVDNR 2007c
<i>Acer spicatum</i>	Mountain Maple			FACU-	7.3	N	WVDNR 2007c
<i>Achillea millefolium var. occidentalis</i>	Western Yarrow				0.0	E	WVDNR 2007c
<i>Aconitum reclinatum</i>	White Monkshood	S3	G3			N	WVDNR 2007c, WVDNR 2007e
<i>Aconitum uncinatum</i>	Blue Monkshood				5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Aconitum uncinatum ssp. uncinatum</i>	Blue Monkshood					N	WVDNR 2007e
<i>Actaea pachypoda</i>	White Baneberry			UPL		N	WVDNR 2007e
<i>Actaea podocarpa</i>	Mountain Bugbane				6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Adiantum pedatum</i>	Northern Maidenhair			FAC-	6.1	N	WVDNR 2007e
<i>Aesculus flava</i>	Yellow Buckeye			FACU	4.0	N	WVDNR 2007c
<i>Ageratina altissima</i>	White Snakeroot						WVDNR 2007c
<i>Agrimonia gryposepala</i>	Tall Hairy Groovebur			FACU	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Agrimonia striata</i>	Woodland Agrimony			FACU-	5.7	N	WVDNR 2007c
<i>Agrostis canina</i>	Velvet Bent Grass			FACU	0.0	E/T	WVDNR 2007c
<i>Agrostis capillaris</i>	Colonial Bentgrass			FAC*	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Agrostis gigantea</i>	Giant Bentgrass			FACW-	0.0	E	WVDNR 2007c, WVDNR 2007e
<i>Agrostis hyemalis</i>	Winter Bentgrass			FAC	4.1	N	WVDNR 2007c, WVDNR 2007e
<i>Agrostis mertensii</i>	Northern Bentgrass	S1	G5	FACU	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Agrostis perennans</i>	Upland Bentgrass			FACU	3.7	N	WVDNR 2007c, WVDNR 2007e
<i>Agrostis scabra</i>	Rough Bentgrass			FAC	3.2	N/T	WVDNR 2007e

<i>Agrostis stolonifera</i>	Creeping Bentgrass			FACW	0.3	I/T	WVDNR 2007c, WVDNR 2007e
<i>Alisma subcordatum</i>	American Water-Plantain			OBL	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Allium cernuum</i> var. <i>cernuum</i>	Wild Onion				4.0	N	WVDNR 2007c
<i>Allium sativum</i>	Garlic				0.0	E	WVDNR 2007c
<i>Allium tricoccum</i>	Ramps			FACU+	4.9	N	WVDNR 2007c
<i>Alnus glutinosa</i>	European Alder			FACW-	0.0	E	WVDNR 2007c
<i>Alnus incana</i> ssp. <i>rugosa</i>	Speckled Alder			FACW	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Alnus serrulata</i>	Smooth Alder			OBL	5.3	N	WVDNR 2007c
<i>Alopecurus aequalis</i> var. <i>aequalis</i>	Short-Awn Foxtail, Short-Awn Meadow-Foxtail					N	WVDNR 2007e
<i>Amanita ceceliae</i>	Strangulated Amanita Mushroom						WVDNR 2007c
<i>Amanita flavaconia</i>	Yellow Patches Mushroom						WVDNR 2007c
<i>Amanita fulva</i>	Orange-Brown Ringless Amanita Mushroom						WVDNR 2007c
<i>Amanita muscaria</i>	Fly Amanita Mushroom						WVDNR 2007c
<i>Amelanchier xneglecta</i>	Serviceberry					N	WVDNR 2007e
<i>Amelanchier arborea</i> var. <i>arborea</i>	Common Serviceberry			FAC-	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Amelanchier bartramiana</i>	Oblong-Fruit Serviceberry	S2	G5	FAC	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Amelanchier laevis</i>	Allegheny Serviceberry				5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Amelanchier stolonifera</i>	Running Serviceberry			FACU	7.0	N	WVDNR 2007c
<i>Amphicarpaea bracteata</i>	American Hog-Peanut			FAC	3.7	N	WVDNR 2007c
<i>Anagallis arvensis</i>	Scarlet Pimpernel			UPL*		E	WVDNR 2007e
<i>Andreaea rothii</i>	Northern Lantern Moss						WVDNR 2007c
<i>Andromeda polifolia</i> var. <i>glaucophylla</i>	Bog-Rosemary	S1	G5T5	OBL	9.7	N	WVDNR 2007c, WVDNR 2007e
<i>Andropogon gerardii</i>	Big Bluestem			FAC-	5.7	N	WVDNR 2007c
<i>Andropogon glomeratus</i> var. <i>glomeratus</i>	Bushy Broom-Sedge	S2	G5T5	FACW +	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Andropogon gyrans</i> var. <i>gyrans</i>	Elliott's Beardgrass					N	WVDNR 2007e
<i>Anemone quinquefolia</i>	Nightcaps			FACU	5.6	N	WVDNR 2007c
<i>Anemone quinquefolia</i> var. <i>quinquefolia</i>	Nightcaps			FACU	5.7	N	WVDNR 2007c

<i>Anemone virginiana</i> <i>var. virginiana</i>	Tall Thimbleweed				3.0	N	WVDNR 2007c
<i>Angelica triquinata</i>	Filmy Angelica				7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Anomodon sp.</i>	Apron Moss						WVDNR 2007c
<i>Anthoxanthum</i> <i>odoratum ssp.</i> <i>odoratum</i>	Sweet Vernal Grass			FACU	0.0	E/T	WVDNR 2007c
<i>Apocynum</i> <i>androsaemifolium</i>	Spreading Dogbane				2.5	N	WVDNR 2007c
<i>Apocynum cannabinum</i>	Indian-Hemp			FACU	2.9	N	WVDNR 2007c
<i>Arabis laevigata var.</i> <i>laevigata</i>	Smooth Rockcress					N	WVDNR 2007e
<i>Aralia hispida</i>	Bristly Sarsaparilla					N	WVDNR 2007e
<i>Aralia nudicaulis</i>	Wild Sarsaparilla			FACU	5.3	N	WVDNR 2007c
<i>Aralia spinosa</i>	Devil's Walkingstick			FAC	4.7	N	CVNWR 2007a
<i>Arisaema triphyllum</i>	Jack-In-The-Pulpit			FACW-	5.4	N	WVDNR 2007c, WVDNR 2007e
<i>Arisaema triphyllum</i> <i>ssp. stewardsonii</i>	Bog Jack-In-The- Pulpit			FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Arisaema triphyllum</i> <i>ssp. triphyllum</i>	Jack-In-The-Pulpit			FACW-	5.5	N	WVDNR 2007c
<i>Aristolochia</i> <i>macrophylla</i>	Pipevine				4.5	N	WVDNR 2007c
<i>Aruncus dioicus</i>	Bride's-Feathers			FACU	4.4	N	WVDNR 2007c
<i>Asclepias incarnata</i>	Swamp Milkweed						WVDNR 2007c, WVDNR 2007e
<i>Asclepias incarnata</i> <i>ssp. pulchra</i>	Swamp Milkweed			OBL	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Asclepias</i> <i>purpurascens</i>	Purple Milkweed			FACU	5.0	N	WVDNR 2007e
<i>Asclepias syriaca</i>	Common Milkweed			FACU-	2.6	N	WVDNR 2007c
<i>Asclepias tuberosa</i>	Butterfly Milkweed				3.0	N	WVDNR 2007c
<i>Asplenium montanum</i>	Mountain Spleenwort				7.7	N	WVDNR 2007c, WVDNR 2007e
<i>Athyrium filix-femina</i> <i>ssp. asplenioides</i>	Southern Ladyfern			FAC*	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Athyrium filix-femina</i> <i>var. angustum</i>	Northeastern Lady Fern				5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Atrichum crispum</i>	Crispy Catherine's Moss						WVDNR 2007c
<i>Atrichum undulatum</i>	Wavy Catherine's Moss						WVDNR 2007c, WVDNR 2007e
<i>Aulacomnium palustre</i>	Swamp Ribbed Moss						WVDNR 2007c, WVDNR 2007e
<i>Aureolaria laevigata</i>	Entireleaf Yellow False Foxglove					N	WVDNR 2007e
<i>Avena sativa</i>	Oats				0.0	E	WVDNR 2007c
<i>Barbarea vulgaris</i>	Garden Yellow-			FACU	0.0	E	WVDNR 2007c

	Rocket						
<i>Bartonia virginica</i>	Yellow Screwstem			FACW	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Bazzania trilobata</i>	Common Bazzania Liverwort						WVDNR 2007c, WVDNR 2007e
<i>Betula alleghaniensis</i> <i>var. alleghaniensis</i>	Yellow Birch			FAC	6.0	N	WVDNR 2007c
<i>Betula lenta</i>	Sweet Birch			FACU	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Betula nigra</i>	River Birch			FACW	5.3	N	WVDNR 2007c
<i>Bidens cernua</i>	Nodding Beggarticks			OBL	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Bidens connata</i>	Purple-Stem Beggarticks			FACW +	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Bidens frondosa</i>	Devil's Pitchfork			FACW	2.5	N	WVDNR 2007c, WVDNR 2007e
<i>Bidens laevis</i>	Smooth Beggarticks			OBL	4.3	N	WVDNR 2007e
<i>Bidens tripartita</i>	Three-Lobe Beggarticks			FACW +	2.4	N	WVDNR 2007c, WVDNR 2007e
<i>Botrychium dissectum</i>	Cutleaf Grapefern			FAC	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Botrychium multifidum</i>	Leathery Grape Fern			FACU	6.7	N	WVDNR 2007e
<i>Botrychium oneidense</i>	Blunt-Lobe Grapefern	S3	G4Q			N	WVDNR 2007e
<i>Brachyelytrum erectum</i>	Bearded Shorthusk				4.0	N	WVDNR 2007c
<i>Brachyelytrum septentrionale</i>	Northern Shorthusk					N	WVDNR 2007c, WVDNR 2007e
<i>Brachythecium rivulare</i>	Brook Mat Moss						WVDNR 2007c
<i>Brachythecium rutabulum</i>	Robust Mat Moss						WVDNR 2007c, WVDNR 2007e
<i>Brachythecium salebrosum</i>	Shaggy Mat Moss						WVDNR 2007c
<i>Brassica rapa var. rapa</i>	Bird's Rape				0.0	E/T	WVDNR 2007c
<i>Bromus ciliatus var. ciliatus</i>	Fringed Brome			FACW	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Bromus inermis ssp. inermis var. inermis</i>	Smooth Bromegrass				0.0	E/T	WVDNR 2007c
<i>Bromus kalmii</i>	Kalm's Brome			FACU	5.0	N	WVDNR 2007c
<i>Brotherella recurvans</i>	Shiny Fern Moss						WVDNR 2007c
<i>Bryhnia novae-angliae</i>	New England Mat Moss						WVDNR 2007c
<i>Bryum pseudotriquetrum</i>	Purple Bryum Moss						WVDNR 2007c
<i>Calamagrostis canadensis var. canadensis</i>	Reedgrass, Bluejoint			FACW +	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Calamagrostis coarctata</i>	Nuttall's Reedgrass			OBL	7.5	N	WVDNR 2007e

<i>Calamagrostis stricta</i>	Western Bluejoint						WVDNR 2007c, WVDNR 2007e
<i>Callicladium haldanianum</i>	Pretty Branch Moss						WVDNR 2007c
<i>Calliergon cordifolium</i>	Heartleaf Marsh Moss						WVDNR 2007c
<i>Callitriche heterophylla</i> ssp. <i>heterophylla</i>	Larger Water Starwort			OBL	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Callitriche palustris</i>	Vernal Water Starwort			OBL	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Callitriche terrestris</i>	Austin's Water Starwort			FACW +	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Calopogon tuberosus</i> var. <i>tuberosus</i>	Tuberous Grass-Pink	S1	G5T5	FACW +	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Caltha palustris</i> var. <i>palustris</i>	Marsh Marigold			OBL	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Calypogeia fissa</i> ssp. <i>neogaea</i>	Notched Sack Liverwort						WVDNR 2007c
<i>Calypogeia muelleriana</i>	Variable Sack Liverwort						WVDNR 2007c
<i>Calypogeia neesiana</i>	Mountain Sack Liverwort						WVDNR 2007c
<i>Calystegia sepium</i>	Hedge False Bindweed						WVDNR 2007c
<i>Campanula aparinoides</i>	Marsh Bellflower			OBL	7.3	N	WVDNR 2007e
<i>Campylium chrysophyllum</i>	Golden Bentleaf Moss						WVDNR 2007c
<i>Cardamine bulbosa</i>	Bulbous Bittercress			OBL	5.7	N	WVDNR 2007c, WVDNR 2007e
<i>Cardamine diphylla</i>	Crinkleroot			FACU*	5.3	N	WVDNR 2007c
<i>Cardamine hirsuta</i>	Hairy Bittercress			FACU	3.3	N	WVDNR 2007c
<i>Cardamine parviflora</i> var. <i>arenicola</i>	Sand Bittercress			FACU	6.0	N	WVDNR 2007c
<i>Cardamine pennsylvanica</i>	Quaker Bittercress			OBL	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Carduus acanthoides</i>	Spiny Plumeless-Thistle					E/T	WVDNR 2007e
<i>Carex x aestivaliformis</i>	Sedge	S1	GNA			N	WVDNR 2007c, WVDNR 2007e
<i>Carex aestivalis</i>	Summer Sedge	S2	G4		8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex amphibola</i>	Eastern Narrowleaf Sedge			FAC	7.3	N	WVDNR 2007c
<i>Carex annectens</i>	Yellow-Fruit Sedge			FACW	6.0	N	WVDNR 2007c
<i>Carex aquatilis</i> var. <i>aquatilis</i>	Aquatic Sedge	S1	G5T5			N	WVDNR 2007e
<i>Carex argyrantha</i>	Hay Sedge					N	WVDNR 2007e
<i>Carex atherodes</i>	Awnead Sedge	S1	G5	OBL	9.3	N	WVDNR 2007c, WVDNR 2007e

<i>Carex atlantica</i>	Prickly Bog Sedge			FACW +	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex atlantica ssp. atlantica</i>	Prickly Bog Sedge			FACW +	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex baileyi</i>	Bailey's Sedge			OBL	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex bebbii</i>	Bebb's Sedge			OBL	9.0	N	WVDNR 2007e
<i>Carex blanda</i>	Eastern Sedge			FAC	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Carex bromoides ssp. bromoides</i>	Brome-Like Sedge	S3	G5T5	FACW	7.6	N	WVDNR 2007c, WVDNR 2007e
<i>Carex brunnescens ssp. brunnescens</i>	Brown Sedge						WVDNR 2007c
<i>Carex brunnescens ssp. sphaerostachya</i>	Brown Sedge			FACW	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex bushii</i>	Bush's Sedge	S2S3	G4	FACW	8.0	N	WVDNR 2007c
<i>Carex buxbaumii</i>	Brown Bog Sedge	S2	G5	OBL	7.3	N	WVDNR 2007d, WVDNR 2007e
<i>Carex canescens ssp. canescens</i>	Silvery Sedge	S3	G5T5	OBL	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex canescens ssp. disjuncta</i>	Silvery Sedge					N	WVDNR 2007e
<i>Carex comosa</i>	Longhair Sedge	S2	G5	OBL	8.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex conjuncta</i>	Soft Fox Sedge			FACW	7.5	N	WVDNR 2007e
<i>Carex crinita var. brevicrinis</i>	Fringed Sedge						WVDNR 2007c
<i>Carex crinita var. crinita</i>	Fringed Sedge			OBL	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Carex cristatella</i>	Crested Sedge			FACW	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex debilis</i>	White-Edge Sedge			FAC	6.3	N	WVDNR 2007c
<i>Carex debilis var. debilis</i>	White-Edge Sedge			FAC	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Carex debilis var. rudgei</i>	White-Edge Sedge						WVDNR 2007c, WVDNR 2007e
<i>Carex deflexa</i>	Northern Sedge	S1	G5			N	WVDNR 2007e
<i>Carex echinata ssp. echinata</i>	Star Sedge			OBL*	8.3	N	WVDNR 2007c, WVDNR 2007e
<i>Carex emoryi</i>	Emory's Sedge	S2	G5	OBL	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Carex festucacea</i>	Fescue Sedge			FAC	8.0	N	CVNWR 2007a
<i>Carex folliculata</i>	Northern Long Sedge			OBL	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Carex gracillima</i>	Graceful Sedge			FACU	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex granularis</i>	Limestone Meadow Sedge			FACW +	4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex gynandra</i>	Nodding Sedge			OBL	5.0	N	WVDNR 2007c, WVDNR 2007e

<i>Carex haydenii</i>	Cloud Sedge	S1	G5	OBL	9.0	N	WVDNR 2007c
<i>Carex hirsutella</i>	Fuzzy-Wuzzy Sedge					N	WVDNR 2007c
<i>Carex hirtifolia</i>	Pubescent Sedge	S2	G5		7.5	N	WVDNR 2007c
<i>Carex hyalinolepis</i>	Shoreline Sedge			OBL	8.5	N	WVDNR 2007e
<i>Carex hystericina</i>	Bottlebrush Sedge			OBL	7.0	N	WVDNR 2007e
<i>Carex interior</i>	Inland Sedge	S1	G5	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex intumescens</i>	Greater Bladder Sedge			FACW +	5.4	N	WVDNR 2007c, WVDNR 2007e
<i>Carex lacustris</i>	Lake Sedge	S2	G5	OBL	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Carex laevivaginata</i>	Smooth-Sheath Sedge			OBL	6.3	N	WVDNR 2007e
<i>Carex lasiocarpa</i> var. <i>americana</i>	Woolly-Fruit Sedge	S1	G5T5	OBL	8.5	N	WVDNR 2007c
<i>Carex laxiculmis</i> var. <i>copulata</i>	Spreading Sedge	S1	G5T3T 5			N	WVDNR 2007e
<i>Carex laxiculmis</i> var. <i>laxiculmis</i>	Spreading Sedge				7.0	N	WVDNR 2007c
<i>Carex leptalea</i> ssp. <i>leptalea</i>	Bristlystalked Sedge			OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex leptonevia</i>	Nerveless Woodland Sedge	S2	G4	FACW	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex lupuliformis</i>	False Hop Sedge	S1	G4	FACW +	8.7	N	WVDNR 2007e
<i>Carex lupulina</i>	Hop Sedge			OBL	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Carex lurida</i>	Sallow Sedge			OBL	4.4	N	WVDNR 2007c, WVDNR 2007e
<i>Carex lurida</i> × <i>C. lupulina</i>	Sedge						WVDNR 2007e
<i>Carex meadii</i>	Mead's Sedge	S1	G4G5	FAC	9.5	N	WVDNR 2007d, WVDNR 2007e
<i>Carex molesta</i>	Troublesome Sedge	S3	G4	FACU	7.0	N	WVDNR 2007e
<i>Carex normalis</i>	Greater Straw Sedge	S3	G5	FACU	6.3	N	WVDNR 2007c
<i>Carex pauciflora</i>	Few-Flower Sedge	S1	G5	OBL	7.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex pellita</i>	Woolly Sedge	S2	G5			N	WVDNR 2007c
<i>Carex pensylvanica</i>	Pennsylvania Sedge				5.0	N	WVDNR 2007c
<i>Carex plantaginea</i>	Plantainleaf Sedge				5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex prasina</i>	Drooping Sedge			OBL	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Carex projecta</i>	Necklace Sedge	S3	G5	FACW	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex radiata</i>	Eastern Star Sedge				6.3	N	WVDNR 2007c
<i>Carex retroflexa</i>	Reflexed Sedge				7.0	N	WVDNR 2007c

<i>Carex rosea</i>	Rosy Sedge				5.5	N	WVDNR 2007e
<i>Carex scabrata</i>	Eastern Rough Sedge			OBL	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex scoparia</i> var. <i>scoparia</i>	Broom Sedge			FACW	5.1	N	WVDNR 2007c, WVDNR 2007e
<i>Carex stipata</i>	Stalk-Grain Sedge			OBL	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex stipata</i> var. <i>stipata</i>	Stalk-Grain Sedge			OBL	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex stricta</i>	Tussock Sedge			OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex suberecta</i>	Prairie Straw Sedge	S1	G4	OBL	9.5	N	WVDNR 2007c
<i>Carex swanii</i>	Swan's Sedge			FACU	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex tenera</i>	Quill Sedge	S1	G5				WVDNR 2007c
<i>Carex torta</i>	Twisted Sedge			FACW	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Carex tribuloides</i>	Blunt Broom Sedge			FACW +	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carex trichocarpa</i>	Hairy-Fruit Sedge	S1	G4	OBL	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Carex trisperma</i> var. <i>trisperma</i>	Three-Seeded Sedge			OBL	7.7	N	WVDNR 2007c, WVDNR 2007e
<i>Carex utriculata</i>	Beaked Sedge	S3	G5	OBL	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex vesicaria</i>	Inflated Sedge	S2	G5	OBL	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Carex virescens</i>	Ribbed Sedge				5.8	N	CVNWR 2007a, WVDNR 2007e
<i>Carex vulpinoidea</i>	Fox Sedge			OBL	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Carpinus caroliniana</i> ssp. <i>virginiana</i>	Muscletree, American Hornbeam, Blue Beech, Water Beech			FAC	4.9	N	WVDNR 2007c, WVDNR 2007e
<i>Castanea dentata</i>	American Chestnut				5.3	N	WVDNR 2007c
<i>Caulophyllum thalictroides</i>	Blue Cohosh				5.3	N	WVDNR 2007c
<i>Cephalozia lunulifolia</i>	Slim Crescent Liverwort						WVDNR 2007c
<i>Cerastium fontanum</i> ssp. <i>vulgare</i>	Common Mouse-Ear Chickweed			FACU-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Chelone glabra</i>	White Turtlehead			OBL	6.1	N	WVDNR 2007c, WVDNR 2007e
<i>Chimaphila umbellata</i> ssp. <i>cisatlantica</i>	Pipsissewa, Prince's Pine				8.2	N	WVDNR 2007c
<i>Chrysosplenium americanum</i>	American Golden-Saxifrage			OBL	7.0	N	WVDNR 2007c, WVDNR 2007e

<i>Cicuta maculata</i> var. <i>maculata</i>	Spotted Water-Hemlock			OBL	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Cinna arundinacea</i>	Sweet Woodreed			FACW	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Cinna latifolia</i>	Slender Woodreed			FACW	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Circaea alpina</i> ssp. <i>alpina</i>	Alpine Enchanter's-Nightshade			FACW	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Cirsium discolor</i>	Field Thistle			UPL		N	WVDNR 2007c, WVDNR 2007e
<i>Cirsium muticum</i>	Swamp Thistle			OBL	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Cladonia arbuscula</i>	Reindeer Lichen						WVDNR 2007c
<i>Cladonia cristatella</i>	British Soliders						WVDNR 2007c
<i>Cladonia grayi</i>	Gray's Cup Lichen						WVDNR 2007c
<i>Cladonia incrasata</i>	Powder-Foot British Soldiers						WVDNR 2007c
<i>Cladonia macilenta</i> var. <i>bacillaris</i>	Lipstick Powderhorn, Pin Lichen						WVDNR 2007c
<i>Cladonia pyxidata</i>	Pebbled Pixie-Cup						WVDNR 2007c
<i>Cladonia rangiferina</i>	Grey Reindeer Lichen						WVDNR 2007c
<i>Cladonia squamosa</i>	Dragon Cladonia						WVDNR 2007c
<i>Cladonia stygia</i>	Black-Footed Reindeer Lichen						WVDNR 2007c
<i>Cladonia subtenuis</i>	Dixie Reindeer Lichen						WVDNR 2007c
<i>Claytonia caroliniana</i>	Carolina Springbeauty			FACU	6.1	N	CVNWR 2007a
<i>Clematis virginiana</i>	Virgin's Bower			FAC	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Climacium americanum</i>	American Climacium Moss						WVDNR 2007c
<i>Clinopodium vulgare</i>	Wild Basil				2.1	N	WVDNR 2007c
<i>Clintonia borealis</i>	Yellow Bluebead-Lily			FAC	7.8	N	CVNWR 2007a, WVDNR 2007e
<i>Clintonia umbellulata</i>	White Bluebead-Lily				6.8	N	WVDNR 2007c
<i>Coeloglossum viride</i> var. <i>virescens</i>	Long-Bracted Green Orchid, Satyr Orchid	S1	G5T5	FACU	7.7	N	WVDNR 2007c
<i>Conium maculatum</i>	Poison-Hemlock			FACW	0.0	E/T	WVDNR 2007e
<i>Conocephalum conicum</i>	Conehead Chamber Liverwort						WVDNR 2007c
<i>Convallaria majuscula</i>	American Lily-Of-The-Valley				7.0	N	WVDNR 2007c
<i>Coptis trifolia</i>	Threeleaf Goldthread	S3	G5	FACW	8.1	N	WVDNR 2007c, WVDNR 2007e

<i>Corallorhiza maculata</i> <i>var. occidentalis</i>	Western Spotted Coralroot	S1	G5T3T 5			N	WVDNR 2007e
<i>Corallorhiza trifida</i>	Early Coralroot	S1	G5	FACW	9.3	N	WVDNR 2007c, WVDNR 2007e
<i>Cornus alternifolia</i>	Alternate-Leaf Dogwood			FAC+*	6.3	N	WVDNR 2007c
<i>Cornus amomum</i>	Silky Dogwood			FACW	5.0	N	WVDNR 2007c
<i>Cornus canadensis</i>	Canadian Bunchberry	S2	G5	FAC-	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Cornus obliqua</i>	Pale Dogwood					N	WVDNR 2007e
<i>Cornus sericea</i> ssp. <i>sericea</i>	Red-Osier Dogwood			FACW +	0.0	I	WVDNR 2007c, WVDNR 2007e
<i>Coronilla varia</i>	Purple Crown- Vetch				0.0	E/T	WVDNR 2007c
<i>Crataegus disperma</i>	Spreading Hawthorn					N	WVDNR 2007e
<i>Crataegus macrosperma</i>	Big-Fruit Hawthorn					N	WVDNR 2007c, WVDNR 2007e
<i>Crataegus pruinosa</i>	Waxy-Fruit Hawthorn					N	WVDNR 2007e
<i>Crataegus punctata</i>	Dotted Hawthorn					N	WVDNR 2007c
<i>Crataegus succulenta</i>	Fleshy Hawthorn					N	WVDNR 2007e
<i>Crepis capillaris</i>	Smooth Hawksbeard				0.0	E	CVNWR 2007a
<i>Cryptotaenia canadensis</i>	Canada Honewort			FAC	5.0	N	WVDNR 2007c
<i>Ctenidium malacodes</i>	Comb Fern Moss						WVDNR 2007c
<i>Cuscuta rostrata</i>	Beaked Dodder	S2	G4			N	WVDNR 2007c, WVDNR 2007e
<i>Cymophyllus fraserianus</i>	Fraser's Sedge	S3	G4	FACW*	7.0	N	WVDNR 2007c
<i>Cyperus echinatus</i>	Globe Flatsedge			FACU	6.0	N	WVDNR 2007e
<i>Cyperus esculentus</i> <i>var. leptostachyus</i>	Edible Nutgrass, Chufa			FACW	4.0	N	WVDNR 2007e
<i>Cypripedium acaule</i>	Pink Lady's- Slipper			FACU-	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Cypripedium reginae</i>	Showy Lady's- Slipper	S1	G4	FACW	9.2	N	WVDNR 2007c, WVDNR 2007e
<i>Dactylis glomerata</i> ssp. <i>glomerata</i>	Orchard Grass			FACU	0.0	E/T	WVDNR 2007c
<i>Dalibarda repens</i>	Robin-Run-Away	S3	G5	FAC	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Danthonia compressa</i>	Flattened Oatgrass			FACU-	5.8	N	WVDNR 2007c
<i>Danthonia spicata</i>	Poverty Oatgrass				5.0	N	WVDNR 2007c
<i>Daucus carota</i>	Queen Anne's- Lace				0.0	E/T	WVDNR 2007c
<i>Dennstaedtia punctilobula</i>	Eastern Hay- Scented Fern				2.3	N	WVDNR 2007c, WVDNR 2007e
<i>Deparia acrostichoides</i>	Silver False Spleenwort			FAC	5.9	N	WVDNR 2007e
<i>Deschampsia</i>	Tufted Hairgrass			FACW	7.8	N	WVDNR 2007c

<i>caespitosa</i>							
<i>Deschampsia flexuosa</i> <i>var. flexuosa</i>	Crinkled Hairgrass				7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Desmodium canadense</i>	Showy Tick-Trefoil			FAC	3.8	N	WVDNR 2007e
<i>Dichanthelium acuminatum</i> ssp. <i>fasciculatum</i>	Western Panicgrass						WVDNR 2007c, WVDNR 2007e
<i>Dichanthelium acuminatum</i> ssp. <i>implicatum</i>	Western Panicgrass						WVDNR 2007c
<i>Dichanthelium clandestinum</i>	Deer-Tongue Witchgrass			FAC+	3.4	N	WVDNR 2007c, WVDNR 2007e
<i>Dichanthelium dichotomum</i> ssp. <i>microcarpon</i>	Forked Panicgrass						WVDNR 2007c
<i>Dichanthelium ovale</i> ssp. <i>villosissimum</i>	Stiff-Leaved Panicgrass						WVDNR 2007c
<i>Dicranella heteromalla</i>	Silky Fork Moss						WVDNR 2007c
<i>Dicranodontium denudatum</i>	Naked Windblown Moss						WVDNR 2007c
<i>Dicranum flagellare</i>	Broodbranch Fork Moss						WVDNR 2007c
<i>Dicranum fulvum</i>	Boulder Fork Moss						WVDNR 2007c
<i>Dicranum montanum</i>	Mountain Fork Moss						WVDNR 2007c
<i>Dicranum ontariense</i>	Clustered Fork Moss						WVDNR 2007c
<i>Dicranum scoparium</i>	Broom Fork Moss						WVDNR 2007c, WVDNR 2007e
<i>Doellingeria umbellata</i> <i>var. umbellata</i>	Parasol Whitetop			FACW	5.2	N	WVDNR 2007c, WVDNR 2007e
<i>Drosera filiformis</i>	Threadleaf Sundew			OBL	0.3	A	WVDNR 2007e
<i>Drosera intermedia</i>	Water Sundew			OBL	0.5	A	WVDNR 2007c, WVDNR 2007e
<i>Drosera rotundifolia</i> <i>var. rotundifolia</i>	Roundleaf Sundew	S3	G5T5	OBL	8.3	N	WVDNR 2007c, WVDNR 2007e
<i>Dryopteris xboottii</i>	Boott's Wood Fern			FACW	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Dryopteris xtriploidea</i>	Sheild Fern					N	WVDNR 2007e
<i>Dryopteris campyloptera</i>	Mountain Woodfern				6.0	N	WVDNR 2007c
<i>Dryopteris carthusiana</i>	Spinulose Woodfern			FAC+	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Dryopteris celsa</i>	Log Fern	SH	G4	OBL	8.0	N	WVDNR 2007e
<i>Dryopteris cristata</i>	Crested Woodfern			FACW +	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Dryopteris intermedia</i>	Intermediate Woodfern			FACU	5.1	N	WVDNR 2007c, WVDNR 2007e
<i>Dryopteris marginalis</i>	Marginal			FACU-	5.5	N	WVDNR 2007c

	Woodfern						
<i>Dulichium arundinaceum</i>	Threeway Sedge			OBL	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Elaeagnus umbellata</i> <i>var. parvifolia</i>	Autumn Olive				0.0	E/T	CVNWR 2007a
<i>Eleocharis acicularis</i> <i>var. acicularis</i>	Needle Spikerush			OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Eleocharis elliptica</i>	Elliptic Spikerush	S1	G5	FACW +	8.5	N	WVDNR 2007e
<i>Eleocharis erythropoda</i> <i>× E. smallii</i>	Spikerush						WVDNR 2007e
<i>Eleocharis obtusa</i>	Blunt Spikerush			OBL	4.2	N	WVDNR 2007c, WVDNR 2007e
<i>Eleocharis palustris</i>	Marsh Spikerush	S3	G5	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Eleocharis tenuis</i> <i>var. tenuis</i>	Kill Cow, Doghair			FACW +	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Elymus canadensis</i>	Nodding Wild Rye			FACU+	4.7	N	WVDNR 2007c, WVDNR 2007e
<i>Elymus riparius</i>	Riverbank Wild Rye			FACW	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Elymus virginicus</i> <i>var. virginicus</i>	Virginia Wild Rye			FACW-	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Epigaea repens</i>	Trailing Arbutus				5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Epilobium ciliatum</i>	Fringed Willowherb			FAC-	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Epilobium coloratum</i>	Purpleleaf Willowherb			FACW +	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Epilobium leptophyllum</i>	Bog Willowherb			OBL	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Equisetum arvense</i>	Field Horsetail			FAC	3.0	N	WVDNR 2007c, WVDNR 2007e
<i>Equisetum fluviatile</i>	Water Horsetail	S2	G5	OBL	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Equisetum hyemale</i> <i>var. affine</i>	Common Scouring-Rush			FACW	3.5	N	WVDNR 2007e
<i>Equisetum sylvaticum</i>	Woodland Horsetail	S1	G5	FACW	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Erechtites hieraciifolia</i> <i>var. hieraciifolia</i>	Pilewort				2.3	N	WVDNR 2007c
<i>Erigeron annuus</i>	Eastern Daisy Fleabane			FACU	2.0	N	WVDNR 2007c
<i>Erigeron strigosus</i> <i>var. strigosus</i>	Daisy Fleabane			FACU+	2.3	N	WVDNR 2007c
<i>Eriophorum virginicum</i>	Tawny Cotton-Grass			OBL	7.7	N	WVDNR 2007c, WVDNR 2007e
<i>Erythronium americanum</i> <i>ssp. americanum</i>	Yellow Trout-Lily					N	WVDNR 2007c

<i>Erythronium umbilicatum</i> ssp. <i>umbilicatum</i>	Dimpled Trout-Lily			FAC	6.7	N	WVDNR 2007c
<i>Eupatorium fistulosum</i>	Trumpetweed			FACW	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Eupatorium maculatum</i>	Spotted Joe-Pyeweed						WVDNR 2007c
<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	Boneset			FACW +	4.7	N	WVDNR 2007c, WVDNR 2007e
<i>Eupatorium pilosum</i>	Rough Boneset	S2	G5	FACW	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Euphorbia cyparissias</i>	Cypress Spurge, Graveyard Weed					E/T	WVDNR 2007e
<i>Euphorbia purpurea</i>	Glade Spurge	S2	G3	FAC	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Eurybia divaricata</i>	White Wood-Aster				4.3	N	WVDNR 2007c
<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	Flat-Top Goldentop			FAC	3.5	N	WVDNR 2007c, WVDNR 2007e
<i>Fagus grandifolia</i>	American Beech			FACU	5.0	N	WVDNR 2007c
<i>Festuca subverticillata</i>	Nodding Fescue			FACU	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Festuca trachyphylla</i>	Hard Fescue				0.0	E	WVDNR 2007c
<i>Filipendula rubra</i>	Queen-Of-The-Prairie			FACW	0.0	E	CVNWR 2007a
<i>Fragaria vesca</i>	Woodland Strawberry				0.0	E	WVDNR 2007c
<i>Fragaria virginiana</i> ssp. <i>virginiana</i>	Virginia Strawberry			FACU	2.5	N	WVDNR 2007c, WVDNR 2007e
<i>Fraxinus americana</i>	White Ash			FACU	5.7	N	WVDNR 2007c
<i>Fraxinus nigra</i>	Black Ash	S3	G5	FACW	8.6	N	WVDNR 2007c, WVDNR 2007e
<i>Fraxinus pennsylvanica</i>	Green Ash			FACW	6.0	N	WVDNR 2007c
<i>Galeopsis tetrahit</i> var. <i>tetrahit</i>	Hemp Nettle					E	WVDNR 2007c
<i>Galium aparine</i>	Sticky Willy			FACU	2.5	N	WVDNR 2007c
<i>Galium asprellum</i>	Rough Bedstraw			OBL	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Galium mollugo</i>	False Baby's-Breath				0.0	E	WVDNR 2007e
<i>Galium obtusum</i> ssp. <i>obtusum</i>	Bluntleaf Bedstraw			FACW +	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Galium tinctorium</i>	Stiff Marsh Bedstraw			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Galium triflorum</i>	Sweet-Scent Bedstraw			FACU	4.6	N	WVDNR 2007c
<i>Gaultheria hispidula</i>	Creeping Teaberry	S3	G5	FACW	8.8	N	WVDNR 2007c, WVDNR 2007e
<i>Gaultheria procumbens</i>	Wintergreen			FACU	5.1	N	WVDNR 2007c, WVDNR 2007e
<i>Gaylussacia baccata</i>	Black Huckleberry			FACU	5.4	N	WVDNR 2007c, WVDNR 2007e

<i>Gentiana andrewsii</i> <i>var. andrewsii</i>	Bottle Gentian			FACW	7.4	N	WVDNR 2007c, WVDNR 2007e
<i>Gentiana clausa</i>	Bottle Gentian			FACW	6.3	N	CVNWR 2007a, WVDNR 2007e
<i>Gentiana linearis</i>	Narrowleaf Gentian			OBL	6.6	N	WVDNR 2007c, WVDNR 2007e
<i>Gentiana saponaria</i> <i>var. saponaria</i>	Soapwort Gentian			FACW	6.7	N	WVDNR 2007e
<i>Gentiana villosa</i>	Striped Gentian					N	WVDNR 2007e
<i>Gentianopsis crinita</i>	Greater Fringed Gentian	S1	G5	OBL	9.0	N	WVDNR 2007c
<i>Geranium maculatum</i>	Spotted Geranium			FACU	4.9	N	WVDNR 2007c
<i>Geum aleppicum</i>	Yellow Avens	S1	G5	FAC	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Geum laciniatum var.</i> <i>laciniatum</i>	Rough Avens			FAC+	6.0	N	WVDNR 2007e
<i>Geum rivale</i>	Purple Avens	S1	G5	OBL	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Geum virginianum</i>	Cream Avens			FAC-	5.5	N	CVNWR 2007a, WVDNR 2007e
<i>Glyceria canadensis</i>	Rattlesnake Mannagrass			OBL	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Glyceria grandis var.</i> <i>grandis</i>	American Mannagrass	S2	G5T5		8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Glyceria laxa</i>	Mannagrass	S2S3	G5		6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Glyceria melicaria</i>	Melic Manna Grass			OBL	6.6	N	WVDNR 2007c, WVDNR 2007e
<i>Glyceria obtusa</i>	Atlantic Mannagrass			OBL			WVDNR 2007c
<i>Glyceria septentrionalis</i>	Floating Mannagrass			OBL	7.3	N	WVDNR 2007c
<i>Glyceria striata</i>	Fowl Mannagrass			OBL	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Gnaphalium uliginosum</i>	Marsh Cudweed			FAC	4.5	N	WVDNR 2007e
<i>Goodyera pubescens</i>	Downy Rattlesnake- Plantain			FACU-	5.2	N	WVDNR 2007c
<i>Gratiola neglecta</i>	Clammy Hedge- Hyssop			OBL	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Gymnocarpium</i> <i>dryopteris</i>	Northern Oak Fern	S1	G5	UPL		N	WVDNR 2007c, WVDNR 2007e
<i>Gymnostomum</i> <i>aeruginosum</i>	Jade Tufa Moss						WVDNR 2007c
<i>Hamamelis virginiana</i>	American Witch- Hazel			FACU+	5.3	N	WVDNR 2007c
<i>Hasteola suaveolens</i>	False Indian- Plantain	S3	G4		8.5	N	WVDNR 2007c, WVDNR 2007e
<i>Helenium autumnale</i> <i>var. autumnale</i>	Yellow Sneezeweed			FACW +	4.6	N	WVDNR 2007c, WVDNR 2007e

<i>Helenium flexuosum</i>	Purple-Head Sneezeweed			FAC-	5.0	N	WVDNR 2007e
<i>Helianthus giganteus</i>	Giant Sunflower			FACW	6.5	A	WVDNR 2007c, WVDNR 2007e
<i>Helianthus microcephalus</i>	Small Woodland Sunflower				6.0	N	WVDNR 2007c
<i>Heliopsis helianthoides</i> <i>var. helianthoides</i>	Ox-Eye Daisy					N	WVDNR 2007e
<i>Heliopsis helianthoides</i> <i>var. scabra</i>	Rough Ox-Eye Daisy				8.0	N	WVDNR 2007c
<i>Heracleum maximum</i>	Cow-Parsnip			FACU-	6.0	N	WVDNR 2007e
<i>Hieracium aurantiacum</i>	Devil's Paintbrush				0.0	E/T	WVDNR 2007c
<i>Hieracium caespitosum</i>	Meadow Hawkweed				0.0	E/T	WVDNR 2007c
<i>Hieracium scabrum</i> <i>var. scabrum</i>	Rough Hawkweed					N	WVDNR 2007e
<i>Hieracium venosum</i>	Rattlesnake-Weed				5.8	N	WVDNR 2007c
<i>Holcus lanatus</i>	Common Velvetgrass			FACU	0.0	E/T	WVDNR 2007c
<i>Houstonia caerulea</i>	Quaker-Ladies			FACU	3.3	N	WVDNR 2007c, WVDNR 2007e
<i>Houstonia serpyllifolia</i>	Appalachian Bluet			FAC	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Huperzia lucidula</i>	Shining Clubmoss			FACW-	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Hydrocotyle americana</i>	American Marsh Pennywort			OBL	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Hydrophyllum virginianum</i>	Shawnee Salad			FAC	6.2	N	CVNWR 2007a, WVDNR 2007e
<i>Hygrohypnum eugyrium</i>	Inflated Boat Moss						WVDNR 2007c
<i>Hygrohypnum ochraceum</i>	Curly Boat Moss						WVDNR 2007c, WVDNR 2007e
<i>Hylocomium splendens</i>	Splendid Stairstep Moss						WVDNR 2007c, WVDNR 2007e
<i>Hypericum canadense</i>	Canadian St. Johnswort			FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Hypericum densiflorum</i>	Bushy St. Johnswort			FAC+	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Hypericum ellipticum</i>	Pale St. Johnswort			OBL	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Hypericum mitchellianum</i>	Blue Ridge St. Johnswort	S1	G3	FACU	9.5	N	WVDNR 2007c
<i>Hypericum mutilum</i>	Dwarf St. Johnswort			FACW	4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Hypericum perforatum</i>	Common St. Johnswort				0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Hypericum prolificum</i>	Shrubby St. Johnswort			FACU	5.0	N	WVDNR 2007c
<i>Hypericum punctatum</i>	Spotted St. Johnswort			FAC-	3.5	N	WVDNR 2007c, WVDNR 2007e

<i>Hypnum fertile</i>	Fertile Fern Moss						WVDNR 2007c
<i>Hypnum imponens</i>	Flat Fern Moss						WVDNR 2007c, WVDNR 2007e
<i>Hypnum lindbergii</i>	Seepy Fern Moss						WVDNR 2007c
<i>Hypnum pallescens</i>	Snaky Fern Moss						WVDNR 2007c
<i>Hypochaeris radicata</i>	Hairy Cat's-Ear				0.0	E	WVDNR 2007c, WVDNR 2007e
<i>Ilex collina</i>	Hill Holly	S2	G3		8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Ilex montana</i>	Mountain Holly				5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Ilex verticillata</i>	Common Winterberry			FACW +	6.6	N	WVDNR 2007c, WVDNR 2007e
<i>Impatiens capensis</i>	Orange Jewelweed			FACW	3.9	N	WVDNR 2007c, WVDNR 2007e
<i>Impatiens pallida</i>	Yellow Jewelweed			FACW	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Iris pseudacorus</i>	Pale Yellow Iris			OBL	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Iris virginica var. shrevei</i>	Virginia Blueflag			OBL	6.3	N	WVDNR 2007e
<i>Isoetes engelmannii</i>	Engelmann's Quillwort			OBL	7.5	N	WVDNR 2007e
<i>Juncus acuminatus</i>	Sharp-Fruit Rush			OBL	4.7	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus articulatus</i>	Jointleaf Rush	S2	G5	OBL	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus biflorus</i>	Bog Rush	S2	G5	FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus brevicaudatus</i>	Narrow-Panicle Rush			OBL	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus bufonius var. bufonius</i>	Toad Rush			FACW	4.3	N	WVDNR 2007e
<i>Juncus canadensis</i>	Canadian Rush			OBL	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus dichotomus</i>	Forked Rush	S1	G5	FACW-	7.0	N	WVDNR 2007c
<i>Juncus dudleyi</i>	Dudley's Rush			FAC-	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus effusus var. conglomeratus</i>	Common Rush					N	WVDNR 2007e
<i>Juncus effusus var. pylaei</i>	Soft Rush					N	WVDNR 2007c, WVDNR 2007e
<i>Juncus effusus var. solutus</i>	Soft Rush			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus filiformis</i>	Thread Rush	S2	G5	FACW	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus marginatus</i>	Grassleaf Rush			FACW	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus nodosus var. nodosus</i>	Knotted Rush	S1S2	G5T5?	OBL	6.3	N	WVDNR 2007d, WVDNR 2007e
<i>Juncus secundus</i>	Lopsided Rush			FACU	7.5	N	WVDNR 2007c, WVDNR 2007e

<i>Juncus subcaudatus</i> <i>var. subcaudatus</i>	Woodland Rush			OBL	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Juncus tenuis</i>	Poverty Rush			FAC-	2.8	N	WVDNR 2007c, WVDNR 2007e
<i>Kalmia latifolia</i>	Mountain Laurel			FACU	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Krigia biflora</i> <i>var.</i> <i>biflora</i>	Cynthia			FACU	3.7	N	WVDNR 2007c, WVDNR 2007e
<i>Lactarius subvellerus</i>	White Hot Lactarius Mushroom						WVDNR 2007c
<i>Lactuca biennis</i>	Tall Blue Lettuce			FACU	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Lactuca canadensis</i>	Florida Blue Lettuce			FACU-	3.3	N	WVDNR 2007c
<i>Laportea canadensis</i>	Canadian Wood- Nettle			FAC	5.0	N	WVDNR 2007c
<i>Larix laricina</i>	Tamarack	S1	G5	FACW	9.3	N	WVDNR 2007c, WVDNR 2007e
<i>Leersia oryzoides</i>	Rice Cutgrass			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Leersia virginica</i>	White Cutgrass			FACW	4.8	N	WVDNR 2007c
<i>Lemna valdiviana</i>	Pale Duckweed	S3	G5	OBL	7.3	N	WVDNR 2007e
<i>Leptodictyum humile</i>	Earth Conecap Moss						WVDNR 2007c
<i>Leucanthemum vulgare</i>	Oxeye Daisy				0.0	E/T	WVDNR 2007c
<i>Leucobryum albidum</i>	Small White Cushion Moss						WVDNR 2007c
<i>Leucobryum glaucum</i>	Common White Cushion Moss						WVDNR 2007c, WVDNR 2007e
<i>Ligusticum canadense</i>	Canadian Wild Lovage			FAC	7.0	N	WVDNR 2007e
<i>Lilium superbum</i>	Turk's-Cap Lily			FACW +	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Linaria vulgaris</i>	Butter-And-Eggs				0.0	E/T	WVDNR 2007c
<i>Lindera benzoin</i>	Northern Spicebush			FACW-	5.4	N	WVDNR 2007c, WVDNR 2007e
<i>Lindernia dubia</i>	Yellowseed False Pimpernel			OBL	4.7	A/ N	WVDNR 2007c, WVDNR 2007e
<i>Lindernia dubia</i> <i>var.</i> <i>dubia</i>	Yellowseed False Pimpernel			FACW	5.0	N	WVDNR 2007c
<i>Linnaea borealis</i> <i>ssp.</i> <i>americana</i>	Twinflower	S1	G5T5	FAC	9.2	N	WVDNR 2007c, WVDNR 2007e
<i>Linum striatum</i>	Ridged Yellow Flax			FACW	5.3	N	WVDNR 2007e
<i>Liparis loeselii</i>	Yellow Wide-Lip Orchid	S3	G5	FACW	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Liriodendron tulipifera</i>	Tuliptree			FACU	4.7	N	WVDNR 2007c
<i>Listera cordata</i> <i>var.</i> <i>cordata</i>	Heartleaf Twayblade	S2	G5T5	FACW +	8.5	N	WVDNR 2007c
<i>Listera smallii</i>	Kidneyleaf Twayblade	S2	G4	FACW	8.6	N	WVDNR 2007c, WVDNR 2007e

<i>Lobaria pulmonaria</i>	Lung Lichen						WVDNR 2007c
<i>Lobelia inflata</i>	Indian-Tobacco			FACU	2.9	N	WVDNR 2007e
<i>Lobelia puberula</i> var. <i>puberula</i>	Downy Lobelia			FACW-	7.3	N	WVDNR 2007e
<i>Loeskeobryum brevirostre</i>	Pinched Mountain Moss						WVDNR 2007c
<i>Lolium arundinaceum</i>	Tall Fescue			FACU	0.0	E/T	WVDNR 2007e
<i>Lolium perenne</i>	Perennial Ryegrass			FACU-	0.0	E	WVDNR 2007c
<i>Lolium pratense</i>	Meadow Ryegrass			FACU-	0.0	E/T	WVDNR 2007c
<i>Lonicera canadensis</i>	Fly Honeysuckle	S2	G5	FACU	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Lonicera dioica</i>	Limber Honeysuckle			FACU	6.7	N	WVDNR 2007e
<i>Lonicera japonica</i>	Japanese Honeysuckle			FAC-	0.0	E/T	WVDNR 2007c
<i>Lonicera morrowii</i>	Morrow's Honeysuckle			FACU	0.0	E/T	WVDNR 2007c
<i>Lophocolea heterophylla</i>	Variable Malepouch Liverwort						WVDNR 2007c
<i>Lotus corniculatus</i>	Garden Bird's- Foot-Trefoil			FACU-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Ludwigia palustris</i>	Marsh Seedbox			OBL	3.6	N	WVDNR 2007c, WVDNR 2007e
<i>Luzula acuminata</i> var. <i>acuminata</i>	Hairy Woodrush			FAC	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Luzula bulbosa</i>	Bulbous Woodrush	S1	G5	FACU	7.0	N	WVDNR 2007c
<i>Luzula multiflora</i> ssp. <i>multiflora</i> var. <i>multiflora</i>	Common Woodrush			FACU	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodiella alopeкуроoides</i>	Foxtail Clubmoss			FACW +			WVDNR 2007e
<i>Lycopodiella appressa</i>	Southern Appressed Clubmoss			FACW +	7.7	N	WVDNR 2007e
<i>Lycopodiella inundata</i>	Northern Bog Clubmoss	S2	G5	OBL	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium annotinum</i>	Stiff Clubmoss			FAC	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium clavatum</i>	Running Clubmoss			FAC	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium dendroideum</i>	Tree Clubmoss			FACU	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium digitatum</i>	Fan Clubmoss				4.4	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium hickeyi</i>	Pennsylvania Ground-Pine					N	WVDNR 2007c, WVDNR 2007e
<i>Lycopodium obscurum</i>	Princess-Pine			FACU	5.4	N	WVDNR 2007c
<i>Lycopodium tristachyum</i>	Deep-Root Ground-Pine					N	WVDNR 2007c, WVDNR 2007e

<i>Lycopus xsherardii</i>	Waterhorehound			OBL	4.0	N	WVDNR 2007e
<i>Lycopus americanus</i>	American Water-Horehound			OBL	4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	Northern Bugleweed			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Lycopus virginicus</i>	Virginia Water-Horehound			OBL	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Lygodium palmatum</i>	American Climbing Fern	S3	G4	FACW	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Lyonia ligustrina</i> var. <i>ligustrina</i>	Maleberry			FACW	5.3	N	WVDNR 2007e
<i>Lysimachia ciliata</i>	Fringed Loosestrife			FACW	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Lysimachia hybrida</i>	Lowland Loosestrife	S1	G5	OBL	8.0	N	WVDNR 2007c
<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife			FACU-	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Lysimachia terrestris</i>	Swamp-Candles			OBL	6.0	N	WVDNR 2007c
<i>Magnolia acuminata</i>	Cucumber-Tree				5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Magnolia fraseri</i>	Fraser Magnolia			FACU	6.7	N	WVDNR 2007c
<i>Maianthemum canadense</i>	Canada Mayflower			FAC-	5.6	N	WVDNR 2007c
<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	Feathery False Lily-Of-The-Valley			FACU-	4.1	N	WVDNR 2007c
<i>Maianthemum stellatum</i>	Starflower False Solomon's-Seal	S2	G5	FACW	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Malaxis unifolia</i>	Green Adder's-Mouth			FAC	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Malus pumila</i>	Apple				0.0	E	WVDNR 2007c
<i>Marshallia grandiflora</i>	Monongahela Barbara's-Buttons	S2	G2	FAC	8.6	N	WVDNR 2007c, WVDNR 2007e
<i>Matteuccia struthiopteris</i>	Ostrich Fern	S2	G5	FACW	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Medeola virginiana</i>	Indian Cucumber-Root				5.5	N	WVDNR 2007c
<i>Medicago lupulina</i>	Black Medic				0.0	E/T	CVNWR 2007a, WVDNR 2007e
<i>Meehania cordata</i>	Meehan's-Mint				5.2	N	WVDNR 2007c, WVDNR 2007e
<i>Melampyrum lineare</i>	Narrowleaf Cow-Wheat			FACU	5.8	N	WVDNR 2007c
<i>Mentha x piperita</i>	Peppermint			FACW +	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Mentha arvensis</i>	Wild Mint			FACW	3.0	N	WVDNR 2007c, WVDNR 2007e
<i>Menyanthes trifoliata</i>	Buckbean	S1	G5	OBL	9.3	N	WVDNR 2007c, WVDNR 2007e
<i>Menziesia pilosa</i>	Minniebush			FAC-	7.0	N	WVDNR 2007c, WVDNR 2007e

<i>Milium effusum</i> var. <i>cisatlanticum</i>	Millet Grass				8.5	N	WVDNR 2007c
<i>Mimulus moschatus</i> var. <i>moschatus</i>	Muskflower			OBL	0.0	I	WVDNR 2007e
<i>Mimulus ringens</i> var. <i>ringens</i>	Common Monkey-Flower			OBL	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Mitchella repens</i>	Partridgeberry			FACU	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Mitella diphylla</i>	Twoleaf Miterwort			FACU	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Mitrula elegans</i>	Swamp Beacon Mushroom						WVDNR 2007c
<i>Mnium hornum</i>	Longleaf Mnium Moss						WVDNR 2007c
<i>Monarda didyma</i>	Scarlet Beebalm			FAC+	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Monotropa uniflora</i>	Indian-Pipe			FACU-	5.1	N	WVDNR 2007c, WVDNR 2007e
<i>Muhlenbergia sylvatica</i>	Woodland Muhly			FAC+	6.0	N	WVDNR 2007c
<i>Myosotis laxa</i>	Smaller Forget-Me-Not			OBL	5.0	N	CVNWR 2007a, WVDNR 2007e
<i>Najas gracillima</i>	Slender Waternymph	S2	G5?	OBL	9.5	N	WVDNR 2007c, WVDNR 2007e
<i>Nemopanthus mucronatus</i>	Catberry			OBL	8.2	N	WVDNR 2007c, WVDNR 2007e
<i>Nyssa sylvatica</i>	Blackgum			FAC	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Oclemena acuminata</i>	Whorled Wood Aster				5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Oenothera fruticosa</i> ssp. <i>fruticosa</i>	Narrow-Leaved Sundrops			FAC	6.3	N	WVDNR 2007e
<i>Oenothera fruticosa</i> ssp. <i>glauca</i>	Narrowleaf Evening-Primrose				6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Oenothera parviflora</i>	Northern Evening-Primrose			FACU-	3.7	N	WVDNR 2007c, WVDNR 2007e
<i>Oenothera perennis</i>	Small Evening-Primrose			FAC-	4.7	N	WVDNR 2007c, WVDNR 2007e
<i>Oenothera pilosella</i> ssp. <i>pilosella</i>	Meadow Sundrops	S2	G5T5?	FAC	6.5	N	WVDNR 2007c
<i>Oligoneuron album</i>	Prairie Goldenrod					N	WVDNR 2007e
<i>Onoclea sensibilis</i>	Sensitive Fern			FACW	4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Ophioglossum engelmannii</i>	Limestone Adder's-Tongue	S1	G5	FACU	10.0	N	WVDNR 2007c
<i>Ophioglossum pusillum</i>	Northern Adder's-Tongue	SH	G5	FACW	9.7	N	WVDNR 2007e
<i>Ophioglossum vulgatum</i>	Southern Adder's-Tongue			FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Orontium aquaticum</i>	Golden Club			OBL	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Osmorhiza claytonii</i>	Blank Sweet-			FACU-	4.7	N	WVDNR 2007c

	Cicely						
<i>Osmunda cinnamomea</i> <i>var. cinnamomea</i>	Cinnamon Fern			FACW	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Osmunda claytoniana</i>	Interrupted Fern			FAC	6.4	N	WVDNR 2007c, WVDNR 2007e
<i>Osmunda regalis</i> <i>var.</i> <i>spectabilis</i>	Royal Fern			OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Oxalis corniculata</i>	Creeping Lady's Sorrel			FACU	0.0	E	WVDNR 2007c
<i>Oxalis dillenii</i>	Slender Yellow Wood Sorrel			FACU*	2.5	N	WVDNR 2007c
<i>Oxalis montana</i>	Mountain Wood Sorrel			FAC-	6.0	N	WVDNR 2007c
<i>Oxalis stricta</i>	Common Yellow Wood Sorrel				2.0	N	WVDNR 2007c, WVDNR 2007e
<i>Oxalis violacea</i>	Violet Wood Sorrel				5.5	N	WVDNR 2007c
<i>Oxydendrum arboreum</i>	Sourwood				5.3	N	WVDNR 2007c
<i>Oxypolis rigidior</i>	Common Water- Dropwort			OBL	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Packera aurea</i>	Golden Ragwort			FACW	3.8	N	WVDNR 2007c, WVDNR 2007e
<i>Pallavicinia lyellii</i>	Wavy Ribbon Liverwort						WVDNR 2007c
<i>Panax trifolius</i>	Dwarf Ginseng					N	WVDNR 2007c
<i>Panicum</i> <i>dichotomiflorum</i> <i>ssp.</i> <i>dichotomiflorum</i>	Fall Panicgrass						WVDNR 2007c
<i>Parnassia asarifolia</i>	Kidneyleaf Grass- Of-Parnassus	S2	G4	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Parthenocissus</i> <i>quinquefolia</i>	Virginia Creeper			FACU	3.6	N	WVDNR 2007c
<i>Paulownia tomentosa</i>	Princess-Tree				0.0	E/T	CVNWR 2007a
<i>Pedicularis canadensis</i> <i>ssp. canadensis</i>	Common Lousewort, Wood Betony			FACU	5.3	N	WVDNR 2007c
<i>Pedicularis lanceolata</i>	Swamp Lousewort	S2	G5	FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Pellia epiphylla</i>	Flap Wing Liverwort						WVDNR 2007c
<i>Pennisetum glaucum</i>	Pearl-Millet			FAC	0.0	E/T	WVDNR 2007c
<i>Penstemon digitalis</i>	Foxglove Beardtongue			FAC	4.8	N	WVDNR 2007c
<i>Penstemon laevigatus</i>	Smooth Beardtongue			FACU	5.0	N	WVDNR 2007e
<i>Phalaris arundinacea</i>	Reed Canarygrass			FACW	1.9	N/T	WVDNR 2007c, WVDNR 2007e
<i>Phegopteris connectilis</i>	Northern Beech Fern			FACU*	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Philonotis fontana</i>	Fountain Apple Moss						WVDNR 2007c
<i>Phleum pratense</i>	Timothy			FACU	0.0	E/T	WVDNR 2007c

<i>Phlox maculata</i>	Wild Sweet-William			FACW	5.7	N	WVDNR 2007c, WVDNR 2007e
<i>Phlox maculata ssp. maculata</i>	Wild Sweet William			FACW	7.0	N	WVDNR 2007e
<i>Photinia melanocarpa</i>	Black Chokeberry			FAC	5.7	N	WVDNR 2007c, WVDNR 2007e
<i>Photinia pyrifolia</i>	Red Chokeberry			FACW	6.2	N	WVDNR 2007c, WVDNR 2007e
<i>Phragmites australis</i>	Common Reed			FACW	0.0	I/T	WVDNR 2007e
<i>Physocarpus opulifolius var. opulifolius</i>	Eastern Ninebark			FACW-	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Physostegia virginiana</i>	Obedient Plant						WVDNR 2007e
<i>Picea abies</i>	Norway Spruce				0.0	I/T	WVDNR 2007c
<i>Picea rubens</i>	Red Spruce			FACU	7.6	N	WVDNR 2007c, WVDNR 2007e
<i>Pieris floribunda</i>	Mountain Fetterbush	S2	G4			N	WVDNR 2007c
<i>Pilea pumila var. pumila</i>	Clearweed			FACW	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Pinus pungens</i>	Table Mountain Pine					N	WVDNR 2007e
<i>Pinus resinosa</i>	Red Pine	S1	G5	FACU	5.5	N	WVDNR 2007c
<i>Pinus rigida</i>	Pitch Pine			FACU	4.9	N	WVDNR 2007c, WVDNR 2007e
<i>Pinus strobus</i>	Eastern White Pine			FACU	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Pinus virginiana</i>	Virginia Pine				6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Plagiomnium ciliare</i>	American Woodsy Mnum Moss						WVDNR 2007c
<i>Plagiomnium cuspidatum</i>	Common Woodsy Mnum Moss						WVDNR 2007c
<i>Plagiomnium ellipticum</i>	Elliptic Plagiomnium Moss						WVDNR 2007c
<i>Plagiothecium denticulatum</i>	Toothed Wing Moss						WVDNR 2007c
<i>Plagiothecium laetum</i>	Pleasing Wing Moss						WVDNR 2007c
<i>Plantago lanceolata</i>	Narrowleaf Plantain				0.0	E	WVDNR 2007c
<i>Plantago rugelii var. rugelii</i>	Common Plantain			FACU	2.0	N	WVDNR 2007c
<i>Platanthera ciliaris</i>	Yellow-Fringe Orchid	S3	G5	FACW	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Platanthera clavellata</i>	Small Green Wood Orchid			FACW +	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Platanthera flava var. herbiola</i>	Pale Green Orchid			FACW	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Platanthera grandiflora</i>	Greater Purple Fringed Orchid			FACW	8.0	N	WVDNR 2007c, WVDNR 2007e

<i>Platanthera lacera</i>	Green Fringed Orchid			FACW	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Platanthera orbiculata</i>	Large Round-Leaved Orchid			FAC	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Platanthera psycodes</i>	Lesser Purple Fringed Orchid	S1	G5	FACW	8.0	N	WVDNR 2007c
<i>Pleurozium schreberi</i>	Redstem Feather Moss						WVDNR 2007c, WVDNR 2007e
<i>Poa alsodes</i>	Grove Bluegrass			FACW-	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Poa annua</i>	Annual Bluegrass			FACU	0.0	E	WVDNR 2007e
<i>Poa compressa</i>	Canada Bluegrass			FACU	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Poa paludigena</i>	Bog Bluegrass	S1	G3	FACW +	3.0	N	WVDNR 2007e
<i>Poa palustris</i>	Fowl Bluegrass			FACW	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Poa pratensis ssp. pratensis</i>	Kentucky Bluegrass			FACU	0.0	E/T	WVDNR 2007c
<i>Poa sylvestris</i>	Woodland Bluegrass			FACW	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Poa trivialis</i>	Rough Bluegrass			FACW	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Podophyllum peltatum</i>	Mayapple			FACU	4.5	N	WVDNR 2007e
<i>Pogonia ophioglossoides</i>	Rose Pogonia	S2	G5	OBL	8.3	N	WVDNR 2007c, WVDNR 2007e
<i>Polemonium reptans var. reptans</i>	Greek Valerian			FACU	5.3	N	WVDNR 2007e
<i>Polemonium vanbruntiae</i>	Bog Jacob's-Ladder	S2	G3G4	FACW	8.7	N	WVDNR 2007c, WVDNR 2007e
<i>Polygala paucifolia</i>	Gaywings			FACU	6.4	N	WVDNR 2007e
<i>Polygala sanguinea</i>	Purple Milkwort			FACU	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Polygonatum pubescens</i>	Hairy Solomon's-Seal				5.1	N	CVNWR 2007a
<i>Polygonum amphibium var. emersum</i>	Water Smartweed	S2S3	G5T5		7.0	N	WVDNR 2007c
<i>Polygonum caespitosum var. longisetum</i>	Oriental Lady's-Thumb			FACU-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Polygonum cilinode</i>	Fringed Black-Bindweed					N	WVDNR 2007e
<i>Polygonum convolvulus var. convolvulus</i>	Black Bindweed			FACU	0.0	E/T	WVDNR 2007c
<i>Polygonum erectum</i>	Erect Knotweed			FACU	3.5	N	WVDNR 2007c
<i>Polygonum hydropiper</i>	Marsh-Pepper Knotweed			OBL	4.7	N	WVDNR 2007c, WVDNR 2007e
<i>Polygonum hydropiperoides</i>	Swamp Smartweed			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Polygonum pennsylvanicum</i>	Pennsylvania Smartweed			FACW	3.7	N	WVDNR 2007c

<i>Polygonum persicaria</i>	Spotted Lady's-Thumb			FACW	0.0	E/T	WVDNR 2007c
<i>Polygonum punctatum</i> <i>var. confertiflorum</i>	Water Smartweed			OBL	6.5	N	WVDNR 2007c
<i>Polygonum punctatum</i> <i>var. punctatum</i>	Water Smartweed			OBL	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Polygonum ramosissimum</i> <i>var. prolificum</i>	Bushy Knotweed				4.0	N	WVDNR 2007e
<i>Polygonum sagittatum</i>	Arrowleaf Tearthumb			OBL	3.6	N	WVDNR 2007c, WVDNR 2007e
<i>Polygonum scandens</i>	Climbing False Buckwheat			FAC	3.2	E/ N	WVDNR 2007c
<i>Polygonum scandens</i> <i>var. cristatum</i>	Climbing False Buckwheat				3.5	N	WVDNR 2007c
<i>Polygonum virginianum</i>	Jumpseed			FAC	5.0	N	WVDNR 2007c
<i>Polypodium virginianum</i>	Rock Polypody				6.3	N	WVDNR 2007c
<i>Polystichum acrostichoides</i>	Christmas Fern			FACU-	3.6	N	WVDNR 2007c, WVDNR 2007e
<i>Polytrichum commune</i>	Common Hair Cap Moss						WVDNR 2007c, WVDNR 2007e
<i>Polytrichum juniperinum</i>	Juniper Hair Cap Moss						WVDNR 2007c
<i>Polytrichum longisetum</i>	Polytrichum Moss						WVDNR 2007c
<i>Polytrichum ohioense</i>	Ohio Hair Cap Moss						WVDNR 2007c
<i>Polytrichum pallidisetum</i>	Mountain Hair Cap Moss						WVDNR 2007c, WVDNR 2007e
<i>Polytrichum strictum</i>	Woolly Hair Cap Moss						WVDNR 2007c, WVDNR 2007e
<i>Populus balsamifera</i> <i>ssp. balsamifera</i>	Balsam Poplar	S1	G5T5	FACW	8.0	A	WVDNR 2007d
<i>Populus grandidentata</i>	Bigtooth Aspen			FACU-	3.5	N	WVDNR 2007c
<i>Populus tremuloides</i>	Quaking Aspen				3.9	N	WVDNR 2007c, WVDNR 2007e
<i>Potamogeton amplifolius</i>	Largeleaf Pondweed			OBL	9.0	N	WVDNR 2007e
<i>Potamogeton diversifolius</i>	Waterthread			OBL	6.3	N	WVDNR 2007e
<i>Potamogeton epihydrus</i>	Ribbonleaf Pondweed			OBL	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Potamogeton foliosus</i> <i>ssp. foliosus</i>	Leafy Pondweed			OBL	7.0	N	WVDNR 2007e
<i>Potamogeton nodosus</i>	Longleaf Pondweed			OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Potamogeton pusillus</i> <i>var. pusillus</i>	Small Pondweed			OBL	7.3	N	WVDNR 2007e
<i>Potamogeton pusillus</i> <i>var. tenuissimus</i>	Slender Pondweed	S1	G5T5	OBL	8.5	N	WVDNR 2007c, WVDNR 2007e
<i>Potamogeton spirillus</i>	Spiral Pondweed	S2	G5	OBL	6.0	A	WVDNR 2007e

<i>Potamogeton tennesseensis</i>	Tennessee Pondweed	S2	G2	OBL	8.5	N	WVDNR 2007d
<i>Potentilla canadensis</i> <i>var. canadensis</i>	Canada Cinquefoil				3.5	N	WVDNR 2007c
<i>Potentilla norvegica</i> <i>ssp. monspeliensis</i>	Rough Cinquefoil			FACU	3.0	N	WVDNR 2007c, WVDNR 2007e
<i>Potentilla recta</i>	Sulphur Cinquefoil				0.0	E/T	WVDNR 2007c
<i>Potentilla simplex</i>	Common Cinquefoil			FACU-	3.8	N	WVDNR 2007c, WVDNR 2007e
<i>Prenanthes altissima</i>	Tall Rattlesnake-Root			FACU-	4.8	N	WVDNR 2007c
<i>Prenanthes trifoliolata</i>	Gall-Of-The-Earth					N	WVDNR 2007c
<i>Prosartes lanuginosa</i>	Yellow Fairybells				5.8	N	WVDNR 2007c
<i>Prunella vulgaris</i>	Common Self-Heal			FACU+	1.2	E	WVDNR 2007c
<i>Prunus pensylvanica</i> <i>var. pensylvanica</i>	Pin Cherry, Bird Cherry, Fire Cherry			FACU-	5.0	N	WVDNR 2007e
<i>Prunus serotina</i> <i>var. serotina</i>	Black Cherry			FACU	3.9	N	WVDNR 2007c, WVDNR 2007e
<i>Prunus virginiana</i> <i>var. virginiana</i>	Choke Cherry			FACU	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Pseudotaxiphyllum distichaceum</i>	Spreading Wing Moss						WVDNR 2007c
<i>Pteridium aquilinum</i>	Bracken Fern			FACU	3.0	N	WVDNR 2007c, WVDNR 2007e
<i>Pteridium aquilinum</i> <i>var. latiusculum</i>	Northern Bracken					N	WVDNR 2007c
<i>Ptilium crista-castrensis</i>	Knight's Plume Moss						WVDNR 2007c
<i>Pycnanthemum verticillatum</i>	Whorled Mountainmint			FAC	5.5	A/ N	WVDNR 2007e
<i>Pylaisiadelphina tenuirostris</i>	Slender Fern Moss						WVDNR 2007c
<i>Quercus alba</i>	White Oak			FACU	4.6	N	WVDNR 2007c
<i>Quercus coccinea</i> <i>var. coccinea</i>	Scarlet Oak				5.6	N	WVDNR 2007c
<i>Quercus ilicifolia</i>	Bear Oak					N	WVDNR 2007c
<i>Quercus prinus</i>	Chestnut Oak				5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Quercus rubra</i>	Northern Red Oak			FACU-	5.2	N	WVDNR 2007c
<i>Quercus velutina</i>	Black Oak				4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Ranunculus abortivus</i>	Kidneyleaf Buttercup			FACW-	3.0	N	WVDNR 2007c, WVDNR 2007e
<i>Ranunculus acris</i> <i>var. acris</i>	Tall Buttercup, Meadow Buttercup			FAC+	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Ranunculus bulbosus</i>	Bulbous Buttercup			UPL*		E/T	WVDNR 2007c
<i>Ranunculus hispidus</i>	Bristly Buttercup			FAC	5.0	N	WVDNR 2007c
<i>Ranunculus hispidus</i> <i>var. hispidus</i>	Hispid Buttercup			FAC	4.5	N	WVDNR 2007c

<i>Ranunculus hispidus</i> <i>var. nitidus</i>	Hispid Buttercup. Swamp Buttercup			FACW +	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Ranunculus</i> <i>pennsylvanicus</i>	Bristly Crowfoot	S1	G5	OBL	6.7	N	WVDNR 2007e
<i>Ranunculus pusillus</i> <i>var. pusillus</i>	Low Spearwort	S1	G5T4?	OBL	7.0	N	WVDNR 2007d, WVDNR 2007e
<i>Ranunculus recurvatus</i> <i>var. recurvatus</i>	Hooked Crowfoot			FAC+	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Ranunculus repens</i>	Creeping Buttercup			FAC	0.3	E/T	WVDNR 2007c, WVDNR 2007e
<i>Rhamnus alnifolia</i>	Alderleaf Buckthorn	S1S2	G5	OBL	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Rhizomnium</i> <i>appalachianum</i>	Woolly Largeleaf Mnium Moss						WVDNR 2007c, WVDNR 2007e
<i>Rhizomnium</i> <i>punctatum</i>	Common Largeleaf Mnium Moss						WVDNR 2007c, WVDNR 2007e
<i>Rhododendron</i> <i>arborescens</i>	Smooth Azalea			FAC	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Rhododendron</i> <i>maximum</i>	Great Laurel			FAC	4.9	N	WVDNR 2007c, WVDNR 2007e
<i>Rhododendron</i> <i>periclymenoides</i>	Pink Azalea			FAC	5.8	N	WVDNR 2007c
<i>Rhododendron</i> <i>prinophyllum</i>	Early Azalea			FAC	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Rhododendron</i> <i>viscosum</i>	Swamp Azalea	S1	G5	FACW +	8.0	N	WVDNR 2007c
<i>Rhus typhina</i>	Staghorn Sumac				4.3	N	WVDNR 2007c
<i>Rhynchospora alba</i>	White Beaksedge			OBL	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Rhynchospora</i> <i>capitellata</i>	Northern Beaksedge			OBL	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Ribes aureum</i> <i>var.</i> <i>villosum</i>	Golden Currant			FACU	0.0	E	WVDNR 2007e
<i>Ribes glandulosum</i>	Skunk Currant			FACW	7.5	N	CVNWR 2007a, WVDNR 2007e
<i>Ribes lacustre</i>	Bristly Black Currant	S2	G5	FACW	8.3	N	WVDNR 2007d
<i>Ribes rotundifolium</i>	Appalachian Gooseberry			UPL		N	WVDNR 2007c, WVDNR 2007e
<i>Ribes triste</i>	Swamp Red Currant	S1	G5	OBL	8.7	N	WVDNR 2007d, WVDNR 2007e
<i>Riccardia multifida</i>	Feathery Coral Liverwort						WVDNR 2007c
<i>Rorippa nasturtium-</i> <i>aquaticum</i>	Watercress			OBL	0.0	I	WVDNR 2007e
<i>Rorippa palustris</i>	Bog Yellowcress			OBL	3.8	E/ N	CVNWR 2007a
<i>Rorippa palustris</i> <i>ssp.</i> <i>fernaldiana</i>	Common Yellow Cress			OBL	5.5	N	WVDNR 2007e
<i>Rosa carolina</i> <i>var.</i> <i>carolina</i>	Pasture Rose				2.5	N	WVDNR 2007c

<i>Rosa multiflora</i>	Multiflora Rose			FACU	0.0	E/T	WVDNR 2007c
<i>Rosa palustris</i>	Swamp Rose			OBL	5.4	N	WVDNR 2007c, WVDNR 2007e
<i>Rubus allegheniensis</i> <i>var. allegheniensis</i>	Allegheny Blackberry			FACU-	6.0	N	WVDNR 2007c
<i>Rubus canadensis</i>	Smooth Blackberry					N	WVDNR 2007e
<i>Rubus flagellaris</i>	Northern Dewberry			FACU	5.4	N	WVDNR 2007e
<i>Rubus hispidus</i>	Bristly Dewberry			FACW	4.5	N	WVDNR 2007c, WVDNR 2007e
<i>Rubus idaeus ssp.</i> <i>strigosus</i>	American Red Raspberry			FAC-	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Rubus illecebrosus</i>	Strawberry- Raspberry					E/T	WVDNR 2007e
<i>Rubus occidentalis</i>	Black Raspberry					N	WVDNR 2007e
<i>Rubus odoratus var.</i> <i>odoratus</i>	Flowering Raspberry					N	WVDNR 2007c, WVDNR 2007e
<i>Rubus paganus</i>	Groundberry			FAC	5.5	N	WVDNR 2007e
<i>Rubus permixtus</i>	Dewberry					N	WVDNR 2007e
<i>Rubus phoenicolasius</i>	Wine Raspberry				0.0	E/T	CVNWR 2007a, WVDNR 2007e
<i>Rubus plicatifolius</i>	Dewberry					N	WVDNR 2007c
<i>Rubus pubescens var.</i> <i>pubescens</i>	Dwarf Red Bramble	S1	G5T5	FACW	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Rubus setosus</i>	Bristly Blackberry			FACW	5.5	N	WVDNR 2007e
<i>Rudbeckia laciniata</i> <i>var. laciniata</i>	Green-Head Coneflower			FACW	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Rumex acetosella</i>	Common Sheep Sorrel				0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Rumex crispus ssp.</i> <i>crispus</i>	Curly Dock			FACU	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Rumex obtusifolius</i>	Broadleaf Dock, Bitter Dock			FACU-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Sagittaria calycina var.</i> <i>calycina</i>	Long-Lobe Arrowhead	S2	G5T5?	OBL	8.0	A	WVDNR 2007c, WVDNR 2007e
<i>Sagittaria latifolia</i>	Broadleaf Arrowhead			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Salix alba</i>	White Willow			FACW	0.0	E/T	WVDNR 2007c
<i>Salix amygdaloides</i>	Peachleaf Willow	S1	G5	FACW	5.5	N	WVDNR 2007e
<i>Salix discolor</i>	Pussy Willow	S2	G5	FACW	7.6	N	WVDNR 2007c, WVDNR 2007e
<i>Salix eriocephala</i>	Missouri Willow			FACW +	5.5	N	WVDNR 2007e
<i>Salix humilis var.</i> <i>humilis</i>	Upland Willow			FACU	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Salix humilis var. tristis</i>	Prairie Willow					N	WVDNR 2007e
<i>Salix lucida ssp. lucida</i>	Shining Willow	S1	G5T5	FACW	7.7	N	WVDNR 2007d
<i>Salix nigra</i>	Black Willow			FACW +	4.2	N	WVDNR 2007c
<i>Salix purpurea</i>	Purple Willow			FACW	0.0	E	WVDNR 2007e

<i>Salix sericea</i>	Silky Willow			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Sambucus nigra ssp. canadensis</i>	Black Elderberry, Common Elder			FACW-	4.6	N	WVDNR 2007c
<i>Sanguisorba canadensis</i>	Canada Burnet	S2S3	G5	FACW +	7.5	N	WVDNR 2007c, WVDNR 2007e
<i>Sarracenia purpurea ssp. gibbosa</i>	Purple Pitcher Plant			OBL	0.0	I	WVDNR 2007c, WVDNR 2007e
<i>Sassafras albidum</i>	Sassafras			FACU-	3.7	N	WVDNR 2007c
<i>Saxifraga micranthidifolia</i>	Branch-Lettuce			OBL	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Saxifraga pensylvanica</i>	Eastern Swamp Saxifrage	S2	G5	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Scapania nemorea</i>	Toothy Mitten Liverwort						WVDNR 2007c
<i>Scapania undulata</i>	Smooth Mitten Liverwort						WVDNR 2007c
<i>Scheuchzeria palustris ssp. americana</i>	Pod Grass	SH	G5T5	OBL	8.7	N	WVDNR 2007d, WVDNR 2007e
<i>Schizachyrium scoparium var. scoparium</i>	Little Bluestem			FACU-	5.0	N	WVDNR 2007c
<i>Schoenoplectus pungens var. pungens</i>	Common Threesquare				7.5	N	WVDNR 2007e
<i>Schoenoplectus purshianus</i>	Clubrush, Bulrush	S3	G4G5	OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Schoenoplectus tabernaemontani</i>	Softstem Bulrush			OBL	5.3	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus atrocinctus</i>	Blackgirdle Bulrush	S3	G5	FACW +	7.7	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus atrovirens</i>	Green Bulrush			OBL	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus cyperinus</i>	Woolgrass Bulrush			FACW +	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus expansus</i>	Woodland Bulrush			OBL	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus georgianus</i>	Georgia Bulrush			OBL	5.0	N	WVDNR 2007e
<i>Scirpus hattorianus</i>	Mosquito Bulrush			OBL	4.2	N	WVDNR 2007e
<i>Scirpus lineatus</i>	Drooping Bulrush					N	WVDNR 2007e
<i>Scirpus microcarpus</i>	Red-Tinge Bulrush	S3	G5	OBL	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Scirpus pendulus</i>	Rufous Bulrush			OBL	4.5	N	WVDNR 2007e
<i>Scirpus polyphyllus</i>	Leafy Bulrush			OBL	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Scutellaria galericulata</i>	Hooded Skullcap	S1	G5	OBL	9.0	N	WVDNR 2007c, WVDNR 2007e
<i>Scutellaria lateriflora var. lateriflora</i>	Mad-Dog Skullcap			FACW +	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Scutellaria saxatilis</i>	Rock Skullcap	S2	G3		7.5	N	WVDNR 2007d
<i>Sedum ternatum</i>	Woodland Stonecrop				4.0	N	WVDNR 2007c

<i>Selaginella apoda</i>	Meadow Spike-Moss			FACW	5.7	N	WVDNR 2007e
<i>Sisyrinchium angustifolium</i>	Narrowleaf Blue-Eyed-Grass			FACW-	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Sisyrinchium mucronatum</i>	Needle-Tip Blue-Eyed-Grass			FAC+	5.0	N	WVDNR 2007c
<i>Sium suave</i>	Hemlock Water-Parsnip			OBL	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Smilax glauca</i>	Whiteleaf Greenbrier			FACU	4.9	N	WVDNR 2007c, WVDNR 2007e
<i>Smilax herbacea</i>	Smooth Carrion-Flower			FAC	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Smilax rotundifolia</i>	Roundleaf Greenbrier			FAC	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Smilax tamnoides</i>	Chinaroot			FAC	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Solanum americanum</i>	American Black Nightshade						WVDNR 2007c
<i>Solanum dulcamara var. dulcamara</i>	Bittersweet			FAC-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Solidago caesia</i>	Wreath Goldenrod			FACU	6.0	N	WVDNR 2007c
<i>Solidago erecta</i>	Slender Goldenrod					N	WVDNR 2007e
<i>Solidago flexicaulis</i>	Zigzag Goldenrod			FACU	5.3	N	WVDNR 2007c
<i>Solidago gracillima</i>	Virginia Goldenrod			OBL	8.5	N	WVDNR 2007e
<i>Solidago roanensis</i>	Roan Mountain Goldenrod					N	WVDNR 2007e
<i>Solidago rugosa ssp. aspera</i>	Wrinkleleaf Goldenrod			FAC	8.0	N	WVDNR 2007c
<i>Solidago rugosa ssp. rugosa var. rugosa</i>	Wrinkled-Leaf Goldenrod					N	WVDNR 2007c, WVDNR 2007e
<i>Solidago rugosa ssp. rugosa var. villosa</i>	Wrinkled-Leaf Goldenrod					N	WVDNR 2007e
<i>Solidago uliginosa var. linoides</i>	Bog Goldenrod					N	WVDNR 2007e
<i>Solidago uliginosa var. uliginosa</i>	Bog Goldenrod			OBL	6.7	N	WVDNR 2007c, WVDNR 2007e
<i>Solidago ulmifolia var. ulmifolia</i>	Elmleaf Goldenrod				5.4	N	WVDNR 2007e
<i>Sorbus americana</i>	American Mountain-Ash			FACU	7.2	N	WVDNR 2007c, WVDNR 2007e
<i>Sparganium americanum</i>	American Bur-Reed			OBL	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Sparganium androcladum</i>	Branched Bur-Reed	S2S3	G4G5	OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Sparganium chlorocarpum</i>	Small Bur-reed						WVDNR 2007c
<i>Sparganium eurycarpum</i>	Giant Bur-Reed			OBL	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Sphagnum affine</i>	Pale Spoon Peatmoss						WVDNR 2007c

<i>Sphagnum angustifolium</i>	Sphagnum Moss							WVDNR 2007c
<i>Sphagnum bartlettianum</i>	Purple Hair Peatmoss							WVDNR 2007e
<i>Sphagnum capillifolium</i> <i>var. capillifolium</i>	Pompom Hair Peatmoss							WVDNR 2007c
<i>Sphagnum compactum</i>	Cushion Peatmoss							WVDNR 2007c
<i>Sphagnum cuspidatum</i>	Common Longleaf Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum fallax</i>	Sharp Longleaf Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum fimbriatum</i>	Ragged Hair Peatmoss							WVDNR 2007c
<i>Sphagnum flexuosum</i>	Flexible Longleaf Peatmoss							WVDNR 2007c
<i>Sphagnum fuscum</i>	Brown Hair Peatmoss							WVDNR 2007c
<i>Sphagnum girgensohnii</i>	Star Hair Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum henryense</i>	Plain Spoon Peatmoss							WVDNR 2007c
<i>Sphagnum lescurii</i>	Plastic Bead Peatmoss							WVDNR 2007c
<i>Sphagnum magellanicum</i>	Red Spoon Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum palustre</i>	Common Spoon Peat Moss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum papillosum</i>	Golden Spoon Peatmoss							WVDNR 2007c
<i>Sphagnum quinquefarium</i>	Spike Hair Peatmoss							WVDNR 2007c
<i>Sphagnum recurvum</i>	Curvy Longleaf Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum rubellum</i>	Red Hair Peatmoss							WVDNR 2007c, WVDNR 2007e
<i>Sphagnum russowii</i>	Russow's Peatmoss							WVDNR 2007c
<i>Sphagnum squarrosum</i>	Spreadleaf Peatmoss							WVDNR 2007c
<i>Sphenopholis intermedia</i>	Slender Wedgescale						N	WVDNR 2007c, WVDNR 2007e
<i>Sphenopholis nitida</i>	Shiny Wedgescale						N	WVDNR 2007e
<i>Sphenopholis obtusata</i>	Prairie Wedgescale			FAC-	5.7		N	WVDNR 2007c
<i>Sphenopholis pennsylvanica</i>	Swamp Wedgescale			OBL	7.0		N	WVDNR 2007e
<i>Spiraea alba</i>	White Meadowsweet			FACW +	4.6		N	WVDNR 2007c, WVDNR 2007e
<i>Spiraea alba var. alba</i>	White Meadowsweet			FACW +	4.5		N	WVDNR 2007c, WVDNR 2007e

<i>Spiraea tomentosa</i>	Steeplebush			FACW-	4.4	N	WVDNR 2007c, WVDNR 2007e
<i>Spiranthes cernua</i>	Nodding Ladies'- Tresses			FACW	4.6	N	WVDNR 2007c, WVDNR 2007e
<i>Spiranthes lacera</i> var. <i>gracilis</i>	Southern Slender Ladies'-Tresses			FACU-	4.0	N	WVDNR 2007c
<i>Spiranthes lucida</i>	Shining Ladies'- Tresses	S1S2	G5	FACW	7.5	N	WVDNR 2007d
<i>Spiranthes ochroleuca</i>	Yellow Nodding Ladies' Tresses					N	WVDNR 2007e
<i>Splachnum ampullaceum</i>	Dung Moss						WVDNR 2007c
<i>Stachys aspera</i>	Gritty Hedge- Nettle	S1	G4?	FACW	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Stachys pilosa</i>	Marsh Woundwort			OBL	8.5	N	WVDNR 2007e
<i>Stachys tenuifolia</i>	Smooth Hedge- Nettle	S3	G5	FACW +	5.5	N	WVDNR 2007c
<i>Steerecleus serrulatus</i>	Beaked Mat Moss						WVDNR 2007c
<i>Stellaria alsine</i>	Bog Chickweed			OBL	9.0	N	CVNWR 2007a, WVDNR 2007e
<i>Stellaria borealis</i> ssp. <i>borealis</i>	Northern Stitchwort	S1	G5T5			N	WVDNR 2007e
<i>Stellaria graminea</i>	Lesser Stitchwort			FACU-	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Stellaria longifolia</i> var. <i>longifolia</i>	Longleaf Stitchwort			FACW	5.7	N	WVDNR 2007c, WVDNR 2007e
<i>Stellaria media</i>	Common Chickweed			UPL*			WVDNR 2007c, WVDNR 2007e
<i>Stellaria pubera</i>	Great Chickweed				4.0	N	CVNWR 2007
<i>Streptopus lanceolatus</i> var. <i>roseus</i>	Rosy Twisted- Stalk			FAC-	7.5	N	WVDNR 2007e
<i>Symphyotrichum cordifolium</i>	Common Blue American-Aster				5.0	N	WVDNR 2007c
<i>Symphyotrichum divaricatum</i>	Lawn American- Aster					N	WVDNR 2007c
<i>Symphyotrichum dumosum</i> var. <i>dumosum</i>	Rice Button American-Aster			FAC	7.3	N	WVDNR 2007c, WVDNR 2007e
<i>Symphyotrichum lanceolatum</i> ssp. <i>lanceolatum</i> var. <i>lanceolatum</i>	Panicled Aster			FACW	4.0	N	WVDNR 2007c, WVDNR 2007e
<i>Symphyotrichum lateriflorum</i>	Calico Aster			FACW-	4.3	N	WVDNR 2007c
<i>Symphyotrichum lowrieianum</i>	Lowrie's Aster, Blue Wood Aster					N	WVDNR 2007e
<i>Symphyotrichum novi- belgii</i>	New Belgium American-Aster	S2S3	G5			N	WVDNR 2007e
<i>Symphyotrichum pilosum</i>	White Oldfield American-Aster				3.0	N	WVDNR 2007c

<i>Symphotrichum praealtum</i>	Willowleaf American-Aster			FACW	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Symphotrichum prenanthoides</i>	Crooked-Stem Aster			FAC	4.3	N	WVDNR 2007c, WVDNR 2007e
<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	Purple-Stem Aster			OBL	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Symplocarpus foetidus</i>	Skunk-Cabbage			OBL	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	Common Dandelion			FACU-	0.0	E	WVDNR 2007c
<i>Taxus canadensis</i>	Canada Yew	S2S3	G5	FAC	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Tetraphis pellucida</i>	Four Tooth Moss						WVDNR 2007c
<i>Thalictrum clavatum</i>	Mountain Meadowrue	S2	G4	FACW	9.0	N	WVDNR 2007c
<i>Thalictrum dioicum</i>	Early Meadowrue			FAC	5.6	N	WVDNR 2007c
<i>Thalictrum pubescens</i>	King-Of-The-Meadow			FACW +	4.9	N	WVDNR 2007c
<i>Thaspium barbinode</i>	Hairy-Joint Meadow-Parsonip				5.0	N	WVDNR 2007e
<i>Thelypteris noveboracensis</i>	New York Fern			FAC	4.8	N	WVDNR 2007c, WVDNR 2007e
<i>Thelypteris palustris</i> var. <i>pubescens</i>	Eastern Marsh Fern			FACW +	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Thelypteris simulata</i>	Bog Fern	S1	G4G5	FACW	8.8	N	WVDNR 2007c, WVDNR 2007e
<i>Thuidium delicatulum</i>	Delicate Fern Moss						WVDNR 2007c
<i>Tiarella cordifolia</i>	Heartleaf Foamflower			FAC-	5.4	N	WVDNR 2007c, WVDNR 2007e
<i>Tilia americana</i>	American Basswood			FACU	5.1	N	WVDNR 2007c
<i>Torreyochloa pallida</i> var. <i>fernaldii</i>	Mannagrass	S2	G5T4 Q	OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Torreyochloa pallida</i> var. <i>pallida</i>	Pale False Mannagrass	S1	G5T5?	OBL	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Toxicodendron radicans</i>	Eastern Poison-Ivy			FAC	2.9	N	WVDNR 2007c
<i>Toxicodendron vernix</i>	Poison-Sumac	S2	G5	OBL	7.4	N	WVDNR 2007d, WVDNR 2007e
<i>Trautvetteria caroliniensis</i> var. <i>caroliniensis</i>	Carolina Tassel-Rue			FACW-	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Triadenum fraseri</i>	Fraser's Marsh-St. John's-Wort			OBL	6.6	N	WVDNR 2007c, WVDNR 2007e
<i>Triadenum virginicum</i>	Virginia Marsh St. John's-Wort			OBL	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Triantha glutinosa</i>	Sticky Bog-Asphodel	S1	G4G5		9.5	N	WVDNR 2007c, WVDNR 2007e
<i>Trichocolea tomentella</i>	Woolly Liverwort						WVDNR 2007c

<i>Trichoglossum hirsutum</i>	Velvety Black Earth Tongue Mushroom						WVDNR 2007c
<i>Trichomanes boschianum</i>	Appalachian Bristle Fern	S1	G4	FACW	8.5	N	WVDNR 2007d
<i>Trientalis borealis ssp. borealis</i>	Star Flower			FAC	7.2	N	WVDNR 2007c
<i>Trifolium aureum</i>	Yellow Hop Clover				0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Trifolium pratense</i>	Red Clover			FACU-	0.0	E/T	WVDNR 2007c
<i>Trifolium repens</i>	White Clover			FACU-	0.0	E/T	WVDNR 2007c
<i>Trillium undulatum</i>	Painted Wakerobin			FACU	6.9	N	WVDNR 2007c, WVDNR 2007e
<i>Tsuga canadensis</i>	Eastern Hemlock			FACU	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Tussilago farfara</i>	Colt's-Foot			FACU	0.0	E/T	WVDNR 2007c, WVDNR 2007e
<i>Tylopilus fellus</i>	Bitter Bolete Mushroom						WVDNR 2007c
<i>Typha angustifolia</i>	Narrowleaf Cattail			OBL	4.6	N	WVDNR 2007e
<i>Typha latifolia</i>	Broadleaf Cattail			OBL	3.6	N	WVDNR 2007c, WVDNR 2007e
<i>Ulmus americana</i>	American Elm			FACW-	5.1	N	WVDNR 2007c
<i>Utricularia cornuta</i>	Horned Bladderwort						WVDNR 2007c
<i>Utricularia geminiscapa</i>	Hidden-Fruit Bladderwort	S1	G4G5	OBL	6.3	A	WVDNR 2007e
<i>Vaccinium angustifolium</i>	Northern Lowbush Blueberry			FACU-	6.1	N	WVDNR 2007c, WVDNR 2007e
<i>Vaccinium corymbosum</i>	Highbush Blueberry			FACW-	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Vaccinium erythrocarpum</i>	Southern Mountain Cranberry			FAC	7.1	N	WVDNR 2007c
<i>Vaccinium macrocarpon</i>	Large Cranberry	S3	G4	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry			FAC	5.8	N	WVDNR 2007c, WVDNR 2007e
<i>Vaccinium oxycoccos</i>	Small Cranberry	S3	G5	OBL	7.7	N	WVDNR 2007c, WVDNR 2007e
<i>Vaccinium pallidum</i>	Hillside Blueberry				3.5	N	WVDNR 2007c, WVDNR 2007e
<i>Vallisneria americana</i>	Tape-Grass			OBL	8.0	N	CVNWR 2007, WVDNR 2007e
<i>Veratrum viride</i>	American False Hellebore			FACW +	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Verbena hastata var. hastata</i>	Blue Vervain, Hastateleaf Vervain			FACW +	4.4	N	WVDNR 2007c, WVDNR 2007e
<i>Verbena urticifolia</i>	White Vervain			FACU	4.0	N	WVDNR 2007c
<i>Verbena urticifolia var. urticifolia</i>	White Vervain, Nettleleaf Vervain			FACU	6.0	N	WVDNR 2007c

<i>Verbesina alternifolia</i>	Wingstem			FAC	2.6	N	WVDNR 2007c
<i>Vernonia noveboracensis</i>	New York Ironweed			FACW+	3.5	N	WVDNR 2007c
<i>Veronica americana</i>	American Brooklime			OBL	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Veronica anagallis-aquatica</i>	Water Speedwell			OBL	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Veronica officinalis</i>	Common Gypsyweed			FACU-	0.0	E	WVDNR 2007c
<i>Veronica scutellata</i>	Grassleaf Speedwell	S2	G5	OBL	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Veronica serpyllifolia ssp. serpyllifolia</i>	Thyme-Leaved Speedwell			FAC+	0.0	E/T	WVDNR 2007c
<i>Veronicastrum virginicum</i>	Culver's-Root			FACU	6.7	N	WVDNR 2007e
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum				5.3	N	WVDNR 2007c
<i>Viburnum dentatum var. dentatum</i>	Rough Arrowwood			FAC	6.3	N	WVDNR 2007e
<i>Viburnum lantanoides</i>	Hobblebush			FACU	6.8	N	WVDNR 2007c, WVDNR 2007e
<i>Viburnum lentago</i>	Nannyberry	S1S2	G5	FAC	6.5	N	WVDNR 2007c, WVDNR 2007e
<i>Viburnum nudum var. cassinoides</i>	Northern Wild Raisin			FACW	6.0	N	WVDNR 2007c, WVDNR 2007e
<i>Viburnum nudum var. nudum</i>	Southern Wild Raisin					N	WVDNR 2007e
<i>Viburnum opulus var. americanum</i>	Highbush Cranberry	S1	G5T5	FACW	8.3	N	WVDNR 2007c, WVDNR 2007e
<i>Viburnum rafinesquianum</i>	Downy Arrow-Wood	S2	G5			N	WVDNR 2007e
<i>Viburnum recognitum</i>	Northern Arrow-Wood			FACW-	5.5	N	WVDNR 2007c, WVDNR 2007e
<i>Viola x palmata</i>	Palmate-Leaved Violet						WVDNR 2007c
<i>Viola x primulifolia</i>	Primrose-Leaf Violet			FAC+	5.5	N	WVDNR 2007e
<i>Viola x wujekii</i>	Violet					N	WVDNR 2007e
<i>Viola appalachensis</i>	Appalachian Blue Violet	S3	G3	FACU	6.3	N	WVDNR 2007c, WVDNR 2007e
<i>Viola blanda</i>	Sweet White Violet			FACW	5.6	N	WVDNR 2007c, WVDNR 2007e
<i>Viola blanda var. palustriformis</i>	Sweet White Violet	SH	G4G5 T4T5	FACW	9.0	N	WVDNR 2007d, WVDNR 2007e
<i>Viola canadensis</i>	Canadian White Violet				5.8	N	CVNWR 2007, WVDNR 2007e
<i>Viola cucullata</i>	Marsh Blue Violet			FACW+	5.0	N	WVDNR 2007c, WVDNR 2007e
<i>Viola hastata</i>	Halberd-Leaf Yellow Violet				6.6	N	WVDNR 2007c
<i>Viola macloskeyi ssp. pallens</i>	Smooth White Violet			OBL	6.8	N	WVDNR 2007c, WVDNR 2007e

<i>Viola rotundifolia</i>	Roundleaf Violet			FAC+	5.6	N	WVDNR 2007c
<i>Viola sagittata</i> var. <i>sagittata</i>	Arrowleaf Violet			FACW	6.7	N	WVDNR 2007e
<i>Viola sororia</i>	Common Blue Violet			FAC	3.8	N	WVDNR 2007c, WVDNR 2007e
<i>Waldsteinia fragarioides</i> ssp. <i>fragarioides</i>	Barren Strawberry					N	WVDNR 2007e
<i>Warnstorfia exannulata</i> var. <i>exannulata</i>	Warnstorfia Moss						WVDNR 2007c
<i>Woodwardia areolata</i>	Netted Chainfern	S2	G5	FACW +	7.7	N	WVDNR 2007d, WVDNR 2007e
<i>Xeromphalina campanella</i>	Golden Trumpet Mushroom						WVDNR 2007c
<i>Xyris torta</i>	Slender Yellow-Eyed-Grass	S2	G5	OBL	7.0	N	WVDNR 2007c, WVDNR 2007e
<i>Zigadenus leimanthoides</i>	Pine Barren Deathcamas	S3	G4Q	OBL	8.0	N	WVDNR 2007c, WVDNR 2007e
<i>Zizia aptera</i>	Heartleaf Alexanders			FAC	5.5	N	CVNWR 2007

**Origin codes:**

N = Native  
E = Exotic  
A = Adventive  
I = Introduced  
T = Invasive Threat

**Sources:**

- CVNWR [Canaan Valley National Wildlife Refuge]. 2007a. Plant species records from Canaan Valley National Wildlife Refuge, contributed by Leah Ceperley to Joint Botanical Field Meeting, June 17-21, 2007.
- WVDNR [West Virginia Division of Natural Resources]. 2007c. Plots2-WV database of community ecology plots. West Virginia Natural Heritage Program, WVDNR. Elkins, WV.
- WVDNR [West Virginia Division of Natural Resources]. 2007d. Biotics database.records of rare species and natural communities. West Virginia Natural Heritage Program, WVDNR. Elkins, WV.
- WVDNR [West Virginia Division of Natural Resources]. 2007e. WV Curatorial Database System maintained by West Virginia Natural Heritage Program. Label database of herbarium specimens from West Virginia University Herbarium, Youngstown State University Herbarium, Marshall University Herbarium, West Virginia Natural Heritage Program Herbarium, Davis and Elkins College Herbarium, Carnegie Museum of Natural History Herbarium, Virginia Polytechnic Institute and State University, University of South Carolina Herbarium, and the private collections of Paul J. Harmon, Scott Shriver, Al Shriver, Clete Smith, and James P. Vanderhorst. West Virginia Natural Heritage Program, WVDNR, Elkins, WV.

Appendix G in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007.  
**Classification and Conservation Assessment of High Elevation Wetland Communities in the Allegheny Mountains of West Virginia.** West Virginia Natural Heritage Program, WVDNR. Elkins, WV.

## Appendix H. Floristic Cover-Constancy Tables by Community Type

### Table of Contents

( <i>Andromeda polifolia</i> var. <i>glaucophylla</i> ) / <i>Polytrichum strictum</i> - <i>Cladonia</i> spp. - <i>Sphagnum</i> spp. peatland .....	2
<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Danthonia compressa</i> - <i>Lycopodium</i> spp. / <i>Sphagnum</i> spp. forested swamp .....	2
<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Ilex verticillata</i> / <i>Sphagnum</i> spp. woodland swamp.....	7
<i>Acer rubrum</i> / <i>Osmunda cinnamomea</i> var. <i>cinnamomea</i> / <i>Sphagnum</i> spp. linear forest seep.....	11
<i>Alnus incana</i> ssp. <i>rugosa</i> - <i>Viburnum recognitum</i> / ( <i>Symplocarpus foetidus</i> ) / <i>Sphagnum</i> shrub swamp .	14
<i>Alnus incana</i> ssp. <i>rugosa</i> shrub swamp.....	16
<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> / <i>Carex scabrata</i> - <i>Viola cucullata</i> / <i>Plagiomnium ciliare</i> sloping linear forest seep .....	21
<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> / <i>Impatiens capensis</i> - <i>Chrysosplenium americanum</i> - ( <i>Symplocarpus foetidus</i> ) / <i>Rhizomnium appalachianum</i> forest seep.....	24
<i>Calamagrostis canadensis</i> wet meadow .....	29
<i>Carex canescens</i> / <i>Polytrichum</i> spp. - <i>Sphagnum</i> spp. herbaceous peatland .....	32
<i>Carex echinata</i> ssp. <i>echinata</i> / <i>Sphagnum</i> spp. herbaceous peatland .....	33
<i>Carex gynandra</i> - <i>Carex atlantica</i> / <i>Sphagnum</i> spp. seepage fen .....	35
<i>Carex lacustris</i> fen.....	37
<i>Carex stricta</i> wet meadow .....	38
<i>Carex torta</i> riverscour prairie .....	42
<i>Carex trichocarpa</i> floodplain prairie .....	45
<i>Carex utriculata</i> / <i>Sphagnum</i> spp. fen .....	47
<i>Dulichium arundinaceum</i> / <i>Sphagnum</i> spp. herbaceous peatland.....	48
<i>Eriophorum virginicum</i> - ( <i>Carex folliculata</i> ) / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. herbaceous peatland ..	51
<i>Fraxinus nigra</i> - <i>Abies balsamea</i> / <i>Alnus incana</i> ssp. <i>rugosa</i> / <i>Rhamnus alnifolia</i> / <i>Carex bromoides</i> ssp. <i>bromoides</i> rich forested swamp .....	54
<i>Hypericum densiflorum</i> / <i>Juncus effusus</i> / <i>Sphagnum</i> spp. shrub peatland.....	60
<i>Larix laricina</i> / <i>Ilex verticillata</i> / <i>Symplocarpus foetidus</i> - <i>Osmunda cinnamomea</i> / <i>Sphagnum</i> spp. woodland swamp .....	65
<i>Leersia oryzoides</i> - <i>Sagittaria latifolia</i> marsh .....	67
<i>Photinia</i> ( <i>melanocarpa</i> , <i>pyrifolia</i> ) - <i>Viburnum nudum</i> var. <i>cassinoides</i> / <i>Eriophorum virginicum</i> / <i>Sphagnum</i> shrub peatland.....	70
<i>Picea rubens</i> - <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> - <i>Tsuga canadensis</i> / <i>Glyceria melicaria</i> / <i>Sphagnum</i> spp. forested swamp.....	74
<i>Picea rubens</i> - <i>Tsuga canadensis</i> / <i>Rhododendron maximum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> forested swamp .....	81
<i>Picea rubens</i> / <i>Carex trisperma</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. high elevation peat woodland .....	86
<i>Picea rubens</i> / <i>Rhododendron maximum</i> - <i>Kalmia latifolia</i> / <i>Osmunda cinnamomea</i> var. <i>cinnamomea</i> / <i>Sphagnum</i> spp. peat woodland .....	88
<i>Picea rubens</i> / <i>Vaccinium erythrocarpum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> high elevation forested swamp .....	92
<i>Pinus rigida</i> - <i>Picea rubens</i> / <i>Nemopanthus mucronata</i> - <i>Kalmia latifolia</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. peat woodland.....	94
<i>Populus tremuloides</i> / <i>Vaccinium myrtilloides</i> / <i>Solidago uliginosa</i> wet forest .....	96
<i>Rhododendron arborescens</i> / <i>Marshallia grandiflora</i> - <i>Triantha glutinosa</i> - <i>Platanthera flava</i> var. <i>herbiola</i> riverscour prairie.....	99
<i>Salix sericea</i> / <i>Sphagnum</i> shrub swamp.....	101
<i>Schoenoplectus tabernaemontani</i> marsh .....	105
<i>Scirpus cyperinus</i> wet meadow .....	106

Solidago rugosa - Euthamia graminifolia var. graminifolia wet meadow .....	108
Sparganium (americanum, chlorocarpum) marsh .....	114
Spiraea alba shrub swamp.....	117
Spiraea tomentosa / Sphagnum palustre dwarf shrub peatland.....	119
Vaccinium myrtilloides / Pteridium aquilinum / Polytrichum spp. wet shrubland.....	120
Vaccinium oxycoccos (Vaccinium macrocarpon) - Rhynchospora alba / Sphagnum spp. shrub peatland .....	124

**(Andromeda polifolia var. glaucophylla) / Polytrichum strictum - Cladonia spp. - Sphagnum spp. peatland**

Stratum	Scientific Name	Average	Min	Max	Constanc
S1	Ilex verticillata	0.50	0.50	0.50	25
	Picea rubens	0.50	0.50	0.50	25
S2	Acer rubrum	0.26	0.01	0.50	50
	Andromeda polifolia var. glaucophylla	40.00	20.00	60.00	50
	Hypericum densiflorum	1.50	1.00	2.00	50
	Ilex verticillata	0.50	0.50	0.50	25
	Photinia melanocarpa	2.75	0.50	5.00	50
	Picea rubens	0.50	0.50	0.50	25
	Viburnum nudum var. cassinoides	0.01	0.01	0.01	25
H	Acer rubrum	0.01	0.01	0.01	25
	Carex trisperma var. trisperma	1.50	1.00	2.00	50
	Eriophorum virginicum	2.50	1.00	5.00	100
	Hypericum densiflorum	0.50	0.50	0.50	25
	Osmunda cinnamomea var. cinnamomea	1.00	1.00	1.00	25
	Photinia melanocarpa	1.00	1.00	1.00	25
	Photinia pyrifolia	0.50	0.50	0.50	25
	Rhynchospora alba	1.50	1.00	2.00	50
	Rubus hispidus	7.75	1.00	10.00	100
	Symplocarpus foetidus	0.50	0.50	0.50	25
	Vaccinium oxycoccos	4.50	3.00	5.00	100
N	Aulacomnium palustre	0.50	0.50	0.50	25
	Cladonia arbuscula	15.50	0.50	40.00	75
	Cladonia rangiferina	2.50	2.50	2.50	25
	Cladonia stygia	19.17	2.50	40.00	75
	Pleurozium schreberi	1.00	1.00	1.00	25
	Polytrichum strictum	42.50	20.00	60.00	100
	Sphagnum flexuosum	25.00	25.00	25.00	25
	Sphagnum magellanicum	12.50	12.50	12.50	25
	Sphagnum rubellum	17.13	1.00	30.00	100
Total					64

**Abies balsamea - Picea rubens / Danthonia compressa - Lycopodium spp. / Sphagnum spp. forested swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Abies balsamea	13.92	2.00	50.00	100
	Acer rubrum	5.50	2.00	10.00	33

	Betula alleghaniensis var. alleghaniensis	5.00	5.00	5.00	8
	Crataegus	5.00	5.00	5.00	8
	Picea rubens	15.67	2.00	40.00	50
	Prunus serotina var. serotina	18.38	0.50	40.00	33
T3	Abies balsamea	11.89	1.00	20.00	75
	Acer rubrum	1.60	1.00	3.00	42
	Amelanchier arborea var. arborea	0.50	0.50	0.50	8
	Betula alleghaniensis var. alleghaniensis	14.00	14.00	14.00	8
	Crataegus	12.50	3.00	22.00	17
	Malus pumila	4.00	4.00	4.00	8
	Picea rubens	8.80	1.00	20.00	42
	Prunus serotina var. serotina	1.75	0.50	3.00	17
	Tsuga canadensis	3.50	1.00	6.00	17
S1	Abies balsamea	11.36	0.50	55.00	92
	Acer rubrum	5.25	0.50	10.00	17
	Alnus incana ssp. rugosa	2.00	1.00	3.00	17
	Amelanchier	1.40	0.50	2.00	42
	Amelanchier laevis	1.00	1.00	1.00	8
	Betula alleghaniensis var. alleghaniensis	1.00	0.50	2.00	25
	Crataegus	2.50	0.50	5.00	25
	Fagus grandifolia	1.25	0.50	2.00	17
	Hypericum densiflorum	18.00	1.00	35.00	17
	Ilex montana	1.17	0.50	2.00	25
	Ilex verticillata	1.50	1.00	2.00	17
	Kalmia latifolia	6.13	0.50	15.00	33
	Malus pumila	0.50	0.50	0.50	8
	Nemopanthus mucronatus	1.00	1.00	1.00	8
	Photinia melanocarpa	0.50	0.50	0.50	17
	Picea rubens	9.69	0.50	30.00	67
	Prunus serotina var. serotina	2.50	0.50	5.00	42
	Smilax rotundifolia	0.50	0.50	0.50	8
	Sorbus americana	0.75	0.50	1.00	17
	Spiraea alba	0.83	0.50	1.00	25
	Tsuga canadensis	2.00	2.00	2.00	8
	Vaccinium myrtilloides	13.50	2.00	25.00	17
	Viburnum nudum var. cassinoides	5.33	0.50	26.00	50
	Viburnum recognitum	0.50	0.50	0.50	25
S2	Abies balsamea	3.50	2.00	5.00	17
	Alnus incana ssp. rugosa	0.50	0.50	0.50	8
	Amelanchier arborea var. arborea	0.50	0.50	0.50	8
	Crataegus	0.50	0.50	0.50	8
	Fagus grandifolia	0.50	0.50	0.50	8
	Hamamelis virginiana	0.50	0.50	0.50	8
	Hypericum densiflorum	0.50	0.50	0.50	8
	Picea rubens	2.50	0.50	5.00	25
	Prunus serotina var. serotina	0.50	0.50	0.50	8
	Vaccinium angustifolium	0.26	0.01	0.50	17
	Vaccinium myrtilloides	30.00	30.00	30.00	8
	Vaccinium pallidum	0.50	0.50	0.50	17
H	Abies balsamea	0.63	0.50	2.00	100

<i>Acer rubrum</i>	0.46	0.10	0.50	92
<i>Achillea millefolium</i> var. <i>occidentalis</i>	0.50	0.50	0.50	25
<i>Agrostis canina</i>	0.50	0.50	0.50	8
<i>Agrostis capillaris</i>	0.50	0.50	0.50	8
<i>Agrostis perennans</i>	0.50	0.50	0.50	33
<i>Amelanchier</i>	0.63	0.50	1.00	67
<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	8
<i>Anthoxanthum odoratum</i> ssp. <i>odoratum</i>	1.50	0.50	4.00	42
<i>Aralia nudicaulis</i>	0.10	0.10	0.10	8
<i>Arisaema triphyllum</i>	0.50	0.50	0.50	8
<i>Asclepias syriaca</i>	0.50	0.50	0.50	8
<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.50	0.50	0.50	17
<i>Brachyelytrum erectum</i>	1.13	0.50	2.00	33
<i>Bromus ciliatus</i> var. <i>ciliatus</i>	0.50	0.50	0.50	17
<i>Carex</i>	4.33	0.50	12.00	25
<i>Carex atlantica</i>	0.50	0.50	0.50	8
<i>Carex baileyi</i>	0.83	0.50	1.00	25
<i>Carex brunnescens</i>	0.50	0.50	0.50	8
<i>Carex debilis</i>	0.50	0.50	0.50	17
<i>Carex debilis</i> var. <i>debilis</i>	1.00	1.00	1.00	8
<i>Carex debilis</i> var. <i>rudgei</i>	8.71	0.50	40.00	58
<i>Carex folliculata</i>	1.17	0.50	4.00	50
<i>Carex gynandra</i>	0.80	0.50	1.00	42
<i>Carex intumescens</i>	0.50	0.50	0.50	8
<i>Carex leptalea</i> ssp. <i>leptalea</i>	0.50	0.50	0.50	17
<i>Carex lurida</i>	0.30	0.10	0.50	17
<i>Carex projecta</i>	0.75	0.50	1.00	17
<i>Carex scoparia</i> var. <i>scoparia</i>	0.75	0.50	1.00	17
<i>Carex swanii</i>	0.88	0.50	2.00	33
<i>Carex torta</i>	2.00	2.00	2.00	8
<i>Carex tribuloides</i>	0.50	0.50	0.50	8
<i>Carex trisperma</i> var. <i>trisperma</i>	2.38	0.50	5.00	33
<i>Cinna latifolia</i>	0.50	0.50	0.50	8
<i>Clematis virginiana</i>	0.50	0.50	0.50	17
<i>Clinopodium vulgare</i>	0.50	0.50	0.50	8
<i>Cornus alternifolia</i>	0.50	0.50	0.50	8
<i>Crataegus</i>	0.50	0.50	0.50	50
<i>Dalibarda repens</i>	1.00	1.00	1.00	8
<i>Danthonia</i>	0.50	0.50	0.50	8
<i>Danthonia compressa</i>	9.29	0.01	35.00	58
<i>Danthonia spicata</i>	22.75	0.50	45.00	17
<i>Dennstaedtia punctilobula</i>	0.94	0.50	2.00	67
<i>Dichanthelium clandestinum</i>	0.10	0.10	0.10	8
<i>Doellingeria umbellata</i> var. <i>umbellata</i>	1.25	0.50	2.00	17
<i>Dryopteris carthusiana</i>	0.75	0.50	1.00	17
<i>Dryopteris cristata</i>	0.50	0.50	0.50	17
<i>Dryopteris intermedia</i>	2.17	0.50	5.00	25
<i>Dryopteris marginalis</i>	0.50	0.50	0.50	8
<i>Eleocharis</i>	6.00	6.00	6.00	8
<i>Eurybia divaricata</i>	0.30	0.10	0.50	17

<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	0.83	0.50	1.50	25
<i>Fagus grandifolia</i>	0.50	0.50	0.50	33
<i>Festuca trachyphylla</i>	0.50	0.50	0.50	8
<i>Fraxinus americana</i>	0.50	0.50	0.50	8
<i>Galium aparine</i>	0.50	0.50	0.50	8
<i>Galium tinctorium</i>	0.50	0.50	0.50	8
<i>Galium triflorum</i>	0.50	0.50	0.50	8
<i>Glyceria</i>	0.10	0.10	0.10	8
<i>Glyceria laxa</i>	0.50	0.50	0.50	17
<i>Glyceria melicaria</i>	2.88	0.50	10.00	33
<i>Glyceria striata</i>	2.75	0.50	5.00	17
<i>Goodyera pubescens</i>	0.10	0.10	0.10	8
<i>Hamamelis virginiana</i>	0.50	0.50	0.50	8
<i>Hieracium caespitosum</i>	0.10	0.10	0.10	17
<i>Holcus lanatus</i>	0.63	0.50	1.00	33
<i>Houstonia caerulea</i>	0.50	0.50	0.50	8
<i>Huperzia lucidula</i>	0.50	0.50	0.50	8
<i>Hypericum</i>	0.50	0.50	0.50	8
<i>Hypericum densiflorum</i>	10.25	0.50	20.00	17
<i>Hypericum ellipticum</i>	0.50	0.50	0.50	8
<i>Hypericum mutilum</i>	0.50	0.50	0.50	8
<i>Hypericum punctatum</i>	0.50	0.50	0.50	8
<i>Ilex</i>	0.50	0.50	0.50	8
<i>Ilex montana</i>	0.50	0.50	0.50	33
<i>Ilex verticillata</i>	0.50	0.50	0.50	42
<i>Impatiens</i>	1.00	1.00	1.00	8
<i>Impatiens capensis</i>	0.50	0.50	0.50	17
<i>Juncus</i>	0.50	0.50	0.50	8
<i>Juncus brevicaudatus</i>	0.75	0.50	1.00	17
<i>Juncus effusus</i>	0.63	0.50	1.00	33
<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.50	0.50	0.50	8
<i>Kalmia latifolia</i>	3.25	0.50	6.00	17
<i>Leersia oryzoides</i>	0.50	0.50	0.50	8
<i>Luzula multiflora</i> ssp. <i>multiflora</i> var. <i>multiflora</i>	0.50	0.50	0.50	8
<i>Lycopodium clavatum</i>	0.78	0.50	3.00	75
<i>Lycopodium digitatum</i>	0.70	0.50	1.00	42
<i>Lycopodium obscurum</i>	6.21	0.50	40.00	58
<i>Lycopus</i>	0.50	0.50	0.50	33
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.50	0.50	0.50	8
<i>Lycopus virginicus</i>	1.00	1.00	1.00	8
<i>Lysimachia terrestris</i>	0.50	0.50	0.50	8
<i>Maianthemum canadense</i>	0.57	0.50	1.00	58
<i>Melampyrum lineare</i>	0.50	0.50	0.50	8
<i>Mitchella repens</i>	0.57	0.50	1.00	58
<i>Monarda didyma</i>	0.50	0.50	0.50	8
<i>Monotropa uniflora</i>	0.10	0.10	0.10	8
<i>Nemopanthus mucronatus</i>	0.50	0.50	0.50	17
<i>Oclemena acuminata</i>	0.50	0.50	0.50	50
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.80	0.50	4.00	42
<i>Osmunda claytoniana</i>	3.00	3.00	3.00	8

Oxalis	0.50	0.50	0.50	8
Oxalis montana	0.63	0.50	1.00	33
Oxypolis rigidior	0.50	0.50	0.50	8
Packera aurea	1.75	0.50	3.00	17
Phleum pratense	0.50	0.50	0.50	8
Photinia melanocarpa	0.75	0.50	1.00	17
Picea rubens	0.50	0.50	0.50	58
Platanthera	0.50	0.50	0.50	8
Platanthera clavellata	0.30	0.10	0.50	17
Poa	0.50	0.50	0.50	8
Poa alsodes	0.50	0.50	0.50	17
Poa trivialis	0.50	0.50	0.50	8
Polygonum sagittatum	0.42	0.10	0.50	42
Polytrichum	10.00	10.00	10.00	8
Potentilla simplex	1.00	0.50	2.00	25
Prenanthes altissima	1.00	1.00	1.00	8
Prenanthes trifoliolata	0.50	0.50	0.50	8
Prunella vulgaris	0.50	0.50	0.50	17
Prunus serotina var. serotina	0.67	0.50	1.00	75
Pteridium aquilinum	1.63	0.50	6.00	67
Ranunculus hispidus	0.10	0.10	0.10	8
Ranunculus repens	1.00	1.00	1.00	8
Rhododendron periclymenoides	0.50	0.50	0.50	8
Ribes	0.50	0.50	0.50	8
Rosa	0.50	0.50	0.50	8
Rosa multiflora	0.50	0.50	0.50	17
Rubus	0.60	0.50	1.00	42
Rubus hispidus	11.31	0.50	50.00	67
Rumex acetosella	0.50	0.50	0.50	8
Sambucus nigra ssp. canadensis	0.50	0.50	0.50	8
Scirpus	0.50	0.50	0.50	8
Scirpus atrovirens	0.50	0.50	0.50	8
Smilax glauca	0.50	0.50	0.50	8
Smilax rotundifolia	0.37	0.10	0.50	25
Smilax tamnoides	0.30	0.10	0.50	17
Solidago	0.50	0.50	0.50	25
Solidago rugosa	0.80	0.50	1.00	42
Solidago uliginosa	0.52	0.10	1.00	42
Sorbus americana	0.50	0.50	0.50	50
Spiraea alba	0.50	0.50	0.50	17
Stellaria graminea	0.50	0.50	0.50	8
Stellaria longifolia var. longifolia	0.50	0.50	0.50	8
Stellaria media	0.50	0.50	0.50	8
Symphyotrichum prenanthoides	0.50	0.50	0.50	17
Symplocarpus foetidus	2.78	0.10	10.00	33
Thalictrum pubescens	0.50	0.50	0.50	17
Thelypteris noveboracensis	5.38	0.50	9.00	33
Triadenum fraseri	1.00	1.00	1.00	8
Trillium	0.50	0.50	0.50	8
Tsuga canadensis	0.37	0.10	0.50	25

	<i>Vaccinium angustifolium</i>	9.50	1.00	18.00	17
	<i>Vaccinium myrtilloides</i>	4.20	0.50	15.00	42
	<i>Vaccinium pallidum</i>	3.00	3.00	3.00	8
	<i>Veronica officinalis</i>	0.50	0.50	0.50	8
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.18	0.10	5.00	50
	<i>Viburnum recognitum</i>	0.50	0.50	0.50	33
	<i>Viola</i>	0.75	0.50	1.00	17
	<i>Viola cucullata</i>	0.50	0.50	0.50	17
	<i>Viola macloskeyi</i> ssp. <i>pallens</i>	3.00	1.00	5.00	17
	<i>Viola sororia</i>	0.50	0.50	0.50	8
N	<i>Bazzania trilobata</i>	0.50	0.50	0.50	8
	<i>Dicranum</i>	0.50	0.50	0.50	8
	<i>Hypnum</i>	0.50	0.50	0.50	8
	<i>Hypnum imponens</i>	1.00	1.00	1.00	8
	<i>Leucobryum</i>	0.50	0.50	0.50	8
	<i>Leucobryum glaucum</i>	0.83	0.50	1.00	25
	<i>Pleurozium schreberi</i>	1.00	1.00	1.00	8
	<i>Polytrichum</i>	1.25	0.50	3.00	33
	<i>Polytrichum pallidisetum</i>	4.00	3.00	5.00	17
	<i>Polytrichum strictum</i>	10.00	10.00	10.00	8
	<i>Sphagnum</i>	7.80	1.00	20.00	42
	<i>Sphagnum girgensohnii</i>	30.00	30.00	30.00	17
	<i>Sphagnum palustre</i>	16.50	3.00	30.00	17
Total					39

### **Abies balsamea - Picea rubens / Ilex verticillata / Sphagnum spp. woodland swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Abies balsamea</i>	9.15	0.50	20.00	83
	<i>Acer rubrum</i>	6.67	2.00	15.00	25
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	6.80	2.00	10.00	42
	<i>Fraxinus americana</i>	7.00	7.00	7.00	8
	<i>Picea rubens</i>	5.14	2.00	12.00	58
	<i>Tsuga canadensis</i>	6.25	5.50	7.00	17
T3	<i>Abies balsamea</i>	6.75	1.00	20.00	67
	<i>Acer rubrum</i>	2.75	2.00	5.00	33
	<i>Alnus incana</i> ssp. <i>rugosa</i>	3.00	3.00	3.00	8
	<i>Amelanchier</i>	5.00	5.00	5.00	8
	<i>Picea rubens</i>	4.20	3.00	6.00	42
	<i>Tsuga canadensis</i>	4.71	2.00	12.00	58
S1	<i>Abies balsamea</i>	8.00	1.00	20.00	100
	<i>Acer rubrum</i>	0.50	0.50	0.50	25
	<i>Acer spicatum</i>	0.50	0.50	0.50	8
	<i>Alnus incana</i> ssp. <i>rugosa</i>	8.13	2.00	25.00	67
	<i>Amelanchier</i>	1.75	0.50	3.00	17
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	8
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	2.19	0.50	10.00	67
	<i>Crataegus</i>	0.50	0.50	0.50	8
	<i>Fraxinus americana</i>	3.00	3.00	3.00	8

	Hypericum densiflorum	0.57	0.50	1.00	58
	Ilex montana	0.50	0.50	0.50	8
	Ilex verticillata	13.94	0.50	35.00	67
	Kalmia latifolia	1.00	1.00	1.00	8
	Lindera benzoin	0.50	0.50	0.50	8
	Nemopanthus mucronatus	0.67	0.50	1.00	25
	Picea rubens	5.54	0.50	15.00	100
	Prunus serotina var. serotina	3.00	1.00	5.00	17
	Rhododendron maximum	1.88	0.50	4.00	67
	Ribes	0.50	0.50	0.50	8
	Rosa multiflora	2.00	2.00	2.00	8
	Rubus	0.50	0.50	0.50	8
	Salix sericea	4.63	0.50	15.00	33
	Sambucus nigra ssp. canadensis	0.50	0.50	0.50	8
	Smilax tamnoides	0.50	0.50	0.50	8
	Sorbus americana	0.67	0.50	1.00	25
	Spiraea alba	8.00	2.00	17.00	42
	Tsuga canadensis	4.13	1.00	15.00	67
	Vaccinium myrtilloides	6.17	1.00	25.00	50
	Viburnum nudum var. cassinoides	1.63	0.50	5.00	33
	Viburnum recognitum	1.00	0.50	2.00	25
S2	Hypericum densiflorum	5.00	5.00	5.00	8
	Sambucus nigra ssp. canadensis	0.50	0.50	0.50	8
	Vaccinium	3.00	3.00	3.00	8
	Viburnum	0.50	0.50	0.50	8
H	Abies balsamea	0.55	0.10	1.00	92
	Acer rubrum	0.55	0.50	1.00	92
	Agrostis perennans	0.50	0.50	0.50	42
	Alnus incana ssp. rugosa	0.50	0.50	0.50	58
	Amelanchier	0.44	0.01	0.50	67
	Amelanchier arborea var. arborea	0.50	0.50	0.50	8
	Anthoxanthum odoratum ssp. odoratum	0.67	0.50	1.00	25
	Aralia nudicaulis	0.50	0.50	0.50	8
	Arisaema triphyllum	0.50	0.50	0.50	8
	Betula alleghaniensis var. alleghaniensis	0.58	0.50	1.00	50
	Bidens	0.50	0.50	0.50	8
	Bromus ciliatus var. ciliatus	0.50	0.50	0.50	8
	Carex	0.63	0.50	1.00	33
	Carex atlantica	1.50	1.00	2.00	17
	Carex baileyi	1.67	0.50	3.50	25
	Carex bromoides ssp. bromoides	0.50	0.50	0.50	8
	Carex brunnescens	0.67	0.50	1.00	25
	Carex brunnescens ssp. sphaerostachya	0.50	0.50	0.50	8
	Carex canescens	0.60	0.50	1.00	42
	Carex debilis var. debilis	1.00	1.00	1.00	8
	Carex debilis var. rudgei	2.00	2.00	2.00	8
	Carex echinata ssp. echinata	2.83	0.50	6.00	25
	Carex folliculata	10.50	1.00	25.00	67
	Carex gynandra	20.21	0.50	60.00	100
	Carex interior	10.83	0.50	30.00	25

Carex intumescens	0.50	0.50	0.50	25
Carex leptalea ssp. leptalea	1.20	0.50	3.00	42
Carex lurida	0.50	0.50	0.50	33
Carex prasina	0.50	0.50	0.50	8
Carex scabrata	0.50	0.50	0.50	8
Carex scoparia var. scoparia	1.58	0.50	3.00	50
Carex stipata	0.94	0.50	2.00	67
Carex torta	60.00	60.00	60.00	8
Carex trisperma var. trisperma	3.90	0.50	20.00	83
Carex vulpinoidea	0.50	0.50	0.50	8
Chelone glabra	0.50	0.50	0.50	17
Cornus canadensis	0.50	0.50	0.50	25
Crataegus	0.50	0.50	0.50	8
Danthonia compressa	1.33	0.50	3.00	25
Dennstaedtia punctilobula	0.50	0.50	0.50	17
Dichanthelium dichotomum ssp. microcarpon	0.50	0.50	0.50	8
Doellingeria umbellata var. umbellata	0.50	0.50	0.50	42
Dryopteris cristata	0.51	0.10	1.00	92
Dryopteris intermedia	0.51	0.10	1.00	58
Eleocharis	2.00	2.00	2.00	8
Eleocharis tenuis	0.50	0.50	0.50	8
Epilobium leptophyllum	0.50	0.50	0.50	8
Equisetum	0.50	0.50	0.50	8
Eriophorum virginicum	0.50	0.50	0.50	8
Eupatorium fistulosum	0.10	0.10	0.10	17
Euthamia graminifolia var. graminifolia	0.55	0.10	1.00	17
Fagus grandifolia	0.50	0.50	0.50	17
Galium	0.50	0.50	0.50	25
Galium tinctorium	0.64	0.50	2.00	92
Galium triflorum	0.50	0.50	0.50	8
Glyceria canadensis	1.50	1.00	2.00	17
Glyceria grandis var. grandis	2.57	0.50	7.00	58
Glyceria laxa	1.00	1.00	1.00	8
Glyceria melicaria	2.00	0.50	6.00	33
Glyceria striata	0.75	0.50	1.00	67
Gratiola neglecta	0.50	0.50	0.50	8
Holcus lanatus	1.25	0.50	2.00	17
Hydrocotyle americana	1.88	0.50	5.00	33
Hypericum	0.50	0.50	0.50	17
Hypericum densiflorum	0.50	0.50	0.50	50
Hypericum ellipticum	1.00	1.00	1.00	8
Hypericum mutilum	0.75	0.50	1.00	17
Hypericum prolificum	2.00	2.00	2.00	8
Ilex	0.50	0.50	0.50	8
Ilex verticillata	0.69	0.50	1.00	67
Impatiens	0.50	0.50	0.50	8
Impatiens capensis	3.20	0.50	15.00	83
Juncus brevicaudatus	0.50	0.50	0.50	17
Juncus effusus	1.06	0.50	3.00	75
Juncus subcaudatus var. subcaudatus	0.50	0.50	0.50	8

Kalmia latifolia	0.50	0.50	0.50	25
Leersia oryzoides	14.00	3.00	25.00	17
Lindera benzoin	1.00	1.00	1.00	8
Lycopodium clavatum	0.30	0.10	0.50	17
Lycopus	0.69	0.50	1.00	67
Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	8
Lycopus virginicus	1.00	1.00	1.00	25
Lysimachia ciliata	0.50	0.50	0.50	8
Maianthemum canadense	0.32	0.01	0.50	58
Mimulus ringens var. ringens	0.50	0.50	0.50	17
Mitchella repens	0.50	0.50	0.50	8
Nemopanthus mucronatus	0.50	0.50	0.50	25
Oclemena acuminata	0.50	0.50	0.50	42
Onoclea sensibilis	0.60	0.50	1.00	42
Osmunda cinnamomea var. cinnamomea	0.91	0.50	2.00	92
Osmunda claytoniana	0.50	0.50	0.50	8
Oxalis montana	0.71	0.50	1.00	58
Oxalis stricta	0.50	0.50	0.50	8
Oxypolis rigidior	0.50	0.50	0.50	17
Packera aurea	1.00	1.00	1.00	17
Phegopteris connectilis	0.50	0.50	0.50	17
Photinia melanocarpa	0.50	0.50	0.50	8
Picea rubens	0.71	0.50	2.00	58
Platanthera clavellata	0.50	0.50	0.50	8
Poa alsodes	0.50	0.50	0.50	8
Poa pratensis ssp. pratensis	0.50	0.50	0.50	8
Poa trivialis	2.00	2.00	2.00	8
Polygonum punctatum	0.50	0.50	0.50	67
Polygonum sagittatum	0.63	0.50	1.00	100
Prunus	0.38	0.01	0.50	33
Prunus serotina var. serotina	0.40	0.10	0.50	33
Pteridium aquilinum	0.40	0.10	0.50	33
Ranunculus hispidus	0.30	0.10	0.50	17
Rhododendron maximum	0.56	0.50	1.00	67
Ribes	0.30	0.10	0.50	17
Rosa	0.50	0.50	0.50	8
Rosa multiflora	0.50	0.50	0.50	17
Rubus	0.50	0.50	0.50	33
Rubus hispidus	24.50	4.00	50.00	67
Rubus pubescens var. pubescens	0.50	0.50	0.50	8
Rumex acetosella	0.50	0.50	0.50	8
Salix sericea	0.75	0.50	1.00	17
Sambucus nigra ssp. canadensis	0.50	0.50	0.50	8
Scirpus expansus	0.50	0.50	0.50	8
Solanum dulcamara var. dulcamara	0.10	0.10	0.10	8
Solidago	0.50	0.50	0.50	25
Solidago rugosa	0.80	0.50	2.00	42
Solidago uliginosa	0.37	0.10	0.50	25
Sorbus americana	0.44	0.10	0.50	58
Sparganium	2.25	0.50	4.00	17

	Spiraea alba	0.75	0.50	1.00	17
	Symphytotrichum puniceum var. puniceum	0.50	0.50	0.50	8
	Symplocarpus foetidus	16.75	0.50	33.00	17
	Thalictrum	0.50	0.50	0.50	8
	Thelypteris noveboracensis	2.53	0.10	7.00	25
	Thelypteris simulata	30.00	30.00	30.00	8
	Tiarella cordifolia	0.50	0.50	0.50	17
	Triadenum fraseri	1.56	0.50	5.00	75
	Tsuga canadensis	0.51	0.10	1.00	75
	Tussilago farfara	1.00	1.00	1.00	8
	Typha latifolia	2.75	0.50	5.00	17
	Vaccinium angustifolium	0.50	0.50	0.50	33
	Vaccinium macrocarpon	0.50	0.50	0.50	8
	Vaccinium myrtilloides	1.33	0.50	5.00	50
	Veratrum viride	0.75	0.50	1.00	17
	Veronica americana	0.26	0.01	0.50	17
	Viburnum nudum var. cassinoides	0.64	0.50	1.00	58
	Viburnum recognitum	0.50	0.50	0.50	42
	Viola	1.00	1.00	1.00	8
	Viola cucullata	1.05	0.50	4.00	83
N	Aulacomnium palustre	0.50	0.50	0.50	8
	Bazzania trilobata	0.50	0.50	0.50	8
	Hypnum imponens	0.50	0.50	0.50	8
	Polytrichum commune	1.00	1.00	1.00	8
	Sphagnum	28.88	3.00	60.00	67
	Sphagnum fallax	8.00	5.00	10.00	42
	Sphagnum flexuosum	10.00	10.00	10.00	8
	Sphagnum fuscum	5.00	5.00	5.00	8
	Sphagnum girgensohnii	3.00	3.00	3.00	8
	Sphagnum magellanicum	10.00	10.00	10.00	8
	Sphagnum palustre	10.67	7.00	15.00	25
Total					52

### **Acer rubrum / Osmunda cinnamomea var. cinnamomea / Sphagnum spp. linear forest seep**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	9.75	1.00	20.00	100
	Amelanchier laevis	0.50	0.50	0.50	25
	Magnolia acuminata	1.00	1.00	1.00	25
	Nyssa sylvatica	20.00	10.00	30.00	50
	Picea rubens	2.00	1.00	3.00	50
	Quercus prinus	1.00	1.00	1.00	25
	Quercus rubra	5.00	5.00	5.00	25
T3	Acer rubrum	1.50	0.50	3.00	75
	Amelanchier arborea var. arborea	1.00	1.00	1.00	25
	Magnolia acuminata	1.00	1.00	1.00	25
	Nyssa sylvatica	5.00	5.00	5.00	25
	Picea rubens	2.00	2.00	2.00	25
S1	Acer pensylvanicum	0.50	0.50	0.50	25

	Hamamelis virginiana	0.50	0.50	0.50	25
	Ilex montana	0.01	0.01	0.01	25
	Ilex verticillata	1.00	1.00	1.00	25
	Kalmia latifolia	0.50	0.50	0.50	50
	Magnolia fraseri	5.00	5.00	5.00	25
	Oxydendrum arboreum	0.50	0.50	0.50	25
	Picea rubens	1.00	1.00	1.00	25
	Spiraea alba	5.00	5.00	5.00	25
	Viburnum nudum var. cassinoides	0.75	0.50	1.00	50
S2	Amelanchier arborea var. arborea	0.50	0.50	0.50	25
	Fagus grandifolia	0.50	0.50	0.50	25
	Hamamelis virginiana	0.50	0.50	0.50	25
	Hypericum densiflorum	1.00	1.00	1.00	25
	Ilex verticillata	0.50	0.50	0.50	50
	Kalmia latifolia	0.50	0.50	0.50	50
	Menziesia pilosa	0.50	0.50	0.50	25
	Nyssa sylvatica	0.50	0.50	0.50	25
	Photinia	1.00	1.00	1.00	25
	Picea rubens	0.50	0.50	0.50	50
	Quercus rubra	0.50	0.50	0.50	25
	Rubus	0.50	0.50	0.50	50
	Salix sericea	0.50	0.50	0.50	25
	Spiraea alba	3.00	3.00	3.00	25
	Vaccinium myrtilloides	0.50	0.50	0.50	25
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	50
H	Acer rubrum	0.34	0.01	0.50	75
	Amelanchier arborea var. arborea	0.50	0.50	0.50	25
	Betula alleghaniensis var. alleghaniensis	0.01	0.01	0.01	25
	Carex	0.50	0.50	0.50	25
	Carex atlantica ssp. atlantica	1.75	0.50	3.00	50
	Carex debilis var. debilis	0.50	0.50	0.50	25
	Carex echinata ssp. echinata	0.75	0.50	1.00	50
	Carex folliculata	1.75	0.50	3.00	50
	Carex gynandra	6.84	0.01	20.00	75
	Carex intumescens	1.17	0.01	3.00	75
	Carex leptalea ssp. leptalea	2.75	0.50	5.00	50
	Carex stipata	0.01	0.01	0.01	25
	Carex trisperma var. trisperma	0.50	0.50	0.50	25
	Chelone glabra	0.50	0.50	0.50	25
	Chrysosplenium americanum	0.01	0.01	0.01	50
	Cornus canadensis	1.00	1.00	1.00	25
	Dennstaedtia punctilobula	0.26	0.01	0.50	50
	Dryopteris cristata	1.00	1.00	1.00	25
	Dryopteris intermedia	0.01	0.01	0.01	25
	Epilobium leptophyllum	0.50	0.50	0.50	25
	Eupatorium maculatum	0.50	0.50	0.50	25
	Galium asprellum	1.00	1.00	1.00	25
	Galium tinctorium	0.50	0.50	0.50	25
	Gaultheria procumbens	1.00	1.00	1.00	25
	Glyceria septentrionalis	1.00	1.00	1.00	25

	<i>Hypericum mutilum</i>	0.50	0.50	0.50	25
	<i>Impatiens</i>	5.25	0.50	10.00	50
	<i>Juncus effusus</i>	1.00	1.00	1.00	25
	<i>Juncus effusus</i> var. <i>solutus</i>	1.00	1.00	1.00	25
	<i>Kalmia latifolia</i>	0.50	0.50	0.50	25
	<i>Lycopodium clavatum</i>	0.50	0.50	0.50	25
	<i>Lycopodium obscurum</i>	0.50	0.50	0.50	25
	<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.50	0.50	0.50	25
	<i>Maianthemum canadense</i>	0.75	0.50	1.00	50
	<i>Mimulus ringens</i> var. <i>ringens</i>	0.01	0.01	0.01	25
	<i>Nyssa sylvatica</i>	0.50	0.50	0.50	25
	<i>Oclemena acuminata</i>	0.50	0.50	0.50	25
	<i>Onoclea sensibilis</i>	0.50	0.50	0.50	25
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	19.50	3.00	30.00	100
	<i>Osmunda claytoniana</i>	2.00	2.00	2.00	25
	<i>Osmunda regalis</i> var. <i>spectabilis</i>	0.01	0.01	0.01	25
	<i>Oxalis montana</i>	0.26	0.01	0.50	50
	<i>Parnassia asarifolia</i>	0.01	0.01	0.01	50
	<i>Picea rubens</i>	0.50	0.50	0.50	25
	<i>Platanthera clavellata</i>	0.50	0.50	0.50	25
	<i>Polygonum sagittatum</i>	0.50	0.50	0.50	25
	<i>Rubus hispidus</i>	0.67	0.50	1.00	75
	<i>Solidago rugosa</i>	0.50	0.50	0.50	25
	<i>Solidago uliginosa</i>	0.51	0.01	1.00	50
	<i>Symphytotrichum puniceum</i> var. <i>puniceum</i>	0.50	0.50	0.50	25
	<i>Thelypteris noveboracensis</i>	0.50	0.50	0.50	25
	<i>Thelypteris palustris</i> var. <i>pubescens</i>	5.00	5.00	5.00	25
	<i>Tiarella cordifolia</i>	0.26	0.01	0.50	50
	<i>Trillium undulatum</i>	0.26	0.01	0.50	50
	<i>Tsuga canadensis</i>	0.50	0.50	0.50	25
	<i>Veronica americana</i>	0.01	0.01	0.01	25
	<i>Viola</i>	0.01	0.01	0.01	25
	<i>Viola appalachensis</i>	0.50	0.50	0.50	25
	<i>Viola blanda</i>	0.01	0.01	0.01	25
	<i>Viola cucullata</i>	1.51	0.01	3.00	50
N	<i>Bazzania trilobata</i>	0.50	0.50	0.50	25
	<i>Brachythecium rivulare</i>	0.01	0.01	0.01	25
	<i>Dicranum</i>	0.01	0.01	0.01	25
	<i>Hylocomium splendens</i>	0.01	0.01	0.01	25
	<i>Hypnum</i>	0.50	0.50	0.50	25
	<i>Leucobryum</i>	0.01	0.01	0.01	25
	<i>Mitula elegans</i>	0.01	0.01	0.01	25
	<i>Philonotis fontana</i>	0.01	0.01	0.01	25
	<i>Plagiomnium cuspidatum</i>	0.50	0.50	0.50	25
	<i>Plagiothecium denticulatum</i>	0.50	0.50	0.50	25
	<i>Rhizomnium appalachianum</i>	3.00	3.00	3.00	25
	<i>Sphagnum</i>	20.00	20.00	20.00	25
	<i>Sphagnum capillifolium</i> var. <i>capillifolium</i>	40.00	40.00	40.00	25
	<i>Sphagnum palustre</i>	30.00	5.00	70.00	75
	<i>Sphagnum recurvum</i>	50.00	50.00	50.00	25

	Thuidium	0.50	0.50	0.50	25
Total					42

**Alnus incana ssp. rugosa - Viburnum recognitum / (Symplocarpus foetidus)  
/ Sphagnum shrub swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	3.00	1.00	5.00	15
	Betula alleghaniensis var. alleghaniensis	3.43	3.00	3.80	23
	Magnolia acuminata	0.40	0.40	0.40	8
	Tsuga canadensis	8.70	5.00	14.00	23
S1	Acer rubrum	1.35	1.00	1.70	15
	Alnus incana ssp. rugosa	24.00	6.00	40.00	92
	Amelanchier laevis	1.00	1.00	1.00	8
	Betula alleghaniensis var. alleghaniensis	3.17	2.00	4.00	23
	Ilex verticillata	6.53	1.00	23.00	54
	Kalmia latifolia	0.01	0.01	0.01	8
	Nyssa sylvatica	0.80	0.80	0.80	8
	Photinia melanocarpa	1.00	1.00	1.00	15
	Prunus serotina var. serotina	0.20	0.20	0.20	8
	Quercus rubra	2.00	2.00	2.00	8
	Rhododendron maximum	35.63	0.80	62.00	31
	Ribes	3.00	3.00	3.00	8
	Rubus idaeus ssp. strigosus	3.00	3.00	3.00	8
	Sambucus nigra ssp. canadensis	2.10	0.60	6.20	46
	Smilax glauca	0.02	0.02	0.02	8
	Sorbus americana	1.20	1.20	1.20	8
	Spiraea alba	15.00	15.00	15.00	15
	Tsuga canadensis	2.65	1.00	4.30	15
	Vaccinium angustifolium	0.20	0.20	0.20	8
	Viburnum lentago	3.00	3.00	3.00	8
Viburnum nudum var. cassinoides	2.60	0.20	5.00	15	
Viburnum recognitum	18.62	0.60	90.00	100	
S2	Acer rubrum	0.50	0.50	0.50	8
	Hypericum densiflorum	1.00	1.00	1.00	8
	Photinia melanocarpa	5.00	5.00	5.00	8
	Rhododendron maximum	5.00	5.00	5.00	8
	Vaccinium myrtilloides	1.25	0.50	2.00	15
H	Acer rubrum	0.36	0.02	1.10	31
	Acer saccharum var. saccharum	0.20	0.20	0.20	8
	Agrostis	10.75	4.50	17.00	15
	Agrostis gigantea	0.25	0.25	0.25	8
	Agrostis hyemalis	0.45	0.40	0.50	15
	Agrostis perennans	3.03	1.40	6.00	46
	Arisaema triphyllum	0.80	0.30	1.60	23
	Aster	0.50	0.50	0.50	8
	Betula alleghaniensis var. alleghaniensis	0.63	0.20	1.20	23
	Calamagrostis canadensis var. canadensis	22.67	5.00	43.00	23
	Carex	7.75	3.00	12.50	15
	Carex atlantica ssp. atlantica	1.87	1.00	3.00	23

Carex canescens	1.25	0.25	3.00	23
Carex comosa	0.25	0.25	0.25	8
Carex debilis	0.50	0.50	0.50	8
Carex echinata ssp. echinata	2.17	0.50	5.00	23
Carex folliculata	1.60	0.40	3.00	46
Carex gynandra	1.93	0.40	3.00	46
Carex leptalea ssp. leptalea	0.50	0.50	0.50	8
Carex scoparia var. scoparia	0.93	0.50	1.50	23
Carex stipata	0.70	0.20	1.40	23
Carex stipata var. stipata	20.00	20.00	20.00	8
Carex stricta	10.52	3.00	31.00	38
Carex trisperma var. trisperma	0.25	0.25	0.25	8
Chelone glabra	2.90	1.80	4.00	15
Cicuta maculata var. maculata	0.25	0.25	0.25	8
Cinna latifolia	0.50	0.50	0.50	8
Clematis virginiana	4.00	4.00	4.00	8
Danthonia spicata	0.10	0.10	0.10	8
Dichanthelium clandestinum	0.48	0.25	1.00	38
Dryopteris carthusiana	3.03	0.40	9.00	46
Dryopteris cristata	0.50	0.25	1.00	23
Dryopteris intermedia	0.38	0.25	0.50	15
Dryopteris marginalis	0.50	0.50	0.50	8
Eleocharis	1.00	1.00	1.00	8
Eleocharis obtusa	0.20	0.20	0.20	8
Elymus	0.25	0.25	0.25	8
Eupatorium perfoliatum var. perfoliatum	0.43	0.20	0.60	23
Euthamia graminifolia var. graminifolia	5.25	1.30	9.20	15
Fraxinus americana	0.60	0.60	0.60	8
Galium	0.50	0.50	0.50	8
Galium tinctorium	3.86	0.40	17.20	77
Glyceria canadensis	0.25	0.25	0.25	8
Glyceria grandis var. grandis	0.25	0.25	0.25	8
Glyceria laxa	20.00	20.00	20.00	8
Glyceria melicaria	5.84	0.60	16.00	38
Glyceria striata	3.00	0.20	9.00	38
Huperzia lucidula	0.25	0.25	0.25	8
Hypericum ellipticum	1.00	1.00	1.00	8
Hypericum mutilum	2.93	0.25	9.20	38
Impatiens	2.75	0.50	5.00	15
Impatiens capensis	7.75	0.50	21.00	62
Juncus effusus	1.91	0.10	8.60	46
Leersia oryzoides	14.06	0.50	51.00	62
Ludwigia palustris	0.50	0.50	0.50	8
Lycopus uniflorus var. uniflorus	2.62	0.50	6.20	77
Magnolia acuminata	0.40	0.40	0.40	8
Mitchella repens	0.02	0.02	0.02	8
Osmunda cinnamomea var. cinnamomea	1.13	0.02	3.50	31
Packera aurea	6.00	6.00	6.00	8
Poa	0.50	0.50	0.50	8
Polygonum sagittatum	4.05	0.02	8.40	77

	<i>Polygonum scandens</i>	0.50	0.50	0.50	8
	<i>Potamogeton epihydrus</i>	1.40	1.40	1.40	8
	<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i>	0.20	0.20	0.20	8
	<i>Prunus serotina</i> var. <i>serotina</i>	0.02	0.02	0.02	8
	<i>Rubus</i>	0.50	0.50	0.50	8
	<i>Rubus hispidus</i>	11.83	0.20	43.00	92
	<i>Scirpus atrocinctus</i>	0.50	0.50	0.50	8
	<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	0.50	0.50	0.50	8
	<i>Solidago rugosa</i>	5.89	0.20	24.00	62
	<i>Solidago uliginosa</i>	3.33	1.00	8.00	23
	<i>Sparganium americanum</i>	5.00	5.00	5.00	8
	<i>Sparganium chlorocarpum</i>	1.87	0.60	3.00	23
	<i>Symplocarpus foetidus</i>	13.43	0.60	31.70	77
	<i>Thalictrum pubescens</i>	1.05	1.00	1.10	15
	<i>Triadenum fraseri</i>	1.88	0.50	5.00	31
	<i>Tsuga canadensis</i>	0.20	0.10	0.40	23
	<i>Viola</i>	4.12	0.02	9.00	69
	<i>Viola cucullata</i>	0.50	0.50	0.50	8
	<i>Viola macloskeyi</i> ssp. <i>pallens</i>	0.50	0.50	0.50	8
N	<i>Atrichum crispum</i>	4.01	0.02	8.00	15
	<i>Atrichum undulatum</i>	1.43	0.80	2.50	23
	<i>Aulacomnium palustre</i>	0.50	0.50	0.50	8
	<i>Polytrichum</i>	5.00	5.00	5.00	8
	<i>Polytrichum commune</i>	2.27	0.40	5.40	23
	<i>Polytrichum juniperinum</i>	0.02	0.02	0.02	8
	<i>Polytrichum ohioense</i>	7.60	7.60	7.60	8
	<i>Sphagnum affine</i>	9.38	0.80	20.00	62
	<i>Sphagnum fimbriatum</i>	4.90	1.20	10.00	54
	<i>Sphagnum girgensohnii</i>	2.90	2.90	2.90	8
	<i>Sphagnum palustre</i>	10.00	10.00	10.00	8
	<i>Sphagnum papillosum</i>	9.90	5.80	14.00	15
	<i>Sphagnum recurvum</i>	5.70	0.40	10.00	31
Total					43

### ***Alnus incana* ssp. *rugosa* shrub swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Abies balsamea</i>	8.17	0.50	23.00	11
	<i>Acer rubrum</i>	1.75	0.50	3.00	7
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	5.50	3.00	8.00	7
	<i>Fraxinus nigra</i>	2.00	2.00	2.00	4
	<i>Picea rubens</i>	4.00	1.00	7.00	7
	<i>Tsuga canadensis</i>	0.75	0.50	1.00	7
T3	<i>Abies balsamea</i>	1.00	1.00	1.00	4
	<i>Acer rubrum</i>	1.67	0.01	3.00	11
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	3.00	3.00	3.00	4
	<i>Picea rubens</i>	2.00	2.00	2.00	4
	<i>Tsuga canadensis</i>	3.50	2.00	5.00	7
S1	<i>Abies balsamea</i>	2.67	0.50	7.00	11
	<i>Alnus incana</i> ssp. <i>rugosa</i>	51.94	0.50	90.00	100

	Amelanchier	1.25	0.50	2.00	7
	Betula alleghaniensis var. alleghaniensis	4.20	2.40	6.00	7
	Ilex collina	30.00	30.00	30.00	4
	Ilex verticillata	14.08	0.02	85.00	48
	Lindera benzoin	1.00	1.00	1.00	4
	Nemopanthus mucronatus	0.50	0.50	0.50	4
	Photinia melanocarpa	0.50	0.50	0.50	7
	Photinia pyrifolia	1.60	1.60	1.60	4
	Picea rubens	0.67	0.50	1.00	11
	Rhododendron maximum	3.00	1.00	5.00	7
	Ribes	3.00	3.00	3.00	7
	Rubus idaeus ssp. strigosus	3.00	3.00	3.00	4
	Salix sericea	1.83	0.50	3.00	11
	Sambucus nigra ssp. canadensis	6.53	2.20	15.00	11
	Sorbus americana	1.00	1.00	1.00	4
	Tsuga canadensis	1.60	0.01	3.00	19
	Vaccinium myrtilloides	2.50	2.00	3.00	7
	Viburnum nudum var. cassinoides	2.07	0.50	3.00	26
	Viburnum recognitum	3.00	0.02	10.00	22
S2	Abies balsamea	0.01	0.01	0.01	4
	Aesculus flava	0.50	0.50	0.50	4
	Alnus incana ssp. rugosa	4.70	0.50	20.00	19
	Amelanchier laevis	0.50	0.50	0.50	4
	Hypericum densiflorum	4.50	0.50	15.00	19
	Ilex collina	10.00	10.00	10.00	4
	Ilex montana	0.01	0.01	0.01	4
	Ilex verticillata	5.38	0.50	20.00	15
	Kalmia latifolia	1.00	1.00	1.00	4
	Lindera benzoin	3.00	3.00	3.00	4
	Nemopanthus mucronatus	0.01	0.01	0.01	4
	Photinia melanocarpa	0.01	0.01	0.01	4
	Picea rubens	0.01	0.01	0.01	4
	Prunus serotina var. serotina	0.01	0.01	0.01	4
	Rhamnus alnifolia	31.50	3.00	60.00	7
	Ribes	0.50	0.50	0.50	4
	Ribes rotundifolium	0.50	0.50	0.50	4
	Rosa multiflora	0.26	0.01	0.50	7
	Rosa palustris	1.00	1.00	1.00	4
	Rubus	0.01	0.01	0.01	4
	Salix sericea	0.01	0.01	0.01	4
	Sambucus nigra ssp. canadensis	0.26	0.01	0.50	7
	Spiraea alba	1.01	0.01	2.00	7
	Tsuga canadensis	0.50	0.50	0.50	4
	Vaccinium myrtilloides	5.50	0.50	15.00	11
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	4
	Viburnum recognitum	0.70	0.50	1.00	19
H	Abies balsamea	0.26	0.01	0.50	7
	Acer rubrum	0.01	0.01	0.01	4
	Agrostis	1.67	0.50	3.50	11
	Agrostis hyemalis	0.50	0.50	0.50	7

Agrostis perennans	1.09	0.20	4.00	30
Amelanchier	0.50	0.50	0.50	4
Arisaema triphyllum	0.60	0.50	1.00	19
Arisaema triphyllum ssp. stewardsonii	1.63	0.25	3.00	7
Aster	1.00	1.00	1.00	4
Bartonia virginica	0.25	0.25	0.25	4
Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	7
Bromus ciliatus var. ciliatus	0.50	0.50	0.50	4
Calamagrostis canadensis var. canadensis	0.73	0.40	1.00	22
Callitriche terrestris	0.50	0.50	0.50	4
Caltha palustris var. palustris	0.95	0.25	3.00	19
Cardamine bulbosa	0.01	0.01	0.01	4
Cardamine parviflora var. arenicola	0.01	0.01	0.01	4
Cardamine pensylvanica	0.50	0.50	0.50	4
Carex	2.25	1.00	3.50	7
Carex atlantica	0.75	0.50	1.00	7
Carex atlantica ssp. atlantica	5.08	0.01	20.00	19
Carex baileyi	0.01	0.01	0.01	4
Carex bromoides ssp. bromoides	7.50	5.00	10.00	7
Carex brunnescens	0.50	0.50	0.50	4
Carex canescens	2.61	0.25	11.00	26
Carex comosa	4.25	0.25	11.50	11
Carex crinita	1.75	0.01	3.00	15
Carex crinita var. crinita	5.00	5.00	5.00	4
Carex echinata ssp. echinata	7.64	0.25	25.00	33
Carex folliculata	2.83	0.01	14.50	30
Carex gynandra	1.89	0.25	10.00	41
Carex intumescens	0.55	0.25	1.00	19
Carex leptalea ssp. leptalea	2.00	0.01	11.00	26
Carex leptoneura	0.50	0.50	0.50	4
Carex lurida	0.50	0.50	0.50	11
Carex prasina	2.00	2.00	2.00	4
Carex projecta	3.00	1.00	5.00	7
Carex retroflexa	1.00	1.00	1.00	4
Carex scabrata	3.00	3.00	3.00	4
Carex scoparia var. scoparia	0.67	0.50	1.00	33
Carex stipata	2.25	0.25	10.00	33
Carex stipata var. stipata	1.75	0.50	3.00	7
Carex stricta	12.05	0.25	20.00	19
Carex torta	2.00	2.00	2.00	4
Carex tribuloides	0.51	0.01	1.00	7
Carex trisperma var. trisperma	0.50	0.01	1.00	11
Carex vulpinoidea	0.25	0.25	0.25	4
Chelone glabra	1.44	0.25	3.00	15
Chrysosplenium americanum	1.70	0.25	7.00	19
Cicuta maculata var. maculata	0.50	0.50	0.50	4
Cinna arundinacea	0.40	0.40	0.40	4
Cinna latifolia	3.88	0.25	14.50	22
Circaea	0.50	0.50	0.50	4
Clematis virginiana	0.65	0.25	1.00	19

Cornus canadensis	0.25	0.25	0.25	4
Crataegus	0.01	0.01	0.01	4
Dichanthelium clandestinum	0.56	0.25	1.00	15
Doellingeria umbellata var. umbellata	1.01	0.01	3.00	15
Drosera rotundifolia var. rotundifolia	0.25	0.25	0.25	4
Dryopteris	1.00	1.00	1.00	4
Dryopteris carthusiana	2.00	1.00	3.00	19
Dryopteris cristata	1.57	0.01	5.00	56
Dryopteris intermedia	2.39	0.25	10.00	26
Dulichium arundinaceum	0.25	0.25	0.25	4
Eleocharis tenuis	0.50	0.50	0.50	4
Elymus	0.50	0.50	0.50	4
Elymus virginicus var. virginicus	1.00	1.00	1.00	4
Epilobium	1.00	1.00	1.00	4
Epilobium ciliatum	0.25	0.25	0.25	4
Epilobium leptophyllum	0.32	0.01	0.50	15
Eriophorum virginicum	0.63	0.25	1.00	7
Euthamia graminifolia var. graminifolia	0.55	0.50	0.60	7
Galium	0.75	0.50	1.00	7
Galium asprellum	2.22	0.25	10.00	30
Galium tinctorium	1.49	0.01	7.00	70
Gaultheria procumbens	0.38	0.25	0.50	7
Glyceria	7.67	0.01	20.00	11
Glyceria canadensis	8.75	0.50	21.50	30
Glyceria grandis var. grandis	2.71	0.25	10.00	22
Glyceria laxa	20.00	20.00	20.00	4
Glyceria melicaria	25.34	0.25	70.00	52
Glyceria septentrionalis	5.00	5.00	5.00	4
Glyceria striata	10.43	0.50	38.00	59
Gratiola neglecta	0.50	0.50	0.50	4
Hasteola suaveolens	4.50	4.50	4.50	4
Hydrocotyle americana	0.75	0.50	1.00	7
Hypericum ellipticum	0.58	0.25	1.00	11
Hypericum mutilum	2.25	1.50	3.00	7
Ilex verticillata	0.67	0.50	1.00	11
Impatiens	5.00	1.00	10.00	22
Impatiens capensis	7.84	0.25	30.00	59
Juncus biflorus	18.50	18.50	18.50	4
Juncus brevicaudatus	0.25	0.25	0.25	4
Juncus effusus	0.58	0.25	1.00	37
Juncus effusus var. solutus	0.50	0.50	0.50	4
Juncus subcaudatus var. subcaudatus	0.50	0.50	0.50	4
Laporteia canadensis	1.00	1.00	1.00	4
Leersia oryzoides	9.51	0.25	33.00	63
Leersia virginica	5.00	5.00	5.00	4
Ludwigia palustris	0.34	0.01	0.50	11
Lycopus uniflorus var. uniflorus	3.13	0.25	12.50	44
Lycopus virginicus	0.56	0.25	1.00	15
Lysimachia ciliata	0.63	0.01	1.50	15
Maianthemum canadense	1.00	0.50	3.00	22

<i>Mentha arvensis</i>	2.50	0.50	8.50	15
<i>Milium effusum</i> var. <i>cisatlanticum</i>	4.00	4.00	4.00	4
<i>Mimulus ringens</i> var. <i>ringens</i>	1.25	0.50	2.00	7
<i>Mitella diphylla</i>	0.50	0.50	0.50	4
<i>Monarda didyma</i>	0.01	0.01	0.01	4
<i>Onoclea sensibilis</i>	1.37	0.01	7.50	26
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.86	0.50	6.00	26
<i>Osmunda claytoniana</i>	1.00	1.00	1.00	4
<i>Oxalis</i>	0.50	0.50	0.50	4
<i>Oxalis montana</i>	0.50	0.50	0.50	7
<i>Packera aurea</i>	2.10	0.50	6.50	19
<i>Phalaris arundinacea</i>	0.50	0.50	0.50	4
<i>Picea rubens</i>	0.50	0.50	0.50	4
<i>Platanthera lacera</i>	0.06	0.01	0.10	7
<i>Poa alsodes</i>	0.50	0.50	0.50	4
<i>Poa pratensis</i> ssp. <i>pratensis</i>	0.50	0.50	0.50	4
<i>Poa trivialis</i>	0.83	0.50	1.00	11
<i>Polemonium vanbruntiae</i>	3.13	0.50	10.00	15
<i>Polygonum</i>	1.17	0.01	3.50	11
<i>Polygonum hydropiper</i>	1.00	1.00	1.00	4
<i>Polygonum hydropiperoides</i>	0.75	0.50	1.00	7
<i>Polygonum punctatum</i>	0.50	0.50	0.50	4
<i>Polygonum sagittatum</i>	5.36	0.01	30.00	81
<i>Polygonum scandens</i>	0.75	0.50	1.00	7
<i>Polystichum acrostichoides</i>	0.50	0.50	0.50	4
<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i>	0.26	0.01	0.50	7
<i>Prunus serotina</i> var. <i>serotina</i>	0.60	0.60	0.60	4
<i>Ranunculus hispidus</i> var. <i>nitidus</i>	0.50	0.50	0.50	4
<i>Rubus</i>	0.50	0.50	0.50	4
<i>Rubus hispidus</i>	8.32	0.50	37.00	70
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	3.00	3.00	3.00	7
<i>Sambucus nigra</i> ssp. <i>canadensis</i>	1.00	1.00	1.00	4
<i>Schoenoplectus tabernaemontani</i>	0.26	0.01	0.50	7
<i>Scirpus</i>	1.00	1.00	1.00	4
<i>Scirpus atrocinctus</i>	0.50	0.50	0.50	4
<i>Scirpus atrovirens</i>	0.01	0.01	0.01	4
<i>Scirpus cyperinus</i>	0.50	0.50	0.50	4
<i>Scirpus microcarpus</i>	1.00	1.00	1.00	4
<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	2.54	0.01	20.00	48
<i>Smilax rotundifolia</i>	3.00	3.00	3.00	4
<i>Solanum americanum</i>	0.01	0.01	0.01	4
<i>Solanum dulcamara</i> var. <i>dulcamara</i>	0.50	0.50	0.50	11
<i>Solidago</i>	2.75	0.50	5.00	7
<i>Solidago rugosa</i>	4.73	0.25	19.50	30
<i>Solidago uliginosa</i>	2.66	0.01	12.50	30
<i>Sparganium</i>	0.26	0.01	0.50	7
<i>Sparganium americanum</i>	7.94	0.25	30.50	15
<i>Spiraea alba</i>	15.00	15.00	15.00	4
<i>Symphyotrichum praealtum</i>	0.50	0.50	0.50	4
<i>Symphyotrichum prenanthoides</i>	0.75	0.50	1.00	7

	<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	0.63	0.40	1.00	11
	<i>Symplocarpus foetidus</i>	10.88	0.25	40.00	52
	<i>Taraxacum officinale</i> ssp. <i>officinale</i>	0.50	0.50	0.50	4
	<i>Thalictrum</i>	0.84	0.01	3.00	22
	<i>Thalictrum pubescens</i>	3.50	0.50	15.00	19
	<i>Tiarella cordifolia</i>	0.82	0.01	3.00	15
	<i>Triadenum</i>	1.00	1.00	1.00	7
	<i>Triadenum fraseri</i>	0.63	0.01	1.00	22
	<i>Triadenum virginicum</i>	2.50	0.50	4.50	15
	<i>Tsuga canadensis</i>	0.50	0.50	0.50	7
	<i>Typha latifolia</i>	3.75	0.25	8.00	11
	<i>Vaccinium myrtilloides</i>	0.75	0.50	1.00	7
	<i>Veratrum viride</i>	2.35	0.01	10.00	19
	<i>Verbena urticifolia</i>	0.01	0.01	0.01	4
	<i>Veronica</i>	0.01	0.01	0.01	4
	<i>Veronica americana</i>	0.12	0.01	0.25	11
	<i>Veronica anagallis-aquatica</i>	0.01	0.01	0.01	4
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.50	0.50	0.50	4
	<i>Viburnum recognitum</i>	1.75	0.50	3.00	7
	<i>Viola</i>	3.90	0.50	15.00	48
	<i>Viola cucullata</i>	6.00	0.50	15.00	41
N	<i>Atrichum undulatum</i>	0.50	0.50	0.50	4
	<i>Aulacomnium</i>	0.50	0.50	0.50	7
	<i>Aulacomnium palustre</i>	1.00	1.00	1.00	7
	<i>Bazzania trilobata</i>	0.01	0.01	0.01	4
	<i>Brachythecium salebrosum</i>	0.50	0.50	0.50	4
	<i>Bryhnia novae-angliae</i>	1.00	1.00	1.00	4
	<i>Climacium americanum</i>	0.50	0.50	0.50	7
	<i>Hypnum imponens</i>	0.83	0.50	1.00	11
	<i>Leucobryum glaucum</i>	1.00	1.00	1.00	4
	<i>Plagiomnium ciliare</i>	0.01	0.01	0.01	4
	<i>Polytrichum</i>	2.00	1.00	3.00	7
	<i>Polytrichum commune</i>	0.50	0.50	0.50	7
	<i>Polytrichum pallidisetum</i>	0.50	0.50	0.50	4
	<i>Polytrichum strictum</i>	2.00	2.00	2.00	4
	<i>Sphagnum</i>	10.50	1.00	20.00	7
	<i>Sphagnum affine</i>	5.83	0.10	20.00	15
	<i>Sphagnum fimbriatum</i>	3.50	2.00	5.00	7
	<i>Sphagnum henryense</i>	15.50	1.00	30.00	7
	<i>Sphagnum papillosum</i>	20.00	20.00	20.00	4
	<i>Sphagnum recurvum</i>	4.40	4.40	4.40	4
	<i>Thuidium delicatulum</i>	1.75	0.50	5.00	22
Total					29

***Betula alleghaniensis* var. *alleghaniensis* / *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* sloping linear forest seep**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Acer rubrum</i>	10.00	10.00	10.00	14
	<i>Acer saccharum</i> var. <i>saccharum</i>	8.60	3.00	10.00	71

	Betula alleghaniensis var. alleghaniensis	26.17	10.00	50.00	86
	Fagus grandifolia	10.00	10.00	10.00	29
	Fraxinus americana	5.50	1.00	10.00	29
	Liriodendron tulipifera	10.00	10.00	10.00	14
	Picea rubens	6.83	0.50	10.00	43
	Prunus serotina var. serotina	7.50	5.00	10.00	29
	Tsuga canadensis	6.50	3.00	10.00	29
T3	Acer saccharum var. saccharum	3.67	2.00	6.00	43
	Betula alleghaniensis var. alleghaniensis	5.75	2.00	15.00	57
	Fagus grandifolia	1.00	1.00	1.00	14
	Picea rubens	1.00	1.00	1.00	14
	Tsuga canadensis	2.67	1.00	5.00	43
S1	Acer pensylvanicum	0.75	0.50	1.00	29
	Fagus grandifolia	1.50	0.50	3.00	43
	Picea rubens	0.50	0.50	0.50	29
	Tsuga canadensis	2.00	2.00	2.00	14
S2	Acer pensylvanicum	0.50	0.50	0.50	14
	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	14
	Fagus grandifolia	0.67	0.50	1.00	43
	Fraxinus americana	0.50	0.50	0.50	14
	Nyssa sylvatica	0.50	0.50	0.50	14
	Picea rubens	0.50	0.50	0.50	14
	Rubus	0.50	0.50	0.50	29
	Smilax rotundifolia	0.50	0.50	0.50	14
H	Acer rubrum	0.50	0.50	0.50	29
	Acer saccharum var. saccharum	0.50	0.50	0.50	29
	Actaea podocarpa	0.01	0.01	0.01	14
	Ageratina altissima	0.50	0.50	0.50	14
	Agrostis perennans	0.01	0.01	0.01	14
	Arisaema triphyllum	0.01	0.01	0.01	14
	Arisaema triphyllum ssp. stewardsonii	1.00	1.00	1.00	14
	Arisaema triphyllum ssp. triphyllum	0.34	0.01	0.50	43
	Athyrium filix-femina ssp. asplenioides	0.50	0.50	0.50	14
	Betula alleghaniensis var. alleghaniensis	0.38	0.01	0.50	57
	Brachyelytrum septentrionale	0.01	0.01	0.01	14
	Cardamine diphylla	1.38	0.50	3.00	57
	Cardamine pensylvanica	0.50	0.01	1.00	43
	Carex	0.01	0.01	0.01	14
	Carex bromoides ssp. bromoides	4.00	3.00	5.00	29
	Carex debilis var. rudgei	0.50	0.50	0.50	14
	Carex laxiculmis var. laxiculmis	0.01	0.01	0.01	14
	Carex leptoneuria	1.75	0.50	3.00	29
	Carex prasina	2.75	0.50	5.00	29
	Carex scabrata	13.43	1.00	30.00	100
	Carex stipata	0.50	0.50	0.50	14
	Carex trisperma var. trisperma	0.01	0.01	0.01	14
	Chelone	1.00	1.00	1.00	14
	Chelone glabra	0.75	0.50	1.00	29
	Chrysosplenium americanum	1.25	0.50	3.00	57
	Cinna latifolia	0.26	0.01	0.50	29

<i>Circaea alpina</i> ssp. <i>alpina</i>	0.50	0.50	0.50	14
<i>Cryptotaenia canadensis</i>	0.01	0.01	0.01	14
<i>Dryopteris intermedia</i>	0.80	0.50	1.00	71
<i>Erythronium americanum</i> ssp. <i>americanum</i>	2.00	2.00	2.00	14
<i>Eupatorium</i>	0.01	0.01	0.01	14
<i>Eupatorium fistulosum</i>	0.01	0.01	0.01	14
<i>Eurybia divaricata</i>	0.75	0.50	1.00	29
<i>Fraxinus americana</i>	0.50	0.50	0.50	14
<i>Galium asprellum</i>	0.51	0.01	1.00	29
<i>Galium triflorum</i>	0.75	0.50	1.00	29
<i>Glyceria</i>	7.17	0.50	20.00	43
<i>Glyceria melicaria</i>	14.00	2.00	30.00	43
<i>Glyceria striata</i>	1.00	1.00	1.00	14
<i>Impatiens</i>	2.00	1.00	3.00	29
<i>Impatiens capensis</i>	12.50	10.00	15.00	29
<i>Laportea canadensis</i>	6.17	1.00	20.00	86
<i>Leersia virginica</i>	0.01	0.01	0.01	14
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.01	0.01	0.01	14
<i>Maianthemum canadense</i>	0.50	0.50	0.50	14
<i>Medeola virginiana</i>	0.01	0.01	0.01	14
<i>Mitella diphylla</i>	0.01	0.01	0.01	14
<i>Monarda didyma</i>	0.17	0.01	0.50	43
<i>Oclemena acuminata</i>	0.50	0.50	0.50	14
<i>Oxalis</i>	0.50	0.50	0.50	14
<i>Oxalis montana</i>	0.17	0.01	0.50	43
<i>Packera aurea</i>	12.67	8.00	20.00	43
<i>Panax trifolius</i>	0.50	0.50	0.50	14
<i>Picea rubens</i>	0.26	0.01	0.50	29
<i>Poa alsodes</i>	0.63	0.01	1.00	57
<i>Poa pratensis</i> ssp. <i>pratensis</i>	0.01	0.01	0.01	14
<i>Polygonum sagittatum</i>	0.01	0.01	0.01	14
<i>Polystichum acrostichoides</i>	0.50	0.50	0.50	14
<i>Prenanthes</i>	0.50	0.50	0.50	14
<i>Prunus serotina</i> var. <i>serotina</i>	0.50	0.50	0.50	29
<i>Ranunculus abortivus</i>	0.50	0.50	0.50	14
<i>Ranunculus hispidus</i> var. <i>hispidus</i>	3.00	3.00	3.00	14
<i>Ranunculus hispidus</i> var. <i>nitidus</i>	0.01	0.01	0.01	14
<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	0.50	0.50	0.50	29
<i>Rubus</i>	0.01	0.01	0.01	14
<i>Rudbeckia laciniata</i> var. <i>laciniata</i>	0.01	0.01	0.01	14
<i>Sambucus</i>	0.50	0.50	0.50	14
<i>Saxifraga micranthidifolia</i>	1.51	0.01	5.00	57
<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	0.01	0.01	0.01	14
<i>Smilax rotundifolia</i>	0.50	0.50	0.50	14
<i>Sorbus americana</i>	0.01	0.01	0.01	14
<i>Symphyotrichum prenanthoides</i>	0.50	0.01	1.00	57
<i>Thelypteris noveboracensis</i>	0.83	0.50	1.00	43
<i>Tiarella cordifolia</i>	3.00	1.00	5.00	86
<i>Tsuga canadensis</i>	1.00	1.00	1.00	14
<i>Veratrum viride</i>	5.50	1.00	10.00	29

	Viola blanda	0.50	0.50	0.50	29
	Viola cucullata	7.57	2.00	15.00	100
N	Atrichum undulatum	1.00	1.00	1.00	14
	Bazzania trilobata	0.50	0.50	0.50	14
	Brachythecium	10.00	10.00	10.00	14
	Brachythecium rivulare	15.67	7.00	20.00	43
	Brotherella recurvans	0.01	0.01	0.01	14
	Bryhnia novae-angliae	5.00	5.00	5.00	14
	Campylium chrysophyllum	5.00	5.00	5.00	14
	Dicranum	0.50	0.50	0.50	14
	Dicranum fulvum	0.75	0.50	1.00	29
	Gymnostomum aeruginosum	0.50	0.50	0.50	14
	Hypnum imponens	5.00	3.00	7.00	29
	Leptodictyum humile	0.50	0.50	0.50	14
	Mitrua elegans	0.01	0.01	0.01	29
	Plagiomnium ciliare	10.67	2.00	30.00	86
	Rhizomnium appalachianum	7.75	0.50	15.00	29
	Thuidium delicatulum	3.50	2.00	7.00	57
	Total				

**Betula alleghaniensis var. alleghaniensis / Impatiens capensis -  
Chrysosplenium americanum - (Symplocarpus foetidus) / Rhizomnium  
appalachianum forest seep**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Abies balsamea	5.00	5.00	5.00	8
	Acer rubrum	4.83	1.00	10.00	46
	Acer saccharum var. saccharum	20.00	20.00	20.00	8
	Betula alleghaniensis var. alleghaniensis	13.13	1.00	40.00	62
	Crataegus	1.00	1.00	1.00	8
	Fagus grandifolia	25.00	25.00	25.00	8
	Fraxinus americana	5.00	5.00	5.00	8
	Fraxinus nigra	2.00	2.00	2.00	8
	Magnolia acuminata	10.00	10.00	10.00	8
	Picea rubens	14.75	3.00	35.00	62
	Prunus serotina var. serotina	7.10	0.50	10.00	38
	Quercus rubra	4.75	2.00	10.00	31
	Tsuga canadensis	20.20	10.00	36.00	38
	T3	Abies balsamea	20.00	20.00	20.00
Acer rubrum		1.33	1.00	2.00	23
Acer saccharum var. saccharum		4.00	3.00	5.00	15
Acer spicatum		2.00	1.00	3.00	15
Amelanchier		5.00	5.00	5.00	8
Betula alleghaniensis var. alleghaniensis		4.75	2.00	10.00	62
Crataegus		3.00	3.00	3.00	8
Fagus grandifolia		2.33	1.00	5.00	23
Magnolia acuminata		1.00	1.00	1.00	8
Picea rubens		2.80	1.00	5.00	38
Sorbus americana		1.00	1.00	1.00	15
Tsuga canadensis		4.33	2.00	8.00	23

S1	<i>Abies balsamea</i>	1.00	1.00	1.00	8
	<i>Acer spicatum</i>	3.00	1.00	5.00	15
	<i>Alnus incana</i> ssp. <i>rugosa</i>	3.33	3.00	4.00	23
	<i>Amelanchier laevis</i>	1.00	1.00	1.00	8
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	1.50	0.50	2.00	23
	<i>Cornus alternifolia</i>	0.50	0.50	0.50	8
	<i>Fagus grandifolia</i>	2.17	0.50	5.00	23
	<i>Fraxinus americana</i>	1.00	1.00	1.00	8
	<i>Hamamelis virginiana</i>	2.00	2.00	2.00	15
	<i>Ilex montana</i>	0.75	0.50	1.00	15
	<i>Ilex verticillata</i>	6.00	6.00	6.00	8
	<i>Kalmia latifolia</i>	2.00	1.00	3.00	15
	<i>Lindera benzoin</i>	0.50	0.50	0.50	8
	<i>Picea rubens</i>	3.93	0.50	20.00	54
	<i>Rhododendron maximum</i>	1.75	0.50	5.00	31
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	5.00	5.00	5.00	8
	<i>Sorbus americana</i>	0.50	0.50	0.50	8
	<i>Tsuga canadensis</i>	1.00	0.50	2.00	31
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.00	1.00	1.00	8
	<i>Viburnum recognitum</i>	5.00	5.00	5.00	8
S2	<i>Acer pensylvanicum</i>	0.50	0.50	0.50	8
	<i>Acer rubrum</i>	5.00	5.00	5.00	8
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.50	0.50	0.50	8
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	1.00	1.00	1.00	8
	<i>Fagus grandifolia</i>	0.75	0.50	1.00	15
	<i>Ilex verticillata</i>	0.50	0.50	0.50	8
	<i>Picea rubens</i>	1.00	0.50	2.00	38
	<i>Rhododendron maximum</i>	0.50	0.50	0.50	8
	<i>Rubus</i>	0.67	0.50	1.00	23
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.75	0.50	1.00	15
	<i>Smilax tamnoides</i>	0.50	0.50	0.50	8
	<i>Tsuga canadensis</i>	0.75	0.50	1.00	15
	<i>Vaccinium erythrocarpum</i>	0.50	0.50	0.50	15
	<i>Viburnum lantanoides</i>	0.50	0.50	0.50	8
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.00	1.00	1.00	8
<i>Viburnum recognitum</i>	1.00	1.00	1.00	8	
H	<i>Abies balsamea</i>	0.50	0.50	0.50	8
	<i>Acer rubrum</i>	0.44	0.01	1.00	62
	<i>Acer saccharum</i> var. <i>saccharum</i>	0.26	0.01	0.50	15
	<i>Aconitum uncinatum</i>	1.00	1.00	1.00	8
	<i>Actaea podocarpa</i>	0.50	0.50	0.50	15
	<i>Ageratina altissima</i>	0.75	0.50	1.00	15
	<i>Agrostis perennans</i>	0.92	0.50	2.00	46
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.50	0.50	0.50	15
	<i>Amelanchier laevis</i>	0.50	0.50	0.50	8
	<i>Anthoxanthum odoratum</i> ssp. <i>odoratum</i>	0.01	0.01	0.01	15
	<i>Aralia nudicaulis</i>	0.50	0.50	0.50	8
	<i>Arisaema triphyllum</i>	0.38	0.01	1.00	31
	<i>Athyrium filix-femina</i> var. <i>angustum</i>	0.75	0.50	1.00	15
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.34	0.01	0.50	23

Brachyelytrum erectum	0.50	0.50	0.50	15
Callitriche	0.01	0.01	0.01	8
Callitriche palustris	3.00	3.00	3.00	8
Caltha palustris var. palustris	0.50	0.50	0.50	8
Cardamine diphylla	0.50	0.50	0.50	8
Cardamine hirsuta	0.26	0.01	0.50	15
Cardamine parviflora var. arenicola	0.01	0.01	0.01	8
Cardamine pensylvanica	0.83	0.50	1.00	23
Carex	1.00	1.00	1.00	8
Carex atlantica	0.50	0.50	0.50	8
Carex atlantica ssp. atlantica	1.00	1.00	1.00	8
Carex baileyi	0.31	0.01	1.00	38
Carex brunnescens	0.50	0.50	0.50	8
Carex folliculata	9.33	1.00	25.00	23
Carex gynandra	2.21	0.50	5.00	54
Carex intumescens	0.50	0.01	1.00	23
Carex leptalea ssp. leptalea	0.67	0.50	1.00	46
Carex leptoneura	1.00	1.00	1.00	8
Carex pensylvanica	1.00	1.00	1.00	8
Carex prasina	3.25	1.00	10.00	31
Carex scabrata	4.90	0.50	20.00	38
Carex scoparia var. scoparia	0.50	0.50	0.50	8
Carex stipata	2.25	0.01	5.00	77
Carex torta	25.00	25.00	25.00	8
Carex trisperma var. trisperma	1.00	1.00	1.00	8
Carex vulpinoidea	1.00	1.00	1.00	8
Chelone glabra	2.90	0.50	10.00	77
Chrysosplenium americanum	2.39	0.01	10.00	69
Cinna latifolia	0.63	0.01	1.00	31
Clematis	0.01	0.01	0.01	8
Clematis virginiana	0.50	0.50	0.50	8
Cymophyllus fraserianus	0.01	0.01	0.01	8
Dennstaedtia punctilobula	3.50	0.01	10.00	23
Dichanthelium	1.00	1.00	1.00	8
Dryopteris campyloptera	2.00	2.00	2.00	8
Dryopteris intermedia	1.05	0.50	2.00	85
Equisetum arvense	0.50	0.50	0.50	8
Eupatorium maculatum	1.00	1.00	1.00	15
Festuca subverticillata	0.50	0.50	0.50	8
Galium	1.00	1.00	1.00	8
Galium asprellum	1.34	0.01	3.00	23
Galium tinctorium	0.67	0.50	1.00	23
Galium triflorum	0.50	0.50	0.50	15
Geum	0.50	0.50	0.50	8
Geum rivale	0.50	0.50	0.50	8
Glyceria	3.00	1.00	5.00	15
Glyceria melicaria	8.00	1.00	20.00	46
Glyceria striata	5.40	0.50	25.00	77
Gratiola neglecta	0.01	0.01	0.01	8
Hamamelis virginiana	0.50	0.50	0.50	15

Hieracium venosum	0.50	0.50	0.50	8
Huperzia lucidula	0.50	0.01	1.00	31
Hydrocotyle americana	2.50	0.50	4.00	23
Hypericum mutilum	0.50	0.50	0.50	8
Hypericum punctatum	0.50	0.50	0.50	8
Ilex	0.50	0.50	0.50	8
Ilex verticillata	0.50	0.50	0.50	8
Impatiens	10.67	1.00	25.00	92
Impatiens capensis	1.00	1.00	1.00	8
Juncus effusus	0.67	0.01	1.00	46
Juncus effusus var. solutus	0.01	0.01	0.01	8
Kalmia latifolia	0.50	0.50	0.50	8
Laportea canadensis	0.63	0.50	1.00	31
Leersia oryzoides	3.00	3.00	3.00	8
Lycopodium clavatum	0.50	0.50	0.50	8
Lycopodium obscurum	0.50	0.01	1.00	31
Lycopus americanus	0.50	0.50	0.50	8
Lycopus uniflorus var. uniflorus	1.70	0.50	3.00	38
Lysimachia ciliata	0.01	0.01	0.01	8
Maianthemum canadense	0.26	0.01	0.50	31
Medeola virginiana	0.01	0.01	0.01	8
Mitchella repens	0.01	0.01	0.01	15
Mitella diphylla	2.75	0.50	5.00	15
Monarda didyma	0.75	0.50	1.00	15
Oclemena acuminata	0.50	0.01	1.00	31
Onoclea sensibilis	0.67	0.50	1.00	23
Osmunda	3.00	3.00	3.00	8
Osmunda cinnamomea var. cinnamomea	1.33	1.00	2.00	23
Osmunda claytoniana	5.00	5.00	5.00	8
Oxalis montana	0.58	0.50	1.00	46
Packera aurea	5.25	1.00	15.00	31
Panicum dichotomiflorum ssp. dichotomiflorum	1.00	1.00	1.00	8
Phegopteris connectilis	0.50	0.50	0.50	8
Picea rubens	0.50	0.50	0.50	23
Pilea pumila var. pumila	0.50	0.50	0.50	8
Platanthera	0.50	0.50	0.50	8
Platanthera grandiflora	0.01	0.01	0.01	8
Platanthera orbiculata	0.50	0.50	0.50	8
Poa alsodes	1.00	1.00	1.00	8
Poa pratensis ssp. pratensis	2.00	2.00	2.00	8
Poa trivialis	1.00	1.00	1.00	8
Polygonum sagittatum	0.38	0.01	0.50	31
Polygonum virginianum	0.50	0.50	0.50	8
Prunus	0.50	0.50	0.50	8
Prunus serotina var. serotina	0.50	0.01	1.00	23
Ranunculus	20.00	20.00	20.00	8
Ranunculus abortivus	0.50	0.50	0.50	8
Ranunculus hispidus var. nitidus	0.26	0.01	0.50	15
Ranunculus recurvatus var. recurvatus	0.50	0.50	0.50	15
Rhododendron maximum	0.50	0.50	0.50	23

	Rubus	0.34	0.01	1.00	46
	Rudbeckia laciniata var. laciniata	0.50	0.50	0.50	8
	Rumex crispus ssp. crispus	0.50	0.50	0.50	8
	Sambucus nigra ssp. canadensis	0.50	0.50	0.50	8
	Saxifraga micranthidifolia	1.01	0.01	2.00	15
	Scutellaria lateriflora var. lateriflora	0.26	0.01	0.50	15
	Smilax rotundifolia	1.00	1.00	1.00	8
	Solidago	0.50	0.50	0.50	8
	Solidago rugosa	3.50	0.01	10.00	23
	Solidago rugosa ssp. aspera	0.50	0.50	0.50	8
	Sorbus americana	0.50	0.50	0.50	15
	Sparganium	0.50	0.50	0.50	8
	Stellaria longifolia var. longifolia	0.01	0.01	0.01	8
	Symphyotrichum prenanthoides	0.59	0.01	1.00	46
	Symphyotrichum puniceum var. puniceum	0.01	0.01	0.01	8
	Symplocarpus foetidus	18.00	5.00	40.00	38
	Thalictrum	1.00	0.01	3.00	31
	Thalictrum pubescens	0.50	0.50	0.50	8
	Thelypteris noveboracensis	5.94	0.50	28.00	62
	Tiarella cordifolia	0.50	0.01	1.00	31
	Trillium undulatum	1.00	1.00	1.00	8
	Tsuga canadensis	0.67	0.50	1.00	23
	Tussilago farfara	0.50	0.50	0.50	8
	Veratrum viride	3.50	0.50	5.00	23
	Veronica americana	0.50	0.50	0.50	8
	Viola	7.17	0.50	20.00	23
	Viola cucullata	4.05	0.50	10.00	77
N	Atrichum undulatum	5.17	0.01	15.00	23
	Bazzania trilobata	2.00	1.00	3.00	31
	Brachythecium	0.50	0.50	0.50	8
	Brotherella recurvans	0.50	0.50	0.50	8
	Bryhnia novae-angliae	0.50	0.50	0.50	15
	Cladonia	0.50	0.50	0.50	8
	Dicranodontium denudatum	1.00	1.00	1.00	15
	Dicranum	0.50	0.50	0.50	15
	Hypnum	0.50	0.50	0.50	23
	Hypnum fertile	1.00	1.00	1.00	8
	Hypnum imponens	2.50	1.00	4.00	15
	Leucobryum glaucum	0.01	0.01	0.01	8
	Lophocolea heterophylla	0.50	0.50	0.50	8
	Mnium hornum	4.00	4.00	4.00	8
	Pallavicinia lyellii	0.01	0.01	0.01	8
	Plagiomnium ciliare	2.33	0.50	5.00	46
	Polytrichum	0.63	0.50	1.00	31
	Polytrichum pallidisetum	7.00	3.00	15.00	23
	Pseudotaxiphyllum distichaceum	0.01	0.01	0.01	8
	Rhizomnium appalachianum	9.75	2.00	20.00	62
	Scapania nemorea	0.01	0.01	0.01	8
	Scapania undulata	0.51	0.01	1.00	15
	Sphagnum	7.50	0.50	20.00	23

	Sphagnum affine	5.00	5.00	5.00	8
	Sphagnum palustre	4.00	3.00	5.00	15
	Sphagnum recurvum	10.00	10.00	10.00	8
	Thuidium delicatulum	0.50	0.50	0.50	62
	Trichocolea tomentella	40.00	40.00	40.00	8
	Xeromphalina campanella	0.01	0.01	0.01	8
Total					35

### Calamagrostis canadensis wet meadow

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Crataegus	0.89	0.89	0.89	13
	Fraxinus pennsylvanica	1.00	1.00	1.00	4
S1	Acer rubrum	0.50	0.50	0.50	4
	Alnus incana ssp. rugosa	12.00	1.00	20.00	17
	Crataegus	1.00	1.00	1.00	4
	Hypericum densiflorum	2.75	1.00	4.00	17
	Ilex montana	0.50	0.50	0.50	4
	Populus tremuloides	2.00	2.00	2.00	4
	Prunus serotina var. serotina	0.50	0.50	0.50	4
	Salix discolor	1.00	1.00	1.00	4
	Spiraea alba	3.44	0.50	10.00	35
	Viburnum nudum var. cassinoides	1.00	1.00	1.00	9
	Viburnum recognitum	2.71	1.00	7.00	30
S2	Acer rubrum	0.50	0.50	0.50	4
	Alnus incana ssp. rugosa	0.50	0.50	0.50	9
	Cornus amomum	0.01	0.01	0.01	4
	Gaylussacia baccata	0.50	0.50	0.50	4
	Hypericum densiflorum	2.40	0.01	8.00	22
	Ilex verticillata	3.00	3.00	3.00	4
	Kalmia latifolia	0.50	0.50	0.50	4
	Nemopanthus mucronatus	0.50	0.50	0.50	4
	Picea rubens	0.01	0.01	0.01	4
	Pinus rigida	0.50	0.50	0.50	4
	Populus tremuloides	1.00	1.00	1.00	4
	Rhododendron maximum	2.00	2.00	2.00	4
	Rosa palustris	0.50	0.50	0.50	4
	Salix sericea	0.50	0.50	0.50	4
	Sambucus nigra ssp. canadensis	0.17	0.01	0.50	13
	Spiraea alba	0.50	0.01	1.00	22
	Vaccinium angustifolium	1.00	1.00	1.00	4
	Vaccinium myrtilloides	0.51	0.01	1.00	9
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	4
	Viburnum recognitum	0.40	0.01	1.00	22
H	Acer rubrum	0.01	0.01	0.01	4
	Agrostis gigantea	3.33	3.33	3.33	4
	Agrostis hyemalis	0.01	0.01	0.01	4
	Agrostis perennans	0.50	0.50	0.50	4
	Arisaema triphyllum	0.01	0.01	0.01	4
	Bidens	0.01	0.01	0.01	4

<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	62.15	10.00	99.20	100
<i>Carex</i>	0.01	0.01	0.01	4
<i>Carex annectens</i>	0.01	0.01	0.01	4
<i>Carex atlantica</i>	1.25	0.50	2.00	9
<i>Carex canescens</i>	0.26	0.01	0.50	9
<i>Carex crinita</i>	0.50	0.50	0.50	4
<i>Carex crinita</i> var. <i>crinita</i>	0.01	0.01	0.01	4
<i>Carex folliculata</i>	1.50	1.00	2.00	9
<i>Carex gynandra</i>	1.06	0.50	1.67	13
<i>Carex intumescens</i>	0.50	0.50	0.50	4
<i>Carex lacustris</i>	3.00	3.00	3.00	4
<i>Carex lurida</i>	0.34	0.01	0.50	13
<i>Carex scoparia</i> var. <i>scoparia</i>	0.87	0.50	1.11	13
<i>Carex stipata</i>	0.75	0.50	1.00	9
<i>Carex stricta</i>	11.30	1.00	30.00	43
<i>Carex tribuloides</i>	0.26	0.01	0.50	9
<i>Carex trisperma</i> var. <i>trisperma</i>	0.01	0.01	0.01	4
<i>Carex utriculata</i>	16.96	0.50	57.20	39
<i>Danthonia compressa</i>	2.33	2.33	2.33	4
<i>Dichanthelium clandestinum</i>	3.74	0.22	10.00	13
<i>Doellingeria umbellata</i> var. <i>umbellata</i>	0.01	0.01	0.01	9
<i>Dryopteris campyloptera</i>	0.26	0.01	0.50	9
<i>Dryopteris cristata</i>	1.13	0.50	2.00	17
<i>Dryopteris intermedia</i>	0.13	0.01	0.50	17
<i>Dulichium arundinaceum</i>	10.50	5.00	16.00	9
<i>Eleocharis obtusa</i>	0.50	0.50	0.50	4
<i>Epilobium coloratum</i>	1.00	1.00	1.00	4
<i>Epilobium leptophyllum</i>	0.26	0.01	0.50	9
<i>Eriophorum virginicum</i>	0.31	0.01	0.60	9
<i>Eupatorium fistulosum</i>	0.78	0.78	0.78	4
<i>Galium asprellum</i>	1.00	1.00	1.00	4
<i>Galium tinctorium</i>	0.59	0.01	1.00	26
<i>Gentiana linearis</i>	0.50	0.50	0.50	4
<i>Glyceria canadensis</i>	3.63	0.50	10.00	17
<i>Glyceria laxa</i>	8.00	8.00	8.00	4
<i>Glyceria obtusa</i>	0.50	0.50	0.50	4
<i>Glyceria striata</i>	6.98	0.50	22.10	17
<i>Helenium autumnale</i> var. <i>autumnale</i>	0.01	0.01	0.01	4
<i>Hydrocotyle americana</i>	0.01	0.01	0.01	4
<i>Hypericum</i>	0.01	0.01	0.01	4
<i>Hypericum ellipticum</i>	0.76	0.01	1.78	13
<i>Hypericum mutilum</i>	0.50	0.50	0.50	4
<i>Hypericum punctatum</i>	0.11	0.11	0.11	4
<i>Ilex montana</i>	0.01	0.01	0.01	4
<i>Impatiens</i>	0.50	0.01	1.00	22
<i>Impatiens capensis</i>	3.00	1.00	5.00	9
<i>Juncus brevicaudatus</i>	4.00	4.00	4.00	4
<i>Juncus effusus</i>	2.02	0.01	9.67	35
<i>Juncus effusus</i> var. <i>solutus</i>	0.51	0.01	1.00	9
<i>Juncus filiformis</i>	0.50	0.01	1.00	13

	Juncus subcaudatus var. subcaudatus	0.75	0.50	1.00	9
	Leersia oryzoides	0.60	0.01	1.00	17
	Lolium perenne	0.68	0.56	0.80	9
	Lycopus uniflorus var. uniflorus	0.50	0.01	1.00	26
	Lysimachia terrestris	0.50	0.50	0.50	4
	Mentha arvensis	0.26	0.01	0.50	9
	Mimulus ringens var. ringens	0.50	0.50	0.50	4
	Onoclea sensibilis	0.01	0.01	0.01	9
	Osmunda cinnamomea var. cinnamomea	0.50	0.50	0.50	9
	Oxalis	0.01	0.01	0.01	4
	Oxypolis rigidior	0.26	0.01	0.50	9
	Phalaris arundinacea	2.67	0.01	5.00	13
	Poa palustris	0.01	0.01	0.01	4
	Polemonium vanbruntiae	1.67	1.67	1.67	4
	Polygonum amphibium var. emersum	2.75	0.50	5.00	9
	Polygonum convolvulus var. convolvulus	0.01	0.01	0.01	4
	Polygonum hydropiper	0.01	0.01	0.01	9
	Polygonum punctatum var. confertiflorum	0.50	0.50	0.50	4
	Polygonum sagittatum	1.31	0.01	3.00	35
	Polygonum scandens	0.50	0.50	0.50	4
	Rubus	10.01	0.01	20.00	9
	Rubus hispidus	10.50	2.00	40.00	52
	Rumex crispus ssp. crispus	0.01	0.01	0.01	4
	Schoenoplectus tabernaemontani	0.50	0.50	0.50	4
	Scirpus atrocinctus	0.01	0.01	0.01	4
	Scirpus cyperinus	8.00	0.01	50.00	30
	Scirpus microcarpus	0.75	0.50	1.00	17
	Scutellaria galericulata	0.50	0.50	0.50	4
	Scutellaria lateriflora var. lateriflora	0.50	0.50	0.50	9
	Solidago rugosa	7.28	0.01	14.56	9
	Solidago uliginosa	2.88	0.10	4.89	26
	Sparganium chlorocarpum	1.00	1.00	1.00	4
	Spiraea alba	0.50	0.50	0.50	13
	Symplocarpus foetidus	4.91	0.11	17.30	30
	Triadenum	0.01	0.01	0.01	4
	Triadenum fraseri	1.50	0.50	5.00	35
	Trifolium	0.89	0.22	1.67	13
	Typha latifolia	30.00	30.00	30.00	4
	Veratrum viride	0.50	0.50	0.50	4
	Verbena hastata var. hastata	0.13	0.01	0.50	17
	Viola	0.11	0.11	0.11	4
	Viola cucullata	0.01	0.01	0.01	4
N	Atrichum undulatum	0.50	0.50	0.50	4
	Aulacomnium	0.01	0.01	0.01	4
	Aulacomnium palustre	0.01	0.01	0.01	4
	Cladonia incrassata	0.01	0.01	0.01	4
	Hypnum	0.01	0.01	0.01	4
	Leptodictyum humile	10.00	10.00	10.00	4
	Leucobryum glaucum	0.01	0.01	0.01	4
	Polytrichum	0.26	0.01	0.50	17

	Polytrichum commune	8.00	1.00	13.00	13
	Polytrichum strictum	10.00	10.00	10.00	4
	Sphagnum	9.12	0.01	40.00	35
	Sphagnum fallax	7.50	5.00	10.00	9
	Sphagnum fimbriatum	7.33	1.00	16.00	13
	Sphagnum flexuosum	16.00	16.00	16.00	4
	Sphagnum henryense	16.00	16.00	16.00	4
	Sphagnum palustre	5.50	1.00	10.00	9
	Sphagnum papillosum	0.50	0.50	0.50	4
	Sphagnum recurvum	12.00	12.00	12.00	4
	Steerecleus serrulatus	0.50	0.50	0.50	4
	Tetraphis pellucida	0.01	0.01	0.01	4
Total					24

### Carex canescens / Polytrichum spp. - Sphagnum spp. herbaceous peatland

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	11
	Picea rubens	1.00	1.00	1.00	11
	Tsuga canadensis	4.00	4.00	4.00	11
T3	Picea rubens	1.00	1.00	1.00	11
S1	Hypericum densiflorum	1.40	1.40	1.40	11
	Kalmia latifolia	0.50	0.50	0.50	11
	Picea rubens	1.00	1.00	1.00	11
	Rhododendron maximum	2.00	2.00	2.00	11
	Tsuga canadensis	2.00	2.00	2.00	11
S2	Abies balsamea	0.01	0.01	0.01	11
	Betula alleghaniensis var. alleghaniensis	0.01	0.01	0.01	11
	Hypericum densiflorum	3.00	0.50	8.00	44
	Kalmia latifolia	0.01	0.01	0.01	11
	Nemopanthus mucronatus	0.01	0.01	0.01	11
	Photinia pyrifolia	0.75	0.50	1.00	22
	Picea rubens	0.01	0.01	0.01	22
	Rhododendron maximum	0.01	0.01	0.01	11
	Spiraea alba	0.01	0.01	0.01	11
	Tsuga canadensis	0.01	0.01	0.01	11
	Vaccinium myrtilloides	0.83	0.50	1.00	33
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	11
H	Acer rubrum	0.01	0.01	0.01	33
	Agrostis hyemalis	0.50	0.50	0.50	11
	Bartonia virginica	0.50	0.50	0.50	11
	Betula alleghaniensis var. alleghaniensis	0.01	0.01	0.01	22
	Calamagrostis canadensis var. canadensis	5.00	5.00	5.00	11
	Carex atlantica	15.00	15.00	15.00	11
	Carex canescens	28.78	3.00	70.00	100
	Carex echinata ssp. echinata	10.00	10.00	10.00	11
	Carex folliculata	0.57	0.20	1.00	33
	Carex gynandra	2.51	0.01	5.00	22
	Carex lurida	0.01	0.01	0.01	11
	Carex scoparia var. scoparia	0.01	0.01	0.02	33

	Carex trisperma var. trisperma	2.00	2.00	2.00	11
	Dennstaedtia punctilobula	2.00	2.00	2.00	11
	Dulichium arundinaceum	0.50	0.50	0.50	11
	Eriophorum virginicum	2.09	0.60	5.00	78
	Gentiana linearis	0.50	0.50	0.50	11
	Glyceria canadensis	1.25	0.50	3.00	44
	Juncus brevicaudatus	0.64	0.01	2.00	56
	Juncus effusus	2.30	0.50	5.00	56
	Juncus effusus var. solutus	0.75	0.50	1.00	22
	Juncus subcaudatus var. subcaudatus	0.75	0.50	1.00	22
	Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	11
	Osmunda	0.50	0.50	0.50	11
	Osmunda cinnamomea var. cinnamomea	1.01	0.01	2.00	22
	Picea rubens	0.01	0.01	0.01	11
	Poa palustris	0.01	0.01	0.01	11
	Prunus serotina var. serotina	0.01	0.01	0.01	11
	Rhynchospora alba	0.01	0.01	0.01	11
	Rubus	0.01	0.01	0.01	11
	Rubus hispidus	7.51	0.01	30.00	89
	Scirpus	0.01	0.01	0.01	11
	Scirpus atrocinctus	0.50	0.50	0.50	11
	Scirpus cyperinus	5.50	1.00	10.00	22
	Solidago uliginosa	1.67	0.01	5.00	33
	Sparganium americanum	0.01	0.01	0.01	11
	Sparganium chlorocarpum	8.00	8.00	8.00	11
	Triadenum fraseri	1.33	0.50	3.00	33
	Vaccinium macrocarpon	0.50	0.50	0.50	11
	Vaccinium oxycoccos	0.26	0.01	0.50	22
	Viola cucullata	0.01	0.01	0.01	11
N	Atrichum crispum	0.50	0.50	0.50	11
	Cladonia squamosa	10.00	10.00	10.00	11
	Cladonia stygia	0.50	0.50	0.50	11
	Polytrichum commune	37.42	0.01	93.00	67
	Polytrichum pallidisetum	70.00	70.00	70.00	11
	Polytrichum strictum	36.67	0.01	60.00	33
	Sphagnum affine	1.00	1.00	1.00	11
	Sphagnum capillifolium var. capillifolium	0.50	0.50	0.50	11
	Sphagnum cuspidatum	1.00	1.00	1.00	22
	Sphagnum fallax	41.78	1.70	94.00	67
	Sphagnum fimbriatum	1.70	1.70	1.70	11
	Sphagnum flexuosum	5.00	5.00	5.00	11
	Sphagnum magellanicum	1.70	1.70	1.70	11
	Sphagnum recurvum	44.50	44.00	45.00	22
	Sphagnum rubellum	5.25	0.50	10.00	22
Total					38

### Carex echinata ssp. echinata / Sphagnum spp. herbaceous peatland

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Picea rubens	10.00	10.00	10.00	25

S1	Nemopanthus mucronatus	0.01	0.01	0.01	25
	Picea rubens	5.25	0.50	10.00	50
S2	Abies balsamea	0.50	0.50	0.50	25
	Amelanchier	0.01	0.01	0.01	25
	Photinia pyrifolia	0.50	0.50	0.50	25
	Picea rubens	2.17	0.50	5.00	75
	Vaccinium myrtilloides	0.50	0.50	0.50	75
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	25
H	Acer rubrum	0.01	0.01	0.01	25
	Agrostis hyemalis	0.01	0.01	0.01	25
	Bartonia virginica	0.50	0.50	0.50	25
	Carex echinata ssp. echinata	31.25	20.00	55.00	100
	Carex gynandra	20.50	1.00	40.00	50
	Cornus canadensis	0.01	0.01	0.01	25
	Drosera rotundifolia var. rotundifolia	0.50	0.01	1.00	75
	Eleocharis tenuis	1.00	1.00	1.00	25
	Eriophorum virginicum	4.88	0.50	15.00	100
	Eupatorium perfoliatum var. perfoliatum	0.01	0.01	0.01	25
	Gaultheria hispidula	0.50	0.50	0.50	25
	Gentiana linearis	0.01	0.01	0.01	25
	Glyceria canadensis	2.00	2.00	2.00	25
	Glyceria laxa	0.50	0.50	0.50	25
	Hypericum canadense	0.26	0.01	0.50	50
	Hypericum densiflorum	0.50	0.50	0.50	25
	Juncus brevicaudatus	2.00	1.00	3.00	50
	Juncus effusus	1.84	0.01	5.00	75
	Juncus subcaudatus var. subcaudatus	1.00	1.00	1.00	25
	Lycopodiella inundata	0.01	0.01	0.01	50
	Lycopus uniflorus var. uniflorus	1.00	1.00	1.00	50
	Nemopanthus mucronatus	0.01	0.01	0.01	25
	Osmunda cinnamomea var. cinnamomea	0.26	0.01	0.50	50
	Picea rubens	0.26	0.01	0.50	50
	Platanthera clavellata	0.50	0.50	0.50	50
	Polygonum	0.01	0.01	0.01	25
	Rhynchospora alba	1.00	1.00	1.00	25
	Rubus hispidus	0.51	0.01	1.00	50
	Scirpus cyperinus	15.00	15.00	15.00	25
	Solidago uliginosa	5.75	3.00	10.00	100
	Spiranthes cernua	0.50	0.50	0.50	25
	Triadenum fraseri	0.01	0.01	0.01	25
Vaccinium myrtilloides	0.01	0.01	0.01	25	
Vaccinium oxycoccos	0.01	0.01	0.01	25	
Viola	0.75	0.50	1.00	50	
Zigadenus leimanthoides	2.00	2.00	2.00	25	
N	Brotherella recurvans	0.50	0.50	0.50	25
	Cladina	0.50	0.50	0.50	25
	Cladonia	1.00	1.00	1.00	25
	Polytrichum	0.50	0.50	0.50	25
	Polytrichum commune	6.00	6.00	6.00	25
	Polytrichum strictum	4.00	4.00	4.00	25

	Sphagnum	58.00	39.00	75.00	75
	Sphagnum fallax	35.00	20.00	50.00	50
	Sphagnum magellanicum	18.67	1.00	50.00	75
	Sphagnum papillosum	75.00	75.00	75.00	25
	Sphagnum rubellum	2.67	1.00	5.00	75
Total					53

### Carex gynandra - Carex atlantica / Sphagnum spp. seepage fen

Stratum	Scientific Name	Average	Min	Max	Constanc
T3	Abies balsamea	0.01	0.01	0.01	13
S1	Abies balsamea	0.01	0.01	0.01	25
	Betula alleghaniensis var. alleghaniensis	0.60	0.60	0.60	13
	Hypericum densiflorum	4.85	0.50	9.20	25
	Ilex verticillata	0.50	0.50	0.50	13
	Picea rubens	2.00	2.00	2.00	13
	Rhododendron maximum	2.40	2.40	2.40	13
	Salix sericea	3.67	1.00	7.00	38
	Spiraea alba	0.75	0.50	1.00	25
	Tsuga canadensis	3.40	3.40	3.40	13
	Viburnum nudum var. cassinoides	0.80	0.60	1.00	25
S2	Amelanchier	0.01	0.01	0.01	13
	Hypericum densiflorum	3.75	1.00	8.00	50
	Photinia melanocarpa	0.50	0.50	0.50	25
	Picea rubens	1.25	0.50	2.00	25
	Populus tremuloides	0.50	0.50	0.50	13
	Salix sericea	3.33	1.00	8.00	38
	Sambucus nigra ssp. canadensis	0.26	0.01	0.50	25
	Sorbus americana	0.01	0.01	0.01	13
	Spiraea alba	4.00	4.00	4.00	13
	Vaccinium angustifolium	0.01	0.01	0.01	13
	Vaccinium myrtilloides	0.83	0.50	1.00	38
	Viburnum nudum var. cassinoides	0.83	0.50	1.00	38
H	Acer rubrum	0.35	0.20	0.50	25
	Aconitum uncinatum	0.01	0.01	0.01	13
	Agrostis hyemalis	0.50	0.50	0.50	13
	Agrostis perennans	0.34	0.01	0.50	38
	Anthoxanthum odoratum ssp. odoratum	0.50	0.50	0.50	13
	Bidens	0.01	0.01	0.01	13
	Calamagrostis canadensis var. canadensis	10.00	10.00	10.00	13
	Caltha palustris var. palustris	0.50	0.50	0.50	13
	Carex atlantica	15.00	10.00	20.00	25
	Carex atlantica ssp. atlantica	26.35	5.40	60.00	50
	Carex canescens	0.50	0.50	0.50	13
	Carex debilis var. debilis	0.50	0.50	0.50	13
	Carex echinata ssp. echinata	2.17	0.50	5.00	38
	Carex folliculata	8.00	8.00	8.00	13
	Carex gynandra	28.83	3.00	80.00	75
	Carex leptalea ssp. leptalea	0.26	0.01	0.50	25
	Carex lurida	1.33	0.50	3.00	38

Carex scoparia var. scoparia	2.92	0.50	10.00	75
Carex stipata	1.50	0.50	3.00	38
Carex stipata var. stipata	0.01	0.01	0.01	13
Chelone glabra	6.84	0.01	20.00	38
Dactylis glomerata ssp. glomerata	0.50	0.50	0.50	13
Doellingeria umbellata var. umbellata	5.25	0.50	10.00	25
Drosera rotundifolia var. rotundifolia	0.75	0.50	1.00	25
Dryopteris campyloptera	0.01	0.01	0.01	13
Dryopteris cristata	2.50	0.50	10.00	63
Eleocharis acicularis var. acicularis	2.00	2.00	2.00	13
Eleocharis palustris	3.00	3.00	3.00	13
Eleocharis tenuis var. tenuis	10.00	10.00	10.00	13
Epilobium leptophyllum	0.34	0.01	1.00	38
Eriophorum virginicum	0.50	0.01	1.00	38
Euthamia graminifolia var. graminifolia	0.67	0.50	1.00	38
Galium tinctorium	0.64	0.01	1.00	88
Glyceria canadensis	1.51	0.01	3.00	25
Glyceria laxa	2.33	1.00	5.00	38
Glyceria striata	0.83	0.50	1.00	38
Holcus lanatus	0.50	0.50	0.50	13
Hydrocotyle americana	1.00	1.00	1.00	13
Hypericum densiflorum	1.00	1.00	1.00	13
Hypericum ellipticum	1.00	1.00	1.00	13
Hypericum mutilum	3.67	0.50	10.00	38
Impatiens	1.00	0.50	2.00	50
Impatiens capensis	1.00	1.00	1.00	13
Juncus brevicaudatus	2.60	1.00	4.20	25
Juncus effusus	0.88	0.50	1.00	50
Juncus effusus var. solutus	1.75	0.50	3.00	25
Juncus subcaudatus var. subcaudatus	3.00	3.00	3.00	13
Leersia oryzoides	1.80	1.00	3.00	38
Lycopus uniflorus var. uniflorus	0.72	0.01	2.00	88
Monarda didyma	0.01	0.01	0.01	13
Onoclea sensibilis	5.00	5.00	5.00	13
Osmunda cinnamomea var. cinnamomea	3.50	0.50	9.00	38
Panicum	0.50	0.50	0.50	13
Photinia pyrifolia	1.00	1.00	1.00	13
Platanthera clavellata	0.34	0.01	0.50	38
Polygonum punctatum	0.50	0.50	0.50	13
Polygonum sagittatum	2.28	0.50	5.00	63
Rubus	0.50	0.50	0.50	13
Rubus hispidus	12.20	1.00	51.00	63
Salix sericea	1.00	1.00	1.00	13
Scirpus	0.67	0.50	1.00	38
Scirpus atrocinctus	0.50	0.50	0.50	13
Scirpus cyperinus	1.33	1.00	2.00	38
Scutellaria lateriflora var. lateriflora	0.50	0.50	0.50	13
Solidago rugosa	1.98	0.50	5.00	50
Solidago uliginosa	5.00	1.00	10.00	75
Sparganium chlorocarpum	3.00	3.00	3.00	13

	<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	2.75	0.50	5.00	25
	<i>Symplocarpus foetidus</i>	0.01	0.01	0.01	13
	<i>Thalictrum</i>	0.01	0.01	0.01	13
	<i>Thelypteris noveboracensis</i>	0.50	0.50	0.50	13
	<i>Thelypteris palustris</i> var. <i>pubescens</i>	10.00	10.00	10.00	13
	<i>Tiarella cordifolia</i>	1.00	1.00	1.00	13
	<i>Triadenum</i>	1.00	1.00	1.00	13
	<i>Typha latifolia</i>	24.65	2.00	40.00	50
	<i>Vaccinium oxycoccos</i>	3.00	3.00	3.00	13
	<i>Viola</i>	3.22	0.01	12.60	63
	<i>Viola cucullata</i>	0.50	0.50	0.50	13
	<i>Zigadenus leimanthoides</i>	1.00	1.00	1.00	13
N	<i>Atrichum undulatum</i>	0.50	0.50	0.50	13
	<i>Aulacomnium palustre</i>	3.67	0.50	10.00	38
	<i>Cephalozia lunulifolia</i>	0.01	0.01	0.01	13
	<i>Cladonia</i>	0.01	0.01	0.01	13
	<i>Dicranum montanum</i>	0.01	0.01	0.01	13
	<i>Hypnum lindbergii</i>	5.00	5.00	5.00	13
	<i>Polytrichum</i>	10.00	10.00	10.00	13
	<i>Polytrichum strictum</i>	3.00	1.00	5.00	25
	<i>Sphagnum</i>	5.00	5.00	5.00	13
	<i>Sphagnum affine</i>	3.00	3.00	3.00	13
	<i>Sphagnum capillifolium</i> var. <i>capillifolium</i>	0.01	0.01	0.01	13
	<i>Sphagnum fimbriatum</i>	27.75	0.50	55.00	25
	<i>Sphagnum flexuosum</i>	12.50	10.00	15.00	25
	<i>Sphagnum henryense</i>	10.00	10.00	10.00	13
	<i>Sphagnum palustre</i>	24.33	3.00	50.00	38
	<i>Sphagnum recurvum</i>	34.00	15.00	53.00	25
	<i>Sphagnum rubellum</i>	5.00	5.00	5.00	13
Total					38

### Carex lacustris fen

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Populus tremuloides</i>	2.00	2.00	2.00	33
S1	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.50	0.50	0.50	33
	<i>Picea rubens</i>	1.00	1.00	1.00	33
	<i>Populus tremuloides</i>	1.00	1.00	1.00	33
	<i>Salix sericea</i>	0.50	0.50	0.50	33
	<i>Spiraea alba</i>	1.00	1.00	1.00	33
S2	<i>Hypericum densiflorum</i>	0.01	0.01	0.01	33
	<i>Ilex montana</i>	0.50	0.50	0.50	33
	<i>Populus tremuloides</i>	0.50	0.50	0.50	33
	<i>Salix sericea</i>	0.50	0.50	0.50	33
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.01	0.01	0.01	33
	<i>Viburnum recognitum</i>	0.50	0.50	0.50	33
H	<i>Agrostis hyemalis</i>	0.50	0.50	0.50	33
	<i>Asclepias incarnata</i>	0.01	0.01	0.01	33
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	1.00	1.00	1.00	33
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	0.50	0.50	0.50	33

	Carex lacustris	70.00	60.00	90.00	100
	Carex lurida	0.50	0.50	0.50	33
	Carex scoparia var. scoparia	2.00	2.00	2.00	33
	Carex stipata var. stipata	0.01	0.01	0.01	33
	Carex utriculata	30.00	30.00	30.00	33
	Doellingeria umbellata var. umbellata	0.50	0.50	0.50	33
	Dryopteris campyloptera	0.50	0.50	0.50	33
	Dryopteris cristata	5.50	1.00	10.00	67
	Epilobium leptophyllum	0.26	0.01	0.50	67
	Galium tinctorium	0.83	0.50	1.00	100
	Glyceria canadensis	0.01	0.01	0.01	33
	Hypericum ellipticum	1.00	1.00	1.00	33
	Impatiens	0.50	0.50	0.50	33
	Impatiens capensis	3.00	3.00	3.00	33
	Juncus effusus	0.75	0.50	1.00	67
	Juncus subcaudatus var. subcaudatus	0.01	0.01	0.01	33
	Leersia oryzoides	1.00	1.00	1.00	33
	Lycopus uniflorus var. uniflorus	0.75	0.50	1.00	67
	Mentha arvensis	0.01	0.01	0.01	33
	Mimulus ringens var. ringens	0.50	0.50	0.50	33
	Polemonium vanbruntiae	0.50	0.50	0.50	33
	Polygonum punctatum var. punctatum	1.00	1.00	1.00	33
	Polygonum sagittatum	0.83	0.50	1.00	100
	Scirpus cyperinus	0.34	0.01	0.50	100
	Solidago uliginosa	0.50	0.50	0.50	33
	Thalictrum	0.01	0.01	0.01	33
	Triadenum fraseri	6.00	2.00	10.00	67
	Verbena hastata var. hastata	0.50	0.50	0.50	33
N	Calliargon cordifolium	20.00	20.00	20.00	33
	Leptodictyum humile	1.00	1.00	1.00	33
	Plagiomnium ellipticum	1.00	1.00	1.00	33
	Sphagnum	2.00	2.00	2.00	33
	Sphagnum palustre	30.00	30.00	30.00	33
	Sphagnum recurvum	30.00	30.00	30.00	33
Total					51

### Carex stricta wet meadow

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Tsuga canadensis	0.90	0.90	0.90	5
S1	Acer rubrum	0.80	0.50	1.10	10
	Alnus incana ssp. rugosa	0.94	0.20	2.30	25
	Alnus serrulata	0.75	0.50	1.00	20
	Amelanchier laevis	0.20	0.20	0.20	5
	Betula alleghaniensis var. alleghaniensis	1.00	0.80	1.20	10
	Gaylussacia baccata	2.00	2.00	2.00	5
	Hypericum densiflorum	2.31	0.10	6.70	35
	Ilex verticillata	1.05	0.20	2.90	20
	Lyonia ligustrina var. ligustrina	2.00	2.00	2.00	5

	<i>Picea rubens</i>	0.50	0.50	0.50	5
	<i>Rhododendron maximum</i>	0.90	0.90	0.90	10
	<i>Salix sericea</i>	12.20	12.20	12.20	5
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.67	0.10	1.80	35
	<i>Sorbus americana</i>	0.10	0.10	0.10	5
	<i>Spiraea alba</i>	0.50	0.50	0.50	5
	<i>Tsuga canadensis</i>	1.15	1.00	1.30	10
	<i>Vaccinium myrtilloides</i>	0.40	0.40	0.40	5
	<i>Viburnum recognitum</i>	0.90	0.01	3.80	40
S2	<i>Acer rubrum</i>	0.30	0.10	0.50	20
	<i>Alnus serrulata</i>	0.50	0.50	0.50	10
	<i>Betula lenta</i>	0.50	0.50	0.50	5
	<i>Gaylussacia baccata</i>	0.67	0.50	1.00	15
	<i>Lyonia ligustrina</i> var. <i>ligustrina</i>	0.67	0.50	1.00	15
	<i>Quercus velutina</i>	0.50	0.50	0.50	5
	<i>Rhododendron maximum</i>	0.50	0.50	0.50	5
	<i>Rubus hispidus</i>	10.50	0.50	30.00	15
	<i>Spiraea alba</i>	0.50	0.50	0.50	5
	<i>Tsuga canadensis</i>	0.50	0.50	0.50	5
	<i>Vaccinium angustifolium</i>	2.00	2.00	2.00	5
	<i>Viburnum recognitum</i>	0.50	0.50	0.50	15
H	<i>Acer rubrum</i>	0.26	0.10	0.50	25
	<i>Agrostis hyemalis</i>	2.54	0.50	5.00	25
	<i>Agrostis perennans</i>	0.76	0.10	1.50	25
	<i>Apocynum cannabinum</i>	2.00	2.00	2.00	5
	<i>Arisaema triphyllum</i>	0.50	0.50	0.50	5
	<i>Asclepias incarnata</i> ssp. <i>incarnata</i>	0.50	0.50	0.50	5
	<i>Asclepias incarnata</i> ssp. <i>pulchra</i>	0.75	0.50	1.00	10
	<i>Bartonia virginica</i>	0.50	0.50	0.50	5
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.15	0.10	0.20	10
	<i>Bidens discoidea</i>	0.10	0.10	0.10	5
	<i>Boehmeria cylindrica</i>	0.50	0.50	0.50	5
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	8.40	0.50	20.00	40
	<i>Calamagrostis coarctata</i>	0.50	0.50	0.50	5
	<i>Calystegia sepium</i>	1.00	1.00	1.00	5
	<i>Carex annectens</i>	1.00	1.00	1.00	5
	<i>Carex atlantica</i>	18.64	0.50	40.00	35
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	1.13	0.01	3.20	20
	<i>Carex baileyi</i>	0.10	0.10	0.10	5
	<i>Carex folliculata</i>	2.93	0.40	20.00	45
	<i>Carex gynandra</i>	4.88	0.70	15.00	20
	<i>Carex interior</i>	0.50	0.50	0.50	5
	<i>Carex lurida</i>	0.40	0.20	0.50	15
	<i>Carex scoparia</i> var. <i>scoparia</i>	1.26	0.50	2.30	55
	<i>Carex stipata</i>	0.90	0.10	2.80	30
	<i>Carex straminea</i>	10.00	10.00	10.00	5
	<i>Carex stricta</i>	48.60	10.00	100.00	100

Carex tribuloides	0.50	0.50	0.50	5
Carex trisperma var. trisperma	0.40	0.40	0.40	5
Carex utriculata	3.63	0.50	5.40	15
Carya ovata	0.50	0.50	0.50	5
Cornus amomum	0.50	0.50	0.50	5
Cyperus strigosus	0.50	0.50	0.50	5
Dichanthelium	3.00	3.00	3.00	5
Dichanthelium dichotomum	6.50	3.00	10.00	10
Drosera rotundifolia var. rotundifolia	0.50	0.50	0.50	25
Dryopteris carthusiana	0.40	0.40	0.40	5
Dryopteris cristata	0.33	0.20	0.50	15
Dulichium arundinaceum	1.00	0.50	2.00	20
Eleocharis acicularis var. acicularis	0.90	0.90	0.90	5
Eleocharis obtusa	1.22	0.20	3.70	30
Eleocharis palustris	4.17	0.20	6.50	15
Eleocharis tenuis	16.00	16.00	16.00	5
Eriophorum virginicum	0.50	0.50	0.50	5
Eupatorium fistulosum	4.00	4.00	4.00	5
Eupatorium perfoliatum var. perfoliatum	0.63	0.10	1.70	20
Euthamia graminifolia var. graminifolia	3.30	0.40	10.00	40
Galium tinctorium	4.58	0.50	15.60	65
Gentiana linearis	0.40	0.40	0.40	5
Glyceria melicaria	0.30	0.30	0.30	5
Glyceria septentrionalis	0.50	0.50	0.50	5
Glyceria striata	2.12	0.20	5.30	30
Holcus lanatus	0.50	0.50	0.50	10
Hypericum canadense	0.50	0.50	0.50	10
Hypericum ellipticum	10.00	10.00	10.00	5
Hypericum mutilum	2.89	0.40	6.50	35
Impatiens	0.50	0.50	0.50	10
Impatiens capensis	3.85	0.02	12.40	45
Juncus	1.00	1.00	1.00	5
Juncus brevicaudatus	2.67	0.02	12.80	45
Juncus canadensis	0.97	0.40	2.00	15
Juncus effusus	3.16	0.50	7.00	75
Juncus tenuis	0.50	0.50	0.50	5
Leersia oryzoides	10.78	0.50	28.50	60
Lycopus uniflorus var. uniflorus	6.23	0.20	14.30	45
Lycopus virginicus	1.83	0.50	3.00	15
Lysimachia ciliata	0.50	0.50	0.50	5
Lysimachia terrestris	2.50	2.00	3.00	10
Mentha arvensis	0.50	0.50	0.50	5
Mimulus ringens var. ringens	0.50	0.50	0.50	5
Oenothera fruticosa ssp. glauca	0.50	0.50	0.50	5
Onoclea sensibilis	0.50	0.50	0.50	20
Osmunda cinnamomea var. cinnamomea	0.78	0.40	2.00	25
Osmunda regalis var. spectabilis	2.00	2.00	2.00	5
Oxalis dillenii	0.01	0.01	0.01	5

	<i>Oxypolis rigidior</i>	0.50	0.50	0.50	5
	<i>Panicum rigidulum</i> ssp. <i>rigidulum</i>	0.50	0.50	0.50	5
	<i>Photinia</i>	0.50	0.50	0.50	5
	<i>Poa palustris</i>	1.00	1.00	1.00	5
	<i>Poa pratensis</i> ssp. <i>pratensis</i>	0.50	0.50	0.50	5
	<i>Polygonum hydropiper</i>	0.50	0.50	0.50	5
	<i>Polygonum sagittatum</i>	7.88	0.50	16.00	65
	<i>Prunus serotina</i> var. <i>serotina</i>	0.10	0.10	0.10	5
	<i>Quercus palustris</i>	0.50	0.50	0.50	5
	<i>Ranunculus hispidus</i> var. <i>nitidus</i>	0.50	0.50	0.50	5
	<i>Rhynchospora alba</i>	0.10	0.10	0.10	5
	<i>Rhynchospora capitellata</i>	0.67	0.50	1.00	15
	<i>Rosa palustris</i>	10.00	10.00	10.00	5
	<i>Rubus hispidus</i>	23.08	0.60	63.00	45
	<i>Sanguisorba canadensis</i>	0.50	0.50	0.50	5
	<i>Schizachyrium scoparium</i> var. <i>scoparium</i>	1.00	1.00	1.00	5
	<i>Schoenoplectus tabernaemontani</i>	1.00	1.00	1.00	5
	<i>Scirpus</i>	2.00	2.00	2.00	5
	<i>Scirpus atrovirens</i>	0.50	0.50	0.50	5
	<i>Scirpus cyperinus</i>	1.52	0.10	3.00	25
	<i>Scutellaria integrifolia</i>	0.50	0.50	0.50	5
	<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	1.25	0.50	2.00	10
	<i>Solanum carolinense</i> var. <i>carolinense</i>	0.50	0.50	0.50	5
	<i>Solidago canadensis</i>	1.00	1.00	1.00	5
	<i>Solidago rugosa</i>	0.60	0.10	1.30	40
	<i>Solidago uliginosa</i>	4.00	4.00	4.00	5
	<i>Sparganium</i>	8.00	1.00	15.00	10
	<i>Sparganium americanum</i>	10.00	10.00	10.00	5
	<i>Sparganium chlorocarpum</i>	3.29	0.02	15.60	40
	<i>Spiraea alba</i>	5.00	5.00	5.00	5
	<i>Symphyotrichum praealtum</i>	0.50	0.50	0.50	5
	<i>Symphyotrichum puniceum</i> var. <i>puniceum</i>	12.50	12.50	12.50	5
	<i>Symplocarpus foetidus</i>	1.90	0.40	2.80	20
	<i>Thelypteris palustris</i> var. <i>pubescens</i>	8.00	8.00	8.00	5
	<i>Triadenum fraseri</i>	3.27	0.80	8.00	15
	<i>Tsuga canadensis</i>	0.10	0.10	0.10	5
	<i>Typha latifolia</i>	3.30	3.30	3.30	5
	<i>Vernonia noveboracensis</i>	1.20	0.60	2.00	15
	<i>Viola</i>	2.79	0.40	11.70	45
	<i>Viola sororia</i>	0.50	0.50	0.50	5
N	<i>Atrichum crispum</i>	0.35	0.30	0.40	10
	<i>Atrichum undulatum</i>	3.90	3.90	3.90	5
	<i>Aulacomnium palustre</i>	0.40	0.40	0.40	5
	<i>Polytrichum</i>	3.50	0.50	5.00	15
	<i>Polytrichum commune</i>	2.98	1.30	5.40	25
	<i>Polytrichum juniperinum</i>	0.70	0.70	0.70	5
	<i>Polytrichum ohioense</i>	0.65	0.50	0.80	10

	Sphagnum	21.67	5.00	50.00	30
	Sphagnum affine	2.03	0.10	5.00	35
	Sphagnum fimbriatum	9.53	1.30	19.80	20
	Sphagnum lescurii	0.25	0.10	0.40	10
	Sphagnum papillosum	1.10	1.10	1.10	5
	Sphagnum recurvum	17.83	6.50	23.80	15
Total					32

### Carex torta riverscour prairie

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	5.50	1.00	10.00	33
	Betula alleghaniensis var. alleghaniensis	25.00	10.00	40.00	33
	Fagus grandifolia	10.00	10.00	10.00	17
	Fraxinus americana	3.00	3.00	3.00	17
	Picea rubens	10.00	10.00	10.00	17
	Platanus occidentalis	5.33	3.00	10.00	50
	Quercus alba	10.00	10.00	10.00	17
	Tsuga canadensis	1.00	1.00	1.00	17
T3	Acer rubrum	1.00	1.00	1.00	17
	Betula alleghaniensis var. alleghaniensis	1.00	1.00	1.00	17
	Carpinus caroliniana ssp. virginiana	5.00	5.00	5.00	17
	Fraxinus americana	1.00	1.00	1.00	17
S1	Acer rubrum	1.00	1.00	1.00	17
	Alnus glutinosa	0.50	0.50	0.50	17
	Alnus serrulata	2.00	1.00	3.00	33
	Betula alleghaniensis var. alleghaniensis	1.00	1.00	1.00	33
	Cornus amomum	1.00	1.00	1.00	17
	Fraxinus americana	0.50	0.50	0.50	17
	Quercus rubra	1.00	1.00	1.00	17
	Rhododendron maximum	3.00	1.00	5.00	50
S2	Alnus glutinosa	0.50	0.50	0.50	17
	Alnus serrulata	1.00	1.00	1.00	17
	Hypericum	0.50	0.50	0.50	17
	Hypericum densiflorum	1.00	1.00	1.00	17
	Lindera benzoin	2.00	2.00	2.00	17
	Liriodendron tulipifera	0.50	0.50	0.50	33
	Platanus occidentalis	0.50	0.50	0.50	17
	Quercus rubra	0.50	0.50	0.50	33
	Rhododendron arborescens	0.50	0.50	0.50	33
	Rhododendron maximum	2.00	1.00	3.00	33
	Rosa multiflora	2.00	1.00	3.00	33
	Salix sericea	0.75	0.50	1.00	33
	Tsuga canadensis	0.50	0.50	0.50	17
H	Aesculus flava	1.00	1.00	1.00	17
	Ageratina altissima	1.00	1.00	1.00	17
	Agrimonia gryposepala	0.01	0.01	0.01	17
	Agrostis gigantea	0.50	0.50	0.50	33
	Agrostis perennans	2.00	2.00	2.00	17

Agrostis stolonifera	1.00	1.00	1.00	17
Alnus serrulata	0.50	0.50	0.50	17
Amphicarpaea bracteata	0.01	0.01	0.01	17
Anthoxanthum odoratum ssp. odoratum	0.50	0.50	0.50	17
Apocynum cannabinum	1.00	1.00	1.00	17
Arnoglossum atriplicifolium	0.50	0.50	0.50	17
Aster	1.50	1.00	2.00	33
Atriplex patula	0.50	0.50	0.50	17
Barbarea vulgaris	0.50	0.50	0.50	17
Bidens vulgata	0.50	0.50	0.50	17
Brachyelytrum erectum	1.00	1.00	1.00	17
Brassica	0.01	0.01	0.01	17
Bromus ciliatus var. ciliatus	1.00	1.00	1.00	17
Campsis radicans	0.50	0.50	0.50	17
Cardamine	0.01	0.01	0.01	17
Carex blanda	1.00	1.00	1.00	17
Carex torta	22.50	5.00	60.00	100
Carpinus caroliniana ssp. virginiana	0.50	0.50	0.50	17
Cirsium discolor	1.00	1.00	1.00	17
Clematis virginiana	0.75	0.50	1.00	33
Cryptotaenia canadensis	1.00	1.00	1.00	17
Danthonia compressa	0.50	0.50	0.50	17
Daucus carota	1.00	1.00	1.00	33
Deschampsia caespitosa	1.00	1.00	1.00	17
Dichanthelium acuminatum ssp. fasciculatum	0.75	0.50	1.00	33
Dichanthelium clandestinum	2.33	1.00	3.00	50
Doellingeria umbellata var. umbellata	2.00	1.00	3.00	33
Dryopteris intermedia	0.50	0.50	0.50	17
Elymus canadensis	3.00	1.00	5.00	33
Elymus riparius	1.00	1.00	1.00	17
Epilobium ciliatum	0.50	0.50	0.50	17
Equisetum arvense	0.50	0.50	0.50	17
Erigeron strigosus var. strigosus	0.50	0.50	0.50	17
Eupatorium fistulosum	0.75	0.50	1.00	33
Eurybia divaricata	1.00	1.00	1.00	33
Euthamia graminifolia var. graminifolia	5.00	2.00	10.00	50
Fragaria virginiana ssp. virginiana	1.00	1.00	1.00	33
Galium aparine	0.50	0.50	0.50	17
Galium tinctorium	0.50	0.50	0.50	17
Galium triflorum	1.00	1.00	1.00	17
Geum canadense var. canadense	0.50	0.50	0.50	17
Glyceria grandis var. grandis	0.50	0.50	0.50	17
Glyceria striata	0.50	0.50	0.50	33
Helenium autumnale var. autumnale	0.50	0.50	0.50	33
Houstonia caerulea	0.75	0.50	1.00	33
Houstonia serpyllifolia	6.50	3.00	10.00	33
Hydrocotyle americana	1.00	1.00	1.00	33
Hypericum mutilum	0.50	0.50	0.50	33
Hypericum perforatum	0.63	0.50	1.00	67

Hypericum punctatum	0.50	0.50	0.50	33
Impatiens pallida	0.50	0.50	0.50	17
Juncus brevicaudatus	5.00	5.00	5.00	33
Juncus dudleyi	1.00	1.00	1.00	17
Juncus effusus	1.00	1.00	1.00	17
Laportea canadensis	0.50	0.50	0.50	17
Leucanthemum vulgare	0.75	0.50	1.00	33
Liriodendron tulipifera	0.50	0.50	0.50	17
Lobelia cardinalis	0.50	0.50	0.50	33
Lolium pratense	0.50	0.50	0.50	17
Lotus corniculatus	1.00	1.00	1.00	17
Lycopus americanus	0.50	0.50	0.50	17
Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	17
Meehania cordata	1.00	1.00	1.00	17
Mimulus ringens var. ringens	0.50	0.50	0.50	17
Oxalis dillenii	0.50	0.50	0.50	17
Oxalis stricta	0.50	0.50	0.50	17
Packera aurea	6.50	3.00	10.00	33
Panicum	2.00	2.00	2.00	17
Parthenocissus quinquefolia	1.00	1.00	1.00	17
Pedicularis canadensis ssp. canadensis	1.00	1.00	1.00	17
Phleum pratense	1.00	1.00	1.00	17
Phlox maculata	0.50	0.50	0.50	17
Platanthera flava var. herbiola	0.50	0.50	0.50	17
Platanus occidentalis	0.50	0.50	0.50	17
Poa alsodes	0.50	0.50	0.50	33
Poa palustris	0.50	0.50	0.50	17
Polygonum caespitosum var. longisetum	0.50	0.50	0.50	17
Polygonum orientale	1.00	1.00	1.00	17
Polygonum sagittatum	0.50	0.01	1.00	50
Polypodium virginianum	1.00	1.00	1.00	17
Polystichum acrostichoides	1.00	1.00	1.00	33
Potentilla simplex	1.00	1.00	1.00	17
Prunella vulgaris	0.70	0.50	1.00	83
Ranunculus	0.50	0.50	0.50	17
Ranunculus abortivus	0.50	0.50	0.50	17
Ranunculus recurvatus var. recurvatus	0.50	0.50	0.50	17
Rhynchospora capitellata	5.00	5.00	5.00	17
Robinia pseudoacacia	0.50	0.50	0.50	17
Rorippa nasturtium-aquaticum	0.50	0.50	0.50	17
Rubus	1.00	1.00	1.00	17
Rubus hispidus	0.50	0.50	0.50	17
Rudbeckia laciniata var. laciniata	0.50	0.50	0.50	17
Scirpus	0.50	0.50	0.50	17
Scutellaria lateriflora var. lateriflora	0.50	0.50	0.50	33
Sedum ternatum	1.00	1.00	1.00	17
Smilax tamnoides	0.50	0.50	0.50	17
Solidago	1.00	1.00	1.00	17
Solidago canadensis	0.75	0.50	1.00	33

	<i>Solidago rugosa</i>	3.83	0.50	10.00	50
	<i>Symphotrichum prenanthoides</i>	0.88	0.50	1.00	67
	<i>Taraxacum officinale</i> ssp. <i>officinale</i>	0.50	0.50	0.50	17
	<i>Thalictrum</i>	0.63	0.50	1.00	67
	<i>Thaspium barbinode</i>	0.50	0.50	0.50	17
	<i>Tiarella cordifolia</i>	0.50	0.50	0.50	17
	<i>Toxicodendron radicans</i>	0.75	0.50	1.00	33
	<i>Trautvetteria caroliniensis</i> var. <i>caroliniensis</i>	1.70	0.50	3.00	83
	<i>Trifolium pratense</i>	3.00	3.00	3.00	17
	<i>Tussilago farfara</i>	0.75	0.50	1.00	33
	<i>Verbena hastata</i> var. <i>hastata</i>	0.50	0.50	0.50	17
	<i>Verbesina alternifolia</i>	0.83	0.50	1.00	50
	<i>Viola</i>	3.00	1.00	5.00	33
	<i>Viola cucullata</i>	0.75	0.50	1.00	33
N	<i>Climacium americanum</i>	10.00	10.00	10.00	17
Total					33

### Carex trichocarpa floodplain prairie

Stratum	Scientific Name	Average	Min	Max	Constanc
S2	<i>Hypericum densiflorum</i>	0.50	0.50	0.50	50
	<i>Hypericum prolificum</i>	1.00	1.00	1.00	25
	<i>Salix sericea</i>	0.50	0.50	0.50	25
H	<i>Agrimonia</i>	0.01	0.01	0.01	25
	<i>Agrostis perennans</i>	0.50	0.50	0.50	25
	<i>Amphicarpaea bracteata</i>	0.50	0.50	0.50	25
	<i>Anthoxanthum odoratum</i> ssp. <i>odoratum</i>	0.50	0.50	0.50	25
	<i>Apocynum cannabinum</i>	1.00	1.00	1.00	25
	<i>Arisaema triphyllum</i>	0.75	0.50	1.00	50
	<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>	1.00	1.00	1.00	25
	<i>Asclepias</i>	1.00	1.00	1.00	25
	<i>Asclepias syriaca</i>	8.50	0.50	20.00	75
	<i>Barbarea vulgaris</i>	0.01	0.01	0.01	25
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	10.00	10.00	10.00	25
	<i>Calystegia sepium</i>	0.50	0.50	0.50	25
	<i>Carex bromoides</i> ssp. <i>bromoides</i>	0.50	0.50	0.50	25
	<i>Carex projecta</i>	1.75	0.50	3.00	50
	<i>Carex torta</i>	0.01	0.01	0.01	25
	<i>Carex trichocarpa</i>	50.00	10.00	90.00	100
	<i>Cinna latifolia</i>	1.00	1.00	1.00	25
	<i>Circaea</i>	0.50	0.50	0.50	25
	<i>Cirsium</i>	0.26	0.01	0.50	50
	<i>Clematis virginiana</i>	7.17	0.50	20.00	75
	<i>Clinopodium vulgare</i>	1.00	1.00	1.00	25
	<i>Dichanthelium clandestinum</i>	3.50	1.00	5.00	100
	<i>Doellingeria umbellata</i> var. <i>umbellata</i>	14.67	1.00	40.00	75
	<i>Eleocharis</i>	0.01	0.01	0.01	25
	<i>Elymus</i>	0.50	0.50	0.50	25
	<i>Elymus canadensis</i>	1.00	1.00	1.00	25

<i>Elymus riparius</i>	0.51	0.01	1.00	50
<i>Eupatorium fistulosum</i>	0.50	0.50	0.50	25
<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	0.50	0.50	0.50	25
<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	0.75	0.50	1.00	100
<i>Galeopsis tetrahit</i> var. <i>tetrahit</i>	0.01	0.01	0.01	25
<i>Galium aparine</i>	0.50	0.50	0.50	25
<i>Galium asprellum</i>	3.00	3.00	3.00	25
<i>Galium tinctorium</i>	0.50	0.50	0.50	25
<i>Galium triflorum</i>	3.00	3.00	3.00	25
<i>Gentiana</i>	0.01	0.01	0.01	25
<i>Geum</i>	0.01	0.01	0.01	25
<i>Glyceria canadensis</i>	0.01	0.01	0.01	25
<i>Glyceria melicaria</i>	0.50	0.50	0.50	25
<i>Helianthus giganteus</i>	0.01	0.01	0.01	25
<i>Heliopsis helianthoides</i> var. <i>scabra</i>	10.00	10.00	10.00	25
<i>Hydrocotyle americana</i>	0.01	0.01	0.01	25
<i>Hypericum</i>	0.50	0.50	0.50	25
<i>Hypericum densiflorum</i>	0.50	0.50	0.50	25
<i>Impatiens</i>	0.50	0.50	0.50	25
<i>Juncus dudleyi</i>	0.01	0.01	0.01	25
<i>Juncus effusus</i> var. <i>solutus</i>	0.50	0.50	0.50	25
<i>Lilium superbum</i>	5.25	0.50	10.00	50
<i>Lycopus americanus</i>	0.01	0.01	0.01	25
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.50	0.50	0.50	25
<i>Lysimachia ciliata</i>	0.01	0.01	0.01	25
<i>Onoclea sensibilis</i>	0.50	0.50	0.50	75
<i>Oxalis</i>	1.00	1.00	1.00	25
<i>Oxalis stricta</i>	0.50	0.50	0.50	25
<i>Phalaris arundinacea</i>	20.17	0.01	60.00	75
<i>Platanthera</i>	0.50	0.50	0.50	25
<i>Poa pratensis</i> ssp. <i>pratensis</i>	2.00	2.00	2.00	25
<i>Poa trivialis</i>	0.01	0.01	0.01	25
<i>Polygonum sagittatum</i>	0.50	0.50	0.50	25
<i>Polygonum scandens</i>	0.50	0.50	0.50	25
<i>Potentilla canadensis</i> var. <i>canadensis</i>	0.01	0.01	0.01	25
<i>Salix sericea</i>	0.50	0.50	0.50	25
<i>Scirpus microcarpus</i>	0.50	0.50	0.50	25
<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	0.50	0.50	0.50	25
<i>Solidago rugosa</i>	0.50	0.50	0.50	50
<i>Stellaria graminea</i>	0.01	0.01	0.01	25
<i>Symphotrichum prenanthoides</i>	0.01	0.01	0.01	25
<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	0.50	0.50	0.50	25
<i>Symplocarpus foetidus</i>	0.50	0.50	0.50	25
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	0.01	0.01	0.01	25
<i>Thalictrum</i>	0.50	0.50	0.50	25
<i>Thalictrum pubescens</i>	1.75	0.50	3.00	50
<i>Thelypteris noveboracensis</i>	0.50	0.50	0.50	25
<i>Veratrum viride</i>	0.75	0.50	1.00	50
<i>Verbena hastata</i> var. <i>hastata</i>	0.63	0.50	1.00	100

Total	47
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### Carex utriculata / Sphagnum spp. fen

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Populus tremuloides	7.00	7.00	7.00	9
S1	Cornus sericea ssp. sericea	0.01	0.01	0.01	9
	Hypericum densiflorum	1.00	1.00	1.00	9
	Photinia melanocarpa	13.50	12.00	15.00	18
	Salix sericea	0.01	0.01	0.01	9
	Vaccinium corymbosum	1.00	1.00	1.00	9
	Vaccinium myrtilloides	4.00	4.00	4.00	9
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	9
	Viburnum recognitum	1.00	1.00	1.00	9
S2	Alnus incana ssp. rugosa	0.50	0.50	0.50	9
	Amelanchier laevis	0.50	0.50	0.50	9
	Hypericum densiflorum	4.13	0.50	10.00	36
	Ilex verticillata	0.26	0.01	0.50	18
	Nemopanthus mucronatus	0.50	0.50	0.50	9
	Photinia melanocarpa	2.25	0.50	5.00	36
	Photinia pyrifolia	0.50	0.50	0.50	45
	Vaccinium angustifolium	0.50	0.50	0.50	9
	Vaccinium myrtilloides	3.70	0.50	15.00	45
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	18
	Viburnum recognitum	0.50	0.50	0.50	18
H	Acer rubrum	0.01	0.01	0.01	9
	Agrostis gigantea	0.33	0.33	0.33	9
	Calamagrostis canadensis var. canadensis	0.50	0.50	0.50	9
	Carex atlantica ssp. atlantica	1.00	1.00	1.00	9
	Carex canescens	0.01	0.01	0.01	18
	Carex echinata ssp. echinata	0.01	0.01	0.01	9
	Carex folliculata	1.46	0.01	5.78	45
	Carex gynandra	0.50	0.50	0.50	9
	Carex normalis	0.01	0.01	0.01	9
	Carex scoparia var. scoparia	2.00	2.00	2.00	9
	Carex stipata	16.20	16.20	16.20	9
	Carex stricta	3.00	3.00	3.00	9
	Carex utriculata	42.88	20.00	70.00	73
	Carex vesicaria	23.67	17.00	27.00	27
	Drosera rotundifolia var. rotundifolia	0.67	0.67	0.67	9
	Dryopteris cristata	0.01	0.01	0.01	9
	Eriophorum virginicum	1.17	0.50	2.33	36
	Gaultheria procumbens	0.50	0.50	0.50	9
	Gentiana linearis	0.50	0.50	0.50	18
	Glyceria striata	3.56	3.56	3.56	9
	Hypericum	0.01	0.01	0.01	9
	Hypericum ellipticum	13.00	1.00	25.00	18
	Juncus	1.00	1.00	1.00	9
Juncus brevicaudatus	0.01	0.01	0.01	9	

	<i>Juncus effusus</i>	2.13	0.01	8.00	36
	<i>Lysimachia terrestris</i>	0.50	0.50	0.50	9
	<i>Menyanthes trifoliata</i>	10.00	10.00	10.00	9
	<i>Orontium aquaticum</i>	0.33	0.33	0.33	9
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	0.61	0.44	0.89	27
	<i>Pogonia ophioglossoides</i>	1.00	1.00	1.00	9
	<i>Rhynchospora alba</i>	0.53	0.50	0.56	18
	<i>Rubus hispidus</i>	15.82	1.00	50.00	100
	<i>Schoenoplectus tabernaemontani</i>	0.01	0.01	0.01	9
	<i>Scirpus</i>	0.01	0.01	0.01	18
	<i>Scirpus atrovirens</i>	0.50	0.50	0.50	9
	<i>Scirpus cyperinus</i>	2.22	2.22	2.22	9
	<i>Scirpus microcarpus</i>	0.50	0.50	0.50	9
	<i>Solidago uliginosa</i>	1.97	0.01	5.00	73
	<i>Symplocarpus foetidus</i>	5.60	0.01	14.45	45
	<i>Triadenum fraseri</i>	0.60	0.01	2.00	45
	<i>Typha latifolia</i>	0.22	0.22	0.22	9
	<i>Vaccinium macrocarpon</i>	4.90	1.00	9.70	27
	<i>Vaccinium oxycoccos</i>	5.50	1.00	10.00	18
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.00	1.00	1.00	9
	<i>Viola</i>	0.11	0.11	0.11	9
	<i>Zigadenus leimanthoides</i>	1.00	1.00	1.00	9
N	<i>Aulacomnium palustre</i>	0.26	0.01	0.50	18
	<i>Polytrichum</i>	80.00	80.00	80.00	9
	<i>Polytrichum commune</i>	20.67	1.00	60.00	27
	<i>Polytrichum strictum</i>	2.51	0.01	5.00	18
	<i>Sphagnum</i>	43.38	30.00	88.00	45
	<i>Sphagnum fallax</i>	26.25	6.00	49.00	36
	<i>Sphagnum fimbriatum</i>	0.50	0.50	0.50	9
	<i>Sphagnum magellanicum</i>	31.25	6.00	60.00	36
	<i>Sphagnum rubellum</i>	13.00	6.00	20.00	18
Total					35

### **Dulichium arundinaceum / Sphagnum spp. herbaceous peatland**

Stratum	Scientific Name	Average	Min	Max	Constanc
S1	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.75	0.50	1.00	22
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.50	0.50	0.50	11
	<i>Hypericum densiflorum</i>	2.40	2.40	2.40	22
	<i>Ilex collina</i>	0.01	0.01	0.01	11
	<i>Ilex verticillata</i>	1.00	1.00	1.00	11
	<i>Picea rubens</i>	2.00	1.00	3.00	22
	<i>Pinus rigida</i>	0.50	0.50	0.50	11
	<i>Rhododendron maximum</i>	0.75	0.50	1.00	22
	<i>Vaccinium erythrocarpum</i>	0.50	0.50	0.50	11
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.60	0.60	0.60	11
S2	<i>Acer rubrum</i>	0.10	0.10	0.10	11
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.50	0.50	0.50	22
	<i>Alnus serrulata</i>	0.50	0.50	0.50	11

	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	11
	<i>Gaylussacia baccata</i>	0.50	0.50	0.50	11
	<i>Hypericum densiflorum</i>	0.26	0.01	0.50	22
	<i>Ilex verticillata</i>	0.20	0.01	0.50	33
	<i>Kalmia latifolia</i>	0.50	0.50	0.50	22
	<i>Lyonia ligustrina</i> var. <i>ligustrina</i>	0.50	0.50	0.50	11
	<i>Photinia melanocarpa</i>	0.50	0.50	0.50	11
	<i>Photinia pyrifolia</i>	0.50	0.50	0.50	11
	<i>Picea rubens</i>	1.00	1.00	1.00	22
	<i>Rhododendron maximum</i>	0.34	0.01	0.50	33
	<i>Rubus hispidus</i>	3.00	3.00	3.00	11
	<i>Vaccinium myrtilloides</i>	0.50	0.50	0.50	11
H	<i>Acer rubrum</i>	0.26	0.01	0.50	22
	<i>Agrostis hyemalis</i>	2.27	0.60	5.60	33
	<i>Agrostis perennans</i>	0.35	0.20	0.50	22
	<i>Amelanchier</i>	0.01	0.01	0.01	11
	<i>Bartonia virginica</i>	0.50	0.50	0.50	11
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.26	0.01	0.50	22
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	0.50	0.50	0.50	11
	<i>Carex atlantica</i>	1.50	0.50	3.00	33
	<i>Carex baileyi</i>	0.01	0.01	0.01	11
	<i>Carex canescens</i>	11.00	8.00	15.00	33
	<i>Carex folliculata</i>	0.01	0.01	0.01	11
	<i>Carex gynandra</i>	2.00	2.00	2.00	11
	<i>Carex lurida</i>	0.50	0.50	0.50	11
	<i>Carex scoparia</i> var. <i>scoparia</i>	0.35	0.20	0.50	22
	<i>Carex stricta</i>	1.00	1.00	1.00	11
	<i>Carex trisperma</i> var. <i>trisperma</i>	0.26	0.01	0.50	22
	<i>Chelone glabra</i>	0.50	0.50	0.50	11
	<i>Dennstaedtia punctilobula</i>	0.26	0.01	0.50	22
	<i>Dichanthelium clandestinum</i>	1.00	1.00	1.00	11
	<i>Doellingeria umbellata</i> var. <i>umbellata</i>	0.50	0.50	0.50	11
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	1.50	1.00	2.00	44
	<i>Dulichium arundinaceum</i>	33.21	6.90	60.00	100
	<i>Eleocharis</i>	0.50	0.50	0.50	11
	<i>Eleocharis acicularis</i> var. <i>acicularis</i>	10.00	10.00	10.00	11
	<i>Eriophorum virginicum</i>	3.00	0.30	10.00	67
	<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	0.50	0.50	0.50	11
	<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	2.00	2.00	2.00	11
	<i>Fagus grandifolia</i>	0.01	0.01	0.01	11
	<i>Galium tinctorium</i>	0.50	0.50	0.50	22
	<i>Glyceria</i>	0.01	0.01	0.01	11
	<i>Glyceria canadensis</i>	3.00	3.00	3.00	11
	<i>Glyceria laxa</i>	2.00	2.00	2.00	11
	<i>Hypericum canadense</i>	0.50	0.50	0.50	11
	<i>Hypericum mutilum</i>	0.50	0.50	0.50	11
	<i>Impatiens</i>	1.00	1.00	1.00	11
	<i>Juncus</i>	0.50	0.50	0.50	11
	<i>Juncus brevicaudatus</i>	3.90	0.40	13.00	56

	<i>Juncus effusus</i>	0.73	0.20	1.00	33
	<i>Juncus effusus</i> var. <i>solutus</i>	0.50	0.50	0.50	11
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.17	0.01	0.50	33
	<i>Kalmia latifolia</i>	0.01	0.01	0.01	11
	<i>Leersia oryzoides</i>	17.74	0.50	66.40	56
	<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.75	0.50	1.00	22
	<i>Maianthemum canadense</i>	0.50	0.50	0.50	11
	<i>Menyanthes trifoliata</i>	0.50	0.50	0.50	11
	<i>Nemopanthus mucronatus</i>	0.01	0.01	0.01	11
	<i>Oclemena acuminata</i>	0.50	0.50	0.50	11
	<i>Onoclea sensibilis</i>	0.50	0.50	0.50	11
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.10	0.01	3.00	56
	<i>Osmunda regalis</i> var. <i>spectabilis</i>	1.00	1.00	1.00	11
	<i>Oxalis montana</i>	0.50	0.50	0.50	11
	<i>Oxypolis rigidior</i>	0.50	0.50	0.50	11
	<i>Phegopteris connectilis</i>	0.50	0.50	0.50	11
	<i>Picea rubens</i>	0.50	0.50	0.50	22
	<i>Platanthera clavellata</i>	0.50	0.50	0.50	11
	<i>Pogonia ophioglossoides</i>	2.75	0.50	5.00	22
	<i>Polygonum sagittatum</i>	2.30	1.00	3.60	22
	<i>Rhododendron maximum</i>	1.00	1.00	1.00	11
	<i>Rhynchospora alba</i>	4.00	0.01	10.00	33
	<i>Rubus</i>	0.01	0.01	0.01	11
	<i>Rubus hispidus</i>	15.08	1.00	65.00	56
	<i>Scirpus atrocinctus</i>	0.50	0.50	0.50	11
	<i>Scirpus cyperinus</i>	5.60	0.50	20.00	56
	<i>Solidago rugosa</i>	0.50	0.50	0.50	11
	<i>Solidago uliginosa</i>	4.00	4.00	4.00	11
	<i>Sorbus americana</i>	0.01	0.01	0.01	11
	<i>Sparganium</i>	0.50	0.50	0.50	22
	<i>Sparganium chlorocarpum</i>	0.50	0.50	0.50	11
	<i>Symphotrichum prenanthoides</i>	0.50	0.50	0.50	11
	<i>Symplocarpus foetidus</i>	0.50	0.50	0.50	11
	<i>Thalictrum</i>	0.50	0.50	0.50	11
	<i>Triadenum fraseri</i>	4.38	0.50	15.00	44
	<i>Vaccinium macrocarpon</i>	0.50	0.50	0.50	11
	<i>Vaccinium oxycoccos</i>	2.75	0.50	5.00	22
	<i>Vernonia noveboracensis</i>	0.01	0.01	0.01	11
	<i>Viola</i>	0.50	0.50	0.50	11
N	<i>Mnium</i>	0.50	0.50	0.50	11
	<i>Polytrichum</i>	0.26	0.01	0.50	22
	<i>Polytrichum commune</i>	19.43	2.10	56.60	44
	<i>Polytrichum pallidisetum</i>	10.00	10.00	10.00	11
	<i>Sphagnum</i>	59.00	20.00	98.00	22
	<i>Sphagnum affine</i>	2.00	2.00	2.00	11
	<i>Sphagnum cuspidatum</i>	25.00	25.00	25.00	11
	<i>Sphagnum fallax</i>	39.75	20.00	80.00	44
	<i>Sphagnum magellanicum</i>	14.67	0.01	24.00	33
	<i>Sphagnum papillosum</i>	10.00	10.00	10.00	11

	Sphagnum recurvum	37.30	20.00	64.00	33
	Thuidium delicatulum	2.00	2.00	2.00	11
	Warnstorfia exannulata var. exannulata	0.50	0.50	0.50	11
Total					31

### Eriophorum virginicum - (Carex folliculata) / Sphagnum spp. - Polytrichum spp. herbaceous peatland

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	1.00	1.00	1.00	10
	Picea rubens	4.22	1.00	10.00	23
	Pinus strobus	2.00	2.00	2.00	3
	Tsuga canadensis	2.75	1.00	5.00	10
T3	Picea rubens	1.00	1.00	1.00	3
S1	Abies balsamea	0.01	0.01	0.01	3
	Acer rubrum	0.10	0.10	0.10	3
	Alnus incana ssp. rugosa	1.00	1.00	1.00	3
	Amelanchier laevis	0.36	0.02	1.00	18
	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	3
	Hamamelis virginiana	0.01	0.01	0.01	3
	Hypericum densiflorum	3.52	0.10	14.00	41
	Ilex verticillata	2.39	0.10	5.20	18
	Kalmia latifolia	1.78	0.01	3.00	23
	Nemopanthus mucronatus	1.30	1.30	1.30	3
	Photinia melanocarpa	5.90	1.00	15.00	26
	Photinia pyrifolia	3.10	0.02	10.90	33
	Picea rubens	1.70	0.10	3.00	8
	Prunus serotina var. serotina	0.01	0.01	0.01	3
	Rhododendron maximum	2.82	0.20	8.00	41
	Rosa multiflora	1.00	1.00	1.00	3
	Salix alba	6.00	6.00	6.00	3
	Salix sericea	5.97	0.30	13.60	8
	Sambucus nigra ssp. canadensis	0.03	0.03	0.03	3
	Sorbus americana	0.60	0.60	0.60	3
	Spiraea alba	1.00	1.00	1.00	3
	Spiraea tomentosa	0.80	0.80	0.80	3
	Vaccinium angustifolium	2.54	0.10	10.00	13
Vaccinium corymbosum	3.50	1.00	6.00	5	
Vaccinium myrtilloides	2.15	0.02	8.00	28	
Viburnum nudum var. cassinoides	1.40	0.01	5.20	41	
Viburnum recognitum	0.10	0.10	0.10	3	
S2	Abies balsamea	0.01	0.01	0.01	3
	Amelanchier	0.01	0.01	0.01	3
	Betula alleghaniensis var. alleghaniensis	0.01	0.01	0.01	3
	Hypericum densiflorum	4.38	0.01	20.00	21
	Ilex verticillata	0.17	0.01	0.50	8
	Kalmia latifolia	0.26	0.01	0.50	5
	Nemopanthus mucronatus	0.50	0.50	0.50	5
Photinia pyrifolia	2.13	0.50	3.00	10	

	<i>Picea rubens</i>	0.50	0.50	0.50	5
	<i>Pinus strobus</i>	0.01	0.01	0.01	3
	<i>Rhododendron maximum</i>	0.50	0.50	0.50	5
	<i>Sorbus americana</i>	0.01	0.01	0.01	3
	<i>Vaccinium myrtilloides</i>	1.50	0.50	3.00	13
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.67	0.01	1.00	8
	<i>Viburnum recognitum</i>	0.34	0.01	1.00	8
H	<i>Acer rubrum</i>	0.01	0.01	0.02	15
	<i>Acer saccharum</i> var. <i>saccharum</i>	0.01	0.01	0.01	3
	<i>Agrostis gigantea</i>	3.26	0.11	11.10	13
	<i>Agrostis hyemalis</i>	0.62	0.10	2.00	23
	<i>Agrostis perennans</i>	0.72	0.01	1.90	18
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.06	0.01	0.10	5
	<i>Carex</i>	15.00	15.00	15.00	3
	<i>Carex atlantica</i>	4.33	3.00	5.00	8
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	4.00	4.00	4.00	3
	<i>Carex baileyi</i>	2.80	2.80	2.80	3
	<i>Carex brunnescens</i>	3.55	2.80	4.30	5
	<i>Carex canescens</i>	5.75	0.50	28.00	15
	<i>Carex crinita</i>	0.01	0.01	0.01	3
	<i>Carex debilis</i>	0.50	0.50	0.50	3
	<i>Carex debilis</i> var. <i>rudgei</i>	1.40	1.40	1.40	3
	<i>Carex echinata</i> ssp. <i>echinata</i>	0.50	0.50	0.50	3
	<i>Carex folliculata</i>	14.08	0.11	70.00	59
	<i>Carex gynandra</i>	3.80	0.50	10.00	15
	<i>Carex lurida</i>	1.43	0.11	3.89	8
	<i>Carex pauciflora</i>	1.89	1.89	1.89	3
	<i>Carex scoparia</i> var. <i>scoparia</i>	0.97	0.10	2.00	15
	<i>Carex stipata</i>	4.66	0.20	11.11	21
	<i>Carex stricta</i>	23.00	23.00	23.00	3
	<i>Carex trisperma</i> var. <i>trisperma</i>	2.27	0.02	5.10	31
	<i>Crataegus</i>	0.10	0.10	0.10	3
	<i>Danthonia compressa</i>	0.67	0.10	2.56	13
	<i>Danthonia spicata</i>	0.20	0.20	0.20	5
	<i>Dichanthelium dichotomum</i> ssp. <i>microcarpon</i>	0.60	0.60	0.60	3
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.76	0.01	2.10	31
	<i>Dryopteris cristata</i>	0.30	0.10	0.50	5
	<i>Dulichium arundinaceum</i>	12.50	0.20	26.90	13
	<i>Eleocharis tenuis</i>	3.33	3.33	3.33	3
	<i>Eriophorum virginicum</i>	8.90	0.20	30.00	95
	<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	1.01	0.01	2.00	5
	<i>Gaultheria hispidula</i>	0.42	0.01	0.89	10
	<i>Gaultheria procumbens</i>	0.01	0.01	0.01	3
	<i>Gentiana linearis</i>	0.48	0.01	1.22	28
	<i>Glyceria canadensis</i>	1.00	1.00	1.00	3
	<i>Glyceria laxa</i>	1.50	1.00	2.00	5
	<i>Glyceria melicaria</i>	1.85	0.30	3.40	5
	<i>Holcus lanatus</i>	0.01	0.01	0.01	3
	<i>Hypericum densiflorum</i>	0.01	0.01	0.01	3

	<i>Hypericum ellipticum</i>	2.00	2.00	2.00	3
	<i>Hypericum mutilum</i>	0.01	0.01	0.01	5
	<i>Juncus</i>	9.84	0.78	23.90	38
	<i>Juncus brevicaudatus</i>	5.70	0.01	20.00	41
	<i>Juncus canadensis</i>	0.11	0.01	0.20	5
	<i>Juncus effusus</i>	3.97	0.01	11.45	49
	<i>Juncus effusus</i> var. <i>solutus</i>	10.50	1.00	20.00	5
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	3.87	0.01	6.40	8
	<i>Leersia oryzoides</i>	1.24	0.20	5.00	13
	<i>Lolium perenne</i>	0.11	0.11	0.11	3
	<i>Lycopodium clavatum</i>	0.23	0.01	0.56	8
	<i>Lycopodium obscurum</i>	0.28	0.22	0.33	5
	<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.50	0.50	0.50	3
	<i>Oenothera fruticosa</i>	0.22	0.22	0.22	3
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	0.72	0.01	2.00	41
	<i>Photinia pyrifolia</i>	1.00	1.00	1.00	3
	<i>Picea rubens</i>	0.06	0.01	0.10	10
	<i>Pinus strobus</i>	0.80	0.80	0.80	3
	<i>Platanthera clavellata</i>	0.10	0.10	0.10	5
	<i>Poa palustris</i>	0.20	0.20	0.20	3
	<i>Polygonum sagittatum</i>	0.39	0.22	0.56	5
	<i>Potentilla simplex</i>	0.71	0.01	1.40	5
	<i>Prunus serotina</i> var. <i>serotina</i>	0.11	0.01	0.20	5
	<i>Pteridium aquilinum</i>	0.38	0.30	0.50	8
	<i>Rhynchospora alba</i>	8.61	1.11	24.60	21
	<i>Rubus</i>	5.00	5.00	5.00	3
	<i>Rubus hispidus</i>	32.17	2.00	80.00	95
	<i>Sarracenia purpurea</i> ssp. <i>gibbosa</i>	1.44	1.44	1.44	3
	<i>Scirpus cyperinus</i>	0.86	0.10	3.00	31
	<i>Scirpus microcarpus</i>	2.25	0.50	4.00	5
	<i>Solidago rugosa</i>	1.75	0.20	3.40	10
	<i>Solidago uliginosa</i>	10.27	0.01	40.00	82
	<i>Sparganium chlorocarpum</i>	3.30	3.30	3.30	3
	<i>Spiranthes cernua</i>	5.11	5.11	5.11	3
	<i>Stellaria graminea</i>	0.33	0.33	0.33	3
	<i>Symplocarpus foetidus</i>	18.04	0.33	40.00	8
	<i>Typha latifolia</i>	0.78	0.78	0.78	3
	<i>Vaccinium macrocarpon</i>	2.14	0.22	6.22	23
	<i>Vaccinium myrtilloides</i>	0.01	0.01	0.01	3
	<i>Vaccinium oxycoccos</i>	10.04	0.44	40.00	21
	<i>Vernonia noveboracensis</i>	11.40	11.40	11.40	3
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.01	0.01	0.01	3
	<i>Viola</i>	0.95	0.10	2.67	15
N	<i>Aulacomnium palustre</i>	0.73	0.20	1.00	8
	<i>Cladina</i>	0.50	0.50	0.50	3
	<i>Cladonia arbuscula</i>	0.50	0.50	0.50	3
	<i>Hygrohypnum eugyrium</i>	0.70	0.11	1.70	10
	<i>Hypnum imponens</i>	0.01	0.01	0.01	3
	<i>Leucobryum glaucum</i>	0.01	0.01	0.01	3

	Polytrichum	12.00	2.00	40.00	10
	Polytrichum commune	33.56	0.10	91.00	44
	Polytrichum juniperinum	0.40	0.40	0.40	3
	Polytrichum ohioense	0.60	0.60	0.60	3
	Polytrichum strictum	20.00	5.00	45.00	8
	Sphagnum	51.30	0.40	80.00	49
	Sphagnum affine	4.59	0.10	12.00	18
	Sphagnum capillifolium var. capillifolium	15.00	15.00	15.00	3
	Sphagnum cuspidatum	1.50	1.00	2.00	5
	Sphagnum fallax	39.40	10.00	90.00	18
	Sphagnum fimbriatum	10.00	10.00	10.00	3
	Sphagnum girgensohnii	20.00	20.00	20.00	3
	Sphagnum magellanicum	12.21	1.00	30.00	26
	Sphagnum palustre	15.00	15.00	15.00	3
	Sphagnum papillosum	15.00	15.00	15.00	3
	Sphagnum recurvum	42.42	5.00	83.90	36
	Sphagnum rubellum	23.30	23.30	23.30	3
Total					34

**Fraxinus nigra - Abies balsamea / Alnus incana ssp. rugosa / Rhamnus alnifolia / Carex bromoides ssp. bromoides rich forested swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Abies balsamea	10.27	4.00	21.00	100
	Acer rubrum	5.50	1.00	15.00	73
	Betula alleghaniensis var. alleghaniensis	3.33	1.00	6.00	55
	Fraxinus americana	20.00	20.00	20.00	9
	Fraxinus nigra	15.44	1.00	50.00	82
	Picea rubens	3.50	1.00	5.00	36
	Prunus	1.00	1.00	1.00	9
	Tsuga canadensis	8.75	1.00	20.00	73
T3	Abies balsamea	5.67	3.00	15.00	55
	Acer rubrum	2.00	2.00	2.00	18
	Alnus incana ssp. rugosa	5.00	5.00	5.00	9
	Amelanchier	3.00	3.00	3.00	9
	Betula alleghaniensis var. alleghaniensis	3.20	1.00	5.00	45
	Crataegus	1.00	1.00	1.00	9
	Fraxinus nigra	4.00	1.00	7.00	18
	Picea rubens	5.67	2.00	10.00	27
	Sorbus americana	1.00	1.00	1.00	9
Tsuga canadensis	4.50	2.00	10.00	36	
S1	Abies balsamea	3.60	0.50	10.00	45
	Acer pensylvanicum	1.00	1.00	1.00	9
	Acer rubrum	1.00	1.00	1.00	9
	Acer spicatum	1.00	1.00	1.00	9
	Alnus incana ssp. rugosa	14.36	1.00	51.00	100
	Amelanchier	0.50	0.50	0.50	9
	Betula alleghaniensis var. alleghaniensis	1.00	1.00	1.00	18
	Carpinus caroliniana ssp. virginiana	5.00	5.00	5.00	9

	Cornus amomum	1.00	1.00	1.00	9
	Crataegus	0.50	0.50	0.50	18
	Fraxinus americana	1.00	1.00	1.00	9
	Fraxinus nigra	0.50	0.50	0.50	9
	Hamamelis virginiana	2.63	0.50	5.00	36
	Hypericum densiflorum	0.50	0.50	0.50	18
	Ilex verticillata	11.83	1.00	40.00	55
	Photinia melanocarpa	0.50	0.50	0.50	9
	Picea rubens	3.67	0.50	10.00	55
	Prunus serotina var. serotina	5.00	5.00	5.00	9
	Prunus virginiana var. virginiana	0.51	0.01	1.00	18
	Rhamnus alnifolia	21.00	2.00	40.00	18
	Rhododendron maximum	1.64	0.50	3.00	64
	Rosa	0.75	0.50	1.00	18
	Rosa multiflora	0.83	0.50	1.00	27
	Salix sericea	0.50	0.50	0.50	9
	Sorbus americana	3.00	3.00	3.00	9
	Spiraea alba	1.00	1.00	1.00	9
	Tsuga canadensis	3.38	0.50	7.00	36
	Vaccinium myrtilloides	2.00	2.00	2.00	9
	Viburnum nudum var. cassinoides	5.00	5.00	5.00	9
	Viburnum recognitum	0.50	0.50	0.50	18
S2	Abies balsamea	0.50	0.50	0.50	9
	Alnus incana ssp. rugosa	0.75	0.50	1.00	18
	Amelanchier	0.50	0.50	0.50	9
	Cornus amomum	8.00	1.00	15.00	18
	Crataegus	0.50	0.50	0.50	18
	Fraxinus nigra	1.00	1.00	1.00	9
	Hamamelis virginiana	0.50	0.50	0.50	9
	Ilex verticillata	0.50	0.50	0.50	9
	Kalmia latifolia	2.00	2.00	2.00	9
	Picea rubens	2.50	2.00	3.00	18
	Rhamnus alnifolia	7.67	1.00	20.00	27
	Rubus	0.01	0.01	0.01	9
	Sambucus nigra ssp. canadensis	1.00	1.00	1.00	9
	Smilax tamnoides	1.00	1.00	1.00	18
	Spiraea alba	2.00	2.00	2.00	9
	Tsuga canadensis	0.50	0.50	0.50	9
	Vaccinium myrtilloides	2.75	0.50	5.00	18
	Viburnum	0.01	0.01	0.01	9
	Viburnum recognitum	1.01	0.01	2.00	18
H	Abies balsamea	0.43	0.10	0.50	55
	Acer rubrum	0.50	0.50	0.50	64
	Achillea millefolium var. occidentalis	0.50	0.50	0.50	18
	Agrostis perennans	0.50	0.50	0.50	9
	Alnus incana ssp. rugosa	0.50	0.50	0.50	45
	Amelanchier	0.50	0.50	0.50	55
	Anemone quinquefolia var. quinquefolia	0.50	0.50	0.50	9
	Anthoxanthum odoratum ssp. odoratum	3.25	0.50	10.00	36

<i>Aralia nudicaulis</i>	0.10	0.10	0.10	9
<i>Arisaema triphyllum</i>	0.40	0.01	0.50	45
<i>Arisaema triphyllum</i> ssp. <i>stewardsonii</i>	1.00	1.00	1.00	9
<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>	0.83	0.50	1.00	27
<i>Asclepias syriaca</i>	1.00	1.00	1.00	9
<i>Aster</i>	1.00	1.00	1.00	27
<i>Athyrium filix-femina</i> var. <i>angustum</i>	0.50	0.50	0.50	18
<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.63	0.50	1.00	36
<i>Bromus ciliatus</i> var. <i>ciliatus</i>	0.50	0.50	0.50	18
<i>Bromus inermis</i> ssp. <i>inermis</i> var. <i>inermis</i>	0.50	0.50	0.50	9
<i>Caltha palustris</i> var. <i>palustris</i>	6.81	0.50	40.00	73
<i>Cardamine</i>	1.00	1.00	1.00	9
<i>Cardamine bulbosa</i>	1.38	0.50	2.00	36
<i>Cardamine diphylla</i>	3.75	0.50	7.00	18
<i>Cardamine pensylvanica</i>	0.01	0.01	0.01	9
<i>Carex</i>	4.25	0.50	25.00	91
<i>Carex atlantica</i> ssp. <i>atlantica</i>	5.00	5.00	5.00	9
<i>Carex baileyi</i>	0.75	0.50	1.00	18
<i>Carex bromoides</i> ssp. <i>bromoides</i>	17.00	2.00	40.00	55
<i>Carex canescens</i>	0.50	0.50	0.50	18
<i>Carex crinita</i>	1.67	1.00	3.00	27
<i>Carex debilis</i> var. <i>debilis</i>	0.50	0.50	0.50	9
<i>Carex folliculata</i>	1.25	0.50	2.00	18
<i>Carex gracillima</i>	1.00	1.00	1.00	18
<i>Carex gynandra</i>	2.50	0.50	6.00	64
<i>Carex intumescens</i>	0.50	0.50	0.50	27
<i>Carex laxiculmis</i>	0.50	0.50	0.50	9
<i>Carex leptalea</i> ssp. <i>leptalea</i>	2.33	0.50	6.00	27
<i>Carex leptoneuria</i>	0.26	0.01	0.50	18
<i>Carex lurida</i>	0.67	0.50	1.00	27
<i>Carex prasina</i>	1.00	0.50	2.00	27
<i>Carex projecta</i>	0.88	0.50	2.00	36
<i>Carex scabrata</i>	1.83	0.50	3.00	27
<i>Carex scoparia</i> var. <i>scoparia</i>	2.75	0.50	5.00	18
<i>Carex stipata</i>	1.50	0.50	2.00	27
<i>Carex torta</i>	2.00	2.00	2.00	9
<i>Carex tribuloides</i>	1.00	1.00	1.00	18
<i>Carex vulpinoidea</i>	0.75	0.50	1.00	18
<i>Chelone glabra</i>	0.50	0.01	1.00	27
<i>Chimaphila umbellata</i> ssp. <i>cisatlantica</i>	1.00	1.00	1.00	9
<i>Chrysosplenium americanum</i>	0.51	0.01	1.00	18
<i>Cinna latifolia</i>	0.50	0.50	0.50	9
<i>Circaea alpina</i> ssp. <i>alpina</i>	0.50	0.50	0.50	9
<i>Cirsium</i>	0.67	0.50	1.00	27
<i>Cirsium muticum</i>	0.10	0.10	0.10	9
<i>Clematis virginiana</i>	0.86	0.50	2.00	64
<i>Clinopodium vulgare</i>	1.00	1.00	1.00	9
<i>Cornus alternifolia</i>	0.50	0.50	0.50	9
<i>Cornus amomum</i>	2.00	2.00	2.00	9

Crataegus	0.50	0.50	0.50	18
Cypripedium reginae	1.00	1.00	1.00	9
Dalibarda repens	1.00	1.00	1.00	9
Danthonia compressa	0.50	0.50	0.50	9
Danthonia spicata	0.50	0.50	0.50	9
Dennstaedtia punctilobula	0.50	0.50	0.50	9
Dichantherium clandestinum	1.33	0.50	3.00	27
Doellingeria umbellata var. umbellata	0.63	0.50	1.00	36
Dryopteris carthusiana	2.00	0.50	5.00	27
Dryopteris cristata	0.61	0.50	1.00	82
Dryopteris intermedia	0.50	0.50	0.50	36
Eleocharis	1.00	1.00	1.00	9
Epilobium coloratum	1.00	1.00	1.00	18
Epilobium leptophyllum	0.50	0.50	0.50	9
Equisetum arvense	0.50	0.50	0.50	9
Euphorbia purpurea	2.08	0.50	6.00	55
Euthamia graminifolia var. graminifolia	0.75	0.50	1.00	18
Fragaria vesca	1.00	0.50	2.00	36
Fraxinus nigra	0.50	0.50	0.50	9
Galium	1.00	1.00	1.00	27
Galium asprellum	1.00	1.00	1.00	27
Galium tinctorium	1.13	0.50	3.00	36
Galium triflorum	0.67	0.50	1.00	27
Gaultheria procumbens	1.00	1.00	1.00	9
Geranium maculatum	0.75	0.50	1.00	18
Geum	0.63	0.50	1.00	36
Geum rivale	0.50	0.50	0.50	18
Glyceria canadensis	1.00	1.00	1.00	18
Glyceria grandis var. grandis	0.50	0.50	0.50	9
Glyceria laxa	6.00	2.00	10.00	18
Glyceria melicaria	8.80	1.00	20.00	45
Glyceria striata	11.29	1.00	30.00	64
Gymnocarpium dryopteris	0.50	0.50	0.50	9
Hamamelis virginiana	0.50	0.50	0.50	18
Helenium autumnale var. autumnale	0.50	0.50	0.50	9
Hieracium caespitosum	0.50	0.50	0.50	18
Holcus lanatus	0.70	0.50	1.00	45
Houstonia serpyllifolia	0.50	0.50	0.50	9
Hydrocotyle americana	3.00	1.00	5.00	18
Hypericum densiflorum	0.50	0.50	0.50	18
Hypericum ellipticum	0.50	0.50	0.50	9
Ilex verticillata	0.50	0.50	0.50	27
Impatiens	2.50	2.00	3.00	18
Impatiens capensis	6.39	0.50	16.00	82
Juncus effusus	0.67	0.50	1.00	55
Laporteia canadensis	0.50	0.50	0.50	18
Leersia oryzoides	7.75	5.00	10.00	36
Lindera benzoin	0.50	0.50	0.50	9
Lolium pratense	0.50	0.50	0.50	9

Lycopus	0.50	0.50	0.50	36
Lycopus americanus	0.01	0.01	0.01	9
Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	27
Lysimachia ciliata	2.00	0.50	4.00	55
Maianthemum canadense	1.05	0.50	3.00	91
Maianthemum racemosum ssp. racemosum	0.50	0.50	0.50	9
Mentha arvensis	0.75	0.50	1.00	18
Milium effusum var. cisatlanticum	3.00	1.00	5.00	18
Mimulus ringens var. ringens	0.75	0.50	1.00	18
Mitchella repens	0.50	0.50	0.50	18
Mitella diphylla	0.75	0.50	1.00	18
Oclemena acuminata	0.50	0.50	0.50	9
Onoclea sensibilis	3.42	0.50	15.00	55
Osmorhiza claytonii	0.50	0.50	0.50	9
Osmunda cinnamomea var. cinnamomea	1.38	1.00	3.00	73
Osmunda claytoniana	1.50	0.50	3.00	27
Osmunda regalis var. spectabilis	1.00	1.00	1.00	9
Oxalis	0.50	0.50	0.50	18
Oxalis montana	1.60	0.50	3.00	45
Oxalis stricta	0.50	0.50	0.50	9
Oxypolis rigidior	0.92	0.50	2.00	55
Packera aurea	3.60	0.50	15.00	91
Parthenocissus quinquefolia	0.50	0.50	0.50	9
Phleum pratense	0.50	0.50	0.50	18
Photinia melanocarpa	0.50	0.50	0.50	9
Physocarpus opulifolius var. opulifolius	0.50	0.50	0.50	9
Picea rubens	0.60	0.50	1.00	45
Platanthera	0.50	0.50	0.50	9
Poa alsodes	16.00	2.00	26.00	27
Poa pratensis ssp. pratensis	0.67	0.50	1.00	27
Poa trivialis	0.50	0.50	0.50	9
Polemonium vanbruntiae	2.00	0.50	7.00	55
Polygonum hydropiper	0.01	0.01	0.01	9
Polygonum sagittatum	2.05	0.50	15.00	100
Polystichum acrostichoides	0.30	0.10	0.50	18
Potentilla simplex	0.30	0.10	0.50	18
Prunella vulgaris	0.50	0.50	0.50	27
Prunus	0.50	0.50	0.50	9
Prunus serotina var. serotina	0.42	0.10	0.50	45
Ranunculus	0.01	0.01	0.01	9
Ranunculus acris var. acris	0.10	0.10	0.10	9
Ranunculus hispidus	0.83	0.50	1.00	27
Ranunculus recurvatus var. recurvatus	0.01	0.01	0.01	9
Ranunculus repens	0.50	0.50	0.50	9
Rhamnus alnifolia	12.00	0.50	35.00	27
Rhododendron maximum	0.50	0.50	0.50	27
Ribes	0.50	0.50	0.50	27
Rosa	0.50	0.50	0.50	27
Rosa multiflora	0.50	0.50	0.50	9

	Rubus	0.67	0.50	1.00	55
	Rubus hispidus	1.72	0.50	5.00	82
	Rubus pubescens var. pubescens	0.50	0.50	0.50	18
	Rumex crispus ssp. crispus	0.50	0.50	0.50	9
	Rumex obtusifolius	0.50	0.50	0.50	9
	Saxifraga pensylvanica	0.50	0.50	0.50	9
	Scirpus	3.00	3.00	3.00	9
	Scirpus atrovirens	0.50	0.50	0.50	9
	Scirpus expansus	0.75	0.50	1.00	18
	Scutellaria lateriflora var. lateriflora	0.67	0.50	1.00	27
	Sisyrinchium	0.10	0.10	0.10	9
	Smilax tamnoides	0.50	0.50	0.50	18
	Solidago	0.83	0.50	1.00	27
	Solidago rugosa	0.59	0.01	1.00	55
	Solidago uliginosa	0.50	0.50	0.50	9
	Sorbus americana	0.50	0.50	0.50	45
	Sphenopholis obtusata	1.25	0.50	2.00	18
	Spiraea alba	2.17	0.50	5.00	27
	Stellaria	0.50	0.50	0.50	9
	Stellaria longifolia var. longifolia	0.50	0.50	0.50	9
	Symphyotrichum prenanthoides	0.50	0.50	0.50	27
	Symphyotrichum puniceum var. puniceum	1.17	0.50	2.00	27
	Symplocarpus foetidus	2.00	1.00	3.00	18
	Taraxacum officinale ssp. officinale	0.01	0.01	0.01	9
	Thalictrum	0.67	0.50	1.00	55
	Thelypteris noveboracensis	0.50	0.50	0.50	18
	Tiarella cordifolia	1.86	0.50	7.00	64
	Triadenum fraseri	0.50	0.50	0.50	27
	Tsuga canadensis	0.50	0.50	0.50	27
	Typha latifolia	0.67	0.50	1.00	27
	Vaccinium myrtilloides	2.70	0.50	11.00	45
	Veratrum viride	3.20	1.00	6.00	45
	Viburnum acerifolium	0.50	0.50	0.50	9
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	18
	Viburnum opulus var. americanum	1.00	1.00	1.00	9
	Viburnum recognitum	0.50	0.50	0.50	45
	Viola cucullata	8.36	0.50	15.00	64
N	Aulacomnium palustre	0.50	0.50	0.50	9
	Bazzania trilobata	3.50	0.01	10.00	27
	Brachythecium rutabulum	1.00	1.00	1.00	9
	Calypogeia fissa ssp. neogaea	0.01	0.01	0.01	9
	Cephalozia lunulifolia	0.01	0.01	0.01	9
	Climacium americanum	0.01	0.01	0.01	9
	Dicranum scoparium	0.75	0.50	1.00	18
	Hypnum imponens	0.88	0.50	1.00	36
	Leucobryum glaucum	0.50	0.01	1.00	27
	Loeskeobryum brevirostre	1.00	1.00	1.00	18
	Mnium	0.50	0.50	0.50	9
	Polytrichum juniperinum	2.00	2.00	2.00	9

	Polytrichum strictum	1.00	1.00	1.00	9
	Sphagnum	0.50	0.50	0.50	18
	Sphagnum affine	3.50	2.00	5.00	18
	Sphagnum girgensohnii	1.00	1.00	1.00	9
	Tetraphis pellucida	0.01	0.01	0.01	9
	Thuidium delicatulum	3.83	0.50	10.00	27
	Trichocolea tomentella	1.00	1.00	1.00	9
Total					41

### Hypericum densiflorum / Juncus effusus / Sphagnum spp. shrub peatland

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	10.00	10.00	10.00	3
	Picea rubens	7.75	1.00	20.00	25
	Pinus resinosa	1.00	1.00	1.00	3
	Pinus strobus	3.45	1.90	5.00	6
	Populus tremuloides	1.00	1.00	1.00	3
	Prunus serotina var. serotina	1.60	1.60	1.60	3
	Tsuga canadensis	3.00	1.00	5.00	6
T3	Acer rubrum	2.00	2.00	2.00	3
S1	Abies balsamea	0.01	0.01	0.01	3
	Acer rubrum	1.25	0.50	2.00	6
	Alnus incana ssp. rugosa	4.20	4.00	4.40	6
	Alnus serrulata	12.50	10.00	15.00	6
	Amelanchier laevis	1.03	0.02	2.20	13
	Betula alleghaniensis var. alleghaniensis	0.80	0.80	0.80	3
	Betula lenta	3.00	3.00	3.00	3
	Carpinus caroliniana ssp. virginiana	4.00	4.00	4.00	3
	Hypericum densiflorum	31.59	5.00	79.00	81
	Ilex verticillata	3.14	0.10	10.00	16
	Kalmia latifolia	2.00	1.00	3.00	6
	Liriodendron tulipifera	0.50	0.50	0.50	3
	Nyssa sylvatica	1.00	1.00	1.00	3
	Photinia melanocarpa	6.86	1.00	25.00	22
	Photinia pyrifolia	2.10	0.20	6.80	16
	Picea rubens	0.60	0.60	0.60	6
	Pinus strobus	1.00	1.00	1.00	3
	Rhododendron maximum	0.65	0.30	1.00	6
	Rhododendron periclymenoides	5.00	5.00	5.00	3
	Salix sericea	1.05	0.50	1.70	13
	Sambucus nigra ssp. canadensis	1.00	1.00	1.00	3
	Spiraea alba	8.00	1.00	25.00	13
	Spiraea tomentosa	4.47	1.00	8.40	9
	Tsuga canadensis	1.55	1.00	2.10	6
	Vaccinium angustifolium	6.86	0.30	15.00	16
	Vaccinium corymbosum	2.50	1.00	4.00	6
	Vaccinium myrtilloides	4.44	0.10	20.00	41
	Vaccinium pallidum	2.50	1.00	4.00	6
	Viburnum lentago	0.10	0.10	0.10	3

	<i>Viburnum nudum</i> var. <i>cassinoides</i>	4.80	0.02	15.00	28
	<i>Viburnum recognitum</i>	0.35	0.10	0.60	6
S2	<i>Acer rubrum</i>	1.00	1.00	1.00	6
	<i>Alnus incana</i> ssp. <i>rugosa</i>	1.00	1.00	1.00	3
	<i>Alnus serrulata</i>	10.00	10.00	10.00	3
	<i>Cornus amomum</i>	20.00	15.00	25.00	6
	<i>Hypericum densiflorum</i>	35.56	5.00	80.00	28
	<i>Ilex verticillata</i>	5.00	5.00	5.00	3
	<i>Kalmia latifolia</i>	3.00	1.00	5.00	6
	<i>Liriodendron tulipifera</i>	0.50	0.50	0.50	3
	<i>Lyonia ligustrina</i> var. <i>ligustrina</i>	15.00	15.00	15.00	3
	<i>Menziesia pilosa</i>	5.00	5.00	5.00	3
	<i>Rhododendron calendulaceum</i>	0.50	0.50	0.50	3
	<i>Rosa multiflora</i>	0.50	0.50	0.50	3
	<i>Rubus</i>	1.00	1.00	1.00	3
	<i>Rubus hispidus</i>	14.33	3.00	20.00	9
	<i>Salix sericea</i>	0.50	0.50	0.50	3
	<i>Spiraea alba</i>	6.63	0.50	20.00	13
	<i>Spiraea tomentosa</i>	12.75	0.50	25.00	6
	<i>Vaccinium myrtilloides</i>	5.00	5.00	5.00	3
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	2.00	2.00	2.00	3
	<i>Viburnum recognitum</i>	20.00	20.00	20.00	3
H	<i>Acer rubrum</i>	0.01	0.01	0.01	6
	<i>Agrostis gigantea</i>	1.36	0.10	6.90	31
	<i>Agrostis hyemalis</i>	0.93	0.20	1.60	19
	<i>Agrostis perennans</i>	0.79	0.02	3.00	22
	<i>Alnus serrulata</i>	5.00	5.00	5.00	3
	<i>Andropogon glomeratus</i> var. <i>glomeratus</i>	0.01	0.01	0.01	3
	<i>Andropogon gyrans</i> var. <i>gyrans</i>	1.00	1.00	1.00	3
	<i>Anthoxanthum odoratum</i> ssp. <i>odoratum</i>	1.94	1.00	2.89	6
	<i>Bidens vulgata</i>	1.00	1.00	1.00	6
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	0.91	0.11	1.70	6
	<i>Carex atlantica</i>	2.50	0.50	4.00	9
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	2.30	0.60	4.00	6
	<i>Carex baileyi</i>	2.00	0.10	3.00	19
	<i>Carex bromoides</i> ssp. <i>bromoides</i>	0.50	0.50	0.50	3
	<i>Carex brunnescens</i>	1.23	0.67	1.67	13
	<i>Carex canescens</i>	2.33	2.33	2.33	3
	<i>Carex crinita</i>	4.00	3.00	5.00	13
	<i>Carex debilis</i>	0.65	0.33	1.33	13
	<i>Carex debilis</i> var. <i>rudgei</i>	1.01	0.20	1.89	13
	<i>Carex echinata</i> ssp. <i>echinata</i>	1.67	1.67	1.67	3
	<i>Carex folliculata</i>	8.30	0.40	28.90	34
	<i>Carex gynandra</i>	4.36	0.40	28.34	41
	<i>Carex interior</i>	16.87	0.11	50.00	9
	<i>Carex intumescens</i>	17.50	10.00	25.00	6
	<i>Carex leptalea</i> ssp. <i>leptalea</i>	1.94	0.89	3.00	6
	<i>Carex lurida</i>	0.96	0.50	1.78	16
	<i>Carex scoparia</i> var. <i>scoparia</i>	1.27	0.22	3.20	50

Carex stipata	9.00	0.50	35.00	47
Carex stricta	7.33	2.00	10.00	9
Carex trisperma var. trisperma	1.77	0.22	4.00	16
Carex vulpinoidea	3.00	3.00	3.00	3
Cinna arundinacea	0.50	0.50	0.50	3
Cornus amomum	2.00	2.00	2.00	3
Crepis pulchra	0.50	0.50	0.50	3
Cuscuta	0.50	0.50	0.50	3
Cystopteris	0.50	0.50	0.50	3
Danthonia compressa	4.96	0.56	12.00	22
Danthonia spicata	3.90	3.00	4.80	6
Dichanthelium	2.00	2.00	2.00	3
Dichanthelium clandestinum	3.30	3.30	3.30	3
Dichanthelium dichotomum ssp. microcarpon	11.33	1.00	30.00	9
Doellingeria umbellata var. umbellata	0.50	0.50	0.50	3
Drosera rotundifolia var. rotundifolia	0.22	0.11	0.50	19
Dryopteris	0.56	0.56	0.56	3
Dryopteris campyloptera	0.50	0.50	0.50	3
Dryopteris cristata	0.50	0.50	0.50	3
Dryopteris intermedia	0.50	0.50	0.50	3
Dryopteris marginalis	2.22	2.22	2.22	3
Dulichium arundinaceum	0.40	0.20	0.60	6
Eleocharis	2.50	2.00	3.00	6
Eleocharis obtusa	0.50	0.50	0.50	9
Eleocharis tenuis	8.61	2.22	15.00	6
Epigaea repens	0.33	0.10	0.56	6
Epilobium ciliatum	0.50	0.50	0.50	3
Eriophorum virginicum	2.02	0.10	9.56	50
Eupatorium fistulosum	0.50	0.50	0.50	3
Eupatorium perfoliatum var. perfoliatum	0.75	0.50	1.00	13
Euthamia graminifolia var. graminifolia	0.94	0.20	3.00	16
Galium aparine	1.25	0.50	2.00	6
Galium asprellum	1.67	1.00	3.00	9
Galium tinctorium	0.63	0.01	1.00	13
Gaultheria hispidula	0.01	0.01	0.01	3
Gaultheria procumbens	1.67	0.44	2.89	6
Gentiana linearis	1.45	0.22	5.20	38
Glyceria canadensis	5.27	0.30	15.00	9
Glyceria striata	4.80	1.00	8.60	6
Holcus lanatus	0.50	0.50	0.50	9
Hypericum canadense	1.00	1.00	1.00	3
Hypericum densiflorum	7.50	5.00	10.00	6
Hypericum ellipticum	0.54	0.22	1.00	13
Hypericum mutilum	3.00	1.00	8.00	13
Hypericum perforatum	1.00	1.00	1.00	3
Hypnum imponens	0.11	0.11	0.11	3
Ilex verticillata	3.00	3.00	3.00	3
Impatiens	1.10	0.50	3.00	16
Impatiens capensis	5.00	5.00	5.00	3

<i>Impatiens pallida</i>	1.00	1.00	1.00	3
<i>Juncus</i>	6.08	0.11	18.67	31
<i>Juncus acuminatus</i>	0.50	0.50	0.50	3
<i>Juncus brevicaudatus</i>	0.70	0.50	1.00	9
<i>Juncus effusus</i>	5.99	0.40	20.00	69
<i>Juncus effusus</i> var. <i>solutus</i>	5.00	5.00	5.00	3
<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	1.66	0.10	5.00	16
<i>Juncus tenuis</i>	0.75	0.50	1.00	6
<i>Leersia oryzoides</i>	0.68	0.50	1.00	13
<i>Lilium superbum</i>	0.01	0.01	0.01	3
<i>Linum striatum</i>	1.00	1.00	1.00	3
<i>Lobelia siphilitica</i> var. <i>siphilitica</i>	1.00	1.00	1.00	6
<i>Ludwigia palustris</i>	0.58	0.50	0.67	6
<i>Lycopodiella inundata</i>	1.01	0.01	2.00	6
<i>Lycopodium clavatum</i>	0.74	0.01	1.78	19
<i>Lycopodium obscurum</i>	1.98	0.33	5.00	22
<i>Lycopodium tristachyum</i>	0.50	0.50	0.50	3
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.99	0.20	3.00	22
<i>Lycopus virginicus</i>	1.00	1.00	1.00	3
<i>Lysimachia quadrifolia</i>	0.01	0.01	0.01	3
<i>Onoclea sensibilis</i>	20.88	0.01	80.00	13
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.46	0.01	4.20	38
<i>Oxalis stricta</i>	0.01	0.01	0.01	3
<i>Oxypolis rigidior</i>	0.50	0.50	0.50	3
<i>Panicum</i>	0.50	0.50	0.50	3
<i>Parthenocissus quinquefolia</i>	1.00	1.00	1.00	3
<i>Pedicularis canadensis</i> ssp. <i>canadensis</i>	0.50	0.50	0.50	3
<i>Phalaris arundinacea</i>	0.11	0.11	0.11	3
<i>Picea rubens</i>	0.10	0.10	0.10	3
<i>Pinus strobus</i>	0.10	0.10	0.10	3
<i>Platanthera clavellata</i>	0.34	0.01	0.56	9
<i>Poa</i>	0.50	0.50	0.50	3
<i>Poa compressa</i>	0.50	0.50	0.50	3
<i>Polygonum hydropiperoides</i>	1.00	1.00	1.00	6
<i>Polygonum sagittatum</i>	0.94	0.20	3.00	16
<i>Polystichum acrostichoides</i>	1.00	1.00	1.00	3
<i>Potamogeton epihydrus</i>	0.01	0.01	0.01	3
<i>Potentilla simplex</i>	1.51	0.02	3.00	6
<i>Prunus serotina</i> var. <i>serotina</i>	0.20	0.10	0.30	6
<i>Prunus virginiana</i> var. <i>virginiana</i>	0.50	0.50	0.50	3
<i>Pteridium aquilinum</i>	0.42	0.11	1.00	13
<i>Rhododendron periclymenoides</i>	0.50	0.50	0.50	3
<i>Rosa</i>	0.50	0.50	0.50	3
<i>Rubus</i>	23.00	1.00	45.00	6
<i>Rubus hispidus</i>	35.08	3.00	78.00	81
<i>Rumex acetosella</i>	1.00	1.00	1.00	3
<i>Schoenoplectus pungens</i> var. <i>pungens</i>	5.00	5.00	5.00	3
<i>Schoenoplectus tabernaemontani</i>	2.00	2.00	2.00	3
<i>Scirpus atrocinctus</i>	0.50	0.50	0.50	3

	<i>Scirpus atrovirens</i>	0.26	0.01	0.50	6
	<i>Scirpus cyperinus</i>	4.07	0.50	20.00	50
	<i>Scirpus expansus</i>	5.00	2.00	10.00	13
	<i>Scutellaria lateriflora</i> var. <i>lateriflora</i>	0.50	0.50	0.50	3
	<i>Smilax rotundifolia</i>	0.50	0.50	0.50	3
	<i>Solanum carolinense</i> var. <i>carolinense</i>	1.00	1.00	1.00	3
	<i>Solidago canadensis</i>	1.00	1.00	1.00	6
	<i>Solidago nemoralis</i> var. <i>nemoralis</i>	0.50	0.50	0.50	3
	<i>Solidago rugosa</i>	1.67	0.10	6.00	31
	<i>Solidago uliginosa</i>	7.17	0.50	36.00	72
	<i>Sparganium americanum</i>	7.75	0.50	15.00	6
	<i>Sparganium chlorocarpum</i>	0.61	0.33	1.00	9
	<i>Spiraea alba</i>	5.00	5.00	5.00	3
	<i>Spiraea tomentosa</i>	1.00	1.00	1.00	3
	<i>Spiranthes cernua</i>	0.01	0.01	0.01	3
	<i>Stellaria graminea</i>	0.22	0.11	0.44	9
	<i>Symphyotrichum</i>	0.50	0.50	0.50	3
	<i>Symphyotrichum racemosum</i>	1.00	1.00	1.00	3
	<i>Symplocarpus foetidus</i>	2.00	2.00	2.00	3
	<i>Thelypteris noveboracensis</i>	1.00	0.50	2.00	9
	<i>Thelypteris palustris</i> var. <i>pubescens</i>	0.50	0.50	0.50	3
	<i>Toxicodendron radicans</i>	0.50	0.50	0.50	3
	<i>Triadenum fraseri</i>	1.63	0.50	3.00	9
	<i>Trifolium</i>	4.20	4.20	4.20	3
	<i>Tsuga canadensis</i>	0.10	0.10	0.10	3
	<i>Typha latifolia</i>	2.55	0.10	5.00	6
	<i>Vaccinium macrocarpon</i>	0.22	0.22	0.22	3
	<i>Vaccinium oxycoccos</i>	10.19	1.70	30.56	16
	<i>Verbena hastata</i> var. <i>hastata</i>	0.50	0.50	0.50	3
	<i>Vernonia noveboracensis</i>	10.60	10.60	10.60	3
	<i>Veronica</i>	0.50	0.50	0.50	3
	<i>Viburnum recognitum</i>	3.00	3.00	3.00	3
	<i>Viola</i>	2.51	0.56	7.00	25
	<i>Viola ×primulifolia</i>	0.67	0.50	1.00	9
	<i>Viola cucullata</i>	1.00	1.00	1.00	6
	<i>Viola macloskeyi</i> ssp. <i>pallens</i>	0.50	0.50	0.50	3
N	<i>Aulacomnium palustre</i>	1.60	0.30	4.00	9
	<i>Hygrohypnum eugyrium</i>	1.47	0.11	3.80	19
	<i>Leucobryum albidum</i>	1.38	1.20	1.56	6
	<i>Leucobryum glaucum</i>	0.35	0.11	1.11	19
	<i>Pleurozium schreberi</i>	0.40	0.40	0.40	3
	<i>Polytrichum commune</i>	31.93	0.40	69.00	25
	<i>Polytrichum strictum</i>	15.50	0.50	45.00	9
	<i>Sphagnum</i>	24.97	9.60	48.34	47
	<i>Sphagnum affine</i>	10.50	0.50	26.00	9
	<i>Sphagnum capillifolium</i> var. <i>capillifolium</i>	60.00	60.00	60.00	3
	<i>Sphagnum fallax</i>	15.00	15.00	15.00	3
	<i>Sphagnum fimbriatum</i>	9.00	9.00	9.00	3
	<i>Sphagnum flexuosum</i>	25.00	25.00	25.00	3

	Sphagnum girgensohnii	0.30	0.30	0.30	3
	Sphagnum magellanicum	25.00	25.00	25.00	3
	Sphagnum recurvum	13.45	1.00	64.60	25
	Thuidium delicatulum	0.50	0.50	0.50	3
Total					27

**Larix laricina / Ilex verticillata / Symplocarpus foetidus - Osmunda cinnamomea / Sphagnum spp. woodland swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	8.33	5.00	10.00	60
	Betula alleghaniensis var. alleghaniensis	8.50	2.00	15.00	40
	Larix laricina	18.75	3.00	30.00	80
	Pinus rigida	7.50	3.00	12.00	40
	Pinus strobus	4.67	1.00	10.00	60
	Populus tremuloides	4.00	4.00	4.00	20
	Tsuga canadensis	8.00	8.00	8.00	20
T3	Acer rubrum	8.00	1.00	16.00	60
	Amelanchier arborea var. arborea	1.00	1.00	1.00	20
	Betula alleghaniensis var. alleghaniensis	12.00	7.00	17.00	40
	Larix laricina	3.00	1.00	6.00	60
	Pinus rigida	1.00	1.00	1.00	20
	Sorbus americana	0.01	0.01	0.01	20
	Tsuga canadensis	1.00	1.00	1.00	20
S1	Acer rubrum	3.00	1.00	5.00	40
	Alnus incana ssp. rugosa	4.50	3.00	6.00	40
	Amelanchier	1.00	1.00	1.00	20
	Amelanchier laevis	2.00	2.00	2.00	20
	Betula alleghaniensis var. alleghaniensis	2.00	2.00	2.00	20
	Hypericum densiflorum	2.00	2.00	2.00	20
	Ilex verticillata	10.33	1.00	20.00	60
	Kalmia latifolia	0.01	0.01	0.01	20
	Larix laricina	3.50	2.00	5.00	40
	Lindera benzoin	1.00	1.00	1.00	20
	Nemopanthus mucronatus	2.33	1.00	5.00	60
	Photinia melanocarpa	10.00	3.00	17.00	40
	Photinia pyrifolia	5.00	5.00	5.00	20
	Rhododendron maximum	11.50	8.00	15.00	40
	Tsuga canadensis	5.00	5.00	5.00	20
	Vaccinium corymbosum	5.00	5.00	5.00	20
	Vaccinium myrtilloides	10.00	10.00	10.00	20
Viburnum nudum var. cassinoides	1.00	1.00	1.00	20	
Viburnum recognitum	1.50	0.50	2.00	60	
S2	Gaylussacia baccata	0.50	0.50	0.50	20
	Hypericum densiflorum	1.00	1.00	1.00	20
	Ilex verticillata	19.00	3.00	35.00	40
	Lindera benzoin	0.50	0.50	0.50	20
	Nemopanthus mucronatus	0.50	0.50	0.50	20
	Photinia melanocarpa	4.00	4.00	4.00	20

	<i>Photinia pyrifolia</i>	20.00	20.00	20.00	20
	<i>Rhododendron maximum</i>	10.00	10.00	10.00	20
	<i>Vaccinium myrtilloides</i>	8.00	1.00	20.00	60
	<i>Viburnum recognitum</i>	1.00	1.00	1.00	20
H	<i>Acer rubrum</i>	0.50	0.50	0.50	40
	<i>Agrostis gigantea</i>	1.20	1.20	1.20	20
	<i>Agrostis perennans</i>	1.00	1.00	1.00	20
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.01	0.01	0.01	20
	<i>Amelanchier laevis</i>	0.01	0.01	0.01	20
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	8.22	8.22	8.22	20
	<i>Carex</i>	1.00	1.00	1.00	20
	<i>Carex atlantica</i>	0.50	0.50	0.50	20
	<i>Carex canescens</i>	0.01	0.01	0.01	20
	<i>Carex folliculata</i>	3.33	2.00	5.00	60
	<i>Carex gynandra</i>	3.78	1.00	6.56	40
	<i>Carex interior</i>	0.01	0.01	0.01	20
	<i>Carex intumescens</i>	3.00	3.00	3.00	20
	<i>Carex trisperma</i> var. <i>trisperma</i>	0.01	0.01	0.01	20
	<i>Eriophorum virginicum</i>	1.04	0.01	3.00	60
	<i>Gaultheria hispidula</i>	1.00	1.00	1.00	20
	<i>Gaultheria procumbens</i>	1.00	1.00	1.00	20
	<i>Gentiana</i>	0.50	0.50	0.50	20
	<i>Glyceria</i>	0.50	0.50	0.50	40
	<i>Glyceria laxa</i>	3.00	3.00	3.00	20
	<i>Glyceria melicaria</i>	1.00	1.00	1.00	20
	<i>Hypnum imponens</i>	0.11	0.11	0.11	20
	<i>Ilex verticillata</i>	0.50	0.50	0.50	20
	<i>Juncus</i>	0.42	0.33	0.50	40
	<i>Juncus effusus</i>	0.50	0.50	0.50	20
	<i>Leersia oryzoides</i>	1.75	0.50	3.00	40
	<i>Lolium perenne</i>	0.56	0.56	0.56	20
	<i>Lycopodium clavatum</i>	0.67	0.67	0.67	20
	<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.36	0.22	0.50	40
	<i>Maianthemum canadense</i>	0.01	0.01	0.01	20
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	9.69	3.00	15.00	100
	<i>Rhododendron maximum</i>	0.26	0.01	0.50	40
	<i>Rubus hispidus</i>	7.60	1.00	15.00	100
	<i>Scirpus cyperinus</i>	1.00	1.00	1.00	20
	<i>Symplocarpus foetidus</i>	22.44	3.00	50.00	100
	<i>Triadenum</i>	0.01	0.01	0.01	20
	<i>Viburnum recognitum</i>	0.01	0.01	0.01	20
N	<i>Aulacomnium palustre</i>	8.30	8.30	8.30	20
	<i>Dicranum</i>	0.01	0.01	0.01	20
	<i>Hypnum</i>	0.50	0.50	0.50	40
	<i>Leucobryum</i>	0.50	0.50	0.50	20
	<i>Leucobryum glaucum</i>	0.22	0.22	0.22	20
	<i>Polytrichum</i>	13.00	13.00	13.00	20
	<i>Polytrichum juniperinum</i>	15.00	15.00	15.00	20
	<i>Sphagnum</i>	25.40	18.20	38.00	60

	Sphagnum fallax	10.00	10.00	10.00	20
	Sphagnum fimbriatum	8.30	8.30	8.30	20
	Sphagnum palustre	9.15	8.30	10.00	40
Total					44

### Leersia oryzoides - Sagittaria latifolia marsh

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer saccharinum	18.00	18.00	18.00	5
	Quercus palustris	4.00	4.00	4.00	5
T3	Acer saccharinum	3.00	3.00	3.00	5
	Betula nigra	10.00	10.00	10.00	5
	Fraxinus americana	5.00	5.00	5.00	5
	Robinia pseudoacacia	10.00	10.00	10.00	5
	Salix nigra	10.00	10.00	10.00	5
S1	Robinia pseudoacacia	3.00	3.00	3.00	5
S2	Acer saccharinum	5.00	5.00	5.00	5
	Cornus amomum	3.00	3.00	3.00	5
	Fraxinus pennsylvanica	1.00	1.00	1.00	10
	Ilex verticillata	0.01	0.01	0.01	5
	Kalmia latifolia	1.00	1.00	1.00	5
	Nemopanthus mucronatus	0.01	0.01	0.01	5
	Picea rubens	0.01	0.01	0.01	5
	Rosa multiflora	3.00	1.00	5.00	10
	Sambucus nigra ssp. canadensis	0.50	0.50	0.50	5
	Vaccinium myrtilloides	0.01	0.01	0.01	5
H	Acer rubrum	0.50	0.50	0.50	10
	Acer saccharinum	0.50	0.50	0.50	10
	Ageratina altissima	1.00	1.00	1.00	5
	Agrostis gigantea	1.00	1.00	1.00	5
	Agrostis hyemalis	1.25	0.50	2.00	10
	Alisma subcordatum	0.50	0.50	0.50	5
	Amphicarpaea bracteata	0.50	0.50	0.50	5
	Apios americana	0.50	0.50	0.50	10
	Asclepias	0.50	0.50	0.50	5
	Asclepias incarnata ssp. pulchra	0.83	0.50	1.00	15
	Betula lenta	0.50	0.50	0.50	5
	Bidens	0.60	0.50	1.00	25
	Bidens frondosa	1.00	1.00	1.00	5
	Boehmeria cylindrica	3.56	0.50	15.00	40
	Calamagrostis canadensis var. canadensis	30.00	30.00	30.00	5
	Callitriche heterophylla ssp. heterophylla	6.00	6.00	6.00	5
	Carex	0.50	0.50	0.50	5
	Carex amphibola	28.00	28.00	28.00	5
	Carex baileyi	4.00	4.00	4.00	5
	Carex canescens	2.00	2.00	2.00	5
	Carex crinita	1.00	1.00	1.00	5
	Carex cristatella	2.00	2.00	2.00	5
	Carex debilis var. rudgei	0.50	0.50	0.50	5

Carex folliculata	0.20	0.20	0.20	5
Carex gynandra	3.00	0.50	8.00	30
Carex intumescens	4.00	4.00	4.00	5
Carex lupulina	1.50	0.50	4.00	20
Carex lurida	10.50	1.00	20.00	10
Carex stipata	0.50	0.50	0.50	5
Carex straminea	5.00	5.00	5.00	5
Carex tribuloides	1.17	0.50	2.00	15
Carex trisperma var. trisperma	1.00	1.00	1.00	5
Carex vesicaria	5.00	5.00	5.00	5
Carex vulpinoidea	5.00	5.00	5.00	5
Cephalanthus occidentalis	4.10	0.50	15.00	25
Chelone glabra	2.00	2.00	2.00	5
Cinna arundinacea	0.50	0.50	0.50	5
Cornus amomum	2.00	1.00	3.00	10
Crepis capillaris	1.00	1.00	1.00	5
Cuscuta	1.00	1.00	1.00	5
Daucus carota	1.00	1.00	1.00	5
Dichanthelium clandestinum	2.00	1.00	3.00	15
Dichanthelium polyanthes	0.50	0.50	0.50	5
Dipsacus fullonum	1.00	1.00	1.00	5
Dulichium arundinaceum	7.10	0.50	25.00	25
Echinochloa crus-galli	0.75	0.50	1.00	10
Elymus virginicus var. virginicus	0.75	0.50	1.00	10
Epilobium coloratum	0.75	0.50	1.00	10
Erechtites hieraciifolia var. hieraciifolia	0.50	0.50	0.50	5
Eriophorum virginicum	0.50	0.50	0.50	5
Eupatorium	0.50	0.50	0.50	5
Eupatorium fistulosum	0.80	0.50	1.00	25
Eupatorium perfoliatum var. perfoliatum	0.83	0.50	1.00	15
Euthamia graminifolia var. graminifolia	3.00	3.00	3.00	5
Galium aparine	0.50	0.50	0.50	5
Galium tinctorium	1.36	0.01	3.00	35
Geum canadense var. canadense	0.50	0.50	0.50	5
Glyceria canadensis	0.50	0.50	0.50	5
Hibiscus moscheutos ssp. moscheutos	4.00	4.00	4.00	5
Hypericum mutilum	1.50	1.00	2.00	10
Impatiens	1.63	0.50	3.00	20
Impatiens capensis	3.10	0.50	10.00	25
Impatiens pallida	1.00	1.00	1.00	5
Iris	2.00	2.00	2.00	5
Juncus brevicaudatus	8.87	1.00	21.60	15
Juncus effusus	6.25	0.50	25.00	30
Juncus effusus var. solutus	2.00	1.00	3.00	10
Leersia oryzoides	53.47	3.00	90.00	100
Leersia virginica	0.50	0.50	0.50	5
Lemna minor	10.00	10.00	10.00	5
Lobelia siphilitica var. siphilitica	1.00	1.00	1.00	10
Lonicera japonica	1.00	1.00	1.00	5

Ludwigia alternifolia	0.50	0.50	0.50	5
Ludwigia palustris	4.92	0.50	25.00	30
Lycopus americanus	0.50	0.50	0.50	15
Lycopus uniflorus var. uniflorus	1.63	0.50	5.00	20
Lycopus virginicus	0.63	0.50	1.00	20
Lysimachia ciliata	1.00	1.00	1.00	10
Lysimachia nummularia	0.50	0.50	0.50	5
Lysimachia terrestris	16.88	0.50	65.00	20
Lythrum salicaria	2.00	2.00	2.00	5
Mentha arvensis	2.00	2.00	2.00	5
Mimulus alatus	0.75	0.50	1.00	10
Mimulus ringens var. ringens	0.67	0.50	1.00	15
Mitchella repens	0.50	0.50	0.50	5
Onoclea sensibilis	0.50	0.50	0.50	15
Osmunda cinnamomea var. cinnamomea	1.00	1.00	1.00	10
Osmunda regalis var. spectabilis	0.83	0.50	1.00	15
Packera aurea	1.00	1.00	1.00	10
Parthenocissus quinquefolia	1.00	1.00	1.00	5
Penthorum sedoides	0.50	0.50	0.50	5
Phalaris arundinacea	8.67	3.00	20.00	15
Pilea pumila var. pumila	2.00	2.00	2.00	15
Platanus occidentalis	0.50	0.50	0.50	5
Polygonum hydropiper	7.50	5.00	10.00	10
Polygonum hydropiperoides	1.00	1.00	1.00	5
Polygonum pensylvanicum	10.00	10.00	10.00	5
Polygonum persicaria	2.00	2.00	2.00	5
Polygonum punctatum	0.50	0.50	0.50	5
Polygonum sagittatum	5.00	0.50	15.00	40
Polygonum virginianum	0.50	0.50	0.50	5
Prunella vulgaris	1.00	1.00	1.00	5
Pycnanthemum	0.50	0.50	0.50	5
Rhynchospora alba	2.00	2.00	2.00	5
Rosa multiflora	0.50	0.50	0.50	5
Rubus	2.00	1.00	3.00	10
Rubus hispidus	1.00	1.00	1.00	10
Rumex crispus ssp. crispus	0.50	0.50	0.50	5
Sagittaria latifolia	18.58	0.50	75.00	60
Salix nigra	0.50	0.50	0.50	5
Sambucus nigra ssp. canadensis	0.50	0.50	0.50	10
Saururus cernuus	20.00	20.00	20.00	5
Scirpus	0.50	0.50	0.50	5
Scirpus atrocinctus	2.00	2.00	2.00	5
Scirpus atrovirens	0.83	0.50	1.00	15
Scirpus cyperinus	1.02	0.20	3.00	55
Scirpus expansus	1.00	1.00	1.00	5
Scutellaria	1.75	0.50	3.00	10
Scutellaria saxatilis	0.50	0.50	0.50	5
Solidago canadensis	1.00	1.00	1.00	5
Solidago rugosa	3.00	3.00	3.00	5

	Solidago uliginosa	0.01	0.01	0.01	5
	Sparganium chlorocarpum	2.67	1.00	4.00	15
	Sparganium eurycarpum	0.50	0.50	0.50	10
	Spiraea tomentosa	1.00	1.00	1.00	5
	Stachys	0.50	0.50	0.50	5
	Symphytotrichum lanceolatum ssp. lanceolatum var. lanceolatum	1.00	1.00	1.00	10
	Symphytotrichum pilosum	1.00	1.00	1.00	5
	Symphytotrichum prenanthoides	0.75	0.50	1.00	10
	Symphytotrichum puniceum var. puniceum	1.00	1.00	1.00	5
	Thelypteris noveboracensis	2.00	2.00	2.00	5
	Toxicodendron radicans	0.75	0.50	1.00	10
	Triadenum fraseri	0.75	0.50	1.00	10
	Typha latifolia	2.00	1.00	5.00	30
	Verbesina alternifolia	3.00	3.00	3.00	5
	Vernonia noveboracensis	1.00	1.00	1.00	10
	Viola	0.40	0.20	0.50	15
	Viola cucullata	0.75	0.50	1.00	10
	Zea mays ssp. mays	0.50	0.50	0.50	5
N	Atrichum crispum	15.00	15.00	15.00	5
	Mnium	0.50	0.50	0.50	5
	Polytrichum commune	0.50	0.50	0.50	5
	Polytrichum pallidisetum	0.50	0.50	0.50	5
	Polytrichum strictum	0.50	0.50	0.50	5
	Sphagnum cuspidatum	0.50	0.50	0.50	5
	Sphagnum fallax	46.00	2.00	90.00	10
Total					23

**Photinia (melanocarpa, pyrifolia) - Viburnum nudum var. cassinoides / Eriophorum virginicum / Sphagnum shrub peatland**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	1.33	0.01	5.00	19
	Betula alleghaniensis var. alleghaniensis	10.00	10.00	10.00	2
	Larix laricina	3.00	3.00	3.00	2
	Nyssa sylvatica	2.00	2.00	2.00	2
	Picea abies	5.00	5.00	5.00	2
	Picea rubens	5.00	1.00	20.00	19
	Pinus	3.00	3.00	3.00	2
	Sorbus americana	0.01	0.01	0.01	2
	Tsuga canadensis	2.88	1.00	7.00	13
T3	Acer rubrum	0.51	0.01	1.00	3
	Amelanchier	3.00	3.00	3.00	2
	Betula alleghaniensis var. alleghaniensis	1.00	1.00	1.00	2
	Larix laricina	3.00	3.00	3.00	2
	Picea rubens	1.80	0.01	5.00	8
	Populus tremuloides	3.00	3.00	3.00	2
	Sorbus americana	0.01	0.01	0.01	2
	Tsuga canadensis	1.33	1.00	2.00	5

S1	<i>Acer rubrum</i>	1.25	0.01	3.00	6
	<i>Alnus incana</i> ssp. <i>rugosa</i>	37.43	2.00	75.00	11
	<i>Amelanchier</i>	3.00	3.00	3.00	2
	<i>Amelanchier arborea</i> var. <i>arborea</i>	1.67	1.00	3.00	5
	<i>Amelanchier laevis</i>	0.21	0.02	0.40	3
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.80	0.60	1.00	3
	<i>Hypericum densiflorum</i>	7.45	0.40	41.40	21
	<i>Ilex montana</i>	3.50	1.00	5.00	6
	<i>Ilex verticillata</i>	14.04	0.20	63.00	19
	<i>Kalmia latifolia</i>	2.95	1.00	10.00	19
	<i>Larix laricina</i>	3.00	3.00	3.00	2
	<i>Nemopanthus mucronatus</i>	6.30	0.60	38.00	19
	<i>Photinia melanocarpa</i>	30.02	0.50	70.00	53
	<i>Photinia pyrifolia</i>	6.17	0.20	26.00	10
	<i>Picea rubens</i>	3.20	0.01	10.00	8
	<i>Pinus rigida</i>	25.00	25.00	25.00	2
	<i>Pinus strobus</i>	1.00	1.00	1.00	2
	<i>Populus tremuloides</i>	18.00	18.00	18.00	2
	<i>Rhododendron maximum</i>	5.73	0.50	38.00	26
	<i>Salix nigra</i>	1.00	1.00	1.00	2
	<i>Salix sericea</i>	0.02	0.02	0.02	2
	<i>Spiraea alba</i>	6.00	6.00	6.00	2
	<i>Tsuga canadensis</i>	0.75	0.50	1.00	3
	<i>Vaccinium angustifolium</i>	2.71	1.00	5.00	11
	<i>Vaccinium corymbosum</i>	2.67	1.00	4.00	15
	<i>Vaccinium myrtilloides</i>	7.18	0.20	35.00	26
	<i>Vaccinium pallidum</i>	5.50	1.00	10.00	3
<i>Viburnum nudum</i> var. <i>cassinoides</i>	3.39	0.20	15.00	61	
<i>Viburnum recognitum</i>	1.00	1.00	1.00	3	
S2	<i>Acer rubrum</i>	0.50	0.50	0.50	3
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	2
	<i>Amelanchier laevis</i>	0.50	0.50	0.50	2
	<i>Gaylussacia baccata</i>	8.75	0.50	25.00	10
	<i>Hypericum densiflorum</i>	7.00	0.50	38.00	11
	<i>Ilex verticillata</i>	19.33	1.00	50.00	5
	<i>Kalmia latifolia</i>	2.60	0.50	5.00	8
	<i>Menziesia pilosa</i>	2.00	2.00	2.00	2
	<i>Nemopanthus mucronatus</i>	6.75	1.00	20.00	6
	<i>Photinia melanocarpa</i>	24.05	1.00	66.00	34
	<i>Photinia pyrifolia</i>	6.86	0.50	25.00	11
	<i>Picea rubens</i>	1.88	0.50	5.00	6
	<i>Pinus rigida</i>	1.00	1.00	1.00	2
	<i>Pinus strobus</i>	0.50	0.50	0.50	2
	<i>Rhododendron maximum</i>	1.88	0.50	5.00	6
	<i>Rubus hispidus</i>	30.00	30.00	30.00	2
	<i>Tsuga canadensis</i>	0.26	0.01	0.50	3
	<i>Vaccinium angustifolium</i>	1.50	0.50	3.00	5
	<i>Vaccinium macrocarpon</i>	32.50	25.00	40.00	3
	<i>Vaccinium myrtilloides</i>	12.33	0.50	60.00	37

	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.75	0.01	3.00	10
H	<i>Acer rubrum</i>	0.07	0.01	0.20	5
	<i>Agrostis gigantea</i>	1.52	0.40	6.00	11
	<i>Agrostis hyemalis</i>	2.49	0.01	6.60	8
	<i>Amelanchier laevis</i>	0.01	0.01	0.01	2
	<i>Bartonia virginica</i>	0.50	0.50	0.50	2
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.60	0.20	1.00	3
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	5.01	0.11	11.78	8
	<i>Carex</i>	0.44	0.33	0.50	5
	<i>Carex atlantica</i>	1.83	0.50	4.00	5
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	4.93	2.40	9.00	5
	<i>Carex brunnescens</i>	0.86	0.11	2.20	6
	<i>Carex canescens</i>	3.47	0.40	11.60	15
	<i>Carex echinata</i> ssp. <i>echinata</i>	0.50	0.50	0.50	2
	<i>Carex folliculata</i>	7.97	0.01	45.00	48
	<i>Carex gynandra</i>	2.27	0.01	7.70	15
	<i>Carex interior</i>	0.01	0.01	0.01	2
	<i>Carex leptalea</i> ssp. <i>leptalea</i>	1.33	1.33	1.33	2
	<i>Carex pauciflora</i>	2.78	2.78	2.78	2
	<i>Carex scoparia</i> var. <i>scoparia</i>	1.00	1.00	1.00	2
	<i>Carex stipata</i>	5.84	0.22	21.11	24
	<i>Carex stricta</i>	0.01	0.01	0.01	2
	<i>Carex trisperma</i> var. <i>trisperma</i>	3.82	0.11	20.22	19
	<i>Carex vesicaria</i>	2.22	2.22	2.22	2
	<i>Coptis trifolia</i>	0.01	0.01	0.01	2
	<i>Cypripedium acaule</i>	0.11	0.11	0.11	2
	<i>Dalibarda repens</i>	1.00	1.00	1.00	2
	<i>Danthonia compressa</i>	3.36	0.50	12.00	11
	<i>Danthonia spicata</i>	11.00	11.00	11.00	2
	<i>Dennstaedtia punctilobula</i>	0.02	0.02	0.02	2
	<i>Deschampsia flexuosa</i> var. <i>flexuosa</i>	0.50	0.50	0.50	2
	<i>Dichanthelium clandestinum</i>	0.60	0.60	0.60	2
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.94	0.11	3.22	34
	<i>Dulichium arundinaceum</i>	0.26	0.01	0.50	3
	<i>Eleocharis tenuis</i>	16.44	2.78	50.00	8
	<i>Eriophorum virginicum</i>	8.33	0.01	50.00	89
	<i>Galium</i>	0.01	0.01	0.01	2
	<i>Gaultheria hispidula</i>	3.75	0.56	8.45	6
	<i>Gaultheria procumbens</i>	3.87	0.33	15.00	16
	<i>Gentiana</i>	0.50	0.50	0.50	2
	<i>Gentiana linearis</i>	1.06	0.01	8.45	32
	<i>Glyceria canadensis</i>	1.50	0.01	5.00	6
	<i>Glyceria laxa</i>	0.26	0.01	0.50	3
	<i>Glyceria melicaria</i>	0.20	0.20	0.20	2
	<i>Glyceria striata</i>	0.75	0.50	1.00	3
	<i>Hypericum canadense</i>	0.50	0.50	0.50	2
	<i>Hypericum mutilum</i>	1.00	1.00	1.00	2
	<i>Ilex verticillata</i>	3.00	3.00	3.00	2
	<i>Juncus</i>	4.48	0.22	12.89	31

	<i>Juncus brevicaudatus</i>	2.07	0.50	7.40	15
	<i>Juncus canadensis</i>	1.80	0.01	5.00	8
	<i>Juncus effusus</i>	2.50	0.01	15.00	24
	<i>Juncus effusus</i> var. <i>solutus</i>	1.00	1.00	1.00	2
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	3.13	0.01	10.00	6
	<i>Juncus tenuis</i>	1.00	1.00	1.00	2
	<i>Larix laricina</i>	3.00	3.00	3.00	2
	<i>Leersia oryzoides</i>	15.40	3.00	27.00	5
	<i>Lycopodiella inundata</i>	0.50	0.50	0.50	2
	<i>Lycopodium annotinum</i>	1.00	1.00	1.00	2
	<i>Lycopodium clavatum</i>	0.31	0.10	0.50	11
	<i>Lycopodium hickeyi</i>	0.01	0.01	0.01	2
	<i>Lycopodium obscurum</i>	1.37	0.01	5.00	21
	<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.01	0.01	0.01	2
	<i>Maianthemum canadense</i>	0.51	0.01	1.00	3
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	5.49	0.11	38.00	45
	<i>Osmunda claytoniana</i>	0.50	0.50	0.50	2
	<i>Picea rubens</i>	0.50	0.50	0.50	2
	<i>Polygala sanguinea</i>	0.50	0.50	0.50	2
	<i>Polygonum sagittatum</i>	8.80	3.40	16.00	5
	<i>Pteridium aquilinum</i>	3.49	0.11	15.00	19
	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	1.00	1.00	1.00	2
	<i>Rhododendron maximum</i>	3.00	3.00	3.00	2
	<i>Rhynchospora alba</i>	4.89	0.50	19.22	27
	<i>Rubus</i>	13.40	1.00	40.00	8
	<i>Rubus hispidus</i>	36.63	1.00	88.00	95
	<i>Sarracenia purpurea</i> ssp. <i>gibbosa</i>	0.11	0.11	0.11	2
	<i>Scirpus atrovirens</i>	1.67	1.00	3.00	5
	<i>Scirpus cyperinus</i>	5.01	0.40	16.00	11
	<i>Solidago rugosa</i>	0.02	0.02	0.02	2
	<i>Solidago uliginosa</i>	4.05	0.11	38.00	55
	<i>Sorbus americana</i>	0.01	0.01	0.01	2
	<i>Sparganium</i>	0.50	0.50	0.50	2
	<i>Sparganium chlorocarpum</i>	5.87	1.00	15.00	5
	<i>Spiranthes cernua</i>	1.89	0.56	3.22	3
	<i>Symplocarpus foetidus</i>	8.57	0.50	38.00	35
	<i>Triadenum fraseri</i>	0.17	0.01	0.50	5
	<i>Trifolium</i>	0.39	0.11	0.67	3
	<i>Tsuga canadensis</i>	0.01	0.01	0.01	2
	<i>Typha latifolia</i>	0.56	0.56	0.56	2
	<i>Vaccinium macrocarpon</i>	1.96	0.01	8.00	21
	<i>Vaccinium oxycoccos</i>	4.69	0.50	11.90	21
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.51	0.01	1.00	3
	<i>Viola</i>	0.25	0.20	0.30	3
	<i>Zigadenus leimanthoides</i>	1.33	1.00	2.00	5
N	<i>Aulacomnium</i>	0.50	0.50	0.50	2
	<i>Cladonia</i>	9.50	0.01	40.00	11
	<i>Cladonia arbuscula</i>	6.00	2.00	10.00	3
	<i>Cladonia cristatella</i>	1.00	1.00	1.00	2

Cladonia rangiferina	1.00	1.00	1.00	3
Cladonia subtenuis	1.00	1.00	1.00	2
Hygrohypnum eugyrium	1.77	0.10	6.70	18
Hypnum	0.50	0.50	0.50	2
Hypnum imponens	0.50	0.50	0.50	2
Leucobryum albidum	0.15	0.11	0.22	5
Leucobryum glaucum	0.40	0.10	0.78	6
Polytrichum	15.91	2.00	30.00	18
Polytrichum commune	16.12	0.50	49.20	21
Polytrichum juniperinum	19.67	1.00	38.00	5
Polytrichum ohioense	9.00	3.00	15.00	3
Polytrichum strictum	12.00	3.00	30.00	5
Sphagnum	46.56	1.00	90.00	82
Sphagnum affine	4.45	0.40	10.00	6
Sphagnum capillifolium var. capillifolium	19.33	2.00	35.00	5
Sphagnum cuspidatum	2.00	2.00	2.00	2
Sphagnum fallax	45.63	10.00	90.00	6
Sphagnum fimbriatum	32.70	32.70	32.70	2
Sphagnum flexuosum	29.00	29.00	29.00	2
Sphagnum girgensohnii	4.00	2.00	6.00	3
Sphagnum magellanicum	23.05	5.00	47.50	6
Sphagnum papillosum	21.75	4.00	50.00	6
Sphagnum recurvum	17.90	4.00	32.70	11
Sphagnum rubellum	16.50	3.00	30.00	3
Total				32

**Picea rubens - Betula alleghaniensis var. alleghaniensis - Tsuga canadensis / Glyceria melicaria / Sphagnum spp. forested swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Abies balsamea	3.50	3.00	4.00	8
	Acer rubrum	6.45	1.00	10.00	44
	Acer rubrum var. trilobum	5.00	5.00	5.00	4
	Betula alleghaniensis var. alleghaniensis	20.26	1.00	65.00	76
	Betula lenta	10.50	1.00	20.00	8
	Fraxinus americana	5.00	5.00	5.00	4
	Fraxinus nigra	16.67	10.00	30.00	12
	Picea rubens	14.78	1.00	46.00	72
	Pinus strobus	10.00	10.00	10.00	4
	Prunus serotina var. serotina	10.00	10.00	10.00	4
	Tsuga canadensis	15.00	0.01	60.00	80
T3	Acer pensylvanicum	5.00	5.00	5.00	4
	Acer rubrum	3.29	1.00	5.00	28
	Alnus incana ssp. rugosa	0.50	0.50	0.50	4
	Amelanchier laevis	1.25	0.50	2.00	8
	Betula alleghaniensis var. alleghaniensis	15.53	1.00	60.00	60
	Betula lenta	15.00	15.00	15.00	4
	Fraxinus nigra	2.25	0.01	5.00	16
	Picea rubens	5.62	1.00	20.00	52

	Pinus strobus	1.00	1.00	1.00	4
	Tsuga canadensis	13.38	1.00	30.00	52
S1	Abies balsamea	1.00	1.00	1.00	4
	Acer pensylvanicum	0.50	0.50	0.50	4
	Acer rubrum	1.33	1.00	2.00	12
	Aesculus flava	0.50	0.50	0.50	4
	Alnus incana ssp. rugosa	14.24	1.00	55.00	68
	Amelanchier arborea var. arborea	0.50	0.50	0.50	4
	Amelanchier laevis	1.00	1.00	1.00	4
	Betula alleghaniensis var. alleghaniensis	3.50	0.50	15.00	28
	Fraxinus americana	0.50	0.50	0.50	4
	Ilex collina	0.01	0.01	0.01	4
	Ilex montana	0.50	0.50	0.50	4
	Ilex verticillata	11.28	0.50	40.00	36
	Kalmia latifolia	6.00	1.00	15.00	12
	Lindera benzoin	3.00	1.00	5.00	8
	Picea rubens	3.00	0.50	10.00	44
	Pinus strobus	0.50	0.50	0.50	4
	Rhododendron maximum	9.78	0.50	30.00	64
	Rosa multiflora	1.00	1.00	1.00	4
	Rubus	0.50	0.50	0.50	4
	Sorbus americana	1.00	1.00	1.00	4
	Spiraea alba	0.01	0.01	0.01	4
	Tsuga canadensis	3.61	0.50	10.00	56
	Viburnum nudum var. cassinoides	1.50	1.00	2.00	16
	Viburnum recognitum	1.50	0.50	3.00	12
S2	Abies balsamea	2.00	2.00	2.00	4
	Acer pensylvanicum	0.50	0.50	0.50	4
	Acer rubrum	0.50	0.50	0.50	12
	Aesculus flava	0.01	0.01	0.01	4
	Alnus incana ssp. rugosa	1.50	1.00	3.00	16
	Amelanchier	0.01	0.01	0.01	8
	Betula alleghaniensis var. alleghaniensis	0.59	0.01	1.00	24
	Fagus grandifolia	0.01	0.01	0.01	4
	Hypericum densiflorum	0.50	0.50	0.50	4
	Ilex montana	0.01	0.01	0.01	4
	Ilex verticillata	2.25	0.50	5.00	32
	Kalmia latifolia	0.75	0.50	1.00	8
	Lindera benzoin	2.25	0.01	5.00	16
	Menziesia pilosa	0.50	0.01	1.00	12
	Nyssa sylvatica	0.50	0.50	0.50	4
	Picea rubens	1.35	0.50	6.00	52
	Prunus serotina var. serotina	0.50	0.50	0.50	4
	Rhododendron maximum	1.13	0.01	2.00	32
	Rosa multiflora	0.50	0.50	0.50	4
	Rosa palustris	0.50	0.50	0.50	8
	Rubus	0.01	0.01	0.01	8
	Sambucus	0.50	0.50	0.50	4
	Sambucus nigra ssp. canadensis	0.26	0.01	0.50	16

	<i>Smilax rotundifolia</i>	0.50	0.50	0.50	8
	<i>Smilax tamnoides</i>	0.26	0.01	0.50	8
	<i>Sorbus americana</i>	0.50	0.50	0.50	4
	<i>Spiraea alba</i>	0.26	0.01	0.50	8
	<i>Taxus canadensis</i>	0.01	0.01	0.01	4
	<i>Tsuga canadensis</i>	0.83	0.50	2.00	36
	<i>Vaccinium corymbosum</i>	0.01	0.01	0.01	4
	<i>Vaccinium erythrocarpum</i>	0.01	0.01	0.01	4
	<i>Vaccinium myrtilloides</i>	5.33	0.50	15.00	12
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.63	0.50	1.00	16
	<i>Viburnum recognitum</i>	0.67	0.50	1.00	24
H	<i>Abies balsamea</i>	0.51	0.01	1.00	8
	<i>Acer rubrum</i>	0.37	0.01	0.50	44
	<i>Acer rubrum</i> var. <i>trilobum</i>	0.50	0.50	0.50	4
	<i>Acer saccharum</i> var. <i>saccharum</i>	0.50	0.50	0.50	4
	<i>Agrostis gigantea</i>	3.44	3.44	3.44	4
	<i>Agrostis hyemalis</i>	0.50	0.50	0.50	4
	<i>Agrostis perennans</i>	0.32	0.01	0.50	32
	<i>Amelanchier</i>	0.01	0.01	0.01	4
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	4
	<i>Aralia nudicaulis</i>	0.01	0.01	0.01	4
	<i>Arisaema triphyllum</i>	0.50	0.50	0.50	24
	<i>Arisaema triphyllum</i> ssp. <i>stewardsonii</i>	0.50	0.50	0.50	12
	<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>	0.75	0.50	1.00	8
	<i>Athyrium filix-femina</i>	0.50	0.50	0.50	4
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.38	0.01	0.50	48
	<i>Betula lenta</i>	0.50	0.50	0.50	4
	<i>Bidens</i>	1.00	1.00	1.00	4
	<i>Brachyelytrum erectum</i>	0.92	0.50	1.33	8
	<i>Brachyelytrum septentrionale</i>	1.34	0.01	3.00	12
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	12.00	12.00	12.00	4
	<i>Callitriche palustris</i>	0.50	0.50	0.50	4
	<i>Caltha palustris</i> var. <i>palustris</i>	2.85	0.50	10.00	52
	<i>Cardamine bulbosa</i>	0.50	0.50	0.50	4
	<i>Cardamine diphylla</i>	0.26	0.01	0.50	8
	<i>Cardamine hirsuta</i>	0.01	0.01	0.01	4
	<i>Cardamine parviflora</i> var. <i>arenicola</i>	0.50	0.50	0.50	8
	<i>Carex</i>	11.45	0.01	35.00	16
	<i>Carex atlantica</i>	1.00	1.00	1.00	4
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	0.01	0.01	0.01	4
	<i>Carex bromoides</i> ssp. <i>bromoides</i>	0.50	0.50	0.50	8
	<i>Carex crinita</i> var. <i>brevicrinis</i>	0.50	0.50	0.50	4
	<i>Carex debilis</i> var. <i>rudgei</i>	2.86	0.01	5.70	8
	<i>Carex echinata</i> ssp. <i>echinata</i>	1.25	0.50	2.00	8
	<i>Carex folliculata</i>	0.50	0.01	1.00	24
	<i>Carex gynandra</i>	1.03	0.01	4.00	44
	<i>Carex intumescens</i>	0.17	0.01	0.50	12
	<i>Carex leptalea</i> ssp. <i>leptalea</i>	0.97	0.01	3.22	56
	<i>Carex leptonevia</i>	0.01	0.01	0.01	4

Carex lupulina	0.01	0.01	0.01	4
Carex lurida	0.01	0.01	0.01	8
Carex prasina	1.13	0.01	3.00	16
Carex projecta	0.01	0.01	0.01	4
Carex scabrata	2.40	1.00	5.00	20
Carex scoparia var. scoparia	0.78	0.78	0.78	4
Carex stipata	0.84	0.01	2.22	44
Carex stricta	10.00	10.00	10.00	4
Carex trisperma var. trisperma	0.97	0.01	3.11	44
Chelone glabra	0.73	0.01	2.00	60
Chrysosplenium americanum	1.77	0.01	5.00	60
Cinna arundinacea	0.50	0.50	0.50	8
Cinna latifolia	1.25	0.01	6.00	40
Circaea alpina ssp. alpina	0.34	0.01	0.50	12
Clematis	0.01	0.01	0.01	4
Clematis virginiana	0.01	0.01	0.01	4
Clintonia	0.38	0.01	0.50	16
Cornus canadensis	0.50	0.50	0.50	4
Cypripedium	0.01	0.01	0.01	4
Danthonia compressa	0.85	0.50	1.20	8
Dennstaedtia punctilobula	0.26	0.01	0.50	8
Dichanthelium	0.50	0.50	0.50	4
Dichanthelium clandestinum	0.50	0.01	1.00	12
Doellingeria umbellata var. umbellata	0.50	0.50	0.50	16
Dryopteris campyloptera	0.38	0.01	0.50	16
Dryopteris carthusiana	0.50	0.50	0.50	8
Dryopteris cristata	0.50	0.50	0.50	4
Dryopteris intermedia	0.50	0.01	2.00	52
Epilobium leptophyllum	2.00	2.00	2.00	4
Eriophorum virginicum	0.01	0.01	0.01	4
Eupatorium	0.26	0.01	0.50	8
Euthamia graminifolia var. graminifolia	0.50	0.50	0.50	4
Fagus grandifolia	0.01	0.01	0.01	4
Fraxinus americana	0.50	0.50	0.50	4
Galium asprellum	0.34	0.01	0.50	24
Galium tinctorium	0.55	0.50	1.00	40
Glyceria	12.50	10.00	15.00	8
Glyceria canadensis	1.75	0.50	3.00	8
Glyceria grandis var. grandis	3.00	3.00	3.00	4
Glyceria melicaria	6.82	0.50	30.00	88
Glyceria striata	2.90	0.50	10.00	40
Gratiola neglecta	0.01	0.01	0.01	4
Hasteola suaveolens	0.50	0.50	0.50	8
Holcus lanatus	0.50	0.50	0.50	4
Houstonia serpyllifolia	0.50	0.50	0.50	4
Hydrocotyle americana	0.75	0.50	1.00	8
Hypericum mutilum	1.25	0.50	2.00	8
Hypnum imponens	0.11	0.11	0.11	4
Ilex montana	0.50	0.50	0.50	4

<i>Ilex verticillata</i>	0.50	0.50	0.50	8
<i>Impatiens</i>	2.80	0.50	10.00	40
<i>Impatiens capensis</i>	6.93	0.50	35.00	52
<i>Juncus effusus</i>	0.40	0.01	1.00	20
<i>Juncus effusus</i> var. <i>solutus</i>	0.75	0.50	1.00	8
<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.26	0.01	0.50	8
<i>Kalmia latifolia</i>	0.01	0.01	0.01	4
<i>Laportea canadensis</i>	1.00	1.00	1.00	4
<i>Leersia oryzoides</i>	4.80	0.01	40.00	60
<i>Listera cordata</i> var. <i>cordata</i>	0.50	0.50	0.50	4
<i>Listera smallii</i>	0.01	0.01	0.01	4
<i>Lycopodium clavatum</i>	3.78	3.78	3.78	4
<i>Lycopodium obscurum</i>	0.06	0.01	0.11	8
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.72	0.50	2.00	36
<i>Lycopus virginicus</i>	0.50	0.50	0.50	8
<i>Lysimachia ciliata</i>	0.50	0.50	0.50	4
<i>Maianthemum canadense</i>	0.65	0.01	3.00	56
<i>Menyanthes trifoliata</i>	0.01	0.01	0.01	4
<i>Mimulus ringens</i> var. <i>ringens</i>	1.00	1.00	1.00	4
<i>Mitchella repens</i>	0.43	0.01	0.50	28
<i>Monarda didyma</i>	0.50	0.50	0.50	8
<i>Monotropa uniflora</i>	0.01	0.01	0.01	8
<i>Oclemena acuminata</i>	1.00	0.01	3.00	24
<i>Onoclea sensibilis</i>	0.88	0.01	2.00	48
<i>Ophioglossum vulgatum</i>	0.22	0.22	0.22	4
<i>Osmunda</i>	0.01	0.01	0.01	4
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	5.23	0.50	20.00	60
<i>Osmunda claytoniana</i>	1.25	0.50	3.00	16
<i>Oxalis</i>	1.88	0.01	7.00	16
<i>Oxalis montana</i>	0.50	0.01	1.00	44
<i>Oxypolis rigidior</i>	0.43	0.01	0.50	28
<i>Packera aurea</i>	0.59	0.01	1.00	24
<i>Phalaris arundinacea</i>	0.50	0.50	0.50	4
<i>Physocarpus opulifolius</i> var. <i>opulifolius</i>	0.50	0.50	0.50	4
<i>Picea rubens</i>	0.55	0.01	1.00	44
<i>Pilea pumila</i> var. <i>pumila</i>	0.01	0.01	0.01	4
<i>Platanthera</i>	0.01	0.01	0.01	4
<i>Platanthera clavellata</i>	0.22	0.22	0.22	4
<i>Poa palustris</i>	0.50	0.50	0.50	4
<i>Poa trivialis</i>	1.00	1.00	1.00	4
<i>Polemonium vanbruntiae</i>	0.17	0.01	0.50	12
<i>Polygonum</i>	0.17	0.01	0.50	12
<i>Polygonum hydropiper</i>	0.01	0.01	0.01	4
<i>Polygonum punctatum</i>	0.50	0.50	0.50	4
<i>Polygonum punctatum</i> var. <i>confertiflorum</i>	2.00	2.00	2.00	4
<i>Polygonum punctatum</i> var. <i>punctatum</i>	0.50	0.50	0.50	4
<i>Polygonum sagittatum</i>	1.07	0.01	5.78	72
<i>Prunus serotina</i> var. <i>serotina</i>	0.38	0.01	0.50	16
<i>Pteridium aquilinum</i>	0.01	0.01	0.01	4

	Ranunculus	3.75	0.50	7.00	8
	Ranunculus abortivus	0.01	0.01	0.01	4
	Ranunculus hispidus var. nitidus	4.42	0.50	10.00	24
	Ranunculus recurvatus var. recurvatus	0.01	0.01	0.01	4
	Rhododendron maximum	0.21	0.01	0.50	20
	Rosa multiflora	0.01	0.01	0.01	4
	Rosa palustris	0.50	0.50	0.50	4
	Rubus	0.26	0.01	0.50	8
	Rubus hispidus	2.09	0.50	15.00	44
	Rumex obtusifolius	0.50	0.50	0.50	4
	Sambucus nigra ssp. canadensis	0.01	0.01	0.01	4
	Saxifraga micranthidifolia	0.34	0.01	0.50	12
	Saxifraga pennsylvanica	0.50	0.50	0.50	4
	Scirpus cyperinus	0.01	0.01	0.01	4
	Scutellaria lateriflora var. lateriflora	0.57	0.01	1.00	28
	Smilax rotundifolia	0.01	0.01	0.01	4
	Smilax tamnoides	0.01	0.01	0.01	4
	Solidago	0.50	0.50	0.50	4
	Solidago rugosa	0.46	0.01	2.00	44
	Solidago rugosa ssp. aspera	0.01	0.01	0.01	4
	Solidago rugosa ssp. rugosa var. rugosa	5.00	5.00	5.00	4
	Sorbus americana	0.21	0.01	0.50	20
	Sparganium	1.00	1.00	1.00	4
	Symphyotrichum prenanthoides	0.34	0.01	0.50	12
	Symphyotrichum puniceum var. puniceum	0.55	0.50	1.00	40
	Symplocarpus foetidus	10.12	0.01	60.00	52
	Thalictrum	0.63	0.50	1.00	16
	Thalictrum clavatum	4.00	3.00	5.00	8
	Thalictrum pubescens	0.75	0.50	1.00	16
	Thelypteris noveboracensis	0.75	0.01	2.00	32
	Thelypteris palustris var. pubescens	0.44	0.44	0.44	4
	Tiarella cordifolia	0.70	0.01	1.00	20
	Triadenum fraseri	0.26	0.01	0.50	16
	Trillium	0.26	0.01	0.50	8
	Trillium undulatum	0.17	0.01	0.50	12
	Tsuga canadensis	0.55	0.01	1.00	40
	Tussilago farfara	0.50	0.50	0.50	4
	Ulmus americana	0.50	0.50	0.50	4
	Veratrum viride	1.07	0.50	2.00	28
	Veronica americana	0.26	0.01	0.50	8
	Viburnum recognitum	0.50	0.50	0.50	4
	Viola	1.47	0.11	5.00	56
	Viola cucullata	3.50	0.50	10.00	36
N	Atrichum	0.50	0.50	0.50	4
	Atrichum undulatum	0.26	0.01	0.50	8
	Aulacomnium	0.50	0.50	0.50	8
	Aulacomnium palustre	4.00	3.00	5.00	8
	Bazzania trilobata	7.19	0.50	30.00	72
	Brotherella recurvans	1.00	1.00	1.00	4

Calliergon cordifolium	1.75	0.50	3.00	8
Cladonia	0.01	0.01	0.01	4
Cladonia squamosa	0.01	0.01	0.01	4
Climacium americanum	0.50	0.50	0.50	4
Dicranum	0.50	0.50	0.50	16
Dicranum flagellare	0.50	0.50	0.50	4
Dicranum scoparium	1.39	0.50	5.00	36
Hygrohypnum eugyrium	3.33	1.44	5.22	8
Hylocomium splendens	1.75	0.50	5.00	16
Hypnum	0.50	0.50	0.50	16
Hypnum imponens	3.91	0.01	15.00	44
Lactarius subvellerus	0.01	0.01	0.01	4
Leucobryum	0.50	0.50	0.50	12
Leucobryum albidum	9.89	9.89	9.89	4
Leucobryum glaucum	0.69	0.50	1.00	16
Loeskeobryum brevirostre	0.75	0.50	1.00	8
Mitrulella elegans	0.01	0.01	0.01	4
Mnium	0.50	0.50	0.50	8
Mnium hornum	3.63	0.50	10.00	16
Pallavicinia lyellii	1.00	1.00	1.00	4
Plagiomnium ciliare	5.50	1.00	10.00	8
Plagiomnium ellipticum	0.51	0.01	1.00	8
Plagiothecium laetum	0.01	0.01	0.01	4
Polytrichum	0.50	0.50	0.50	12
Polytrichum commune	0.50	0.50	0.50	4
Polytrichum juniperinum	0.50	0.50	0.50	4
Polytrichum pallidisetum	1.25	0.50	2.00	8
Ptilium crista-castrensis	0.01	0.01	0.01	4
Pylaisiadelphina tenuirostris	1.00	1.00	1.00	4
Rhizomnium appalachianum	10.30	1.00	20.00	40
Rhizomnium punctatum	20.00	20.00	20.00	4
Sphagnum	27.46	0.50	62.40	28
Sphagnum affine	2.00	1.00	3.00	8
Sphagnum angustifolium	3.00	3.00	3.00	4
Sphagnum fallax	8.80	1.00	25.00	20
Sphagnum fimbriatum	8.50	0.50	20.00	12
Sphagnum girgensohnii	6.00	1.00	12.00	12
Sphagnum henryense	20.00	20.00	20.00	4
Sphagnum magellanicum	14.33	8.00	20.00	12
Sphagnum palustre	25.60	3.00	60.00	20
Sphagnum quinquefarium	1.00	1.00	1.00	4
Sphagnum squarrosum	16.50	3.00	30.00	8
Thuidium delicatulum	3.68	0.50	10.00	56
Trichoglossum hirsutum	0.01	0.01	0.01	4
Warnstorfia exannulata var. exannulata	0.50	0.50	0.50	4
Total				36

**Picea rubens - Tsuga canadensis / Rhododendron maximum / Sphagnum spp. - Bazzania trilobata forested swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	4.91	0.01	10.00	46
	Betula alleghaniensis var. alleghaniensis	8.22	3.00	20.00	38
	Betula nigra	5.00	5.00	5.00	4
	Larix laricina	5.00	5.00	5.00	4
	Nyssa sylvatica	2.00	2.00	2.00	4
	Picea rubens	22.84	2.00	50.00	79
	Pinus strobus	0.50	0.50	0.50	4
	Prunus serotina var. serotina	5.00	5.00	5.00	4
	Tsuga canadensis	27.69	5.00	80.00	67
	Ulmus	1.00	1.00	1.00	4
T3	Acer rubrum	5.36	1.00	15.00	58
	Amelanchier	1.00	1.00	1.00	4
	Amelanchier laevis	1.00	1.00	1.00	4
	Betula alleghaniensis var. alleghaniensis	8.53	1.00	20.00	63
	Betula lenta	4.00	3.00	5.00	13
	Fraxinus americana	7.33	1.00	20.00	13
	Lindera benzoin	1.00	1.00	1.00	4
	Liriodendron tulipifera	1.00	1.00	1.00	4
	Magnolia acuminata	1.75	0.50	3.00	8
	Nyssa sylvatica	1.67	1.00	3.00	13
	Picea rubens	16.42	1.00	43.00	50
	Sorbus americana	2.33	1.00	5.00	13
	Tsuga canadensis	12.00	2.00	30.00	67
	S1	Acer rubrum	0.90	0.50	1.00
Alnus incana ssp. rugosa		9.00	3.00	15.00	8
Amelanchier laevis		1.00	1.00	1.00	4
Betula alleghaniensis var. alleghaniensis		1.86	0.50	5.00	29
Betula lenta		1.33	0.50	3.00	13
Hamamelis virginiana		0.50	0.50	0.50	4
Hypericum densiflorum		0.50	0.50	0.50	4
Ilex collina		1.00	1.00	1.00	4
Ilex montana		4.33	1.00	10.00	13
Ilex verticillata		1.88	0.50	3.00	33
Kalmia latifolia		3.40	1.00	5.00	21
Lindera benzoin		4.00	3.00	5.00	8
Liriodendron tulipifera		0.01	0.01	0.01	4
Magnolia acuminata		1.00	1.00	1.00	4
Nemopanthus mucronatus		5.80	1.00	20.00	21
Picea rubens		3.90	0.50	20.00	63
Quercus rubra		0.01	0.01	0.01	4
Rhododendron maximum		21.02	0.01	50.00	96
Rosa multiflora		1.00	1.00	1.00	4
Sambucus nigra ssp. canadensis		0.50	0.50	0.50	4
Sassafras albidum		0.01	0.01	0.01	4
Smilax rotundifolia		0.50	0.50	0.50	4

	<i>Sorbus americana</i>	2.00	0.50	5.00	13
	<i>Tsuga canadensis</i>	6.30	0.50	35.00	42
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.30	0.50	3.00	21
S2	<i>Acer rubrum</i>	0.59	0.01	1.00	25
	<i>Alnus incana</i> ssp. <i>rugosa</i>	1.00	1.00	1.00	4
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.38	0.01	0.50	17
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.59	0.01	1.00	25
	<i>Fagus grandifolia</i>	0.50	0.50	0.50	4
	<i>Gaylussacia baccata</i>	1.00	1.00	1.00	4
	<i>Hypericum densiflorum</i>	0.75	0.50	1.00	8
	<i>Ilex</i>	0.01	0.01	0.01	4
	<i>Ilex montana</i>	0.75	0.50	1.00	8
	<i>Ilex verticillata</i>	0.71	0.50	1.00	29
	<i>Kalmia latifolia</i>	2.43	1.00	5.00	29
	<i>Lindera benzoin</i>	2.00	1.00	3.00	13
	<i>Magnolia acuminata</i>	0.01	0.01	0.01	4
	<i>Nemopanthus mucronatus</i>	0.63	0.01	1.00	17
	<i>Picea rubens</i>	1.47	0.01	5.00	58
	<i>Prunus serotina</i> var. <i>serotina</i>	0.01	0.01	0.01	4
	<i>Quercus rubra</i>	0.01	0.01	0.01	4
	<i>Rhododendron maximum</i>	2.73	0.50	10.00	63
	<i>Rubus</i>	0.26	0.01	0.50	8
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.26	0.01	0.50	8
	<i>Sassafras albidum</i>	0.01	0.01	0.01	4
	<i>Smilax rotundifolia</i>	0.01	0.01	0.01	4
	<i>Smilax tamnoides</i>	0.01	0.01	0.01	4
	<i>Taxus canadensis</i>	0.01	0.01	0.01	4
	<i>Tsuga canadensis</i>	0.86	0.50	3.00	46
	<i>Vaccinium angustifolium</i>	0.50	0.50	0.50	4
	<i>Vaccinium erythrocarpum</i>	0.50	0.50	0.50	13
	<i>Vaccinium myrtilloides</i>	0.67	0.50	1.00	13
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.26	0.01	0.50	17
H	<i>Acer rubrum</i>	0.35	0.01	0.50	67
	<i>Agrostis gigantea</i>	3.39	1.00	5.78	8
	<i>Agrostis hyemalis</i>	0.01	0.01	0.01	4
	<i>Agrostis perennans</i>	0.17	0.01	0.50	13
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.01	0.01	0.01	4
	<i>Amelanchier</i>	0.50	0.50	0.50	4
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	4
	<i>Anthoxanthum odoratum</i> ssp. <i>odoratum</i>	0.50	0.50	0.50	4
	<i>Arisaema triphyllum</i>	0.01	0.01	0.01	4
	<i>Arisaema triphyllum</i> ssp. <i>stewardsonii</i>	0.01	0.01	0.01	4
	<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i>	0.01	0.01	0.01	4
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.29	0.01	1.00	58
	<i>Betula lenta</i>	0.50	0.50	0.50	4
	<i>Bidens connata</i>	0.50	0.50	0.50	4
	<i>Cardamine pensylvanica</i>	0.01	0.01	0.01	4
	<i>Carex</i>	0.30	0.10	0.50	8
	<i>Carex atlantica</i>	20.00	20.00	20.00	4

Carex baileyi	0.17	0.01	0.50	13
Carex brunnescens	0.50	0.50	0.50	4
Carex brunnescens ssp. sphaerostachya	1.00	1.00	1.00	4
Carex debilis	0.17	0.01	0.50	13
Carex debilis var. rudgei	0.50	0.50	0.50	4
Carex echinata ssp. echinata	0.59	0.01	1.00	25
Carex folliculata	0.30	0.01	0.50	21
Carex gynandra	2.48	0.01	13.34	25
Carex intumescens	0.50	0.50	0.50	4
Carex lupulina	0.01	0.01	0.01	4
Carex lurida	0.26	0.01	0.50	8
Carex scabrata	0.50	0.50	0.50	4
Carex stipata	2.67	0.01	5.33	8
Carex trisperma var. trisperma	4.75	0.50	40.00	71
Chelone glabra	0.17	0.01	0.50	13
Chrysosplenium americanum	0.01	0.01	0.01	4
Cinna latifolia	0.01	0.01	0.01	4
Coptis trifolia	1.00	1.00	1.00	4
Cornus canadensis	0.50	0.50	0.50	4
Cypripedium acaule	0.01	0.01	0.01	4
Dennstaedtia punctilobula	0.68	0.01	2.00	46
Dichanthelium clandestinum	3.00	3.00	3.00	4
Drosera rotundifolia var. rotundifolia	1.00	1.00	1.00	4
Dryopteris	7.00	7.00	7.00	4
Dryopteris carthusiana	0.13	0.01	0.50	17
Dryopteris intermedia	0.38	0.01	0.50	17
Eriophorum virginicum	0.67	0.50	1.00	13
Eupatorium	0.01	0.01	0.01	4
Fagus grandifolia	0.50	0.50	0.50	4
Galium asprellum	0.01	0.01	0.01	4
Galium tinctorium	0.50	0.50	0.50	4
Gaultheria hispidula	0.50	0.01	1.00	17
Gaultheria procumbens	0.51	0.01	1.00	8
Glyceria canadensis	1.75	0.50	3.00	8
Glyceria laxa	15.01	0.01	30.00	8
Glyceria melicaria	1.22	0.01	5.00	38
Glyceria striata	1.00	1.00	1.00	4
Huperzia lucidula	0.34	0.01	0.50	13
Hypnum imponens	0.22	0.22	0.22	4
Ilex	0.50	0.50	0.50	4
Ilex montana	0.01	0.01	0.01	4
Ilex verticillata	0.22	0.01	0.50	29
Impatiens capensis	0.46	0.01	1.00	17
Juncus brevicaudatus	0.34	0.01	0.50	13
Juncus effusus	0.50	0.50	0.50	13
Juncus effusus var. solutus	0.17	0.01	0.50	13
Juncus subcaudatus var. subcaudatus	0.50	0.01	1.00	29
Kalmia latifolia	0.01	0.01	0.01	8
Leersia oryzoides	1.20	0.01	3.00	21

Lindera benzoin	0.34	0.01	0.50	13
Liriodendron tulipifera	0.01	0.01	0.01	4
Lycopodium dendroideum	0.01	0.01	0.01	4
Lycopodium obscurum	0.50	0.50	0.50	4
Lycopus uniflorus var. uniflorus	1.00	0.01	4.00	25
Maianthemum canadense	0.17	0.01	0.50	13
Medeola virginiana	0.01	0.01	0.01	4
Mitchella repens	0.15	0.01	0.50	29
Monotropa uniflora	0.01	0.01	0.01	8
Nemopanthus mucronatus	0.17	0.01	0.50	13
Nyssa sylvatica	0.50	0.50	0.50	4
Oclemena acuminata	0.34	0.01	0.50	13
Onoclea sensibilis	0.50	0.50	0.50	8
Osmunda cinnamomea var. cinnamomea	1.33	0.01	5.10	71
Oxalis	0.01	0.01	0.01	4
Oxalis montana	0.34	0.01	0.50	13
Picea rubens	2.35	0.01	20.00	42
Platanthera	0.01	0.01	0.01	4
Platanthera clavellata	0.51	0.01	1.00	8
Platanthera grandiflora	0.01	0.01	0.01	4
Polygonum sagittatum	0.04	0.01	0.11	13
Prunus serotina var. serotina	0.50	0.50	0.50	8
Quercus rubra	0.01	0.01	0.01	4
Rhododendron maximum	0.75	0.01	2.00	42
Rubus	0.75	0.50	1.00	8
Rubus hispidus	0.82	0.01	3.00	33
Sassafras albidum	0.01	0.01	0.01	4
Scirpus atrovirens	1.00	1.00	1.00	4
Scirpus cyperinus	2.50	2.00	3.00	8
Smilax rotundifolia	0.26	0.01	0.50	8
Smilax tamnoides	0.01	0.01	0.01	4
Solidago	0.50	0.50	0.50	4
Solidago rugosa	0.50	0.50	0.50	4
Solidago uliginosa	0.50	0.50	0.50	8
Sorbus americana	0.28	0.01	0.50	38
Sparganium	0.50	0.50	0.50	4
Sparganium chlorocarpum	3.00	3.00	3.00	4
Spiranthes cernua	0.50	0.50	0.50	4
Symphyotrichum puniceum var. puniceum	0.50	0.50	0.50	4
Symplocarpus foetidus	1.06	0.50	3.00	33
Thelypteris noveboracensis	2.33	1.00	5.00	13
Triadenum fraseri	0.50	0.01	1.00	17
Trientalis borealis ssp. borealis	0.50	0.50	0.50	8
Trillium undulatum	0.01	0.01	0.01	8
Tsuga canadensis	1.40	0.01	10.00	42
Vaccinium myrtilloides	0.34	0.01	0.50	13
Vernonia noveboracensis	0.01	0.01	0.01	4
Viburnum nudum var. cassinoides	0.50	0.50	0.50	8
Viburnum recognitum	0.50	0.50	0.50	4

	Viola	0.50	0.01	1.00	21
	Viola cucullata	1.00	1.00	1.00	4
N	Aulacomnium	0.01	0.01	0.01	4
	Aulacomnium palustre	0.50	0.50	0.50	8
	Bazzania trilobata	8.42	1.00	50.00	79
	Brotherella recurvans	0.75	0.50	1.00	8
	Calypogeia fissa ssp. neogaea	1.50	0.50	3.00	13
	Calypogeia muelleriana	0.50	0.50	0.50	4
	Calypogeia neesiana	1.00	1.00	1.00	4
	Cephalozia lunulifolia	0.50	0.50	0.50	4
	Cladina	1.00	1.00	1.00	4
	Cladonia	0.30	0.01	0.50	21
	Dicranodontium denudatum	0.26	0.01	0.50	8
	Dicranum	0.38	0.01	0.50	17
	Dicranum flagellare	0.50	0.50	0.50	4
	Dicranum scoparium	0.50	0.01	1.00	17
	Hygrohypnum eugyrium	0.33	0.33	0.33	4
	Hylocomium splendens	1.00	1.00	1.00	4
	Hypnum	0.50	0.50	0.50	4
	Hypnum imponens	2.15	0.50	5.00	54
	Leucobryum	0.50	0.50	0.50	17
	Leucobryum albidum	0.40	0.40	0.40	4
	Leucobryum glaucum	0.51	0.01	1.00	17
	Lobaria pulmonaria	0.01	0.01	0.01	4
	Mnium	1.00	1.00	1.00	4
	Pallavicinia lyellii	0.01	0.01	0.01	4
	Polytrichum	0.50	0.50	0.50	4
	Polytrichum commune	17.43	1.00	70.00	29
	Polytrichum pallidisetum	1.33	0.50	5.00	25
	Polytrichum strictum	2.00	1.00	3.00	8
	Rhizomnium	0.50	0.50	0.50	4
	Rhizomnium appalachianum	1.75	0.50	5.00	17
	Sphagnum	5.60	0.50	27.70	50
	Sphagnum capillifolium var. capillifolium	10.00	10.00	10.00	8
	Sphagnum cuspidatum	1.00	1.00	1.00	4
	Sphagnum fallax	39.16	10.00	95.00	33
	Sphagnum fimbriatum	3.00	3.00	3.00	4
	Sphagnum flexuosum	18.00	18.00	18.00	4
	Sphagnum girgensohnii	22.72	10.00	30.00	25
	Sphagnum magellanicum	12.10	3.00	28.30	13
	Sphagnum palustre	26.11	5.00	80.00	38
	Sphagnum papillosum	7.75	0.01	15.00	17
	Sphagnum quinquefarium	3.00	3.00	3.00	4
	Sphagnum recurvum	21.50	3.00	40.00	8
	Sphagnum rubellum	4.50	1.00	10.00	17
	Tetraphis pellucida	0.50	0.50	0.50	4
	Thuidium delicatulum	2.50	2.00	3.00	8
Total					35

**Picea rubens / Carex trisperma / Sphagnum spp. - Polytrichum spp. high elevation peat woodland**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	1.00	1.00	1.00	29
	Amelanchier laevis	1.00	1.00	1.00	14
	Picea rubens	33.14	2.00	60.00	100
	Pinus rigida	1.00	1.00	1.00	14
	Pinus strobus	30.00	30.00	30.00	14
	Sorbus americana	0.50	0.50	0.50	14
T3	Acer rubrum var. trilobum	2.00	2.00	2.00	14
	Amelanchier laevis	3.00	3.00	3.00	14
	Betula alleghaniensis var. alleghaniensis	3.00	3.00	3.00	14
	Picea rubens	26.75	12.00	40.00	57
	Pinus strobus	20.00	20.00	20.00	14
S1	Abies balsamea	1.00	1.00	1.00	14
	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	14
	Ilex verticillata	3.00	3.00	3.00	14
	Kalmia latifolia	3.00	1.00	5.00	29
	Nemopanthus mucronatus	2.00	1.00	3.00	43
	Photinia melanocarpa	0.75	0.50	1.00	29
	Photinia pyrifolia	1.00	1.00	1.00	14
	Picea rubens	7.29	3.00	20.00	100
	Pinus strobus	1.00	1.00	1.00	14
	Rhododendron maximum	1.00	1.00	1.00	14
	Sorbus americana	0.50	0.50	0.50	14
	Vaccinium erythrocarpum	2.00	2.00	2.00	14
	Viburnum nudum var. cassinoides	2.17	0.50	5.00	43
S2	Abies balsamea	1.00	1.00	1.00	14
	Acer rubrum	0.50	0.50	0.50	43
	Amelanchier	0.50	0.50	0.50	29
	Amelanchier laevis	0.50	0.50	0.50	14
	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	29
	Fagus grandifolia	0.50	0.50	0.50	14
	Gaylussacia baccata	1.00	1.00	1.00	43
	Hypericum densiflorum	0.50	0.50	0.50	14
	Ilex montana	0.50	0.50	0.50	29
	Ilex verticillata	1.00	1.00	1.00	14
	Kalmia latifolia	2.83	0.50	5.00	43
	Menziesia pilosa	0.83	0.50	1.00	43
	Nemopanthus mucronatus	3.00	3.00	3.00	14
	Photinia melanocarpa	1.13	0.50	3.00	57
	Photinia pyrifolia	1.50	0.50	3.00	43
	Picea rubens	3.00	1.00	10.00	86
	Pinus strobus	0.50	0.50	0.50	14
	Rhododendron maximum	0.50	0.50	0.50	14
	Sorbus americana	0.38	0.01	0.50	57
	Vaccinium angustifolium	5.20	1.00	20.00	71
	Vaccinium erythrocarpum	2.00	1.00	3.00	29

	<i>Vaccinium myrtilloides</i>	13.20	1.00	30.00	71
	<i>Vaccinium pallidum</i>	0.50	0.50	0.50	14
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.92	0.01	3.00	86
H	<i>Abies balsamea</i>	0.50	0.50	0.50	14
	<i>Acer rubrum</i>	0.01	0.01	0.01	14
	<i>Acer rubrum</i> var. <i>trilobum</i>	0.01	0.01	0.01	14
	<i>Agrostis perennans</i>	0.50	0.50	0.50	14
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.01	0.01	0.01	14
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	0.01	0.01	0.01	14
	<i>Carex brunnescens</i>	0.50	0.50	0.50	14
	<i>Carex debilis</i>	0.26	0.01	0.50	29
	<i>Carex debilis</i> var. <i>debilis</i>	0.50	0.50	0.50	29
	<i>Carex debilis</i> var. <i>rudgei</i>	0.50	0.50	0.50	14
	<i>Carex echinata</i> ssp. <i>echinata</i>	6.33	1.00	15.00	43
	<i>Carex gynandra</i>	0.50	0.50	0.50	14
	<i>Carex trisperma</i> var. <i>trisperma</i>	15.57	1.00	40.00	100
	<i>Coptis trifolia</i>	1.00	1.00	1.00	14
	<i>Cornus canadensis</i>	0.50	0.50	0.50	14
	<i>Danthonia compressa</i>	0.50	0.50	0.50	29
	<i>Dennstaedtia punctilobula</i>	2.00	2.00	2.00	14
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	1.50	1.00	2.00	29
	<i>Epigaea repens</i>	0.50	0.50	0.50	14
	<i>Eriophorum virginicum</i>	1.75	0.50	5.00	57
	<i>Gaultheria hispidula</i>	1.00	0.01	3.00	71
	<i>Gaultheria procumbens</i>	1.00	0.50	2.00	43
	<i>Gentiana linearis</i>	0.50	0.50	0.50	29
	<i>Glyceria</i>	0.50	0.50	0.50	14
	<i>Glyceria canadensis</i>	0.01	0.01	0.01	14
	<i>Glyceria laxa</i>	0.50	0.50	0.50	14
	<i>Glyceria melicaria</i>	1.00	1.00	1.00	14
	<i>Huperzia lucidula</i>	0.50	0.50	0.50	14
	<i>Ilex verticillata</i>	0.50	0.50	0.50	14
	<i>Juncus brevicaudatus</i>	0.50	0.50	0.50	14
	<i>Juncus effusus</i> var. <i>solutus</i>	1.00	1.00	1.00	14
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.26	0.01	0.50	29
	<i>Kalmia latifolia</i>	0.50	0.50	0.50	14
	<i>Lycopodiella inundata</i>	0.01	0.01	0.01	29
	<i>Lycopodium clavatum</i>	1.00	1.00	1.00	14
	<i>Lycopodium dendroideum</i>	0.50	0.50	0.50	14
	<i>Lycopodium hickeyi</i>	0.26	0.01	0.50	29
	<i>Lycopodium obscurum</i>	0.50	0.01	1.00	43
	<i>Oclemena acuminata</i>	0.01	0.01	0.01	14
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	2.00	0.50	5.00	71
	<i>Photinia melanocarpa</i>	0.50	0.50	0.50	14
	<i>Photinia pyrifolia</i>	0.50	0.50	0.50	14
	<i>Picea rubens</i>	0.63	0.50	1.00	57
	<i>Pteridium aquilinum</i>	1.00	1.00	1.00	14
	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	0.50	0.50	0.50	14
	<i>Rhynchospora alba</i>	0.75	0.50	1.00	29

	Rubus	0.50	0.50	0.50	14
	Rubus hispidus	3.33	0.50	10.00	86
	Solidago uliginosa	1.00	1.00	1.00	14
	Sorbus americana	0.17	0.01	0.50	43
	Symplocarpus foetidus	0.50	0.50	0.50	14
	Vaccinium angustifolium	0.50	0.50	0.50	14
	Vaccinium myrtilloides	0.50	0.50	0.50	14
	Vaccinium oxycoccos	1.10	0.01	3.00	71
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	14
	Zigadenus leimanthoides	3.00	3.00	3.00	14
N	Amanita muscaria	0.01	0.01	0.01	14
	Aulacomnium palustre	0.50	0.50	0.50	14
	Bazzania trilobata	2.75	0.50	5.00	29
	Cladonia	0.50	0.50	0.50	29
	Cladonia arbuscula	0.75	0.50	1.00	29
	Dicranodontium denudatum	2.25	2.00	2.50	29
	Dicranum	0.50	0.50	0.50	14
	Dicranum scoparium	2.50	2.50	2.50	14
	Hypnum	0.50	0.50	0.50	14
	Hypnum imponens	3.40	0.50	10.00	71
	Leucobryum albidum	2.50	2.50	2.50	14
	Leucobryum glaucum	1.20	0.50	2.50	71
	Polytrichum commune	23.50	8.00	39.00	29
	Polytrichum ohioense	1.00	1.00	1.00	14
	Polytrichum strictum	6.17	0.50	10.00	43
	Sphagnum capillifolium var. capillifolium	5.33	1.00	10.00	43
	Sphagnum cuspidatum	0.50	0.50	0.50	14
	Sphagnum fallax	20.14	5.00	40.00	71
	Sphagnum magellanicum	6.70	6.70	6.70	14
	Sphagnum palustre	0.50	0.50	0.50	14
	Sphagnum papillosum	16.50	3.00	30.00	29
	Sphagnum rubellum	23.28	6.70	50.00	86
	Sphagnum russowii	5.00	5.00	5.00	14
Total					47

**Picea rubens / Rhododendron maximum - Kalmia latifolia / Osmunda cinnamomea var. cinnamomea / Sphagnum spp. peat woodland**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	1.50	1.00	2.50	27
	Betula alleghaniensis var. alleghaniensis	1.17	0.50	2.00	27
	Magnolia acuminata	0.01	0.01	0.01	9
	Picea rubens	8.90	2.00	25.00	45
	Tsuga canadensis	8.63	2.00	20.00	64
T3	Betula alleghaniensis var. alleghaniensis	2.00	2.00	2.00	9
	Picea rubens	2.00	2.00	2.00	9
	Tsuga canadensis	21.00	21.00	21.00	9
S1	Acer rubrum	0.63	0.01	1.00	36
	Amelanchier laevis	0.97	0.50	1.80	27

	Betula alleghaniensis var. alleghaniensis	1.27	0.50	4.30	64
	Hamamelis virginiana	0.50	0.01	1.00	27
	Hypericum densiflorum	0.50	0.20	0.80	18
	Ilex collina	2.00	2.00	2.00	9
	Ilex montana	1.00	0.01	2.00	27
	Ilex verticillata	6.14	1.00	10.00	73
	Kalmia latifolia	4.59	0.50	17.20	91
	Nemopanthus mucronatus	6.91	0.50	12.40	73
	Photinia pyrifolia	0.74	0.01	2.00	27
	Picea rubens	6.05	0.50	20.00	73
	Pinus strobus	3.00	3.00	3.00	9
	Rhododendron maximum	17.61	3.00	39.50	91
	Salix sericea	8.60	6.00	11.20	18
	Sorbus americana	0.51	0.02	1.00	27
	Tsuga canadensis	4.97	1.00	10.80	64
	Viburnum lantanoides	0.26	0.01	0.50	18
	Viburnum nudum var. cassinoides	0.64	0.02	1.20	45
	Viburnum recognitum	3.00	3.00	3.00	9
S2	Acer rubrum	0.67	0.50	1.00	27
	Amelanchier	0.50	0.50	0.50	9
	Amelanchier laevis	0.50	0.50	0.50	9
	Betula alleghaniensis var. alleghaniensis	0.50	0.01	1.00	27
	Hamamelis virginiana	0.50	0.50	0.50	9
	Hypericum densiflorum	2.75	0.50	5.00	18
	Ilex collina	10.00	10.00	10.00	9
	Ilex verticillata	2.33	1.00	3.00	27
	Kalmia latifolia	2.08	0.50	5.00	55
	Menziesia pilosa	3.00	3.00	3.00	9
	Nemopanthus mucronatus	1.75	0.50	5.00	36
	Photinia melanocarpa	2.75	0.50	5.00	18
	Photinia pyrifolia	0.50	0.50	0.50	9
	Picea rubens	0.75	0.50	1.00	36
	Prunus serotina var. serotina	0.01	0.01	0.01	9
	Rhododendron maximum	7.75	0.50	20.00	55
	Rubus	0.50	0.50	0.50	9
	Salix sericea	3.00	3.00	3.00	9
	Sorbus americana	0.50	0.50	0.50	18
	Tsuga canadensis	1.00	0.50	2.00	27
	Vaccinium erythrocarpum	5.00	5.00	5.00	9
	Vaccinium myrtilloides	2.00	1.00	3.00	27
	Viburnum lantanoides	0.50	0.50	0.50	9
	Viburnum nudum var. cassinoides	2.00	1.00	3.00	27
H	Acer rubrum	0.67	0.01	3.00	55
	Acer saccharum var. saccharum	0.40	0.40	0.40	9
	Agrostis hyemalis	0.50	0.50	0.50	9
	Agrostis perennans	0.60	0.60	0.60	18
	Amelanchier	0.50	0.50	0.50	9
	Amelanchier laevis	0.50	0.50	0.50	9
	Arisaema triphyllum	0.20	0.20	0.20	9

Athyrium filix-femina ssp. asplenoides	0.50	0.50	0.50	9
Betula alleghaniensis var. alleghaniensis	0.35	0.10	0.70	36
Carex atlantica	0.50	0.50	0.50	9
Carex baileyi	6.75	1.00	12.50	18
Carex debilis var. rudgei	0.01	0.01	0.01	9
Carex echinata ssp. echinata	3.00	1.00	5.00	18
Carex folliculata	2.80	1.00	4.00	27
Carex gynandra	2.15	0.60	4.00	36
Carex leptalea ssp. leptalea	0.83	0.50	1.00	27
Carex lurida	0.50	0.50	0.50	9
Carex scoparia var. scoparia	1.00	1.00	1.00	9
Carex stipata	0.50	0.50	0.50	9
Carex trisperma var. trisperma	3.35	0.50	10.00	55
Chelone glabra	1.47	0.50	3.00	27
Clematis virginiana	1.00	1.00	1.00	9
Clintonia	0.01	0.01	0.01	9
Cornus canadensis	1.00	1.00	1.00	9
Dalibarda repens	0.50	0.50	0.50	18
Danthonia spicata	1.50	1.50	1.50	9
Dennstaedtia punctilobula	0.75	0.50	1.00	36
Doellingeria umbellata var. umbellata	4.20	4.20	4.20	9
Drosera rotundifolia var. rotundifolia	1.40	0.01	5.00	45
Dryopteris carthusiana	0.50	0.50	0.50	9
Dryopteris cristata	0.50	0.50	0.50	9
Dryopteris intermedia	0.01	0.01	0.01	9
Epilobium	0.20	0.20	0.20	9
Eriophorum virginicum	1.13	0.01	3.00	36
Fagus grandifolia	0.01	0.01	0.01	9
Galium tinctorium	0.45	0.40	0.50	18
Gaultheria hispidula	3.17	0.50	8.00	27
Gaultheria procumbens	1.75	0.50	3.00	18
Gentiana linearis	1.23	0.50	2.00	27
Glyceria canadensis	0.75	0.50	1.00	18
Glyceria melicaria	3.98	0.50	10.90	36
Glyceria striata	1.70	0.40	3.00	18
Hypericum densiflorum	0.50	0.50	0.50	9
Hypericum mutilum	0.50	0.50	0.50	9
Juncus brevicaudatus	0.83	0.50	1.00	27
Juncus canadensis	3.00	3.00	3.00	9
Juncus effusus	0.43	0.30	0.50	36
Juncus subcaudatus var. subcaudatus	2.70	1.40	4.00	18
Kalmia latifolia	0.50	0.50	0.50	9
Leersia oryzoides	0.31	0.01	0.60	18
Leersia virginica	0.50	0.50	0.50	9
Listera smallii	0.50	0.50	0.50	9
Lycopodium clavatum	0.50	0.50	0.50	9
Lycopodium obscurum	1.84	0.01	5.00	27
Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	9
Maianthemum canadense	0.26	0.01	0.50	18

	<i>Oclemena acuminata</i>	1.60	0.50	4.40	36
	<i>Onoclea sensibilis</i>	7.40	7.40	7.40	9
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	5.71	1.00	18.00	82
	<i>Oxalis</i>	0.20	0.20	0.20	9
	<i>Photinia pyrifolia</i>	0.50	0.50	0.50	9
	<i>Picea rubens</i>	0.50	0.01	1.00	36
	<i>Platanthera clavellata</i>	0.01	0.01	0.01	18
	<i>Polygonum sagittatum</i>	0.55	0.50	0.60	18
	<i>Pteridium aquilinum</i>	0.50	0.50	0.50	9
	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	3.00	3.00	3.00	9
	<i>Rhododendron maximum</i>	1.00	1.00	1.00	9
	<i>Rhynchospora alba</i>	0.50	0.50	0.50	9
	<i>Rubus hispidus</i>	13.50	0.50	26.50	91
	<i>Scirpus</i>	0.26	0.01	0.50	18
	<i>Scirpus cyperinus</i>	0.33	0.20	0.50	27
	<i>Smilax rotundifolia</i>	0.01	0.01	0.01	9
	<i>Solidago rugosa</i>	0.50	0.50	0.50	9
	<i>Solidago uliginosa</i>	6.60	0.20	22.00	64
	<i>Sorbus americana</i>	0.50	0.50	0.50	9
	<i>Sparganium chlorocarpum</i>	3.00	3.00	3.00	9
	<i>Thelypteris palustris</i> var. <i>pubescens</i>	0.50	0.50	0.50	9
	<i>Tsuga canadensis</i>	0.26	0.01	0.50	36
	<i>Typha latifolia</i>	16.00	2.00	30.00	18
	<i>Vaccinium oxycoccos</i>	0.50	0.50	0.50	9
	<i>Veronica americana</i>	0.01	0.01	0.01	9
	<i>Viola</i>	1.42	0.02	4.40	45
	<i>Viola cucullata</i>	0.50	0.50	0.50	9
N	<i>Aulacomnium</i>	3.00	3.00	3.00	9
	<i>Aulacomnium palustre</i>	0.75	0.50	1.00	18
	<i>Bazzania trilobata</i>	0.50	0.50	0.50	18
	<i>Cladonia</i>	0.50	0.50	0.50	9
	<i>Cladonia arbuscula</i>	0.01	0.01	0.01	9
	<i>Cladonia grayi</i>	0.25	0.25	0.25	9
	<i>Cladonia squamosa</i>	0.25	0.25	0.25	9
	<i>Hypnum</i>	0.50	0.50	0.50	18
	<i>Hypnum imponens</i>	1.51	0.01	3.00	18
	<i>Leucobryum glaucum</i>	0.26	0.01	0.50	36
	<i>Pellia epiphylla</i>	1.00	1.00	1.00	9
	<i>Polytrichum commune</i>	3.85	0.40	10.00	55
	<i>Polytrichum ohioense</i>	0.25	0.20	0.30	18
	<i>Polytrichum strictum</i>	1.00	1.00	1.00	9
	<i>Sphagnum</i>	38.67	11.00	60.00	27
	<i>Sphagnum affine</i>	24.20	11.40	37.00	36
	<i>Sphagnum capillifolium</i> var. <i>capillifolium</i>	23.00	23.00	23.00	9
	<i>Sphagnum fallax</i>	31.08	1.00	70.00	55
	<i>Sphagnum fimbriatum</i>	4.00	4.00	4.00	9
	<i>Sphagnum flexuosum</i>	23.00	23.00	23.00	9
	<i>Sphagnum girgensohnii</i>	7.87	0.50	13.10	27
	<i>Sphagnum lescurii</i>	0.30	0.30	0.30	9

	Sphagnum magellanicum	25.26	4.00	38.50	45
	Sphagnum recurvum	25.48	7.40	48.80	36
	Sphagnum rubellum	41.33	39.00	45.00	27
Total					39

**Picea rubens / Vaccinium erythrocarpum / Sphagnum spp. - Bazzania trilobata high elevation forested swamp**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	5.00	5.00	5.00	33
	Betula alleghaniensis var. alleghaniensis	4.00	3.00	5.00	33
	Picea rubens	46.17	25.00	60.00	100
T3	Acer pensylvanicum	3.00	3.00	3.00	17
	Acer rubrum	11.80	2.00	20.00	83
	Amelanchier laevis	1.00	1.00	1.00	17
	Betula alleghaniensis var. alleghaniensis	8.40	1.00	20.00	83
	Picea rubens	16.00	1.00	40.00	67
S1	Acer rubrum	0.50	0.50	0.50	17
	Alnus incana ssp. rugosa	0.50	0.50	0.50	17
	Amelanchier laevis	0.50	0.50	0.50	17
	Betula alleghaniensis var. alleghaniensis	1.17	0.50	2.00	50
	Ilex collina	1.00	1.00	1.00	17
	Ilex montana	3.00	1.00	5.00	50
	Kalmia latifolia	1.00	1.00	1.00	17
	Nemopanthus mucronatus	1.00	1.00	1.00	17
	Picea rubens	16.17	1.00	50.00	100
	Prunus serotina var. serotina	1.00	1.00	1.00	17
	Rhododendron maximum	5.50	1.00	10.00	33
	Sorbus americana	0.26	0.01	0.50	33
	Vaccinium erythrocarpum	3.00	3.00	3.00	17
Viburnum lantanoides	0.50	0.50	0.50	17	
S2	Acer rubrum	0.26	0.01	0.50	33
	Amelanchier bartramiana	0.01	0.01	0.01	17
	Betula alleghaniensis var. alleghaniensis	0.50	0.50	0.50	33
	Fagus grandifolia	0.01	0.01	0.01	17
	Hypericum densiflorum	0.01	0.01	0.01	17
	Ilex collina	1.00	1.00	1.00	17
	Ilex montana	3.33	2.00	5.00	50
	Kalmia latifolia	13.00	13.00	13.00	17
	Menziesia pilosa	5.00	5.00	5.00	17
	Nemopanthus mucronatus	0.50	0.50	0.50	33
	Picea rubens	1.80	1.00	3.00	83
	Rhododendron maximum	0.50	0.50	0.50	33
	Sorbus americana	0.50	0.50	0.50	33
	Vaccinium erythrocarpum	10.08	0.50	30.00	100
	Viburnum lantanoides	0.50	0.50	0.50	50
Viburnum nudum var. cassinoides	0.50	0.50	0.50	17	
H	Acer rubrum	0.01	0.01	0.01	17
	Athyrium filix-femina	0.50	0.50	0.50	17

	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.26	0.01	0.50	33
	<i>Brachyelytrum erectum</i>	0.50	0.50	0.50	17
	<i>Carex debilis</i> var. <i>debilis</i>	0.26	0.01	0.50	33
	<i>Carex debilis</i> var. <i>rudgei</i>	0.50	0.50	0.50	17
	<i>Carex gynandra</i>	0.01	0.01	0.01	17
	<i>Carex trisperma</i> var. <i>trisperma</i>	0.63	0.50	1.00	67
	<i>Cinna latifolia</i>	0.50	0.50	0.50	17
	<i>Clintonia</i>	0.30	0.01	0.50	83
	<i>Dennstaedtia punctilobula</i>	2.50	2.00	3.00	33
	<i>Dryopteris campyloptera</i>	1.75	0.50	3.00	33
	<i>Dryopteris intermedia</i>	11.50	3.00	20.00	33
	<i>Glyceria laxa</i>	0.50	0.50	0.50	17
	<i>Ilex montana</i>	0.50	0.50	0.50	17
	<i>Juncus brevicaudatus</i>	0.50	0.50	0.50	17
	<i>Kalmia latifolia</i>	0.50	0.50	0.50	17
	<i>Maianthemum canadense</i>	0.90	0.01	3.00	83
	<i>Medeola virginiana</i>	0.50	0.50	0.50	33
	<i>Oclemena acuminata</i>	0.51	0.01	1.00	33
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.92	0.50	5.00	100
	<i>Oxalis</i>	1.34	0.01	3.00	50
	<i>Oxalis montana</i>	0.26	0.01	0.50	33
	<i>Picea rubens</i>	0.50	0.50	0.50	67
	<i>Rhododendron maximum</i>	0.50	0.50	0.50	17
	<i>Rubus</i>	0.50	0.50	0.50	17
	<i>Sorbus americana</i>	0.34	0.01	0.50	50
	<i>Symplocarpus foetidus</i>	0.50	0.50	0.50	17
	<i>Thelypteris noveboracensis</i>	10.00	10.00	10.00	17
	<i>Trillium undulatum</i>	0.26	0.01	0.50	33
	<i>Vaccinium erythrocarpum</i>	0.50	0.50	0.50	17
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.50	0.50	0.50	17
N	<i>Amanita ceceliae</i>	0.50	0.50	0.50	17
	<i>Amanita flavaconia</i>	0.50	0.50	0.50	17
	<i>Amanita fulva</i>	0.50	0.50	0.50	17
	<i>Amanita muscaria</i>	0.01	0.01	0.01	17
	<i>Bazzania trilobata</i>	21.33	3.00	50.00	100
	<i>Brotherella recurvans</i>	1.00	1.00	1.00	17
	<i>Calypogeia fissa</i> ssp. <i>neogaea</i>	1.00	1.00	1.00	17
	<i>Cladina</i>	0.50	0.50	0.50	17
	<i>Cladonia</i>	0.50	0.50	0.50	17
	<i>Cladonia macilenta</i> var. <i>bacillaris</i>	0.01	0.01	0.01	17
	<i>Cladonia squamosa</i>	0.01	0.01	0.01	17
	<i>Dicranum</i>	0.50	0.50	0.50	17
	<i>Dicranum scoparium</i>	3.00	1.00	5.00	33
	<i>Hypnum</i>	0.50	0.50	0.50	17
	<i>Hypnum imponens</i>	0.88	0.50	1.00	67
	<i>Leucobryum</i>	0.50	0.50	0.50	17
	<i>Leucobryum glaucum</i>	0.50	0.50	0.50	17
	<i>Mnium hornum</i>	1.00	1.00	1.00	17
	<i>Polytrichum</i>	2.75	0.50	5.00	33

	Polytrichum pallidisetum	0.51	0.01	1.00	33
	Sphagnum fallax	25.00	15.00	35.00	33
	Sphagnum girgensohnii	20.00	10.00	35.00	83
	Sphagnum palustre	10.50	1.00	20.00	33
	Sphagnum rubellum	30.00	30.00	30.00	17
	Tylopilus fellus	0.50	0.50	0.50	17
Total					52

**Pinus rigida - Picea rubens / Nemopanthus mucronata - Kalmia latifolia / Sphagnum spp. - Polytrichum spp. peat woodland**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Nemopanthus mucronatus	1.00	1.00	1.00	33
	Picea rubens	7.67	5.00	10.00	100
	Pinus rigida	18.00	18.00	18.00	33
	Tsuga canadensis	1.00	1.00	1.00	33
T3	Acer rubrum	2.00	2.00	2.00	67
	Picea rubens	3.50	3.00	4.00	67
	Pinus rigida	17.00	14.00	20.00	67
	Tsuga canadensis	1.00	1.00	1.00	33
S1	Gaylussacia baccata	1.00	1.00	1.00	33
	Ilex verticillata	2.00	2.00	2.00	33
	Kalmia latifolia	18.50	15.00	22.00	67
	Menziesia pilosa	2.00	2.00	2.00	33
	Nemopanthus mucronatus	14.33	10.00	21.00	100
	Photinia melanocarpa	1.00	1.00	1.00	33
	Picea rubens	0.83	0.50	1.00	100
	Pinus rigida	2.33	1.00	5.00	100
	Rhododendron maximum	0.75	0.50	1.00	67
	Tsuga canadensis	1.00	1.00	1.00	33
	Viburnum nudum var. cassinoides	2.00	2.00	2.00	33
S2	Gaylussacia baccata	6.00	3.00	10.00	100
	Ilex verticillata	1.00	1.00	1.00	33
	Kalmia latifolia	8.50	0.50	20.00	100
	Menziesia pilosa	2.75	0.50	5.00	67
	Nemopanthus mucronatus	0.67	0.50	1.00	100
	Photinia melanocarpa	5.33	3.00	8.00	100
	Picea rubens	0.50	0.50	0.50	100
	Pinus rigida	1.50	1.00	2.00	67
	Quercus ilicifolia	0.01	0.01	0.01	33
	Rhododendron maximum	0.50	0.50	0.50	67
	Tsuga canadensis	0.50	0.50	0.50	33
	Vaccinium angustifolium	3.67	1.00	5.00	100
	Vaccinium myrtilloides	14.00	2.00	30.00	100
Viburnum nudum var. cassinoides	2.00	0.01	5.00	100	
H	Acer rubrum	0.01	0.01	0.01	67
	Bartonia virginica	0.01	0.01	0.01	33
	Carex echinata ssp. echinata	0.01	0.01	0.01	33
	Carex trisperma var. trisperma	0.50	0.50	0.50	67

	<i>Coptis trifolia</i>	0.83	0.50	1.00	100
	<i>Cornus canadensis</i>	1.00	1.00	1.00	33
	<i>Dalibarda repens</i>	0.34	0.01	0.50	100
	<i>Deschampsia flexuosa</i> var. <i>flexuosa</i>	0.50	0.50	0.50	33
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.26	0.01	0.50	67
	<i>Dryopteris intermedia</i>	0.01	0.01	0.01	33
	<i>Epigaea repens</i>	1.01	0.01	2.00	67
	<i>Eriophorum virginicum</i>	2.00	1.00	3.00	67
	<i>Gaultheria procumbens</i>	1.00	0.01	2.00	100
	<i>Gaylussacia baccata</i>	0.50	0.50	0.50	33
	<i>Gentiana linearis</i>	0.01	0.01	0.01	67
	<i>Hypericum densiflorum</i>	0.01	0.01	0.01	33
	<i>Ilex verticillata</i>	0.01	0.01	0.01	33
	<i>Juncus brevicaudatus</i>	0.01	0.01	0.01	67
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.01	0.01	0.01	33
	<i>Kalmia latifolia</i>	0.26	0.01	0.50	67
	<i>Lycopodiella inundata</i>	0.01	0.01	0.01	33
	<i>Lycopodium annotinum</i>	2.00	2.00	2.00	33
	<i>Lycopodium dendroideum</i>	0.01	0.01	0.01	33
	<i>Lycopodium hickeyi</i>	0.50	0.50	0.50	33
	<i>Lycopodium obscurum</i>	1.00	1.00	1.00	67
	<i>Maianthemum canadense</i>	0.01	0.01	0.01	67
	<i>Mitchella repens</i>	0.50	0.50	0.50	33
	<i>Nemopanthus mucronatus</i>	0.34	0.01	0.50	100
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.00	1.00	1.00	67
	<i>Photinia melanocarpa</i>	0.26	0.01	0.50	67
	<i>Picea rubens</i>	0.26	0.01	0.50	67
	<i>Pinus rigida</i>	0.26	0.01	0.50	67
	<i>Pteridium aquilinum</i>	0.01	0.01	0.01	33
	<i>Rhododendron maximum</i>	0.01	0.01	0.01	33
	<i>Rhynchospora alba</i>	0.75	0.50	1.00	67
	<i>Rubus hispidus</i>	2.67	2.00	3.00	100
	<i>Sorbus americana</i>	0.01	0.01	0.01	33
	<i>Tsuga canadensis</i>	0.01	0.01	0.01	33
	<i>Vaccinium angustifolium</i>	0.50	0.50	0.50	33
	<i>Vaccinium myrtilloides</i>	0.50	0.50	0.50	33
	<i>Vaccinium oxycoccos</i>	1.17	0.50	2.00	100
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.01	0.01	0.01	33
N	<i>Cladonia</i>	0.01	0.01	0.01	33
	<i>Hypnum imponens</i>	0.75	0.50	1.00	67
	<i>Leucobryum glaucum</i>	0.01	0.01	0.01	33
	<i>Polytrichum commune</i>	21.00	2.00	40.00	67
	<i>Polytrichum pallidisetum</i>	10.00	10.00	10.00	33
	<i>Sphagnum fallax</i>	30.50	27.00	34.00	67
	<i>Sphagnum magellanicum</i>	31.50	1.00	62.00	67
	<i>Sphagnum papillosum</i>	2.50	2.00	3.00	67
	<i>Sphagnum rubellum</i>	13.00	3.00	30.00	100
	<i>Splachnum ampullaceum</i>	0.01	0.01	0.01	33
Total					71

**Populus tremuloides / Vaccinium myrtilloides / Solidago uliginosa wet forest**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Amelanchier laevis	0.30	0.30	0.30	6
	Crataegus macrosperma	0.30	0.30	0.30	6
	Crataegus punctata	0.70	0.60	0.80	13
	Populus tremuloides	56.25	30.00	98.00	100
T3	Picea rubens	1.00	1.00	1.00	6
	Populus tremuloides	10.00	10.00	10.00	13
S1	Acer rubrum	1.00	1.00	1.00	6
	Amelanchier laevis	1.10	0.01	2.50	25
	Crataegus	1.00	1.00	1.00	6
	Crataegus macrosperma	0.01	0.01	0.01	6
	Crataegus punctata	1.25	1.25	1.25	13
	Hypericum densiflorum	4.38	1.25	7.50	25
	Nemopanthus mucronatus	3.00	3.00	3.00	6
	Photinia melanocarpa	15.83	1.25	45.00	19
	Photinia pyrifolia	1.13	1.00	1.25	13
	Picea rubens	0.01	0.01	0.01	13
	Populus tremuloides	4.97	0.50	35.00	75
	Prunus serotina var. serotina	1.88	1.25	2.50	13
	Spiraea alba	4.00	4.00	4.00	6
	Spiraea alba var. alba	29.84	2.50	67.50	25
	Vaccinium angustifolium	20.00	20.00	20.00	6
	Vaccinium myrtilloides	11.75	1.25	26.25	63
Viburnum nudum var. cassinoides	5.44	0.63	15.00	63	
Viburnum recognitum	2.81	1.25	8.75	50	
S2	Acer rubrum	0.01	0.01	0.01	6
	Amelanchier	0.50	0.50	0.50	6
	Betula alleghaniensis var. alleghaniensis	0.01	0.01	0.01	6
	Crataegus	0.50	0.50	0.50	6
	Hypericum densiflorum	0.50	0.50	0.50	6
	Nemopanthus mucronatus	1.00	1.00	1.00	6
	Photinia melanocarpa	25.00	25.00	25.00	6
	Photinia pyrifolia	0.51	0.01	1.00	13
	Populus tremuloides	10.25	0.50	20.00	13
	Prunus serotina var. serotina	0.50	0.50	0.50	6
	Quercus ilicifolia	0.01	0.01	0.01	6
	Rubus	0.50	0.50	0.50	6
	Salix sericea	0.50	0.50	0.50	6
	Spiraea alba	20.50	1.00	40.00	13
	Vaccinium myrtilloides	4.34	0.01	10.00	19
	Viburnum	0.50	0.50	0.50	6
Viburnum nudum var. cassinoides	5.50	1.00	10.00	13	
Viburnum recognitum	5.01	0.01	10.00	13	
H	Achillea millefolium var. occidentalis	1.06	0.75	1.50	25
	Agrostis gigantea	1.50	1.50	1.50	6

Agrostis hyemalis	0.83	0.50	1.50	19
Agrostis perennans	0.50	0.50	0.50	6
Anthoxanthum odoratum ssp. odoratum	3.11	0.50	7.50	56
Apocynum cannabinum	0.38	0.25	0.50	13
Brachyelytrum erectum	2.40	0.50	10.00	31
Bromus ciliatus var. ciliatus	1.00	1.00	1.00	6
Bromus kalmii	1.63	0.50	2.50	25
Calamagrostis canadensis var. canadensis	5.00	1.50	10.00	19
Carex	0.50	0.50	0.50	6
Carex atlantica ssp. atlantica	0.83	0.50	1.50	19
Carex baileyi	0.01	0.01	0.01	6
Carex canescens	0.50	0.50	0.50	6
Carex debilis	1.68	0.50	4.50	44
Carex debilis var. rudgei	0.50	0.50	0.50	6
Carex echinata ssp. echinata	0.92	0.50	1.00	38
Carex folliculata	0.75	0.50	1.50	38
Carex gynandra	2.67	2.00	3.00	19
Carex leptalea ssp. leptalea	0.50	0.50	0.50	6
Carex lurida	1.00	1.00	1.00	6
Carex retroflexa	0.50	0.50	0.50	6
Carex scoparia var. scoparia	1.45	0.01	3.50	31
Carex stipata	0.50	0.50	0.50	6
Carex swanii	0.50	0.50	0.50	13
Carex tribuloides	2.67	1.50	3.50	19
Carex vulpinoidea	0.75	0.50	1.00	25
Circaea	0.01	0.01	0.01	6
Danthonia compressa	7.12	0.50	36.00	81
Dennstaedtia punctilobula	3.00	3.00	3.00	6
Deschampsia flexuosa var. flexuosa	2.00	2.00	2.00	6
Dichanthelium clandestinum	7.71	0.50	18.50	38
Doellingeria umbellata var. umbellata	3.91	0.50	10.00	69
Dryopteris cristata	2.00	2.00	2.00	6
Dryopteris intermedia	0.26	0.01	0.50	13
Dryopteris marginalis	1.50	1.50	1.50	6
Elymus virginicus var. virginicus	1.00	1.00	1.00	6
Epilobium leptophyllum	1.50	0.50	3.00	19
Equisetum arvense	0.50	0.50	0.50	6
Equisetum sylvaticum	0.50	0.50	0.50	6
Euthamia graminifolia var. graminifolia	2.65	0.50	10.00	81
Fragaria virginiana ssp. virginiana	1.00	1.00	1.00	6
Galium asprellum	1.00	1.00	1.00	6
Galium tinctorium	0.50	0.50	0.50	19
Gaultheria procumbens	3.00	3.00	3.00	6
Gentiana	0.01	0.01	0.01	6
Geum rivale	0.01	0.01	0.01	6
Glyceria canadensis	8.40	0.50	15.00	31
Glyceria laxa	0.01	0.01	0.01	6
Glyceria melicaria	2.00	2.00	2.00	6
Glyceria striata	2.00	0.50	3.50	19

Hieracium aurantiacum	0.50	0.50	0.50	6
Hieracium caespitosum	0.50	0.50	0.50	6
Holcus lanatus	0.50	0.50	0.50	6
Houstonia serpyllifolia	0.75	0.50	1.00	25
Hypericum	0.01	0.01	0.01	6
Hypericum punctatum	0.01	0.01	0.01	6
Impatiens capensis	1.50	1.50	1.50	6
Juncus brevicaudatus	0.50	0.50	0.50	6
Juncus effusus	1.11	0.50	3.00	56
Juncus filiformis	0.50	0.50	0.50	6
Juncus subcaudatus var. subcaudatus	0.50	0.50	0.50	6
Juncus tenuis	0.26	0.01	0.50	13
Leersia oryzoides	14.00	0.50	27.50	13
Lonicera japonica	0.01	0.01	0.01	6
Ludwigia palustris	0.50	0.50	0.50	13
Luzula bulbosa	0.56	0.25	1.00	25
Lycopodium clavatum	0.84	0.01	2.00	19
Lycopodium obscurum	0.26	0.01	0.50	13
Lycopodium tristachyum	0.25	0.25	0.25	6
Lycopus uniflorus var. uniflorus	1.33	0.50	2.00	19
Lycopus virginicus	0.50	0.50	0.50	6
Lysimachia ciliata	1.00	1.00	1.00	6
Malaxis unifolia	0.50	0.50	0.50	6
Mentha arvensis	0.50	0.50	0.50	6
Oclemena acuminata	0.01	0.01	0.01	6
Osmunda cinnamomea var. cinnamomea	0.50	0.50	0.50	6
Oxalis stricta	0.50	0.50	0.50	6
Packera aurea	6.00	3.00	12.00	19
Pedicularis lanceolata	2.00	2.00	2.00	6
Phleum pratense	0.50	0.50	0.50	6
Platanthera clavellata	0.90	0.01	2.00	31
Platanthera lacera	0.67	0.50	1.00	19
Poa pratensis ssp. pratensis	0.79	0.01	2.00	38
Poa sylvestris	0.50	0.50	0.50	6
Polemonium vanbruntiae	0.01	0.01	0.01	6
Polygonum sagittatum	1.13	0.50	2.00	25
Potentilla simplex	1.63	0.50	4.50	81
Prunella vulgaris	0.50	0.50	0.50	6
Pteridium aquilinum	0.51	0.01	1.00	13
Pteridium aquilinum var. latiusculum	6.07	1.00	15.50	44
Ranunculus abortivus	0.50	0.50	0.50	6
Ranunculus acris var. acris	1.25	0.50	2.00	13
Ranunculus bulbosus	1.75	1.50	2.00	13
Ranunculus hispidus var. hispidus	2.50	2.50	2.50	6
Rubus hispidus	16.55	0.50	42.50	94
Scirpus atrocinctus	0.50	0.50	0.50	13
Scirpus microcarpus	0.50	0.50	0.50	6
Sisyrinchium angustifolium	1.00	0.50	2.00	19
Solidago rugosa	4.77	0.50	20.00	81

	<i>Solidago uliginosa</i>	17.57	1.00	62.00	94
	<i>Sphenopholis intermedia</i>	0.50	0.50	0.50	6
	<i>Symphotrichum</i>	0.50	0.50	0.50	6
	<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	0.50	0.50	0.50	6
	<i>Symplocarpus foetidus</i>	1.00	1.00	1.00	6
	<i>Taraxacum officinale</i> ssp. <i>officinale</i>	1.01	0.01	2.00	13
	<i>Triadenum fraseri</i>	0.50	0.50	0.50	6
	<i>Viburnum recognitum</i>	1.00	1.00	1.00	6
	<i>Viola</i>	0.94	0.25	2.00	25
	<i>Viola cucullata</i>	0.42	0.25	0.50	19
N	<i>Aulacomnium palustre</i>	0.01	0.01	0.01	6
	<i>Callicladium haldanianum</i>	0.75	0.50	1.00	13
	<i>Climacium americanum</i>	0.01	0.01	0.01	6
	<i>Hypnum imponens</i>	0.50	0.50	0.50	6
	<i>Plagiomnium ciliare</i>	0.50	0.50	0.50	6
	<i>Polytrichum commune</i>	5.00	0.01	10.00	19
	<i>Sphagnum fallax</i>	5.00	5.00	5.00	6
	<i>Sphagnum girgensohnii</i>	35.00	35.00	35.00	6
	<i>Thuidium delicatulum</i>	0.01	0.01	0.01	6
Total					40

**Rhododendron arborescens / Marshallia grandiflora - Triantha glutinosa - Platanthera flava var. herbiola riverscour prairie**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Acer saccharum</i> var. <i>saccharum</i>	1.00	1.00	1.00	20
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	5.00	5.00	5.00	20
	<i>Fagus grandifolia</i>	1.00	1.00	1.00	20
	<i>Picea rubens</i>	1.00	1.00	1.00	20
S1	<i>Alnus</i>	5.00	5.00	5.00	20
	<i>Alnus incana</i> ssp. <i>rugosa</i>	2.00	1.00	3.00	40
	<i>Hypericum densiflorum</i>	10.00	10.00	10.00	20
	<i>Rhododendron arborescens</i>	1.00	1.00	1.00	20
	<i>Spiraea alba</i>	0.50	0.50	0.50	20
S2	<i>Alnus</i>	5.00	5.00	5.00	20
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.75	0.50	1.00	40
	<i>Hypericum densiflorum</i>	7.00	1.00	10.00	60
	<i>Physocarpus opulifolius</i> var. <i>opulifolius</i>	0.50	0.50	0.50	20
	<i>Picea rubens</i>	0.50	0.50	0.50	20
	<i>Rhododendron arborescens</i>	2.17	0.50	5.00	60
	<i>Salix</i>	0.50	0.50	0.50	20
	<i>Salix sericea</i>	1.75	0.50	3.00	40
	<i>Spiraea alba</i>	0.50	0.50	0.50	20
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.50	0.50	0.50	20
H	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0.50	0.50	0.50	40
	<i>Agrimonia</i>	0.01	0.01	0.01	20
	<i>Agrostis</i>	0.50	0.50	0.50	20
	<i>Agrostis perennans</i>	0.50	0.50	0.50	60
	<i>Andropogon gerardii</i>	1.00	1.00	1.00	40

Anthoxanthum odoratum ssp. odoratum	0.38	0.01	0.50	80
Apocynum cannabinum	0.50	0.50	0.50	40
Aster	0.60	0.50	1.00	100
Calamagrostis canadensis var. canadensis	4.50	0.50	10.00	60
Carex haydenii	7.40	1.00	20.00	100
Carex scoparia var. scoparia	0.50	0.50	0.50	20
Clematis	0.01	0.01	0.01	20
Clematis virginiana	0.50	0.50	0.50	40
Danthonia compressa	0.50	0.50	0.50	40
Daucus carota	0.50	0.50	0.50	80
Deschampsia caespitosa	0.50	0.01	1.00	80
Deschampsia flexuosa var. flexuosa	0.50	0.50	0.50	20
Dichanthelium acuminatum	3.00	3.00	3.00	20
Dichanthelium acuminatum ssp. fasciculatum	0.50	0.50	0.50	20
Dichanthelium acuminatum ssp. implicatum	0.50	0.50	0.50	20
Dichanthelium clandestinum	0.75	0.50	1.00	40
Doellingeria umbellata var. umbellata	0.50	0.50	0.50	40
Dulichium arundinaceum	0.50	0.50	0.50	20
Eleocharis tenuis	7.00	0.50	30.00	100
Elymus	0.01	0.01	0.01	20
Elymus riparius	0.50	0.50	0.50	20
Eupatorium purpureum var. purpureum	0.01	0.01	0.01	20
Euthamia graminifolia var. graminifolia	8.20	3.00	20.00	100
Galium	0.01	0.01	0.01	20
Galium tinctorium	0.50	0.50	0.50	20
Glyceria striata	1.00	1.00	1.00	20
Helenium autumnale var. autumnale	0.01	0.01	0.01	20
Holcus lanatus	0.50	0.50	0.50	40
Houstonia serpyllifolia	1.50	1.00	3.00	80
Hydrocotyle americana	0.50	0.50	0.50	20
Hypericum	0.50	0.50	0.50	40
Hypericum ellipticum	0.63	0.50	1.00	80
Hypericum mutilum	1.75	0.50	3.00	40
Hypericum perforatum	0.50	0.50	0.50	20
Impatiens	0.50	0.50	0.50	20
Juncus	0.50	0.50	0.50	40
Juncus brevicaudatus	5.00	5.00	5.00	20
Juncus dudleyi	2.00	0.50	5.00	60
Juncus marginatus	0.50	0.50	0.50	20
Juncus subcaudatus var. subcaudatus	3.00	3.00	3.00	20
Krigia	0.50	0.50	0.50	20
Krigia biflora var. biflora	0.50	0.50	0.50	40
Leucanthemum vulgare	0.67	0.50	1.00	60
Lotus corniculatus	0.50	0.50	0.50	20
Lycopus uniflorus var. uniflorus	0.50	0.50	0.50	60
Lysimachia quadrifolia	0.50	0.50	0.50	40
Marshallia grandiflora	13.38	0.50	30.00	80
Onoclea sensibilis	0.50	0.50	0.50	20
Oxalis dillenii	0.01	0.01	0.01	20

	<i>Oxalis stricta</i>	0.50	0.50	0.50	20
	<i>Oxypolis rigidior</i>	0.50	0.50	0.50	40
	<i>Packera aurea</i>	0.50	0.50	0.50	60
	<i>Panicum</i>	0.50	0.50	0.50	20
	<i>Pedicularis canadensis</i> ssp. <i>canadensis</i>	0.50	0.50	0.50	40
	<i>Phlox maculata</i>	0.83	0.50	1.00	60
	<i>Plantago</i>	0.50	0.50	0.50	40
	<i>Platanthera flava</i> var. <i>herbiola</i>	0.50	0.50	0.50	60
	<i>Polygonum sagittatum</i>	0.50	0.50	0.50	40
	<i>Potentilla simplex</i>	1.38	0.50	3.00	80
	<i>Prunella vulgaris</i>	0.63	0.50	1.00	80
	<i>Pteridium aquilinum</i>	1.00	1.00	1.00	20
	<i>Rhynchospora capitellata</i>	2.75	0.50	5.00	40
	<i>Rubus</i>	0.83	0.50	1.00	60
	<i>Sanguisorba canadensis</i>	1.40	0.01	3.00	100
	<i>Scirpus cyperinus</i>	0.26	0.01	0.50	40
	<i>Solidago rugosa</i>	1.00	0.50	3.00	100
	<i>Sphenopholis obtusata</i>	0.50	0.50	0.50	20
	<i>Spiraea alba</i>	0.50	0.50	0.50	20
	<i>Symphotrichum prenanthoides</i>	0.50	0.50	0.50	20
	<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	0.50	0.50	0.50	20
	<i>Toxicodendron radicans</i>	0.50	0.50	0.50	20
	<i>Trautvetteria caroliniensis</i> var. <i>caroliniensis</i>	3.00	1.00	5.00	60
	<i>Triantha glutinosa</i>	1.63	0.50	5.00	80
	<i>Trifolium aureum</i>	0.50	0.50	0.50	20
	<i>Veratrum viride</i>	0.01	0.01	0.01	20
	<i>Vicia</i>	0.50	0.50	0.50	20
	<i>Viola</i>	0.50	0.50	0.50	40
	<i>Viola</i> × <i>primulifolia</i>	0.01	0.01	0.01	20
	<i>Viola cucullata</i>	3.00	1.00	5.00	40
N	<i>Polytrichum commune</i>	0.50	0.50	0.50	20
Total					54

### Salix sericea / Sphagnum shrub swamp

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Acer rubrum</i>	1.00	1.00	1.00	9
S1	<i>Abies balsamea</i>	0.01	0.01	0.01	9
	<i>Acer rubrum</i>	0.50	0.50	0.50	9
	<i>Alnus incana</i> ssp. <i>rugosa</i>	11.00	2.00	20.00	18
	<i>Amelanchier laevis</i>	0.20	0.20	0.20	9
	<i>Hypericum densiflorum</i>	15.80	2.00	37.00	27
	<i>Ilex verticillata</i>	2.70	0.40	5.00	18
	<i>Photinia melanocarpa</i>	0.50	0.50	0.50	9
	<i>Populus tremuloides</i>	2.00	2.00	2.00	9
	<i>Salix sericea</i>	47.09	0.50	80.00	91
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.30	0.20	0.40	18
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.00	1.00	1.00	9
	<i>Viburnum recognitum</i>	0.50	0.50	0.50	9

S2	<i>Acer rubrum</i> var. <i>rubrum</i>	0.50	0.50	0.50	9
	<i>Alnus incana</i> ssp. <i>rugosa</i>	0.50	0.50	0.50	9
	<i>Gaylussacia baccata</i>	3.00	3.00	3.00	9
	<i>Hypericum densiflorum</i>	1.50	1.00	2.00	18
	<i>Ilex verticillata</i>	2.00	0.50	5.00	27
	<i>Kalmia latifolia</i>	0.01	0.01	0.01	9
	<i>Lonicera morrowii</i>	3.00	3.00	3.00	9
	<i>Menziesia pilosa</i>	0.50	0.50	0.50	9
	<i>Photinia melanocarpa</i>	2.51	0.01	5.00	18
	<i>Photinia pyrifolia</i>	5.25	0.50	10.00	18
	<i>Picea rubens</i>	0.67	0.50	1.00	27
	<i>Populus tremuloides</i>	0.50	0.50	0.50	18
	<i>Rubus</i>	0.01	0.01	0.01	9
	<i>Salix discolor</i>	3.00	3.00	3.00	9
	<i>Salix humilis</i> var. <i>humilis</i>	1.00	1.00	1.00	9
	<i>Salix sericea</i>	8.50	2.00	25.00	36
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.50	0.50	0.50	18
	<i>Vaccinium angustifolium</i>	5.00	5.00	5.00	9
	<i>Vaccinium myrtilloides</i>	0.50	0.01	1.00	36
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	1.00	1.00	1.00	9
<i>Viburnum recognitum</i>	0.50	0.50	0.50	9	
H	<i>Acer rubrum</i>	0.50	0.50	0.50	9
	<i>Agrostis hyemalis</i>	1.00	1.00	1.00	9
	<i>Agrostis perennans</i>	1.55	0.50	4.00	36
	<i>Aster</i>	1.00	1.00	1.00	9
	<i>Athyrium filix-femina</i> var. <i>angustum</i>	0.01	0.01	0.01	9
	<i>Brachyelytrum septentrionale</i>	0.01	0.01	0.01	9
	<i>Callitriche</i>	1.00	1.00	1.00	9
	<i>Carex atlantica</i>	1.33	1.00	2.00	27
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	10.00	10.00	10.00	9
	<i>Carex baileyi</i>	0.50	0.50	0.50	9
	<i>Carex echinata</i> ssp. <i>echinata</i>	15.00	15.00	15.00	9
	<i>Carex folliculata</i>	1.34	0.01	3.00	27
	<i>Carex gynandra</i>	2.98	0.40	10.00	55
	<i>Carex intumescens</i>	0.01	0.01	0.01	9
	<i>Carex leptalea</i> ssp. <i>leptalea</i>	2.14	0.50	6.00	64
	<i>Carex lurida</i>	1.70	0.50	5.00	45
	<i>Carex scoparia</i> var. <i>scoparia</i>	6.14	0.50	17.40	45
	<i>Carex stipata</i>	2.83	0.50	6.00	27
	<i>Carex tribuloides</i>	30.00	30.00	30.00	9
	<i>Carex trisperma</i> var. <i>trisperma</i>	0.01	0.01	0.01	9
	<i>Chelone glabra</i>	0.43	0.20	0.50	36
	<i>Chrysosplenium americanum</i>	0.01	0.01	0.01	9
	<i>Clematis virginiana</i>	0.02	0.02	0.02	9
	<i>Cornus amomum</i>	1.00	1.00	1.00	9
	<i>Crataegus</i>	0.01	0.01	0.01	9
	<i>Dichanthelium clandestinum</i>	1.00	1.00	1.00	9
	<i>Dichanthelium dichotomum</i> ssp. <i>microcarpon</i>	0.40	0.40	0.40	9
	<i>Doellingeria umbellata</i> var. <i>umbellata</i>	11.30	2.60	20.00	18

<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.75	0.50	1.00	18
<i>Dryopteris carthusiana</i>	0.83	0.50	1.00	27
<i>Dryopteris cristata</i>	0.82	0.40	1.00	55
<i>Dryopteris intermedia</i>	0.01	0.01	0.01	9
<i>Eleocharis tenuis</i>	3.00	3.00	3.00	9
<i>Epilobium</i>	1.00	1.00	1.00	9
<i>Epilobium ciliatum</i>	0.11	0.01	0.20	18
<i>Epilobium leptophyllum</i>	0.38	0.01	0.60	36
<i>Equisetum arvense</i>	0.01	0.01	0.01	9
<i>Eriophorum virginicum</i>	7.75	0.50	15.00	18
<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	1.93	1.00	2.40	27
<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	19.84	0.01	55.00	45
<i>Galium asprellum</i>	1.67	1.00	3.00	27
<i>Galium obtusum</i> ssp. <i>obtusum</i>	1.00	1.00	1.00	9
<i>Galium tinctorium</i>	2.34	0.01	7.00	45
<i>Gentiana linearis</i>	0.85	0.50	1.20	18
<i>Glyceria canadensis</i>	4.00	0.50	10.00	36
<i>Glyceria laxa</i>	12.20	1.00	30.00	45
<i>Glyceria melicaria</i>	2.17	0.50	5.00	27
<i>Glyceria striata</i>	3.72	1.00	8.40	45
<i>Hypericum</i>	0.50	0.50	0.50	9
<i>Hypericum canadense</i>	0.50	0.50	0.50	9
<i>Hypericum densiflorum</i>	0.01	0.01	0.01	9
<i>Hypericum ellipticum</i>	0.50	0.50	0.50	9
<i>Hypericum mutilum</i>	1.88	0.50	6.00	36
<i>Hypericum punctatum</i>	0.75	0.50	1.00	18
<i>Impatiens</i>	5.50	1.00	10.00	18
<i>Impatiens capensis</i>	4.87	2.00	7.60	27
<i>Juncus brevicaudatus</i>	1.00	1.00	1.00	9
<i>Juncus effusus</i>	1.40	0.50	5.00	64
<i>Juncus effusus</i> var. <i>solutus</i>	1.00	1.00	1.00	9
<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.75	0.50	1.00	36
<i>Leersia oryzoides</i>	3.00	1.00	5.00	36
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.60	0.40	1.00	36
<i>Lycopus virginicus</i>	3.00	3.00	3.00	9
<i>Mentha arvensis</i>	0.50	0.50	0.50	9
<i>Milium effusum</i> var. <i>cisatlanticum</i>	20.00	20.00	20.00	9
<i>Mimulus</i>	2.00	2.00	2.00	9
<i>Onoclea sensibilis</i>	11.50	5.00	18.00	18
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	2.57	0.01	10.00	55
<i>Oxalis</i>	1.00	1.00	1.00	9
<i>Packera aurea</i>	2.50	2.00	3.00	18
<i>Platanthera clavellata</i>	0.50	0.50	0.50	9
<i>Poa palustris</i>	0.01	0.01	0.01	9
<i>Poa pratensis</i> ssp. <i>pratensis</i>	0.01	0.01	0.01	9
<i>Polemonium vanbruntiae</i>	6.00	2.00	10.00	18
<i>Polygonum hydropiper</i>	0.50	0.50	0.50	9
<i>Polygonum sagittatum</i>	6.33	0.01	15.00	73
<i>Polygonum scandens</i>	0.01	0.01	0.01	9

	Potentilla simplex	1.00	1.00	1.00	9
	Rosa	0.40	0.40	0.40	9
	Rubus hispidus	10.29	0.01	38.00	91
	Salix sericea	0.50	0.50	0.50	9
	Scirpus cyperinus	2.75	0.50	5.00	18
	Scirpus polyphyllus	2.00	2.00	2.00	9
	Scutellaria lateriflora var. lateriflora	0.67	0.50	1.00	27
	Solidago	2.00	2.00	2.00	9
	Solidago rugosa	10.68	1.00	30.00	45
	Solidago uliginosa	10.04	0.01	35.00	73
	Sparganium chlorocarpum	3.67	0.50	10.00	27
	Symphyotrichum dumosum var. dumosum	14.20	14.20	14.20	9
	Symphyotrichum lateriflorum	1.00	1.00	1.00	9
	Symphyotrichum pilosum	3.00	3.00	3.00	9
	Symphyotrichum prenanthoides	0.50	0.50	0.50	9
	Symphyotrichum puniceum var. puniceum	1.47	0.40	3.00	64
	Symplocarpus foetidus	20.00	20.00	20.00	9
	Thelypteris palustris var. pubescens	3.00	3.00	3.00	9
	Triadenum fraseri	1.33	0.50	3.00	27
	Typha latifolia	17.63	0.50	40.00	36
	Vaccinium macrocarpon	0.01	0.01	0.01	9
	Vaccinium oxycoccos	5.67	3.00	10.00	27
	Viola	1.85	0.60	4.00	55
	Viola cucullata	4.00	3.00	5.00	18
N	Aulacomnium palustre	0.50	0.50	0.50	18
	Bryum pseudotriquetrum	1.00	1.00	1.00	9
	Cladina	0.26	0.01	0.50	18
	Cladonia	0.01	0.01	0.01	9
	Hygrohypnum eugyrium	1.00	1.00	1.00	9
	Hypnum imponens	1.00	1.00	1.00	9
	Hypnum pallescens	0.01	0.01	0.01	9
	Plagiothecium denticulatum	0.01	0.01	0.01	9
	Pleurozium schreberi	2.25	0.50	4.00	18
	Polytrichum	6.67	5.00	10.00	27
	Polytrichum commune	5.73	0.20	15.00	27
	Polytrichum strictum	35.00	35.00	35.00	9
	Sphagnum	70.00	70.00	70.00	9
	Sphagnum affine	18.00	18.00	18.00	9
	Sphagnum fallax	10.00	10.00	10.00	9
	Sphagnum flexuosum	14.00	14.00	14.00	9
	Sphagnum girgensohnii	10.00	1.00	19.00	18
	Sphagnum lescurii	0.50	0.50	0.50	9
	Sphagnum magellanicum	14.00	14.00	14.00	9
	Sphagnum palustre	20.25	1.00	60.00	36
	Sphagnum papillosum	10.00	10.00	10.00	9
	Sphagnum rubellum	10.00	10.00	10.00	9
	Steerecleus serrulatus	10.00	10.00	10.00	9
	Thuidium delicatulum	0.75	0.50	1.00	18
	Umbilicaria	0.01	0.01	0.01	9

Total	34
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### Schoenoplectus tabernaemontani marsh

Stratum	Scientific Name	Average	Min	Max	Constanc
S2	Hypericum densiflorum	0.01	0.01	0.01	50
	Salix sericea	0.50	0.50	0.50	50
H	Alisma subcordatum	5.00	5.00	5.00	50
	Bidens cernua	0.50	0.50	0.50	50
	Calamagrostis canadensis var. canadensis	1.00	1.00	1.00	50
	Carex atlantica	0.01	0.01	0.01	50
	Carex lurida	0.75	0.50	1.00	100
	Carex scoparia var. scoparia	0.50	0.50	0.50	50
	Carex stipata	0.01	0.01	0.01	50
	Carex stricta	0.50	0.50	0.50	50
	Cornus canadensis	0.01	0.01	0.01	50
	Dryopteris intermedia	0.01	0.01	0.01	50
	Eleocharis	1.00	1.00	1.00	50
	Eleocharis obtusa	0.50	0.50	0.50	50
	Eleocharis tenuis	0.01	0.01	0.01	50
	Epilobium leptophyllum	0.01	0.01	0.01	50
	Galium tinctorium	1.00	1.00	1.00	100
	Glyceria striata	0.01	0.01	0.01	50
	Helenium autumnale var. autumnale	0.01	0.01	0.01	50
	Hypericum mutilum	0.50	0.50	0.50	50
	Iris pseudacorus	1.00	1.00	1.00	50
	Juncus effusus var. solutus	1.00	1.00	1.00	50
	Leersia oryzoides	5.25	0.50	10.00	100
	Ludwigia palustris	5.25	0.50	10.00	100
	Lycopus americanus	0.01	0.01	0.01	50
	Mentha arvensis	1.00	1.00	1.00	50
	Mimulus ringens var. ringens	0.50	0.50	0.50	50
	Phalaris arundinacea	1.00	1.00	1.00	50
	Poa pratensis ssp. pratensis	0.01	0.01	0.01	50
	Polygonum punctatum var. confertiflorum	0.50	0.50	0.50	50
	Polygonum sagittatum	0.50	0.50	0.50	50
	Schoenoplectus tabernaemontani	20.00	20.00	20.00	100
	Scirpus cyperinus	20.50	1.00	40.00	100
Scirpus microcarpus	10.00	10.00	10.00	50	
Scutellaria lateriflora var. lateriflora	0.01	0.01	0.01	50	
Sparganium	0.50	0.50	0.50	50	
Triadenum fraseri	0.50	0.50	0.50	50	
Verbena hastata var. hastata	3.00	3.00	3.00	50	
Veronica scutellata	0.50	0.50	0.50	50	
N	Brachytecium rivulare	1.00	1.00	1.00	50
	Thuidium delicatulum	0.50	0.50	0.50	50
Total					63

## Scirpus cyperinus wet meadow

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Picea rubens</i>	0.50	0.50	0.50	7
	<i>Populus tremuloides</i>	0.01	0.01	0.01	7
S1	<i>Hypericum densiflorum</i>	11.54	2.00	18.30	36
	<i>Ilex verticillata</i>	0.02	0.02	0.02	7
	<i>Nemopanthus mucronatus</i>	0.02	0.02	0.02	7
	<i>Photinia pyrifolia</i>	1.20	0.60	1.80	14
	<i>Picea rubens</i>	0.50	0.50	0.50	7
	<i>Rhododendron maximum</i>	1.10	1.00	1.20	14
	<i>Rubus</i>	0.01	0.01	0.01	7
	<i>Tsuga canadensis</i>	0.50	0.50	0.50	7
	<i>Vaccinium myrtilloides</i>	7.00	7.00	7.00	7
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	2.27	1.00	4.40	21
	<i>Viburnum recognitum</i>	0.11	0.02	0.20	14
S2	<i>Acer rubrum</i>	0.50	0.50	0.50	7
	<i>Amelanchier</i>	0.01	0.01	0.01	7
	<i>Betula alleghaniensis</i> var. <i>alleghaniensis</i>	0.01	0.01	0.01	7
	<i>Hypericum densiflorum</i>	2.17	0.50	5.00	21
	<i>Prunus serotina</i> var. <i>serotina</i>	0.01	0.01	0.01	7
	<i>Rhododendron maximum</i>	0.01	0.01	0.01	7
	<i>Spiraea alba</i>	0.01	0.01	0.01	7
	<i>Spiraea tomentosa</i>	0.50	0.50	0.50	14
H	<i>Acer rubrum</i>	0.01	0.01	0.02	21
	<i>Agrostis hyemalis</i>	2.80	0.01	10.00	79
	<i>Agrostis perennans</i>	0.68	0.01	2.20	57
	<i>Arisaema triphyllum</i>	0.01	0.01	0.01	7
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	4.60	1.00	8.20	14
	<i>Callitriche heterophylla</i> ssp. <i>heterophylla</i>	0.02	0.02	0.02	7
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	0.87	0.01	2.00	21
	<i>Carex baileyi</i>	0.50	0.50	0.50	7
	<i>Carex canescens</i>	1.00	1.00	1.00	7
	<i>Carex debilis</i> var. <i>debilis</i>	0.01	0.01	0.01	7
	<i>Carex debilis</i> var. <i>rudgei</i>	0.50	0.50	0.50	7
	<i>Carex echinata</i> ssp. <i>echinata</i>	5.00	5.00	5.00	7
	<i>Carex folliculata</i>	12.00	12.00	12.00	7
	<i>Carex gynandra</i>	1.50	0.01	5.00	29
	<i>Carex leptalea</i> ssp. <i>leptalea</i>	0.01	0.01	0.01	7
	<i>Carex lurida</i>	2.42	0.50	5.00	43
	<i>Carex scoparia</i> var. <i>scoparia</i>	10.69	0.20	60.00	64
	<i>Carex stipata</i>	0.20	0.20	0.20	7
	<i>Carex stipata</i> var. <i>stipata</i>	1.33	1.00	2.00	21
	<i>Carex trisperma</i> var. <i>trisperma</i>	0.01	0.01	0.01	14
	<i>Carex vulpinoidea</i>	0.50	0.50	0.50	7
	<i>Chelone glabra</i>	0.01	0.01	0.01	7
	<i>Cinna latifolia</i>	0.50	0.50	0.50	7
	<i>Danthonia compressa</i>	0.01	0.01	0.01	7
	<i>Dennstaedtia punctilobula</i>	1.17	0.01	3.00	21
	<i>Dichanthelium clandestinum</i>	0.60	0.20	1.20	29

<i>Dichantherium dichotomum</i> ssp. <i>microcarpon</i>	0.50	0.50	0.50	7
<i>Doellingeria umbellata</i> var. <i>umbellata</i>	2.51	0.01	5.00	14
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.26	0.02	0.50	14
<i>Dryopteris carthusiana</i>	0.01	0.01	0.01	7
<i>Dryopteris cristata</i>	0.67	0.50	1.00	21
<i>Dulichium arundinaceum</i>	2.20	0.60	3.40	21
<i>Eleocharis obtusa</i>	3.00	3.00	3.00	7
<i>Eleocharis tenuis</i>	0.50	0.50	0.50	7
<i>Eleocharis tenuis</i> var. <i>tenuis</i>	0.50	0.50	0.50	7
<i>Epilobium leptophyllum</i>	0.67	0.50	1.00	21
<i>Equisetum arvense</i>	0.01	0.01	0.01	7
<i>Eriophorum virginicum</i>	2.94	0.70	10.20	36
<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	0.50	0.50	0.50	7
<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	0.01	0.01	0.01	7
<i>Galium aparine</i>	0.50	0.50	0.50	7
<i>Galium asprellum</i>	0.50	0.50	0.50	7
<i>Galium tinctorium</i>	4.50	0.50	11.00	43
<i>Gentiana linearis</i>	0.41	0.02	1.00	21
<i>Glyceria canadensis</i>	6.00	2.00	10.00	14
<i>Glyceria laxa</i>	2.00	1.00	3.00	14
<i>Glyceria striata</i>	0.34	0.01	0.50	21
<i>Holcus lanatus</i>	0.50	0.50	0.50	7
<i>Hydrocotyle americana</i>	0.50	0.50	0.50	7
<i>Hypericum densiflorum</i>	0.50	0.50	0.50	7
<i>Hypericum ellipticum</i>	0.01	0.01	0.01	7
<i>Hypericum mutilum</i>	3.26	0.01	8.00	29
<i>Impatiens</i>	1.00	1.00	1.00	7
<i>Impatiens capensis</i>	1.67	1.00	2.00	21
<i>Juncus brevicaudatus</i>	1.87	0.01	4.40	50
<i>Juncus effusus</i>	3.56	1.00	6.60	57
<i>Juncus effusus</i> var. <i>solutus</i>	1.17	0.50	2.00	21
<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	0.83	0.50	1.00	21
<i>Leersia oryzoides</i>	8.73	0.20	48.00	71
<i>Ludwigia palustris</i>	3.00	3.00	3.00	7
<i>Lycopus uniflorus</i> var. <i>uniflorus</i>	0.75	0.50	1.00	14
<i>Mentha arvensis</i>	0.01	0.01	0.01	7
<i>Mimulus ringens</i> var. <i>ringens</i>	1.25	0.50	2.00	14
<i>Onoclea sensibilis</i>	0.50	0.50	0.50	7
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	0.01	0.01	0.01	21
<i>Photinia melanocarpa</i>	1.00	1.00	1.00	7
<i>Platanthera clavellata</i>	0.01	0.01	0.01	7
<i>Platanthera lacera</i>	0.01	0.01	0.01	7
<i>Poa pratensis</i> ssp. <i>pratensis</i>	0.01	0.01	0.01	7
<i>Polemonium vanbruntiae</i>	2.00	2.00	2.00	7
<i>Polygonum hydropiper</i>	1.00	1.00	1.00	7
<i>Polygonum sagittatum</i>	2.50	0.50	10.00	43
<i>Potentilla simplex</i>	0.01	0.01	0.01	14
<i>Rubus</i>	0.01	0.01	0.01	7
<i>Rubus hispidus</i>	39.63	0.01	83.60	64

	Scirpus atrocinctus	2.00	2.00	2.00	7
	Scirpus cyperinus	28.31	1.00	80.00	100
	Scirpus microcarpus	70.00	70.00	70.00	7
	Scirpus polyphyllus	0.75	0.50	1.00	14
	Scutellaria lateriflora var. lateriflora	0.01	0.01	0.01	14
	Solidago rugosa	0.47	0.01	1.40	21
	Solidago uliginosa	2.35	0.80	4.00	29
	Sparganium chlorocarpum	5.00	1.00	17.00	36
	Thelypteris noveboracensis	0.75	0.50	1.00	14
	Triadenum	0.50	0.50	0.50	7
	Triadenum fraseri	2.00	1.00	3.00	14
	Typha latifolia	0.01	0.01	0.01	7
	Vaccinium myrtilloides	0.01	0.01	0.01	7
	Viburnum nudum var. cassinoides	0.50	0.50	0.50	7
	Viola	0.26	0.01	0.50	14
	Viola macloskeyi ssp. pallens	0.01	0.01	0.01	7
N	Atrichum	0.50	0.50	0.50	7
	Atrichum crispum	2.51	0.01	5.00	14
	Aulacomnium palustre	1.70	0.50	4.00	36
	Cladonia	0.01	0.01	0.01	7
	Hypnum imponens	0.01	0.01	0.01	7
	Hypnum lindbergii	2.00	2.00	2.00	7
	Leptodictyum humile	1.00	1.00	1.00	7
	Leucobryum glaucum	0.01	0.01	0.01	7
	Pellia epiphylla	0.01	0.01	0.01	7
	Plagiomnium ellipticum	4.00	4.00	4.00	7
	Polytrichum commune	39.92	1.00	64.40	71
	Polytrichum longisetum	0.50	0.50	0.50	7
	Polytrichum pallidisetum	1.00	1.00	1.00	7
	Polytrichum strictum	20.00	20.00	20.00	7
	Sphagnum	8.00	8.00	8.00	7
	Sphagnum affine	6.00	6.00	6.00	7
	Sphagnum capillifolium var. capillifolium	15.00	15.00	15.00	7
	Sphagnum cuspidatum	0.50	0.50	0.50	7
	Sphagnum fallax	13.58	0.50	40.00	43
	Sphagnum fimbriatum	2.00	2.00	2.00	7
	Sphagnum flexuosum	1.00	1.00	1.00	7
	Sphagnum girgensohnii	1.00	1.00	1.00	7
	Sphagnum palustre	1.00	1.00	1.00	7
	Sphagnum papillosum	4.17	0.50	10.00	21
	Sphagnum recurvum	4.88	2.00	10.00	36
	Thuidium delicatulum	0.50	0.50	0.50	7
Total					33

### Solidago rugosa - Euthamia graminifolia var. graminifolia wet meadow

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Acer rubrum	0.01	0.01	0.01	5
	Betula alleghaniensis var. alleghaniensis	5.00	5.00	5.00	5

	Pinus strobus	2.00	2.00	2.00	5
	Prunus serotina var. serotina	25.00	25.00	25.00	5
	Quercus bicolor	5.00	5.00	5.00	5
	Quercus palustris	10.00	10.00	10.00	5
	Quercus rubra	0.01	0.01	0.01	5
T3	Acer rubrum	10.50	1.00	20.00	10
	Betula alleghaniensis var. alleghaniensis	2.00	2.00	2.00	5
	Crataegus punctata	3.00	3.00	3.00	5
	Fraxinus americana	3.00	3.00	3.00	5
	Ulmus rubra	3.00	3.00	3.00	5
S1	Acer rubrum	0.50	0.50	0.50	5
	Hamamelis virginiana	1.00	1.00	1.00	5
	Ilex montana	10.01	0.01	20.00	10
	Ilex verticillata	0.01	0.01	0.01	5
	Picea rubens	0.75	0.50	1.00	10
	Rhododendron maximum	0.50	0.50	0.50	5
	Salix sericea	2.50	0.50	5.00	15
	Sambucus nigra ssp. canadensis	0.50	0.50	0.50	10
	Spiraea alba	0.01	0.01	0.01	5
	Spiraea tomentosa	1.00	1.00	1.00	5
	Tsuga canadensis	0.75	0.50	1.00	10
S2	Acer pensylvanicum	0.01	0.01	0.01	5
	Acer rubrum	0.50	0.50	0.50	10
	Acer saccharinum	0.50	0.50	0.50	5
	Acer saccharum var. saccharum	0.50	0.50	0.50	5
	Carya ovata	0.50	0.50	0.50	5
	Cornus amomum	4.75	1.00	10.00	20
	Crataegus	2.00	2.00	2.00	10
	Hypericum densiflorum	6.00	1.00	10.00	15
	Ilex montana	0.50	0.50	0.50	5
	Lonicera morrowii	0.50	0.50	0.50	5
	Photinia pyrifolia	1.00	1.00	1.00	5
	Prunus serotina var. serotina	0.50	0.50	0.50	5
	Ribes	0.50	0.50	0.50	5
	Rosa multiflora	2.00	1.00	3.00	15
	Rubus	0.50	0.50	0.50	15
	Rubus pensilvanicus	3.00	3.00	3.00	5
	Salix sericea	0.75	0.50	1.00	10
	Sambucus nigra ssp. canadensis	0.84	0.01	2.00	15
	Smilax glauca	0.50	0.50	0.50	5
	Smilax rotundifolia	0.01	0.01	0.01	5
	Sorbus americana	0.01	0.01	0.01	5
	Spiraea alba	0.83	0.50	1.00	15
	Spiraea tomentosa	0.50	0.50	0.50	5
	Vaccinium angustifolium	3.00	3.00	3.00	5
H	Acer rubrum	0.75	0.50	1.00	10
	Achillea millefolium var. occidentalis	3.17	0.01	9.00	15
	Aconitum uncinatum	20.50	1.00	40.00	10
	Ageratina altissima	0.67	0.50	1.00	15

Agrostis gigantea	2.00	1.00	3.00	10
Agrostis hyemalis	0.13	0.01	0.50	20
Agrostis perennans	0.64	0.50	1.00	35
Allium	0.50	0.50	0.50	5
Ambrosia artemisiifolia var. elatior	0.75	0.50	1.00	10
Amphicarpaea bracteata	0.50	0.50	0.50	5
Anemone	0.50	0.50	0.50	5
Anthoxanthum odoratum ssp. odoratum	0.50	0.50	0.50	5
Apios americana	0.50	0.50	0.50	5
Apocynum xfloribundum	1.00	1.00	1.00	5
Apocynum cannabinum	3.00	1.00	5.00	10
Asclepias	0.01	0.01	0.01	5
Asclepias incarnata ssp. pulchra	2.00	2.00	2.00	5
Athyrium filix-femina	0.50	0.50	0.50	5
Bidens	0.01	0.01	0.01	5
Blephilia hirsuta var. hirsuta	0.50	0.50	0.50	5
Boehmeria cylindrica	0.50	0.50	0.50	10
Botrychium dissectum	0.50	0.50	0.50	5
Brassica	0.50	0.50	0.50	5
Brassica rapa var. rapa	0.50	0.50	0.50	5
Callitriche	0.01	0.01	0.01	5
Cardamine diphylla	0.50	0.50	0.50	5
Carex	1.00	0.50	2.00	35
Carex annectens	15.00	15.00	15.00	5
Carex atlantica	3.67	1.00	5.00	15
Carex atlantica ssp. atlantica	1.00	1.00	1.00	5
Carex baileyi	0.75	0.50	1.00	10
Carex bromoides ssp. bromoides	1.00	1.00	1.00	5
Carex brunnescens	3.00	3.00	3.00	5
Carex crinita	2.00	1.00	3.00	10
Carex debilis	0.01	0.01	0.01	5
Carex debilis var. debilis	0.50	0.50	0.50	5
Carex echinata ssp. echinata	0.01	0.01	0.01	5
Carex folliculata	0.01	0.01	0.01	5
Carex gracillima	0.50	0.50	0.50	5
Carex granularis	0.50	0.50	0.50	5
Carex gynandra	1.10	0.01	2.00	25
Carex intumescens	0.50	0.50	0.50	5
Carex leptalea ssp. leptalea	3.17	0.50	7.00	15
Carex lurida	0.75	0.50	1.00	20
Carex scabrata	1.25	0.50	2.00	10
Carex scoparia var. scoparia	1.43	0.50	5.00	35
Carex squarrosa	18.00	18.00	18.00	5
Carex stipata	5.50	1.00	10.00	10
Carex stipata var. stipata	1.00	1.00	1.00	5
Carex tribuloides	4.50	4.00	5.00	10
Chelone glabra	0.50	0.50	0.50	10
Cinna arundinacea	1.00	1.00	1.00	5
Cinna latifolia	0.50	0.50	0.50	5

Cirsium muticum	5.25	0.50	10.00	10
Clematis virginiana	11.83	0.50	55.00	45
Clinopodium vulgare	0.50	0.50	0.50	5
Cornus amomum	2.17	0.50	5.00	15
Coronilla varia	5.00	5.00	5.00	5
Crataegus	0.26	0.01	0.50	10
Danthonia compressa	0.88	0.50	1.00	20
Danthonia spicata	5.00	5.00	5.00	5
Daucus carota	0.01	0.01	0.01	5
Dennstaedtia punctilobula	11.79	0.50	50.00	35
Deschampsia flexuosa var. flexuosa	1.00	1.00	1.00	5
Dichanthelium clandestinum	5.23	0.50	30.00	55
Dichanthelium dichotomum	2.17	0.50	5.00	15
Dichanthelium dichotomum ssp. microcarpon	1.00	1.00	1.00	5
Dichanthelium ovale ssp. villosissimum	0.75	0.50	1.00	10
Doellingeria umbellata var. umbellata	27.29	0.50	50.00	35
Dryopteris cristata	0.01	0.01	0.01	5
Dryopteris intermedia	0.50	0.50	0.50	5
Elaeagnus umbellata var. parvifolia	1.75	0.50	3.00	10
Eleocharis obtusa	0.01	0.01	0.01	5
Eleocharis tenuis	21.38	0.01	75.00	20
Elymus	0.50	0.50	0.50	5
Elymus hystrix	0.50	0.50	0.50	5
Elymus repens	1.00	1.00	1.00	5
Elymus riparius	3.00	1.00	5.00	10
Elymus virginicus var. virginicus	0.67	0.50	1.00	15
Epilobium ciliatum	0.50	0.50	0.50	5
Equisetum arvense	0.50	0.50	0.50	5
Erigeron annuus	1.00	1.00	1.00	5
Eupatorium fistulosum	1.50	0.50	3.00	30
Eupatorium perfoliatum var. perfoliatum	0.50	0.50	0.50	15
Euthamia graminifolia var. graminifolia	33.94	1.00	98.00	90
Festuca subverticillata	0.50	0.50	0.50	5
Fragaria virginiana ssp. virginiana	1.75	0.50	3.00	10
Galium	10.00	10.00	10.00	5
Galium aparine	2.75	0.50	8.00	30
Galium asprellum	5.01	0.01	10.00	10
Galium concinnum	1.00	1.00	1.00	5
Galium tinctorium	4.94	0.01	35.00	40
Galium triflorum	1.00	1.00	1.00	5
Gentiana andrewsii var. andrewsii	0.50	0.50	0.50	5
Geum canadense var. canadense	1.13	0.50	3.00	20
Glechoma hederacea	1.00	1.00	1.00	5
Glyceria canadensis	1.00	1.00	1.00	5
Glyceria melicaria	0.50	0.50	0.50	5
Glyceria striata	2.25	0.50	4.00	10
Hieracium caespitosum	0.50	0.50	0.50	5
Holcus lanatus	1.00	0.01	3.00	20
Houstonia caerulea	0.50	0.50	0.50	10

Houstonia serpyllifolia	0.50	0.50	0.50	5
Hydrocotyle americana	0.38	0.01	0.50	20
Hypericum	0.50	0.50	0.50	5
Hypericum densiflorum	2.50	0.50	5.00	15
Hypericum ellipticum	0.50	0.50	0.50	5
Hypericum mutilum	0.40	0.01	1.00	25
Hypericum prolificum	0.50	0.50	0.50	5
Hypericum punctatum	0.63	0.50	1.00	20
Impatiens	5.25	0.50	15.00	30
Impatiens capensis	0.83	0.50	1.00	15
Juncus effusus	2.05	0.01	10.00	50
Juncus effusus var. solutus	0.34	0.01	0.50	15
Juncus subcaudatus var. subcaudatus	0.01	0.01	0.01	5
Juncus tenuis	2.25	0.50	4.00	10
Lactuca	0.50	0.50	0.50	5
Leersia oryzoides	0.50	0.50	0.50	5
Lobelia cardinalis	1.00	1.00	1.00	5
Lycopodium clavatum	3.00	3.00	3.00	5
Lycopodium digitatum	0.50	0.50	0.50	5
Lycopodium obscurum	1.00	1.00	1.00	5
Lycopus americanus	0.50	0.50	0.50	5
Lycopus uniflorus var. uniflorus	0.50	0.01	1.00	30
Lysimachia ciliata	1.75	0.50	4.00	20
Mentha arvensis	2.00	2.00	2.00	5
Mimulus ringens var. ringens	0.50	0.50	0.50	5
Monarda clinopodia	0.50	0.50	0.50	5
Monarda didyma	1.00	1.00	1.00	5
Oenothera fruticosa ssp. glauca	0.50	0.50	0.50	5
Oenothera parviflora	0.50	0.50	0.50	5
Onoclea sensibilis	0.67	0.50	1.00	30
Osmunda cinnamomea var. cinnamomea	0.90	0.50	2.00	25
Oxalis	0.88	0.50	2.00	20
Oxalis corniculata	0.50	0.50	0.50	5
Oxalis stricta	1.00	1.00	1.00	5
Packera aurea	0.83	0.50	1.00	15
Panicum rigidulum ssp. rigidulum	5.00	5.00	5.00	5
Phalaris arundinacea	2.00	2.00	2.00	5
Phleum pratense	0.67	0.50	1.00	15
Platanthera grandiflora	0.50	0.50	0.50	5
Poa pratensis ssp. pratensis	3.90	0.01	15.00	25
Poa trivialis	0.50	0.50	0.50	5
Polygonum hydropiper	0.01	0.01	0.01	5
Polygonum sagittatum	5.89	0.50	28.00	45
Polygonum scandens	1.00	1.00	1.00	5
Polygonum scandens var. cristatum	0.50	0.50	0.50	10
Polystichum acrostichoides	1.00	1.00	1.00	5
Potamogeton epihydrus	0.50	0.50	0.50	5
Potamogeton nodosus	1.00	1.00	1.00	5
Potentilla canadensis var. canadensis	0.50	0.01	1.00	15

Potentilla norvegica ssp. monspeliensis	0.50	0.50	0.50	5
Potentilla simplex	0.50	0.50	0.50	10
Prunella vulgaris	0.50	0.50	0.50	5
Prunus serotina var. serotina	1.00	1.00	1.00	10
Pteridium aquilinum	0.50	0.01	1.00	15
Pycnanthemum verticillatum	1.00	1.00	1.00	5
Rosa multiflora	6.00	2.00	10.00	10
Rosa palustris	5.25	0.50	10.00	10
Rubus	3.10	0.50	7.00	50
Rubus hispidus	13.40	2.00	30.00	25
Rumex acetosella	0.26	0.01	0.50	10
Rumex obtusifolius	0.75	0.50	1.00	10
Sambucus nigra ssp. canadensis	0.75	0.50	1.00	10
Scirpus	5.38	0.50	20.00	20
Scirpus cyperinus	0.79	0.50	2.00	35
Scirpus polyphyllus	0.01	0.01	0.01	5
Scutellaria lateriflora var. lateriflora	1.75	0.50	5.00	20
Sisyrinchium	0.50	0.50	0.50	15
Smilax glauca	0.75	0.50	1.00	10
Smilax rotundifolia	0.75	0.50	1.00	10
Solanum carolinense var. carolinense	1.00	1.00	1.00	15
Solidago canadensis	29.00	1.00	85.00	15
Solidago flexicaulis	1.00	1.00	1.00	5
Solidago rugosa	32.73	0.50	85.00	65
Solidago rugosa ssp. aspera	1.00	1.00	1.00	5
Solidago uliginosa	4.00	3.00	5.00	10
Sparganium chlorocarpum	0.50	0.50	0.50	5
Spiraea alba	3.00	3.00	3.00	5
Stellaria graminea	0.50	0.50	0.50	5
Stellaria longifolia var. longifolia	30.00	30.00	30.00	5
Symphyotrichum lateriflorum	3.00	1.00	5.00	10
Symphyotrichum praealtum	25.25	0.50	50.00	10
Symphyotrichum prenanthoides	1.00	1.00	1.00	5
Symphyotrichum puniceum var. puniceum	0.50	0.01	1.00	15
Symplocarpus foetidus	0.01	0.01	0.01	5
Taraxacum officinale ssp. officinale	0.01	0.01	0.01	5
Teucrium canadense	0.75	0.50	1.00	10
Thalictrum	5.01	0.01	10.00	10
Thalictrum pubescens	0.63	0.50	1.00	20
Thaspium barbinode	0.50	0.50	0.50	5
Thelypteris noveboracensis	3.27	0.01	15.00	55
Tiarella cordifolia	0.50	0.50	0.50	5
Toxicodendron radicans	0.75	0.50	1.00	10
Triadenum	0.50	0.50	0.50	5
Trifolium repens	0.01	0.01	0.01	5
Verbascum blattaria	1.00	1.00	1.00	5
Verbena hastata var. hastata	0.50	0.50	0.50	5
Verbena urticifolia var. urticifolia	1.00	1.00	1.00	5
Verbesina alternifolia	10.17	0.50	20.00	15

	<i>Vernonia noveboracensis</i>	14.67	2.00	30.00	15
	<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	0.50	0.50	0.50	5
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.50	0.50	0.50	5
	<i>Viola</i>	0.50	0.01	1.00	20
	<i>Viola</i> × <i>palmata</i>	3.00	3.00	3.00	5
	<i>Viola cucullata</i>	2.83	0.50	5.00	15
	<i>Viola sororia</i>	1.33	0.50	3.00	15
	<i>Vitis aestivalis</i> var. <i>bicolor</i>	1.00	1.00	1.00	5
N	<i>Atrichum crispum</i>	0.01	0.01	0.01	5
	<i>Atrichum undulatum</i>	5.00	5.00	5.00	5
	<i>Aulacomnium palustre</i>	0.01	0.01	0.01	5
	<i>Brachythecium rutabulum</i>	5.00	5.00	5.00	5
	<i>Ctenidium malacodes</i>	5.00	5.00	5.00	5
	<i>Hygrohypnum ochraceum</i>	5.00	5.00	5.00	5
	<i>Hypnum imponens</i>	0.01	0.01	0.01	5
	<i>Hypnum lindbergii</i>	0.01	0.01	0.01	5
	<i>Lophocolea heterophylla</i>	0.01	0.01	0.01	5
	<i>Plagiomnium ciliare</i>	0.01	0.01	0.01	5
	<i>Polytrichum</i>	4.17	0.50	10.00	15
	<i>Polytrichum commune</i>	10.01	0.01	20.00	10
	<i>Sphagnum</i>	3.67	0.01	10.00	15
	<i>Sphagnum affine</i>	0.01	0.01	0.01	5
	<i>Sphagnum fallax</i>	0.01	0.01	0.01	5
	<i>Sphagnum flexuosum</i>	0.01	0.01	0.01	5
	<i>Sphagnum girgensohnii</i>	1.00	1.00	1.00	5
	<i>Sphagnum palustre</i>	0.50	0.50	0.50	5
	<i>Sphagnum papillosum</i>	5.25	0.50	10.00	10
	<i>Steerecleus serrulatus</i>	1.00	1.00	1.00	5
	<i>Thuidium delicatulum</i>	0.26	0.01	0.50	10
Total					22

### Sparganium (americanum, chlorocarpum) marsh

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	<i>Acer rubrum</i>	5.25	0.50	10.00	14
	<i>Tsuga canadensis</i>	5.00	5.00	5.00	7
T3	<i>Acer rubrum</i>	10.00	10.00	10.00	7
	<i>Tsuga canadensis</i>	5.00	5.00	5.00	7
S1	<i>Acer rubrum</i>	1.00	1.00	1.00	7
	<i>Alnus serrulata</i>	3.50	2.00	5.00	14
	<i>Betula lenta</i>	0.75	0.50	1.00	14
	<i>Kalmia latifolia</i>	3.00	3.00	3.00	7
	<i>Rhododendron maximum</i>	2.00	0.01	5.00	21
	<i>Viburnum recognitum</i>	2.00	2.00	2.00	7
S2	<i>Alnus serrulata</i>	2.00	1.00	3.00	14
	<i>Amelanchier arborea</i> var. <i>arborea</i>	0.50	0.50	0.50	7
	<i>Amelanchier laevis</i>	0.50	0.50	0.50	7
	<i>Betula lenta</i>	1.00	1.00	1.00	7
	<i>Hypericum densiflorum</i>	6.13	0.50	20.00	29

	<i>Kalmia latifolia</i>	3.00	3.00	3.00	7
	<i>Liriodendron tulipifera</i>	0.50	0.50	0.50	7
	<i>Rosa palustris</i>	1.00	1.00	1.00	7
	<i>Rubus</i>	0.50	0.50	0.50	14
	<i>Rubus hispidus</i>	20.00	20.00	20.00	7
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	0.50	0.50	0.50	7
	<i>Smilax rotundifolia</i>	1.00	1.00	1.00	7
	<i>Tsuga canadensis</i>	3.00	3.00	3.00	7
H	<i>Acer rubrum</i>	0.50	0.50	0.50	14
	<i>Agrostis hyemalis</i>	0.27	0.01	1.00	29
	<i>Agrostis perennans</i>	0.26	0.01	0.50	14
	<i>Bidens</i>	0.50	0.50	0.50	7
	<i>Bidens frondosa</i>	0.01	0.01	0.01	7
	<i>Bidens tripartita</i>	0.01	0.01	0.01	7
	<i>Bidens vulgata</i>	3.00	3.00	3.00	7
	<i>Boykinia aconitifolia</i>	1.00	1.00	1.00	7
	<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	1.01	0.01	2.00	14
	<i>Callitriche</i>	0.50	0.01	1.00	21
	<i>Callitriche heterophylla</i> ssp. <i>heterophylla</i>	1.00	1.00	1.00	7
	<i>Carex</i>	1.00	1.00	1.00	7
	<i>Carex atlantica</i>	0.50	0.50	0.50	7
	<i>Carex atlantica</i> ssp. <i>atlantica</i>	4.00	4.00	4.00	7
	<i>Carex baileyi</i>	3.00	3.00	3.00	7
	<i>Carex bromoides</i> ssp. <i>bromoides</i>	3.00	3.00	3.00	7
	<i>Carex canescens</i>	1.00	1.00	1.00	7
	<i>Carex crinita</i>	4.00	2.00	5.00	21
	<i>Carex gynandra</i>	2.51	0.01	5.00	14
	<i>Carex interior</i>	5.00	5.00	5.00	7
	<i>Carex intumescens</i>	2.33	1.00	3.00	21
	<i>Carex lurida</i>	0.60	0.01	1.00	36
	<i>Carex scoparia</i> var. <i>scoparia</i>	1.00	0.01	3.00	36
	<i>Carex vulpinoidea</i>	3.00	3.00	3.00	7
	<i>Cinna arundinacea</i>	0.50	0.50	0.50	7
	<i>Dichanthelium acuminatum</i> ssp. <i>implicatum</i>	1.00	1.00	1.00	7
	<i>Dichanthelium clandestinum</i>	20.00	20.00	20.00	7
	<i>Dichanthelium dichotomum</i> ssp. <i>microcarpon</i>	1.00	1.00	1.00	7
	<i>Dryopteris intermedia</i>	0.50	0.50	0.50	7
	<i>Dulichium arundinaceum</i>	3.00	1.00	5.00	14
	<i>Eleocharis</i>	1.51	0.01	3.00	14
	<i>Eleocharis obtusa</i>	5.43	0.01	30.00	50
	<i>Eleocharis tenuis</i>	2.00	2.00	2.00	7
	<i>Epilobium coloratum</i>	1.00	1.00	1.00	7
	<i>Erechtites hieraciifolia</i> var. <i>hieraciifolia</i>	3.00	3.00	3.00	7
	<i>Erigeron annuus</i>	1.00	1.00	1.00	7
	<i>Eriophorum virginicum</i>	0.01	0.01	0.01	7
	<i>Eupatorium fistulosum</i>	3.00	3.00	3.00	7
	<i>Eupatorium perfoliatum</i> var. <i>perfoliatum</i>	0.50	0.50	0.50	7
	<i>Eupatorium purpureum</i> var. <i>purpureum</i>	3.00	3.00	3.00	7
	<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	0.26	0.01	0.50	14

Galium asprellum	1.00	1.00	1.00	7
Galium tinctorium	2.34	0.01	10.00	64
Glyceria canadensis	1.00	1.00	1.00	7
Glyceria laxa	1.00	1.00	1.00	7
Glyceria melicaria	0.50	0.50	0.50	7
Hydrocotyle americana	1.00	1.00	1.00	7
Hypericum densiflorum	0.51	0.01	1.00	14
Hypericum ellipticum	2.51	0.01	5.00	14
Hypericum mutilum	2.22	0.01	10.00	50
Ilex verticillata	1.00	1.00	1.00	7
Impatiens	1.33	1.00	2.00	21
Impatiens capensis	0.67	0.50	1.00	21
Juncus	5.00	5.00	5.00	7
Juncus brevicaudatus	0.67	0.50	1.00	21
Juncus effusus	3.20	1.00	5.00	36
Juncus effusus var. solutus	5.17	0.50	10.00	21
Juncus subcaudatus var. subcaudatus	0.38	0.01	0.50	29
Juncus tenuis	1.00	1.00	1.00	7
Leersia oryzoides	7.72	0.50	30.00	64
Lindernia dubia	0.50	0.50	0.50	7
Lindernia dubia var. dubia	1.00	1.00	1.00	14
Linum striatum	0.50	0.50	0.50	7
Liriodendron tulipifera	0.50	0.50	0.50	7
Lobelia cardinalis	5.00	5.00	5.00	7
Ludwigia palustris	4.08	0.50	15.00	43
Lycopus uniflorus var. uniflorus	0.75	0.01	2.00	43
Lycopus virginicus	1.50	0.50	3.00	21
Mimulus ringens var. ringens	0.01	0.01	0.01	7
Nuphar lutea ssp. advena	1.00	1.00	1.00	7
Onoclea sensibilis	0.67	0.50	1.00	21
Osmunda cinnamomea var. cinnamomea	1.00	1.00	1.00	14
Parthenocissus quinquefolia	1.00	1.00	1.00	7
Pinus strobus	0.50	0.50	0.50	7
Platanthera clavellata	0.50	0.50	0.50	7
Poa palustris	0.50	0.50	0.50	7
Polygonum	0.50	0.50	0.50	7
Polygonum hydropiper	0.50	0.50	0.50	14
Polygonum hydropiperoides	1.00	1.00	1.00	7
Polygonum punctatum	0.26	0.01	0.50	14
Polygonum sagittatum	0.57	0.01	1.00	50
Potamogeton epihydrus	1.00	1.00	1.00	7
Potentilla simplex	1.00	1.00	1.00	7
Rubus hispidus	5.00	5.00	5.00	7
Schoenoplectus purshianus	3.00	1.00	5.00	14
Schoenoplectus tabernaemontani	0.26	0.01	0.50	14
Scirpus	3.00	3.00	3.00	7
Scirpus atrovirens	1.00	1.00	1.00	7
Scirpus cyperinus	4.25	0.50	15.00	57
Scirpus expansus	8.33	5.00	10.00	21

	Scirpus polyphyllus	0.50	0.50	0.50	7
	Scutellaria lateriflora var. lateriflora	0.75	0.50	1.00	14
	Solidago canadensis	1.00	1.00	1.00	7
	Solidago rugosa	0.50	0.50	0.50	7
	Sparganium americanum	36.09	2.00	90.00	79
	Sparganium chlorocarpum	27.00	10.00	70.00	36
	Sparganium eurycarpum	1.00	1.00	1.00	7
	Thelypteris noveboracensis	2.00	1.00	3.00	14
	Thelypteris palustris var. pubescens	0.50	0.50	0.50	7
	Torreyochloa pallida var. fernaldii	0.01	0.01	0.01	7
	Triadenum fraseri	1.00	0.50	2.00	29
	Typha latifolia	13.67	1.00	30.00	21
	Veronica americana	0.50	0.50	0.50	7
	Viola	0.01	0.01	0.01	7
	Viola ×primulifolia	1.00	1.00	1.00	7
N	Atrichum crispum	1.00	1.00	1.00	7
	Aulacomnium	0.01	0.01	0.01	7
	Mnium	0.83	0.50	1.00	21
	Philonotis fontana	1.00	1.00	1.00	7
	Polytrichum strictum	0.01	0.01	0.01	7
	Riccia bifurca	3.00	3.00	3.00	7
	Sphagnum	2.00	0.01	10.00	50
	Sphagnum fimbriatum	1.00	1.00	1.00	7
	Sphagnum flexuosum	14.00	14.00	14.00	7
Total					27

### Spiraea alba shrub swamp

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Prunus serotina var. serotina	2.00	2.00	2.00	14
S1	Alnus incana ssp. rugosa	0.50	0.50	0.50	14
	Salix sericea	3.00	1.00	5.00	29
	Spiraea alba	69.57	25.00	98.00	100
	Viburnum nudum var. cassinoides	1.00	1.00	1.00	14
	Viburnum recognitum	30.00	30.00	30.00	14
S2	Hypericum densiflorum	1.00	1.00	1.00	14
	Ilex verticillata	0.26	0.01	0.50	29
	Ribes	0.50	0.50	0.50	14
	Salix sericea	3.00	3.00	3.00	14
	Spiraea alba	5.88	0.50	20.00	57
	Viburnum nudum var. cassinoides	0.01	0.01	0.01	14
	Viburnum recognitum	0.75	0.50	1.00	29
H	Agrostis hyemalis	0.50	0.50	0.50	14
	Agrostis perennans	0.50	0.50	0.50	29
	Amelanchier	0.01	0.01	0.01	14
	Asclepias incarnata ssp. pulchra	0.50	0.50	0.50	14
	Bidens	0.50	0.50	0.50	14
	Bromus ciliatus var. ciliatus	0.01	0.01	0.01	14
	Calamagrostis canadensis var. canadensis	28.26	7.00	40.00	43

Callitriche	0.01	0.01	0.01	14
Carex atlantica ssp. atlantica	1.00	1.00	1.00	14
Carex baileyi	0.75	0.50	1.00	29
Carex bromoides ssp. bromoides	0.50	0.50	0.50	14
Carex echinata ssp. echinata	5.00	5.00	5.00	14
Carex folliculata	0.50	0.50	0.50	14
Carex gynandra	0.85	0.50	1.89	57
Carex hirtifolia	1.70	1.70	1.70	14
Carex intumescens	1.00	1.00	1.00	14
Carex leptalea ssp. leptalea	0.50	0.50	0.50	14
Carex lurida	2.00	2.00	2.00	14
Carex projecta	0.50	0.50	0.50	14
Carex scoparia var. scoparia	0.74	0.50	1.22	71
Carex stipata	0.67	0.50	1.00	43
Carex stricta	3.00	3.00	3.00	14
Carex utriculata	0.50	0.50	0.50	14
Chelone glabra	0.50	0.50	0.50	14
Chrysosplenium americanum	0.50	0.50	0.50	14
Dichanthelium acuminatum ssp. fasciculatum	0.56	0.56	0.56	14
Dichanthelium clandestinum	4.07	0.50	11.78	57
Dryopteris	1.00	1.00	1.00	14
Dryopteris cristata	0.50	0.50	0.50	14
Dryopteris marginalis	0.56	0.56	0.56	14
Dulichium arundinaceum	0.50	0.50	0.50	14
Eleocharis obtusa	0.50	0.50	0.50	14
Epilobium leptophyllum	0.01	0.01	0.01	14
Euthamia graminifolia var. graminifolia	0.17	0.01	0.50	43
Galium tinctorium	0.52	0.11	1.00	71
Gentiana linearis	0.50	0.50	0.50	14
Glyceria canadensis	5.25	0.50	10.00	29
Glyceria grandis var. grandis	0.34	0.01	0.50	43
Glyceria laxa	0.26	0.01	0.50	29
Glyceria striata	1.00	0.50	2.00	43
Helenium autumnale var. autumnale	0.50	0.50	0.50	14
Hydrocotyle americana	0.50	0.50	0.50	14
Hypericum	0.50	0.50	0.50	14
Hypericum ellipticum	0.36	0.01	0.50	57
Hypericum mutilum	0.38	0.01	0.50	57
Impatiens	0.67	0.50	1.00	43
Impatiens capensis	0.01	0.01	0.01	14
Juncus effusus	0.92	0.50	1.67	57
Juncus effusus var. solutus	10.00	10.00	10.00	14
Juncus subcaudatus var. subcaudatus	1.25	0.50	2.00	29
Ludwigia palustris	1.00	1.00	1.00	29
Lycopodium clavatum	1.00	1.00	1.00	14
Lycopus americanus	0.01	0.01	0.01	14
Lycopus uniflorus var. uniflorus	0.34	0.01	0.50	43
Lysimachia ciliata	0.01	0.01	0.01	14
Mentha arvensis	1.00	1.00	1.00	14

	Mimulus ringens var. ringens	0.26	0.01	0.50	29
	Onoclea sensibilis	1.00	1.00	1.00	14
	Oxalis stricta	0.50	0.50	0.50	14
	Poa palustris	1.00	1.00	1.00	14
	Polemonium vanbruntiae	0.50	0.50	0.50	14
	Polygonum punctatum var. confertiflorum	0.01	0.01	0.01	14
	Polygonum sagittatum	0.67	0.50	1.00	43
	Potentilla simplex	0.01	0.01	0.01	14
	Pteridium aquilinum	0.89	0.89	0.89	14
	Ranunculus	0.50	0.50	0.50	14
	Rubus hispidus	2.33	1.00	5.00	43
	Salix sericea	0.50	0.50	0.50	14
	Scirpus atrocinctus	1.75	0.50	3.00	29
	Scirpus cyperinus	0.50	0.50	0.50	29
	Scirpus microcarpus	0.75	0.50	1.00	29
	Scutellaria lateriflora var. lateriflora	0.50	0.01	1.00	43
	Sium suave	0.01	0.01	0.01	14
	Solidago rugosa	0.50	0.01	1.00	43
	Solidago uliginosa	0.75	0.50	1.00	29
	Sparganium americanum	0.50	0.50	0.50	14
	Sparganium chlorocarpum	0.26	0.01	0.50	29
	Spiraea alba	0.50	0.50	0.50	29
	Symphyotrichum	1.00	1.00	1.00	14
	Symphyotrichum puniceum var. puniceum	1.00	1.00	1.00	14
	Taraxacum officinale ssp. officinale	0.01	0.01	0.01	14
	Thalictrum	0.50	0.50	0.50	14
	Thelypteris noveboracensis	1.00	1.00	1.00	14
	Triadenum fraseri	0.50	0.50	0.50	29
	Viburnum recognitum	0.50	0.50	0.50	14
	Viola	1.48	0.01	3.00	43
N	Atrichum crispum	0.01	0.01	0.01	14
	Atrichum undulatum	1.00	1.00	1.00	14
	Aulacomnium	0.50	0.50	0.50	14
	Aulacomnium palustre	0.26	0.01	0.50	29
	Leucobryum albidum	0.56	0.56	0.56	14
	Lophocolea heterophylla	0.01	0.01	0.01	14
	Plagiothecium denticulatum	0.01	0.01	0.01	14
	Polytrichum commune	0.01	0.01	0.01	14
	Sphagnum	1.69	0.50	2.89	29
	Sphagnum affine	2.00	2.00	2.00	14
	Sphagnum flexuosum	0.75	0.50	1.00	29
	Sphagnum palustre	0.50	0.50	0.50	14
	Sphagnum papillosum	1.00	1.00	1.00	14
	Thuidium delicatulum	1.00	1.00	1.00	14
Total					34

### **Spiraea tomentosa / Sphagnum palustre dwarf shrub peatland**

Stratum	Scientific Name	Average	Min	Max	Constanc
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S1	Picea rubens	1.00	1.00	1.00	50
	Rubus allegheniensis var. allegheniensis	5.00	5.00	5.00	50
	Spiraea tomentosa	30.00	30.00	30.00	50
S2	Picea rubens	0.50	0.50	0.50	50
	Spiraea tomentosa	30.00	30.00	30.00	50
H	Agrostis hyemalis	0.50	0.50	0.50	50
	Agrostis perennans	10.00	10.00	10.00	50
	Carex atlantica	10.00	10.00	10.00	50
	Carex gynandra	0.50	0.50	0.50	50
	Carex lurida	0.50	0.50	0.50	50
	Carex scoparia var. scoparia	1.00	1.00	1.00	100
	Carex tribuloides	1.00	1.00	1.00	50
	Carex trisperma var. trisperma	10.00	10.00	10.00	50
	Dichanthelium clandestinum	5.00	5.00	5.00	50
	Doellingeria umbellata var. umbellata	1.00	1.00	1.00	50
	Dryopteris cristata	1.00	1.00	1.00	50
	Epilobium coloratum	0.50	0.50	0.50	50
	Euthamia graminifolia var. graminifolia	0.50	0.50	0.50	50
	Galium tinctorium	1.00	1.00	1.00	50
	Hypericum mutilum	0.50	0.50	0.50	50
	Juncus effusus	0.50	0.50	0.50	50
	Juncus subcaudatus var. subcaudatus	3.00	3.00	3.00	50
	Lycopus uniflorus var. uniflorus	1.00	1.00	1.00	50
	Osmunda cinnamomea var. cinnamomea	5.00	5.00	5.00	100
	Polygonum sagittatum	0.50	0.50	0.50	50
	Scirpus cyperinus	2.00	1.00	3.00	100
	Solidago rugosa ssp. rugosa var. rugosa	3.00	3.00	3.00	50
	Sparganium chlorocarpum	0.50	0.50	0.50	50
Thelypteris noveboracensis	5.00	5.00	5.00	50	
Viola	1.25	0.50	2.00	100	
N	Aulacomnium	0.50	0.50	0.50	50
	Polytrichum	1.00	1.00	1.00	50
	Polytrichum commune	10.00	10.00	10.00	50
	Sphagnum fallax	1.00	1.00	1.00	50
	Sphagnum fimbriatum	1.00	1.00	1.00	50
	Sphagnum palustre	89.00	80.00	98.00	100
Total					62

### Vaccinium myrtilloides / Pteridium aquilinum / Polytrichum spp. wet shrubland

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Abies balsamea	7.33	3.00	12.00	9
	Acer rubrum	9.33	8.00	10.00	9
	Amelanchier	5.00	5.00	5.00	3
	Betula alleghaniensis var. alleghaniensis	8.00	8.00	8.00	3
	Crataegus	2.67	2.67	2.67	3
	Picea rubens	3.17	1.00	5.00	18
	Populus tremuloides	3.50	3.00	4.00	6

	Prunus serotina var. serotina	3.50	2.00	5.00	12
	Tsuga canadensis	0.50	0.50	0.50	3
T3	Abies balsamea	2.00	2.00	2.00	6
	Amelanchier	2.40	0.50	5.00	15
	Picea rubens	2.00	2.00	2.00	3
	Populus tremuloides	4.67	2.00	7.00	9
	Prunus serotina var. serotina	0.75	0.50	1.00	12
S1	Abies balsamea	1.17	0.50	2.00	9
	Acer rubrum	0.50	0.50	0.50	3
	Alnus incana ssp. rugosa	1.00	1.00	1.00	3
	Amelanchier	1.10	0.50	3.00	15
	Amelanchier arborea var. arborea	0.50	0.50	0.50	3
	Amelanchier laevis	0.50	0.50	0.50	3
	Amelanchier stolonifera	0.50	0.50	0.50	3
	Crataegus	2.00	1.00	3.00	6
	Hypericum densiflorum	31.92	0.50	70.00	18
	Ilex montana	1.00	1.00	1.00	3
	Kalmia latifolia	5.00	5.00	5.00	3
	Nemopanthus mucronatus	0.50	0.50	0.50	3
	Photinia melanocarpa	10.50	1.00	20.00	6
	Picea rubens	4.67	1.00	10.00	9
	Populus tremuloides	2.42	0.50	5.00	18
	Prunus serotina var. serotina	2.33	1.00	5.00	9
	Salix sericea	0.50	0.50	0.50	3
	Spiraea alba	2.50	1.00	4.00	6
	Vaccinium angustifolium	5.50	5.00	6.00	6
	Vaccinium corymbosum	8.50	2.00	15.00	6
	Vaccinium myrtilloides	11.00	2.00	18.00	27
	Viburnum nudum var. cassinoides	4.69	0.50	35.00	64
	Viburnum recognitum	3.25	0.50	11.00	12
S2	Abies balsamea	0.50	0.50	0.50	3
	Crataegus	0.50	0.50	0.50	3
	Hypericum densiflorum	10.97	0.50	50.00	52
	Kalmia latifolia	2.75	0.50	5.00	6
	Photinia melanocarpa	24.92	0.50	78.00	58
	Photinia pyrifolia	35.00	20.00	50.00	6
	Populus tremuloides	0.50	0.50	0.50	3
	Smilax rotundifolia	0.50	0.50	0.50	3
	Spiraea alba	0.01	0.01	0.01	3
	Vaccinium angustifolium	40.00	20.00	60.00	6
	Vaccinium myrtilloides	27.42	3.00	70.00	73
	Viburnum nudum var. cassinoides	1.00	0.01	3.00	12
	Viburnum recognitum	1.75	0.50	3.00	6
H	Abies balsamea	0.50	0.50	0.50	9
	Acer rubrum	0.34	0.01	0.50	9
	Agrostis gigantea	6.07	0.11	15.00	15
	Amelanchier	0.50	0.50	0.50	6
	Amelanchier arborea var. arborea	0.50	0.50	0.50	3
	Anthoxanthum odoratum ssp. odoratum	4.72	0.22	7.70	9
	Apocynum androsaemifolium	10.50	0.50	30.00	9

<i>Bartonia virginica</i>	0.50	0.50	0.50	3
<i>Brachyelytrum erectum</i>	16.04	0.50	60.00	12
<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	6.00	6.00	6.00	3
<i>Carex atlantica</i>	0.26	0.01	0.50	6
<i>Carex brunnescens</i>	0.50	0.50	0.50	9
<i>Carex debilis</i>	3.56	0.50	10.78	15
<i>Carex debilis</i> var. <i>debilis</i>	0.50	0.50	0.50	3
<i>Carex debilis</i> var. <i>rudgei</i>	2.08	0.50	5.22	21
<i>Carex folliculata</i>	4.20	0.01	15.00	15
<i>Carex gynandra</i>	0.50	0.50	0.50	9
<i>Carex hirsutella</i>	2.50	2.00	3.00	6
<i>Carex intumescens</i>	0.50	0.50	0.50	3
<i>Carex scoparia</i> var. <i>scoparia</i>	0.58	0.33	1.00	15
<i>Carex swanii</i>	0.50	0.50	0.50	3
<i>Carex trisperma</i> var. <i>trisperma</i>	0.50	0.50	0.50	3
<i>Coptis trifolia</i>	1.00	1.00	1.00	3
<i>Crataegus</i>	0.75	0.50	1.00	12
<i>Cypripedium acaule</i>	0.50	0.50	0.50	3
<i>Danthonia compressa</i>	10.90	0.50	40.00	67
<i>Dennstaedtia punctilobula</i>	0.50	0.50	0.50	3
<i>Deschampsia flexuosa</i> var. <i>flexuosa</i>	0.67	0.50	1.00	9
<i>Dichantherium clandestinum</i>	0.50	0.50	0.50	3
<i>Doellingeria umbellata</i> var. <i>umbellata</i>	0.50	0.50	0.50	12
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	0.50	0.50	0.50	3
<i>Dryopteris carthusiana</i>	2.00	2.00	2.00	3
<i>Epigaea repens</i>	3.00	3.00	3.00	3
<i>Eriophorum virginicum</i>	3.50	0.50	15.00	24
<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	0.50	0.50	0.50	12
<i>Fagus grandifolia</i>	0.10	0.10	0.10	3
<i>Festuca trachyphylla</i>	0.50	0.50	0.50	3
<i>Gaultheria procumbens</i>	21.29	2.00	38.00	21
<i>Gentiana linearis</i>	0.80	0.50	2.00	15
<i>Glyceria canadensis</i>	3.13	0.50	8.00	12
<i>Glyceria striata</i>	0.50	0.50	0.50	3
<i>Hypericum densiflorum</i>	5.25	0.50	10.00	6
<i>Ilex verticillata</i>	0.50	0.50	0.50	3
<i>Juncus</i>	0.33	0.33	0.33	3
<i>Juncus brevicaudatus</i>	0.50	0.50	0.50	3
<i>Juncus effusus</i>	2.33	0.11	20.00	39
<i>Juncus tenuis</i>	0.01	0.01	0.01	3
<i>Luzula multiflora</i> ssp. <i>multiflora</i> var. <i>multiflora</i>	0.50	0.50	0.50	3
<i>Lycopodium clavatum</i>	1.22	0.33	6.00	24
<i>Lycopodium digitatum</i>	0.50	0.50	0.50	6
<i>Lycopodium obscurum</i>	1.26	0.22	3.00	52
<i>Lysimachia quadrifolia</i>	15.00	15.00	15.00	6
<i>Maianthemum canadense</i>	0.50	0.50	0.50	3
<i>Melampyrum lineare</i>	0.50	0.50	0.50	6
<i>Mitchella repens</i>	0.10	0.10	0.10	3
<i>Oclemena acuminata</i>	0.50	0.50	0.50	3
<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	2.75	1.00	5.00	12

	<i>Photinia melanocarpa</i>	0.50	0.50	0.50	6
	<i>Picea rubens</i>	0.26	0.01	0.50	6
	<i>Platanthera flava</i> var. <i>herbiola</i>	0.50	0.50	0.50	3
	<i>Populus tremuloides</i>	0.50	0.50	0.50	9
	<i>Potentilla simplex</i>	0.50	0.50	0.50	3
	<i>Prunus serotina</i> var. <i>serotina</i>	0.78	0.10	1.00	12
	<i>Pteridium aquilinum</i>	16.84	0.44	88.00	76
	<i>Ribes</i>	0.50	0.50	0.50	3
	<i>Rubus</i>	0.10	0.10	0.10	3
	<i>Rubus hispidus</i>	42.72	3.00	65.00	97
	<i>Rumex acetosella</i>	0.65	0.10	1.00	12
	<i>Salix sericea</i>	0.50	0.50	0.50	3
	<i>Scirpus</i>	0.56	0.56	0.56	3
	<i>Solidago rugosa</i>	4.88	0.50	15.00	12
	<i>Solidago uliginosa</i>	9.01	0.01	40.00	76
	<i>Symphotrichum lanceolatum</i> ssp. <i>lanceolatum</i> var. <i>lanceolatum</i>	0.50	0.50	0.50	3
	<i>Symplocarpus foetidus</i>	1.00	1.00	1.00	3
	<i>Thelypteris noveboracensis</i>	1.00	1.00	1.00	3
	<i>Tsuga canadensis</i>	0.50	0.50	0.50	3
	<i>Vaccinium angustifolium</i>	0.75	0.50	1.00	6
	<i>Vaccinium myrtilloides</i>	6.67	4.00	10.00	9
	<i>Vaccinium pallidum</i>	3.00	3.00	3.00	3
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.70	0.50	1.00	15
	<i>Viburnum recognitum</i>	0.75	0.50	1.00	6
	<i>Viola cucullata</i>	0.50	0.50	0.50	3
N	<i>Aulacomnium palustre</i>	0.01	0.01	0.01	3
	<i>Cephalozia lunulifolia</i>	42.50	42.50	42.50	3
	<i>Cladonia</i>	0.50	0.50	0.50	12
	<i>Cladonia arbuscula</i>	0.01	0.01	0.01	3
	<i>Cladonia cristatella</i>	2.00	1.00	3.00	6
	<i>Cladonia grayi</i>	0.01	0.01	0.01	3
	<i>Cladonia macilenta</i> var. <i>bacillaris</i>	0.01	0.01	0.01	3
	<i>Dicranum flagellare</i>	3.00	3.00	3.00	3
	<i>Dicranum ontariense</i>	0.50	0.50	0.50	3
	<i>Dicranum scoparium</i>	0.01	0.01	0.01	3
	<i>Hygrohypnum eugyrium</i>	0.22	0.22	0.22	3
	<i>Leucobryum albidum</i>	0.70	0.22	1.67	9
	<i>Leucobryum glaucum</i>	0.22	0.22	0.22	3
	<i>Pleurozium schreberi</i>	0.01	0.01	0.01	6
	<i>Polytrichum</i>	46.71	0.50	93.00	52
	<i>Polytrichum commune</i>	40.33	1.00	90.00	9
	<i>Polytrichum juniperinum</i>	38.50	15.00	63.00	12
	<i>Polytrichum pallidisetum</i>	3.00	3.00	3.00	3
	<i>Polytrichum strictum</i>	51.25	42.50	60.00	6
	<i>Sphagnum</i>	14.55	0.50	60.00	58
	<i>Sphagnum fallax</i>	0.75	0.50	1.00	6
	<i>Sphagnum girgensohnii</i>	2.00	2.00	2.00	3
	<i>Sphagnum rubellum</i>	1.00	1.00	1.00	3
Total					35

**Vaccinium oxycoccos (Vaccinium macrocarpon) - Rhynchospora alba / Sphagnum spp. shrub peatland**

Stratum	Scientific Name	Average	Min	Max	Constanc
T2	Amelanchier laevis	1.00	1.00	1.00	4
	Tsuga canadensis	5.00	5.00	5.00	4
S1	Kalmia latifolia	3.00	2.00	4.00	8
	Larix laricina	1.00	1.00	1.00	4
	Photinia melanocarpa	6.00	2.00	10.00	8
	Pinus rigida	3.50	1.00	6.00	8
	Pinus strobus	1.00	1.00	1.00	4
	Rhododendron maximum	4.00	2.00	6.00	8
	Vaccinium corymbosum	1.50	1.00	2.00	8
	Vaccinium myrtilloides	1.00	1.00	1.00	4
S2	Viburnum nudum var. cassinoides	3.00	3.00	3.00	4
	Acer rubrum	0.34	0.01	0.50	12
	Amelanchier	0.01	0.01	0.01	4
	Ilex verticillata	0.63	0.01	1.00	15
	Kalmia latifolia	0.50	0.50	0.50	12
	Larix laricina	1.00	1.00	1.00	4
	Nemopanthus mucronatus	0.51	0.01	1.00	8
	Nyssa sylvatica	0.50	0.50	0.50	4
	Photinia melanocarpa	1.95	0.01	8.00	38
	Photinia pyrifolia	3.00	0.50	10.00	42
	Picea rubens	0.63	0.50	1.00	15
	Pinus rigida	2.50	2.00	3.00	8
	Pinus strobus	0.34	0.01	0.50	12
	Rhododendron maximum	0.51	0.01	1.00	8
	Sorbus americana	0.01	0.01	0.01	4
	Tsuga canadensis	1.00	1.00	1.00	4
H	Vaccinium angustifolium	0.50	0.01	1.00	12
	Vaccinium myrtilloides	1.14	0.01	4.00	27
	Viburnum nudum var. cassinoides	0.34	0.01	0.50	12
	Acer rubrum	0.42	0.01	1.00	23
	Acer saccharum var. saccharum	0.01	0.01	0.01	4
	Agrostis perennans	0.01	0.01	0.01	4
	Amelanchier	0.26	0.01	0.50	8
	Bartonia virginica	0.50	0.50	0.50	4
	Calopogon tuberosus var. tuberosus	0.50	0.50	0.50	8
	Carex atlantica	1.00	0.01	2.00	19
	Carex canescens	11.28	0.01	40.00	15
	Carex echinata ssp. echinata	8.00	8.00	8.00	4
	Carex folliculata	0.83	0.01	3.00	19
	Carex gynandra	30.00	30.00	30.00	4
	Carex haydenii	10.00	10.00	10.00	4
	Carex pauciflora	2.51	0.01	5.00	8
Carex trisperma var. trisperma	0.75	0.50	1.00	8	
Carex utriculata	1.00	1.00	1.00	4	
Coptis trifolia	0.01	0.01	0.01	4	
Deschampsia flexuosa var. flexuosa	0.01	0.01	0.01	4	
Doellingeria umbellata var. umbellata	0.50	0.50	0.50	4	

	<i>Drosera intermedia</i>	0.01	0.01	0.01	4
	<i>Drosera rotundifolia</i> var. <i>rotundifolia</i>	2.03	0.50	8.00	42
	<i>Dulichium arundinaceum</i>	5.00	5.00	5.00	4
	<i>Eriophorum virginicum</i>	9.45	0.01	50.00	92
	<i>Gaultheria hispidula</i>	0.50	0.50	0.50	4
	<i>Gaultheria procumbens</i>	0.63	0.50	1.00	15
	<i>Gentiana linearis</i>	0.50	0.01	1.00	23
	<i>Glyceria canadensis</i>	0.01	0.01	0.01	4
	<i>Glyceria laxa</i>	0.51	0.01	1.00	8
	<i>Hypericum canadense</i>	0.50	0.50	0.50	4
	<i>Juncus</i>	3.39	2.56	4.22	8
	<i>Juncus brevicaudatus</i>	1.60	0.50	5.00	19
	<i>Juncus effusus</i>	0.50	0.50	0.50	8
	<i>Juncus filiformis</i>	0.01	0.01	0.01	4
	<i>Juncus subcaudatus</i> var. <i>subcaudatus</i>	1.01	0.01	2.00	8
	<i>Leersia oryzoides</i>	0.50	0.50	0.50	4
	<i>Lycopodiella inundata</i>	0.01	0.01	0.01	8
	<i>Lycopodium obscurum</i>	0.01	0.01	0.01	4
	<i>Nemopanthus mucronatus</i>	0.50	0.50	0.50	4
	<i>Osmunda cinnamomea</i> var. <i>cinnamomea</i>	1.91	0.01	10.00	42
	<i>Oxypolis rigidior</i>	0.50	0.50	0.50	4
	<i>Photinia pyrifolia</i>	9.67	1.00	20.00	12
	<i>Picea rubens</i>	0.50	0.50	0.50	8
	<i>Pinus rigida</i>	0.50	0.50	0.50	8
	<i>Pinus strobus</i>	0.50	0.50	0.50	4
	<i>Platanthera ciliaris</i>	1.00	1.00	1.00	4
	<i>Pogonia ophioglossoides</i>	1.00	1.00	1.00	4
	<i>Rhynchospora alba</i>	19.89	0.01	50.00	77
	<i>Rubus hispidus</i>	7.21	0.01	25.00	85
	<i>Sarracenia purpurea</i> ssp. <i>gibbosa</i>	5.73	0.50	16.20	12
	<i>Solidago uliginosa</i>	1.06	0.01	3.00	31
	<i>Symplocarpus foetidus</i>	6.40	0.50	20.00	19
	<i>Triadenum fraseri</i>	1.00	0.01	3.00	15
	<i>Typha latifolia</i>	1.00	1.00	1.00	4
	<i>Utricularia cornuta</i>	1.00	1.00	1.00	4
	<i>Vaccinium angustifolium</i>	0.50	0.50	0.50	4
	<i>Vaccinium macrocarpon</i>	16.73	0.50	63.00	38
	<i>Vaccinium myrtilloides</i>	0.50	0.50	0.50	8
	<i>Vaccinium oxycoccos</i>	14.13	0.50	30.00	73
	<i>Viburnum nudum</i> var. <i>cassinoides</i>	0.50	0.50	0.50	8
	<i>Xyris torta</i>	2.00	2.00	2.00	4
	<i>Zigadenus leimanthoides</i>	4.00	0.01	15.00	15
N	<i>Aulacomnium palustre</i>	0.50	0.50	0.50	4
	<i>Cladina</i>	0.26	0.01	0.50	8
	<i>Cladonia</i>	0.51	0.01	1.00	8
	<i>Polytrichum</i>	13.67	0.01	40.00	12
	<i>Polytrichum commune</i>	8.08	0.50	20.00	23
	<i>Polytrichum strictum</i>	32.33	1.00	99.00	23
	<i>Sphagnum</i>	73.23	35.60	90.00	46
	<i>Sphagnum cuspidatum</i>	32.67	3.00	90.00	12

Sphagnum fallax	48.05	20.00	94.00	23
Sphagnum flexuosum	99.00	99.00	99.00	4
Sphagnum magellanicum	24.65	20.00	29.30	8
Sphagnum palustre	4.00	3.00	5.00	8
Sphagnum papillosum	31.43	20.00	45.00	12
Sphagnum recurvum	85.00	85.00	85.00	4
Sphagnum rubellum	52.67	1.00	95.00	23
<b>Total</b>				<b>35</b>

Appendix H *in* Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007.  
**Classification and Conservation Assessment of High Elevation Wetland  
Communities in the Allegheny Mountains of West Virginia.** West Virginia  
Natural Heritage Program, WVDNR. Elkins, WV.

# Appendix I. Detailed State and National Vegetation Classification Descriptions of Wetland Associations

## Table of Contents

<b>I. &amp; II. Forest and Woodland .....</b>	<b>3</b>
<b>I.A.8.N.g. Saturated temperate or subpolar needle-leaved evergreen forest .....</b>	<b>3</b>
Balsam Fir - Oatgrass Swamp .....	3
Balsam Fir - Winterberry Swamp .....	7
Red Spruce - Heath Peat Woodland .....	11
Red Spruce - Hemlock - Great Laurel Swamp .....	16
Red Spruce - Southern Mountain Cranberry Swamp .....	21
Red Spruce - Three-seeded Sedge Peat Woodland .....	25
<b>I.B.2.N.d. Temporarily flooded cold-deciduous forest .....</b>	<b>29</b>
Quaking Aspen Swamp .....	29
<b>I.B.2.N.g. Saturated cold-deciduous forest .....</b>	<b>33</b>
Balsam Fir - Black Ash Swamp .....	33
Cinnamon Fern Seep .....	39
Tamarack Swamp .....	43
<b>I.C.3.N.d. Saturated mixed needle-leaved evergreen - cold-deciduous forest .....</b>	<b>46</b>
Red Spruce - Yellow Birch - Mannagrass Swamp .....	47
<b>II.A.4.N.f. Saturated temperate or subpolar needle-leaved evergreen woodland .....</b>	<b>53</b>
Pitch Pine - Heath Peat Woodland .....	53
<b>III. Shrubland .....</b>	<b>57</b>
<b>III.B.2.N.e. Seasonally flooded cold-deciduous shrubland .....</b>	<b>57</b>
Meadowsweet Shrub Swamp .....	57
Silky Willow Shrub Swamp .....	60
Speckled Alder Shrub Swamp .....	65
Speckled Alder - Arrowwood Shrub Swamp .....	71
Steeplebush Shrub Swamp .....	75
<b>III.B.2.N.g. Saturated cold-deciduous shrubland .....</b>	<b>78</b>
Blueberry - Bracken Fern Shrub Swamp .....	79
Bushy St. Johnswort Shrub Swamp .....	82
Chokeberry - Northern Wild Raisin Shrub Peatland .....	87
<b>IV. Dwarf-shrubland .....</b>	<b>93</b>
<b>IV.A.1.N.g. Saturated needle-leaved or microphyllous evergreen dwarf-shrubland .....</b>	<b>93</b>
Cranberry - Beakrush Peatland .....	93
<b>V. Herbaceous vegetation.....</b>	<b>100</b>
<b>V.A.5.N.j. Temporarily flooded temperate or subpolar grassland .....</b>	<b>100</b>
Hairy-fruit Sedge Floodplain Prairie .....	100
Twisted Sedge Riverscour Prairie .....	104
<b>V.A.5.N.k. Seasonally flooded temperate or subpolar grassland .....</b>	<b>108</b>
American Bur-reed Marsh .....	108
Beaked Sedge Fen .....	113
Bluejoint Grass Wet Meadow .....	118
Lake Sedge Fen .....	123
Rice Cutgrass Marsh .....	126
Tussock Sedge Wet Meadow .....	130
Woolgrass Wet Meadow .....	135
<b>V.A.5.N.l. Semi-permanently flooded temperate or subpolar grassland .....</b>	<b>138</b>

Softstem Bulrush Marsh.....	138
<b>V.A.5.N.m. Saturated temperate or subpolar grassland .....</b>	<b>142</b>
Cottongrass Fen.....	142
Nodding Sedge – Prickly Bog Sedge Seep .....	146
Silvery Sedge Fen .....	151
Star Sedge Fen .....	155
Threeway Sedge Fen.....	160
<b>V.B.2.N.b. Low temperate or subpolar perennial forb vegetation .....</b>	<b>164</b>
Goldenrod Wet Meadow .....	164
<b>V.B.2.N.f. Saturated temperate perennial forb vegetation .....</b>	<b>168</b>
Monongahela Barbara's-buttons Riverscour Prairie.....	168
Golden Saxifrage Seep.....	172
Rough Sedge Seep .....	176
<b>VI. Bryophyte vegetation .....</b>	<b>180</b>
<b>VIA.1.N.c. Saturated bryophyte vegetation.....</b>	<b>180</b>
Bog-rosemary Peatland .....	180
<b>References cited .....</b>	<b>184</b>

## I. & II. Forest and Woodland

### I.A.8.N.g. Saturated temperate or subpolar needle-leaved evergreen forest

#### Balsam Fir - Oatgrass Swamp

Scientific Name:	<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Danthonia compressa</i> - <i>Lycopodium</i> spp. / <i>Sphagnum</i> spp. Forested Swamp
Translated Name:	Balsam Fir - Red Spruce / Flattened Oatgrass - Clubmoss / Peatmoss Forested Swamp
NVC Name:	CEGL006592: <i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Danthonia compressa</i> - <i>Lycopodium</i> spp. / <i>Sphagnum</i> spp. Forest
Conservation Rank:	S2 / G2

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer woodland swamp occurs on moist to saturated soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations of 960-1130 m above sea level. It occurs on Mississippian and Pennsylvanian bedrock, usually on Mauch Chunk shale or Greenbrier limestone, and occasionally on the more acidic Pottsville or Conemaugh formations. It occupies gently sloping land (1- to 10-degree slopes) along small headwater streams, in mixed wetland mosaics, often at the base of upland slopes. This type is at the drier end of the wetland range. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. Anthropogenic disturbance includes historic logging and fires around the year 1900. Current fluctuations in hydrologic regime occur as a result of beaver activity, but do not appear to immediately threaten this community. Most *Abies balsamea* (balsam fir) show slight to severe damage from *Adelges piceae* (balsam woolly adelgid), including bark infestation and gout damage; however, this community type also includes the best multi-aged disease-free stand of *Abies balsamea* (balsam fir) in West Virginia, where the species is at the southernmost edge of its range. Combined with excessive deer herbivory, the adelgid damage may be severe enough to eliminate balsam fir and change the dominant species composition of this community in the future. Soils are moderately- to poorly-drained loamy soils with mottling in the upper 20 cm and occasional gleyed horizons. Hydric soil indicators include sandy redox, stripped matrix, depleted matrix, and redox depressions. Soil chemistry is characterized by high Al, Fe, H, N, and total exchange capacity; moderate K, P, organic matter; and low B, Ca, Cu, Mg, Mn, Na, S, Zn (n=10). Soil pH averages 4.0 (n=10). The unvegetated surface is predominantly litter, with an average of 3% downed wood and 1% standing water.

**Vegetation Description:** This evergreen swamp occurs in scattered high-elevation sites in the Allegheny Mountains of West Virginia. The canopy is open to closed and dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Prunus serotina* var. *serotina* (black cherry). Mean canopy cover is 30%. Canopy height rarely exceeds 20 m and is generally less than 15 m. The subcanopy averages 19% cover and is dominated by

*Abies balsamea* (balsam fir) with smaller amounts of *Picea rubens* (red spruce), *Acer rubrum* (red maple), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). *Tsuga canadensis* (eastern hemlock), *Amelanchier arborea* var. *arborea* (common serviceberry), and *Crataegus* (hawthorn) spp. may be present with very low cover in the subcanopy. The tall-shrub layer averages 31% cover and is also dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce). The short-shrub layer averages 18% cover, with locally abundant *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Hypericum densiflorum* (bushy St. Johnswort). Regeneration of canopy species is present in this stratum. The herbaceous ground layer is fairly diverse, with mean 48% cover and typically including 25-50 species. The most abundant species are *Danthonia compressa* (flattened oatgrass), *Lycopodium obscurum* (rare clubmoss), and *Rubus hispidus* (bristly dewberry). Other herbaceous species with high constancy include the canopy species, *Lycopodium clavatum* (running clubmoss), *Carex folliculata* (northern long sedge), *Dennstaedtia punctilobula* (eastern hayscented fern), *Pteridium aquilinum* (western brackenfern), and *Oclemena acuminata* (whorled wood aster). Nonvascular plants average 17% cover in this community, dominated by *Sphagnum* species and *Polytrichum* species; *Leucobryum glaucum* is also common. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex debilis* (white edge sedge), *Crataegus* (hawthorn) spp., *Lycopodium clavatum* (running clubmoss), *Lycopodium digitatum* (fan clubmoss), *Mitchella repens* (partridgeberry), *Polytrichum* (polytrichum moss) ssp., *Prunus serotina* var. *serotina* (black cherry), and *Pteridium aquilinum* (western brackenfern). These indicator species highlight the slightly drier habitat of this swamp community, which provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex projecta* (necklace sedge) (S3G5), *Dalibarda repens* (robin runaway) (S3G5), and *Glyceria laxa* (limp mannagrass) (S1G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 41 taxa per 400 square meters.

**Fauna observed:** *Calypteryx maculata* (ebony jewelwing), a damselfly, was observed within this community type.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-		plant	WV species of concern
<i>Carex projecta</i> (necklace sedge)	-		plant	WV species of concern
<i>Dalibarda repens</i> (robin runaway)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern

**West Virginia Range:** The known distribution of this community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 960 and 1130 m. Within this region, the community is known only from Canaan Valley, Blister Run Swamp, and Dolly Sods.

**Classification Comments:** Twelve plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. Eleven of the plots were sampled by Ceperley (2002) and classified into two types which are included in this broader type.

**Local Description Author:** E.A. Byers

**Plots:** CASP.18, CVWR.1, CVWR.4, CVWR.5, CVWR.6, CVWR.21, MONF.57, MONF.89, MONF.90, MONF.91, TUCK.3, TUCK.4.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g.)
Alliance	<i>Picea rubens</i> - <i>Abies balsamea</i> Saturated Forest Alliance (A.202)
Alliance (English name)	Red Spruce - Balsam Fir Saturated Forest Alliance
Association	<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Danthonia compressa</i> - <i>Lycopodium</i> spp. / <i>Sphagnum</i> spp. Forest
Association (English name)	Balsam Fir - Red Spruce / Flattened Oatgrass - Clubmoss species / Peatmoss species Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic conifer woodland or forested swamp occurs on moist to saturated soils in headwater basins in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1130 m. It is a small-patch community fed by slow seepage and rainfall. It occupies gently sloping land (1- to 10-degree slopes) along small headwater streams and in mixed wetland mosaics, often at the base of upland slopes. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. Soils are moderately to poorly drained loamy soils with mottling in the upper 20 cm and occasional gleyed horizons. The canopy is open to closed and dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Prunus serotina* var. *serotina* (black cherry). The subcanopy is dominated by *Abies balsamea* (balsam fir) with smaller amounts of *Picea rubens* (red spruce), *Acer rubrum* (red maple), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is also dominated by *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce). The short-shrub layer contains regenerating canopy species and locally abundant *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Hypericum densiflorum* (bushy St. Johnswort). The herbaceous ground layer is fairly diverse, typically including 25-50 species. The most abundant species are *Danthonia compressa* (flattened oatgrass), *Lycopodium obscurum* (rare clubmoss), and *Rubus hispidus* (bristly dewberry). Other herbaceous species with high constancy include the regenerating canopy species, *Lycopodium clavatum* (running clubmoss), *Carex folliculata* (northern long sedge), *Dennstaedtia punctilobula* (eastern hayscented fern), *Pteridium aquilinum* (western brackenfern), and *Oclemena acuminata* (whorled wood aster). Nonvascular plants are dominated by *Sphagnum* species and *Polytrichum* species; *Leucobryum glaucum* is also common. The community is characterized by a number of diagnostic species that highlight the slightly drier habitat of this swamp type and include *Carex debilis* (white edge sedge), *Crataegus* (hawthorn) spp., *Lycopodium clavatum* (running clubmoss), *Lycopodium digitatum* (fan clubmoss),

*Mitchella repens* (partridgeberry), *Polytrichum* (polytrichum moss) ssp., *Prunus serotina* var. *serotina* (black cherry), and *Pteridium aquilinum* (western brackenfern). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 41 taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### **DISTRIBUTION**

**Range:** The known distribution of this community is restricted to the Allegheny Mountains region of West Virginia, at elevations above 960 m. Within this region, the community is known only from Canaan Valley, Blister Run Swamp, and Dolly Sods.

**States/Provinces:** WV:S2

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### **CONSERVATION STATUS**

**Rank:** G2 (30-Mar-2007)

**Reasons:** This is a small-patch community that is restricted in known distribution to seven occurrences in the Allegheny Mountains region of West Virginia. It is limited by its requirement for moist or saturated conditions along flat or gently sloping headwater basins between 960 and 1130 m elevation. The community is further limited in extent by the range of *Abies balsamea* (balsam fir), which is disjunct and reaches its southern range limit in West Virginia and Virginia. The expected range has been searched in West Virginia, and more than five additional occurrences are not expected to be found.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

#### **Similar Associations:**

- *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006591)--has a longer hydroperiod, the presence of weakly minerotrophic species such as *Impatiens capensis* or *Viola cucullata*, and a more open canopy and shrub layer.

#### **Related Concepts:**

- *Abies balsamea* - *Picea rubens* / *Vaccinium* / *Lycopodium* hummock wetland (Ceperley 2002) F
- *Abies balsamea* / *Pteridium aquilinum* hummock wetland (Ceperley 2002) F
- *Picea rubens* - *Tsuga canadensis* - *Abies balsamea* swamp forest (Fortney et al. 2005) B

#### **SOURCES**

**Description Author:** E.A. Byers

**References:** Ceperley 2002, Eastern Ecology Working Group n.d., Fortney et al. 2005

## Balsam Fir - Winterberry Swamp

<b>Scientific Name:</b>	<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Ilex verticillata</i> / <i>Sphagnum</i> spp. Woodland Swamp
<b>Translated Name:</b>	Balsam Fir - Red Spruce / Common Winterberry / Peatmoss Woodland Swamp
<b>NVC Name:</b>	CEGL006591: <i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Ilex verticillata</i> / <i>Sphagnum</i> spp. Forest
<b>Conservation Rank:</b>	S1 / G2

### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer woodland swamp occurs on temporarily to semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations of 980-1120 me above sea level. It occupies flat to very gently sloping land (0- to 3-degree slopes) along small headwater streams, often in mixed wetland mosaics. Microtopography is characterized by interfingering of wetter and drier areas, with irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. It is a small-patch type that occurs on shale and limestone bedrock. It is probable that this type was more common in presettlement vegetation. During the period 1885-1920, logging and fires removed most of the forest in the region. Present-day shrub swamps may be successional to this type. The community is influenced by beaver activity, and there is evidence of migration of the balsam fir populations, possibly in response to fluctuating hydrology. Most *Abies balsamea* (balsam fir) show damage from *Adelges piceae* (balsam woolly adelgid), including bark infestation and gout damage. Combined with excessive deer herbivory, the adelgid damage may be severe enough to eliminate balsam fir and change the dominant species composition of this community in the future. Soils are poorly to very poorly drained clayey or mucky soils with mottling in the upper 20 cm and occasional gleyed horizons. Hydric soil indicators include sandy redox, sandy gleyed matrix, depleted matrix, and muck. Soil chemistry is characterized by high Al, Fe, Na, exchangeable nitrogen, organic matter, and total exchange capacity; moderate B, Ca, Cu, K, Mg, and P; and low Mn, S, and Zn (n=11). Soil pH averages 4.6 (n=11). The unvegetated surface is predominantly litter, with an average of 4% downed wood and 9% standing water.

**Vegetation Description:** This evergreen woodland swamp occurs in frost-pocket headwater basins in the Allegheny Mountains of West Virginia. The canopy is open and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) and *Acer rubrum* (red maple). Mean canopy cover is 25%. Canopy height rarely exceeds 15 m. The subcanopy averages 20% cover and is dominated by *Abies balsamea* (balsam fir) and *Tsuga canadensis* (eastern hemlock) with smaller amounts of *Picea rubens* (red spruce) and *Acer rubrum* (red maple). *Amelanchier* (serviceberry) spp. may be present with very low cover in the subcanopy. The shrub strata average 30% cover and are dominated by *Ilex verticillata* (common winterberry), the regenerating canopy species, and *Alnus incana* ssp. *rugosa* (speckled alder). Low cover of *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), and *Vaccinium myrtilloides* (velvetleaf huckleberry) may be present. The herbaceous ground layer is fairly diverse, with mean 80% cover and typically including 30-40 species. The most abundant species are *Carex gynandra* (nodding sedge), *Carex folliculata* (northern long sedge), and *Rubus hispidus* (bristly dewberry). Other herbaceous species with high constancy

include regenerating woody species and *Polygonum sagittatum* (arrowleaf tearthumb), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Galium tinctorium* (stiff marsh bedstraw), *Dryopteris cristata* (crested woodfern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Impatiens capensis* (jewelweed), *Viola cucullata* (marsh blue violet), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Juncus effusus* (common rush), *Carex stipata* (owlfruit sedge), *Glyceria striata* (fowl mannagrass), *Polygonum punctatum* (dotted smartweed), *Glyceria grandis* var. *grandis* (American mannagrass), *Oxalis montana* (mountain woodsorrel), *Dryopteris intermedia* (intermediate woodfern), and *Maianthemum canadense* (Canada mayflower). Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum palustre*, *Sphagnum flexuosum*, *Sphagnum magellanicum*, *Sphagnum fuscum*, *Sphagnum girgensohnii*) and average 35% cover in this community. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex canescens* (silvery sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), *Glyceria grandis* var. *grandis* (American mannagrass), and *Triadenum fraseri* (Fraser's marsh St. Johnswort). Species of conservation concern in West Virginia include *Abies balsamea* (balsam fir) (S3G5), *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex canescens* (silvery sedge) (S3G5), *Carex interior* (inland sedge) (S1G5), *Cornus canadensis* (bunchberry dogwood) (S3G5), *Glyceria grandis* (American mannagrass) (S2G5T5), *Glyceria laxa* (limp mannagrass) (S1G5), *Rubus pubescens* var. *pubescens* (dwarf red blackberry) (S1G5T5), *Thelypteris simulata* (bog fern) (S1G4G5), and *Vaccinium macrocarpon* (cranberry) (S2G4). Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 31-66 (mean = 48) taxa per 400 square meters.

#### Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-	plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex interior</i> (inland sedge)	-	plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern
<i>Glyceria grandis</i> (American mannagrass)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Rubus pubescens</i> var. <i>pubescens</i> (dwarf blackberry)	-	plant	WV species of concern
<i>Thelypteris simulata</i> (bog fern)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern

**West Virginia Range:** The known distribution of this community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 980 and 1120 m. Within this region, the community is known from Canaan Valley, Blister Run Swamp, and Blister Swamp.

**Classification Comments:** Twelve plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type has been sampled throughout its range in West Virginia. This type clusters and ordinales well, in an intermediate position between the circumneutral *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* Forest (CEGL006003) and the drier *Abies balsamea* - *Picea rubens* /

*Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest (CEGL006592). The plots were originally sampled and classified by Ceperley (2002) into two types, which have subsequently been lumped into this one type.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.8, CASP.9, CASP.10, CASP.11, CASP.12, CASP.14, CASP.16, CASP.17, CVWR.3, MONF.92, MONF.93, POCA.1.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g.)
Alliance	<i>Picea rubens</i> - <i>Abies balsamea</i> Saturated Forest Alliance (A.202)
Alliance (English name)	Red Spruce - Balsam Fir Saturated Forest Alliance
Association	<i>Abies balsamea</i> - <i>Picea rubens</i> / <i>Ilex verticillata</i> / <i>Sphagnum</i> spp. Forest
Association (English name)	Balsam Fir - Red Spruce / Common Winterberry / Peatmoss species Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic conifer woodland swamp occurs on temporarily to semi-permanently flooded soils in frost-pocket headwater basins in the Allegheny Mountains region of West Virginia, at elevations between 980 and 1120 m. It is a small-patch community fed by seepage, occasional overflow from low-gradient headwater streams, and rainfall. It occupies flat to very gently sloping land (0- to 3-degree slopes) along small headwater streams, often in mixed wetland mosaics. Microtopography is characterized by interfingering of wetter and drier areas, with irregular hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. The community is influenced by beaver activity, and there is evidence of migration of the balsam fir populations, possibly in response to fluctuating hydrology. Soils are poorly to very poorly drained clayey or mucky soils with mottling in the upper 20 cm and occasional gleyed horizons. The canopy is open and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir) and *Picea rubens* (red spruce), with occasional presence of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) and *Acer rubrum* (red maple). The subcanopy is dominated by *Abies balsamea* (balsam fir) and *Tsuga canadensis* (eastern hemlock) with smaller amounts of *Picea rubens* (red spruce) and *Acer rubrum* (red maple). *Amelanchier* (serviceberry) spp. may be present with very low cover in the subcanopy. The shrub layer is dominated by *Ilex verticillata* (common winterberry), the regenerating canopy species, and *Alnus incana* ssp. *rugosa* (speckled alder). Low cover of *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), and *Vaccinium myrtilloides* (velvetleaf huckleberry) may be present. The herbaceous ground layer is dense and fairly diverse, typically including 30-40 species. The most abundant species are *Carex gynandra* (nodding sedge), *Carex folliculata* (northern long sedge), and *Rubus*

*hispidus* (bristly dewberry). Other herbaceous species with high constancy include regenerating woody species and *Polygonum sagittatum* (arrowleaf tearthumb), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Galium tinctorium* (stiff marsh bedstraw), *Dryopteris cristata* (crested woodfern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Impatiens capensis* (jewelweed), *Viola cucullata* (marsh blue violet), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Juncus effusus* (common rush), *Carex stipata* (owlfruit sedge), *Glyceria striata* (fowl mannagrass), *Polygonum punctatum* (dotted smartweed), *Glyceria grandis* var. *grandis* (American mannagrass), *Oxalis montana* (mountain woodsorrel), *Dryopteris intermedia* (intermediate woodfern), and *Maianthemum canadense* (Canada mayflower). Nonvascular plants are dominated by *Sphagnum* spp. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex canescens* (silvery sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), *Glyceria grandis* var. *grandis* (American mannagrass), and *Triadenum fraseri* (Fraser's marsh St. Johnswort). Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 31-66 (mean = 48) taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### DISTRIBUTION

**Range:** The known distribution of this community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 980 and 1120 m.

**States/Provinces:** WV:S1

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### CONSERVATION STATUS

**Rank:** G2 (30-Mar-2007)

**Reasons:** This is a small-patch type that is restricted in known distribution to three occurrences (12 patches) within the Allegheny Mountains region of West Virginia. It is limited by its requirement for temporarily to semi-permanently flooded soil conditions along flat or very gently sloping frost-pocket headwater basins between 980 and 1120 m elevation. It also appears to be limited to shale and limestone bedrock areas, which provide a significant nutrient base. The community is further limited in extent by the range of *Abies balsamea* (balsam fir), which is disjunct and reaches its southern range limit in West Virginia and Virginia. The expected range has been searched in West Virginia, and more than three additional occurrences are not expected to be found.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

#### Similar Associations:

- *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest (CEGL006592)--lacks weak enrichment indicators such as *Impatiens capensis* or *Viola cucullata* and has a shorter hydroperiod.

#### Related Concepts:

- *Abies balsamea* - *Picea rubens* - *Tsuga canadensis* bottomland forest (Fortney 1975) B

- *Abies balsamea* / *Glyceria melicaria* open forested wetland (Ceperley 2002) F
- *Abies balsamea* / *Ilex verticillata* - *Alnus incana* acidic swamp (Ceperley 2002) F
- *Picea rubens* - *Tsuga canadensis* - *Abies balsamea* swamp forest (Fortney et al. 2005) B

#### SOURCES

**Description Author:** E.A. Byers

**References:** Ceperley 2002, Eastern Ecology Working Group n.d., Fortney 1975, Fortney et al. 2005

### Red Spruce - Heath Peat Woodland

**Scientific Name:** *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. Peat Woodland

**Translated Name:** Red Spruce / Great Laurel - Mountain Laurel / Cinnamon Fern / Peatmoss Peat Woodland

**NVC Name:** CEG1006588: *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest

**Conservation Rank:** S2 / G2G3

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer woodland occurs on saturated soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 860 and 1300 m. It is a small-patch type that occupies flat to very gently sloping land (0- to 1-degree slopes) along the margins of open peatlands and in seepage-fed portions of wetland mosaics. Seepage from adjacent upland forest and the high water table in adjacent open wetlands keep the community wet enough to kill trees during wet years, leaving numerous snags. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, and decaying wood. Bedrock is typically sandstone or shale. Soils are moderately to very poorly drained peat, underlain by clay-rich deposits. Depth of organic soil averages 40 cm (n=6). Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, 2 cm muck, and depleted matrix. Soil pH averages 3.6 (n=5). Mean pore water pH is 4.8 and electrical conductivity averages 47 micromhos/cm (n=9). Soil chemistry is characterized by high Al, Cu, P, S, exchangeable nitrogen, total exchange capacity, and organic matter; and low B, Ca, Fe, K, Mg, Mn, Na, and Zn (n=5). The unvegetated surface is predominantly litter, with an average of 1% downed wood and 2% standing water.

**Vegetation Description:** This conifer woodland swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of stunted, inundation-stressed trees with a diverse shrub and herb layer growing on hummock-forming bryophytes. The canopy is dominated by *Tsuga canadensis* (eastern hemlock) and *Picea rubens* (red spruce), occasionally including low cover of *Acer rubrum* (red maple) or *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Mean canopy cover is 25%. Canopy height is less than 15 m and sometimes as low as 5 m, essentially crossing the transition between woodland and shrubland physiognomy. The tall-shrub layer averages 30% cover and includes the canopy species along with *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Nemopanthus mucronatus* (catberry), and *Ilex verticillata* (common winterberry). Other species that occasionally occur with low cover in the tall-shrub layer include *Viburnum nudum* var.

*cassinoides* (northern wild raisin), *Ilex montana* (mountain holly), *Photinia pyrifolia* (red chokeberry), *Acer rubrum* (red maple), *Sorbus americana* (American mountain ash), *Amelanchier laevis* (Allegheny serviceberry), and *Hamamelis virginiana* (American witchhazel). The short-shrub layer averages 15% cover and is similar in composition to the tall-shrub layer. The herbaceous layer, with mean 30% cover, typically includes *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and the regenerating canopy species. Species with lower cover often include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Dennstaedtia punctilobula* (eastern hayscented fern), *Carex gynandra* (nodding sedge), *Glyceria melicaria* (melic mannagrass), *Eriophorum virginicum* (tawny cottongrass), *Oclemena acuminata* (whorled wood aster), and *Juncus effusus* (common rush). Nonvascular plants average 80% cover and are dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum affine*, *Sphagnum capillifolium*) and *Polytrichum commune*. Indicator species that help to distinguish this community from others within the forest, woodland, and shrubland physiognomies for high-elevation wetlands of the Allegheny Mountains region include *Kalmia latifolia* (mountain laurel), *Oclemena acuminata* (whorled wood aster), and *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). This community provides habitat for species of conservation concern in West Virginia, including *Cornus canadensis* (bunchberry dogwood) (S3G5), *Dalibarda repens* (robin runaway) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Ilex collina* (longstalk holly) (S2G3), *Listera smallii* (kidneyleaf twayblade) (S2G4), and *Vaccinium oxycoccos* (small cranberry) (S2G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 22-54 (mean=31) taxa per 400 square meters, with most of the diversity in the shrub and herb layers.

**Fauna observed:** The following butterfly species were observed in this community: *Papilio canadensis* (Canada swallowtail), *Colias interior* (pink-edged sulphur), *Colias philodice* (clouded sulphur), *Limenitis arthemis astyanax* (red-spotted purple), *Boloria selene myrina* (silver-bordered), and *Papilio* sp. (tiger swallowtail). The odonate *Leucorrhina hudsonica* (Hudsonian whiteface) was noted within the community. Spiders include *Araneus pratensis* (angulate/roundshouldered orbweaver), *Argiope trifasciata* (banded garden spider), *Neriene radiata* (filmy dome spider), *Pirata insularis* (insular spider), *Misumenoides formosipes* (whitebanded crab spider), and *Misumenops* sp. (flower crab spider). Insects from the order Diptera (true flies) were collected including *Cetema* sp. and *Elachiptera costata* (frit flies), *Diastata* sp. (a diastatid fly), *Minettia* sp. (a lauxaniid fly), *Lonchoptera* sp. (a spear-winged fly), *Polietes* sp. (a housefly), *Syrphus* sp. (a hoverfly), and species from the families Dolichopodidae (long-legged flies), Ephydriidae (shore flies), and Fanniidae (lesser houseflies). Species collected from the order Hemiptera (true bugs) include *Clastoptera* sp. (a spittlebug), *Cicadula* sp. (a leafhopper), *Deltocephalus* sp. (a leafhopper), *Draeculacephala angulifera* (a leafhopper), *Platymetopius acutus* (a leafhopper), and *Scaphoideus* sp. (a leafhopper), and *Stobaera* sp. (a planthopper). From the order Hymenoptera (bees, wasps, and ants), species were collected from Braconidae (parasitoid wasps) as well as *Tapinoma sessile* (odorous house ant).

#### Other Noteworthy Species:

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern

<i>Dalibarda repens</i> (robin runaway)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Ilex collina</i> (longstalk holly)	G3	plant	WV species of concern
<i>Listera smallii</i> (kidneyleaf twayblade)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 860 and 1300 m. Within this region, the community is known from Big Run Bog, Laurel Fork, Laurel Run of Stony River, Shavers Lick Run and Condon Run in Otter Creek Wilderness, and Odey Run Bog.

**Classification Comments:** Eleven plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordinales well and has been sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.102, MONF.108, MONF.155, MONF.157, MONF.168, MONF.249, MONF.251, WALB.1, WALB.2, WALB.21, WALB.22.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g.)
Alliance	<i>Picea rubens</i> Saturated Forest Alliance (A.198)
Alliance (English name)	Red Spruce Saturated Forest Alliance
Association	<i>Picea rubens</i> / <i>Rhododendron maximum</i> - <i>Kalmia latifolia</i> / <i>Eriophorum virginicum</i> / <i>Sphagnum</i> spp. Forest
Association (English name)	Red Spruce / Great Laurel - Mountain Laurel / Tawny Cotton-grass / Peatmoss species Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This saturated acidic conifer woodland occurs in the Allegheny Mountains region of West Virginia and eastern Pennsylvania. It occurs in headwater basins at higher elevations, ranging between 860 and 1300 m in West Virginia examples. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, and decaying wood. Soils are moderately to very poorly drained peat, underlain by clay-rich deposits. The community is characterized by an open canopy of stunted, inundation-stressed trees with a diverse shrub and herb layer growing on hummock-forming bryophytes. The canopy is dominated by *Tsuga canadensis* (eastern hemlock) and *Picea rubens* (red spruce), occasionally including low cover of *Acer rubrum* (red maple) or

*Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Canopy height is less than 15 m and sometimes as low as 5 m, essentially at the transition between woodland and shrubland physiognomy. The tall-shrub layer includes the canopy species and *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Nemopanthus mucronatus* (catberry), and *Ilex verticillata* (common winterberry). Other species that occasionally occur with low cover in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), *Vaccinium corymbosum* (highbush blueberry), *Ilex montana* (mountain holly), *Photinia pyrifolia* (red chokeberry), *Acer rubrum* (red maple), *Sorbus americana* (American mountain ash), *Amelanchier laevis* (Allegheny serviceberry), and *Hamamelis virginiana* (American witchhazel). The short-shrub layer is similar in composition to the tall-shrub layer. The herbaceous layer typically includes *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and the regenerating canopy species. Species with lower cover often include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Dennstaedtia punctilobula* (eastern hayscented fern), *Carex gynandra* (nodding sedge), *Maianthemum trifolium* (threeleaf false lily of the valley), *Glyceria melicaria* (melic mannagrass), *Eriophorum virginicum* (tawny cottongrass), *Oclemena acuminata* (whorled wood aster), and *Juncus effusus* (common rush). Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum affine*, *Sphagnum capillifolium*) and *Polytrichum commune*.

**Environmental Description:** This saturated acidic conifer woodland occurs in the Allegheny Mountains region of West Virginia and eastern Pennsylvania. It occurs in headwater basins at higher elevations, ranging between 860 and 1300 m in West Virginia examples. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, and decaying wood. Soils are moderately to very poorly drained peat, underlain by clay-rich deposits

**Vegetation Description:** This vegetation is characterized by an open canopy of stunted, inundation-stressed trees with a diverse shrub and herb layer growing on hummock-forming bryophytes. The canopy is dominated by *Tsuga canadensis* (eastern hemlock) and *Picea rubens* (red spruce), occasionally including low cover of *Acer rubrum* (red maple) or *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The moderately open tall-shrub layer includes the canopy species along with *Rhododendron maximum* (great laurel), *Kalmia latifolia* (mountain laurel), *Vaccinium corymbosum* (highbush blueberry), *Nemopanthus mucronatus* (catberry), and *Ilex verticillata* (common winterberry). Other species that occasionally occur with low cover in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Ilex montana* (mountain holly), *Photinia pyrifolia* (red chokeberry), *Acer rubrum* (red maple), *Sorbus americana* (American mountain ash), *Amelanchier laevis* (Allegheny serviceberry), and *Hamamelis virginiana* (American witchhazel). The short-shrub layer is similar in composition to the tall-shrub layer. The herbaceous layer typically includes *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and the regenerating canopy species. Species with lower cover often include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Dennstaedtia punctilobula* (eastern hayscented fern), *Carex gynandra* (nodding sedge), *Glyceria melicaria* (melic mannagrass), *Eriophorum virginicum* (tawny cottongrass), *Oclemena*

*acuminata* (whorled wood aster), and *Juncus effusus* (common rush). The nonvascular stratum is dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum affine*, *Sphagnum capillifolium*) and *Polytrichum commune*.

#### Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Ilex collina</i> (longstalk holly)	G3	plant	

#### DISTRIBUTION

**Range:** This community is currently known from the Allegheny Mountains region of West Virginia, at elevations between 860 and 1300 m. It also occurs in the Pocono Plateau and northeastern Pennsylvania.

**States/Provinces:** PA, WV:S2

**Federal Lands:** USFS (Monongahela)

#### CONSERVATION STATUS

**Rank:** G2G3 (4-Apr-2007)

**Reasons:** This is a small-patch type that is restricted in known distribution to six occurrences within the Allegheny Mountains region of West Virginia and to the Pocono Plateau and northeastern Pennsylvania. It is limited by its requirement for saturated peat conditions along flat or very gently sloping headwater basins at higher elevation. The expected range has been searched in West Virginia, and more than six additional occurrences are not expected to be found. The Pennsylvania state rank for this type is S2S3.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Although this vegetation is characterized by the open canopy of a woodland, it is placed in a forest alliance because the floristic composition is best characterized by the forest alliance. Eleven plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. Vegetation classified as Red Spruce Palustrine Woodland in Pennsylvania (Fike 1999) is similar to this vegetation but has a greater cover of deciduous trees, the presence of *Chamaedaphne calyculata* (leatherleaf) and *Kalmia angustifolia* (sheep laurel), and lacks *Eriophorum virginicum* (tawny cottongrass). The Pennsylvania vegetation may be influenced by beaver flooding (A. Davis pers. comm.)

#### Similar Associations:

- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277)--has a more closed tree canopy, presence of weakly minerotrophic indicators, such as *Symplocarpus foetidus* and *Lindera benzoin*, and in general a greater diversity of deciduous canopy associates.
- *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest (CEGL006590)
- *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593)

#### Related Concepts:

- *Picea rubens* forest (Walbridge and Lang 1982) =
- *Picea rubens* swamp forest (Walbridge 1982) =
- *Sphagnum* - shrub community (Wieder et al. 1981) =

## SOURCES

**Description Author:** E.A. Byers

**References:** Davis pers. comm., Eastern Ecology Working Group n.d., Fike 1999, Walbridge 1982, Walbridge and Lang 1982, Wieder et al. 1981

## Red Spruce - Hemlock - Great Laurel Swamp

**Scientific Name:** *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. - *Bazzania trilobata* Forested Swamp  
**Translated Name:** Red Spruce - Eastern Hemlock / Great Laurel / Peatmoss – *Bazzania* moss Forested Swamp  
**NVC Name:** CEGl006277: *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest  
**Conservation Rank:** S2 / G2?

### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer swamp occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 770 and 1150 m. It occupies flat to very gently sloping land (0- to 1-degree slopes) along small streams, often in mixed wetland mosaics. It is a small-patch type which forms "islands" in open shrublands or peatlands, and occurs in backswamp locations, separated from the adjacent stream by a levee. It is also found along the margins of beaver-influenced wetlands. Microtopography is characterized by interfingering of wetter and drier areas, with irregular mossy hummocks formed over tree roots, tip-up mounds, nurse logs, and decaying wood. Tree roots are often buttressed and may form thick "root rafts" on top of mucky soils. Hollows are typically filled with standing water or muck. Anthropogenic disturbance includes historic logging and fires around the year 1900 and occasionally more recent logging. Soils are poorly drained muck, peat, or organic-rich silt loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, 2 cm muck, loamy gleyed matrix, and redox depressions. Depth of organic soil varies greatly from 1-70 cm (n=18). Soil pH averages 3.8 (n=12). Pore water pH ranges from 4.1-6.1, with an average of 4.7 (n=10). Soil chemistry is characterized by high P, S, exchangeable nitrogen, and organic matter; moderate B, Fe, K, Na, Zn, and total exchange capacity; and low Al, Cu (n=12). Ca and Mg are highly variable, ranging from 171 to 4858 ppm and 34 to 353 ppm, respectively. Electrical conductivity is also variable, ranging from 16 to 169 micromhos/cm. The unvegetated surface is predominantly litter, with an average of 4% downed wood and 2% standing water.

**Vegetation Description:** This evergreen swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open to closed canopy of inundation-stressed trees and a dense *Rhododendron maximum* (great laurel) shrub layer over a sparse herbaceous layer and abundant bryophytes. The canopy is dominated by *Picea rubens* (red spruce) and *Tsuga canadensis* (eastern hemlock), with lower cover of *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), and occasional presence of *Nyssa sylvatica* (blackgum), *Larix laricina* (tamarack), or *Pinus strobus* (eastern white pine). Mean canopy cover is 45%. The subcanopy averages 30% cover and is dominated by *Tsuga canadensis* (eastern

hemlock) with *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Acer rubrum* (red maple), and *Picea rubens* (red spruce). Species that may be present with low cover in the subcanopy include *Fraxinus americana* (white ash), *Betula lenta* (sweet birch), *Nyssa sylvatica* (blackgum), *Magnolia acuminata* (cucumber-tree), *Amelanchier laevis* (Allegheny serviceberry), *Lindera benzoin* (northern spicebush), *Liriodendron tulipifera* (tuliptree), and *Sorbus americana* (American mountain ash). The tall-shrub layer averages 35% cover and is dominated by *Rhododendron maximum* (great laurel). Other commonly occurring species in the tall-shrub layer include *Ilex verticillata* (common winterberry), *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce), and *Sorbus americana* (American mountain ash). Low cover of *Nemopanthus mucronatus* (catberry) and *Kalmia latifolia* (mountain laurel) may be present. The short-shrub layer averages 10% cover, with species composition similar to that of the tall-shrub stratum, and the occasional addition of *Viburnum nudum* var. *cassinoides* (northern wild raisin). The herbaceous ground layer is sparse and variable, with mean 8% cover and often including *Carex trisperma* (threeseeded sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Acer rubrum* (red maple), *Symplocarpus foetidus* (skunk cabbage), *Dennstaedtia punctilobula* (eastern hayscented fern), *Glyceria melicaria* (melic mannagrass), and *Mitchella repens* (partridgeberry). Nonvascular plants average 50% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum fallax*, *Sphagnum girgensohnii*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum papillosum*), *Bazzania trilobata*, and *Hypnum imponens*. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Hypnum imponens*, *Rhododendron maximum* (great laurel), *Symplocarpus foetidus* (skunk cabbage), and *Tsuga canadensis* (eastern hemlock). This community provides habitat for species of conservation concern in West Virginia, including *Ilex collina* (longstalk holly) (S2G3), *Coptis trifolia* (threeleaf goldthread) (S2G5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), and *Glyceria laxa* (limp mannagrass) (S1G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1%, is 26 taxa per 400 square meters, with about 15% of the diversity occurring in the bryophyte layer.

**Fauna observed:** *Sympetrum* sp. (meadowhawk), a dragonfly, was observed in this community. Spiders were collected including *Nereine radiata* (filmy dome spider), *Pityohyphantes* sp. (hammock spider), *Zygoballus bettini* (jumper), *Neoscona arabesca* (arabesque orbweaver), *Tetragnatha* sp. (longjawed orbweaver), *Theridion frondeum* (cobweb weaver), *Xysticus* sp. (ground crab spider), and Opiliones (harvestmen). Insects from five orders were collected. From Coleoptera (beetles), species include *Cyphon* sp. and *Prionocyphon* sp. (marsh beetles). Dipterans (true flies) include *Ischnomyia* sp. (a leafmining fly), Chironomidae (midges), *Apotropina* sp. (a frit fly), Culicidae (mosquitoes), Dolichopodidae (long-legged flies), Drosophilidae (vinegar and fruit flies), Muscidae (houseflies), Mycetophilidae (fungus gnats), *Platycheirus* sp. (a hoverfly), and *Euaesta* sp. (a fruit fly). Insects from the order Hemiptera (true bugs) were collected including *Clastoptera* sp. (a spittlebug), *Draeculacephala noveboracensis* and *Draeculacephala mollipes* (leafhoppers), *Cymus* sp. (a seed bug), *Delphacodes* sp. (a planthopper), *Euschistus tristigmus* (a stink bug), and *Phylloplecta* sp. and *Psyllia* sp. (jumping plant lice). Representing the order Hymenoptera (bees, wasps, and ants) are *Dolichoderus pustulatus* (an ant), Braconidae (parasitoid wasps), and Ichneumonidae (ichneumon wasps). From the order Orthoptera (grasshoppers and crickets), *Conocephalus brevipennis* (short-winged meadow katydid) was collected.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Coptis trifolia</i> (threeleaf goldthread)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Ilex collina</i> (longstalk holly)	G3	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1150 m, with most occurrences between 800 and 1000 m elevation. Within this region, the community is known from Cranesville Swamp, Laurel and Gladly Forks of the Cheat River, Desert Branch, Falls Run on Cheat Mountain, Yellow Creek in Otter Creek Wilderness, Odey Run Swamp, Piney Swamp, Whitmeadow Run, Canaan Valley State Park, Cranberry Glades, Glade Run below Gaudineer Knob, Helmick Run, Little Laurel Creek of the Cherry River, Sinks of Gandy, and the Williams River.

**Classification Comments:** Thirty-one plots (13 occurrences) represent this type (CEGL006277), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. Outlier plots include six older (Robinette 1966) plots from Cranesville Swamp with higher canopy cover of *Acer rubrum* (red maple), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), and *Prunus serotina* var. *serotina* (black cherry). Cranesville Swamp was re-sampled in 2004 and 2005, and Robinette's spruce swamp type with higher deciduous cover was not found, possibly indicating that succession to spruce dominance has occurred in the last 46 years at this site. Plot GREE.1, which is an old-growth swamp in Little Clear Creek, has low *Sphagnum* spp. cover and few hydrophytes on muck soil.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.15, CRSW.17, CRSW.18, CRSW.3, CRSW.4, CRSW.9, FRAN.2, GRAN.12, GREE.1, MINE.2, MINE.3, MONF.103, MONF.154, MONF.161, MONF.194, MONF.195, MONF.202, MONF.203, MONF.212, MONF.228, MONF.247, MONF.253, MONF.72, RAND.8, RAND.17, RAND.18, ROBI.28, ROBI.29, ROBI.30, ROBI.31, ROBI.32, ROBI.33.

**GLOBAL INFORMATION****NVC CLASSIFICATION**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g.)
Alliance	<i>Picea rubens</i> Saturated Forest Alliance (A.198)
Alliance (English name)	Red Spruce Saturated Forest Alliance
Association	<i>Picea rubens</i> - ( <i>Tsuga canadensis</i> ) / <i>Rhododendron maximum</i> Saturated Forest
Association (English name)	Red Spruce - (Eastern Hemlock) / Great Laurel Saturated Forest

Ecological System(s)      North-Central Appalachian Acidic Swamp (CES202.604)  
Southern and Central Appalachian Bog and Fen (CES202.300)  
High Allegheny Wetland (CES202.069)

#### **GLOBAL DESCRIPTION**

**Concept Summary:** This spruce-hemlock wetland forest of the central and southern Appalachian Mountains occurs on relatively flat terrain in poorly drained bottomlands of small streams at high elevations (above 1067 m [3500 feet] elevation in the Southern Blue Ridge to above 610 m [2000 feet] in the Central Appalachians). Small patches of this community also occur in the High Allegheny Plateau of Pennsylvania and New York. It historically occurred in Tennessee. Soils are seasonally to semi-permanently saturated due to a high water table or seepage from adjacent slopes. The tree canopy is dominated by *Picea rubens* (red spruce) or mixtures of *Picea rubens* (red spruce) and *Tsuga canadensis* (eastern hemlock). Other tree species that may occur in the canopy or subcanopy include *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Acer rubrum* var. *rubrum* (red maple), *Taxus canadensis* (Canada yew), and *Amelanchier arborea* (common serviceberry). This forest often has a dense shrub layer dominated by *Rhododendron maximum* (great laurel), with other associates often including *Kalmia latifolia* (mountain laurel), *Ilex verticillata* (common winterberry), *Ilex collina* (longstalk holly), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Photinia melanocarpa* (black chokeberry), and *Vaccinium* (blueberry) spp. The herbaceous layer is sparse, with the majority of herbaceous species restricted to openings, and includes *Carex trisperma* (threeseeded sedge), *Carex folliculata* (northern long sedge), *Glyceria melicaria* (melic mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), and *Maianthemum canadense* (Canada mayflower). *Listera smallii* (kidneyleaf twayblade), *Oclemena acuminata* (whorled wood aster), *Huperzia lucidula* (shining clubmoss), and *Dryopteris campyloptera* (mountain woodfern) are characteristic herbs. The bryophyte layer is of variable cover but is dominated by *Sphagnum* species. The absence of *Abies balsamea* (balsam fir) and the importance of *Rhododendron maximum* (great laurel) differentiate this forest from *Picea rubens* - *Abies balsamea* / *Sphagnum magellanicum* Forest (CEGL006311).

**Environmental Description:** This community occurs in poorly drained bottomlands of small streams at high elevations: 1300-1400 m (4200-4500 feet) in North Carolina, 770-1150 m (2500-3800 feet) in West Virginia, and 1070 m (3500 feet) in Virginia. It also occurs in isolated upland depressions on ridgetops in the High Allegheny Plateau of Pennsylvania and New York. Flooding is rare and soils are seasonally to semi-permanently saturated due to a high water table or seepage from adjacent slopes.

**Vegetation Description:** This community generally occurs as an open canopy woodland dominated by *Picea rubens* (red spruce), with an open to dense shrub layer, interspersed with small, open *Sphagnum*-herb-dominated depressions. Other tree species that may occur in the canopy or subcanopy include *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Acer rubrum* var. *rubrum* (red maple), *Pinus strobus* (eastern white pine), and *Amelanchier arborea* (common serviceberry). A dense shrub layer, dominated by *Kalmia latifolia* (mountain laurel) and *Rhododendron maximum* (great laurel) or *Rhododendron catawbiense* (Catawba rosebay), is usually present. Other characteristic shrubs include *Ilex verticillata* (common winterberry), *Ilex collina* (longstalk holly), *Taxus canadensis* (Canada yew), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Photinia melanocarpa* (black

chokeberry), and *Vaccinium* (blueberry) spp. The herbaceous layer is sparse and patchy and generally restricted to openings with plenty of light. Characteristic herbs include *Carex trisperma* (threeseeded sedge), *Carex folliculata* (northern long sedge), *Glyceria melicaria* (melic mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Listera smallii* (kidneyleaf twayblade), *Maianthemum canadense* (Canada mayflower), and *Houstonia serpyllifolia* (thymeleaf bluet). *Sphagnum* patches may occur scattered beneath the canopy as well as in small depressions. Other nonvascular plants include *Bazzania trilobata* and *Leucobryum glaucum*.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i> (red spruce)
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i> (Catawba rosebay), <i>Rhododendron maximum</i> (great laurel)
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i> (mountain laurel)

**Characteristic Species:** *Bazzania trilobata* (three-lobed bazzania), *Carex trisperma* (threeseeded sedge), *Ilex collina* (longstalk holly), *Sphagnum palustre* (prairie sphagnum)

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Ageratina altissima</i> var. <i>roanensis</i> (white snakeroot)	G5T3T4		plant
<i>Ilex collina</i> (longstalk holly)	G3		plant

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This red spruce wetland forest occurs in small patches in the southern and central Appalachian Mountains north to the High Allegheny Plateau.

**States/Provinces:** MD, NC, NY:S1, PA:S1, TN?:SH, VA?, WV:S2

**Federal Lands:** NPS (Upper Delaware?); USFS (Jefferson?, Monongahela, Nantahala, Pisgah)

**CONSERVATION STATUS**

**Rank:** G2? (1-Dec-1997)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** This community is rare in the Southern Blue Ridge, and remaining examples are in poor condition throughout its range. It is known from the Blue Ridge of North Carolina (Alarka Laurel, Long Hope Valley), and was historic in Tennessee.

**Similar Associations:**

- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588)

**Related Concepts:**

- *Tsuga canadensis* - *Picea rubens* Forest (Walton et al. 1997) ?
- IIE1a. Southern Appalachian Bog Complex (Allard 1990) B
- Oligotrophic Forest (Rawinski 1992) ?
- Red Spruce-Northern Hardwoods (17) (USFS 1988) ?

- Red Spruce: 32 (Eyre 1980) B
- Red spruce-hemlock/great laurel swamp (CAP pers. comm. 1998) ?
- Spruce forest community (Robinette 1966) =
- Swamp Forest-Bog Complex (Spruce Subtype) (Schafale 1998a) ?

#### SOURCES

**Description Authors:** M.G. Anderson, mod. K.D. Patterson and E. Largay

**References:** Allard 1990, Anderson 1990, Anderson et al. 1990, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Eyre 1980, Fike 1999, Francl et al. 2004, Harrison 2004, Peet et al. unpubl. data 2002, Rawinski 1992, Rawinski et al. 1994, Richardson and Gibbons 1993, Robinette 1966, Schafale 1998a, Schafale and Weakley 1990, Stotler and Crandall-Stotler 1977, TDNH unpubl. data, USFS 1988, Walton et al. 1997, Weakley and Schafale 1994

### Red Spruce - Southern Mountain Cranberry Swamp

<b>Scientific Name:</b>	<i>Picea rubens</i> / <i>Vaccinium erythrocarpum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> High Elevation Swamp
<b>Translated Name:</b>	Red Spruce / Southern Mountain Cranberry / Peatmoss – <i>Bazzania</i> Moss High Elevation Swamp
<b>NVC Name:</b>	CEGL006593: <i>Picea rubens</i> / <i>Vaccinium erythrocarpum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> Forest
<b>Conservation Rank:</b>	S2 / G2

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer swamp occurs on saturated and temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1140 and 1400 m above sea level. It occupies gently sloping land (0- to 6-degree slopes) on the margins between upland spruce forest and open beaver-influenced headwater wetlands, and in alluvial bottoms along high-elevation meandering streams. Standing snags are common, the result of inundation stress during wet years and beaver-influenced water table fluctuations. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, decaying wood, and around woody stem clusters. The community occurs on Carboniferous period bedrock, usually on Mauch Chunk shale and occasionally on Pottsville sandstone. Soils are somewhat poorly to poorly drained peat, muck, or organic-rich mottled silt loam, generally underlain by clay. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, 2 cm muck, depleted matrix, and redox depressions. Soil chemistry is characterized by high Al, B, Fe, H, N, P, organic matter, and total exchange capacity; and low Ca, Cu, K, Mg, Mn, Na, S, and Zn (n=4). Soil pH averages 3.6 (n=4). Pore water pH varies from 3.5-4.7, and electrical conductivity averages 54 micromhos/cm (n=2). The unvegetated surface is predominantly litter, with an average of 7% downed wood and trace amounts of standing water.

**Vegetation Description:** This evergreen swamp occurs at high elevations in the Allegheny Mountains of West Virginia. The canopy is open to closed and strongly dominated by *Picea rubens* (red spruce). Mean canopy cover is 50%. The subcanopy averages 35% cover and is also dominated by *Picea rubens* (red spruce), with lower cover by *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). *Acer pensylvanicum* (striped maple) and *Amelanchier laevis* (Allegheny serviceberry) may be present with very low cover in the

subcanopy. The tall-shrub layer averages 25% cover and is similar in composition to the subcanopy, with the occasional addition of *Ilex montana* (mountain holly), *Rhododendron maximum* (great laurel), or *Sorbus americana* (American mountain ash). The short-shrub layer averages 18% cover and is dominated by *Vaccinium erythrocarpum* (southern mountain cranberry), with locally abundant *Kalmia latifolia* (mountain laurel). The herbaceous ground layer is variable and sparse, with mean 13% cover. *Dryopteris intermedia* (intermediate woodfern) or *Thelypteris noveboracensis* (New York fern) may be locally abundant. Species with high constancy but low cover include *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Maianthemum canadense* (Canada mayflower), *Clintonia* (bluebead) spp., and *Carex trisperma* var. *trisperma* (threeseeded sedge). Nonvascular plants average 60% cover in this community, dominated by *Bazzania trilobata*, which blankets the abundant downfall, and *Sphagnum* ssp. (*Sphagnum girgensohnii*, *Sphagnum fallax*, *Sphagnum palustre*, and *Sphagnum rubellum*), which carpet the mucky hollows; *Polytrichum* spp. and *Hypnum imponens* are also common. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Vaccinium erythrocarpum* (southern mountain cranberry), *Bazzania trilobata*, *Maianthemum canadense* (Canada mayflower), and *Clintonia* (bluebead) spp. This community provides habitat for species of conservation concern in West Virginia including *Amelanchier bartramiana* (oblongfruit serviceberry) (S1G5), *Glyceria laxa* (limp mannagrass) (S1G5), and *Ilex collina* (longstalk holly) (S2G3). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 27 taxa per 400 square meters.

**Fauna observed:** Spiders collected within this community include *Clubiona* sp. (leafcurling sac spider), *Dictyna* sp. (meshweaver), *Helophora insignis* (sheetweb/dwarf weaver), *Neriene radiata* (filmy dome spider), *Theridion frondeum* (cobweb weaver), and *Leiobunum* sp. (harvestmen). Insects were collected including *Mycetophila* sp. (a fungus gnat), *Stobaera* sp. (a planthopper) and *Psyllia* sp. (a jumping plant louse).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>Rank</u>	<u>Type</u>	<u>Note</u>
<i>Amelanchier bartramiana</i> (oblongfruit serviceberry)	-			plant WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Ilex collina</i> (longstalk holly)	G3		plant	WV species of concern; globally vulnerable

**West Virginia Range:** The known distribution of this community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 1140 and 1400 m. Within this region, the community is known from Mt. Porte Crayon, Glade Run below Gaudineer Knob, Odey Run Bog, First Fork of the Upper Shavers, and the Upper Shavers Fork.

**Classification Comments:** Six plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.68, MONF.70, MONF.137, MONF.154, MONF.206, MONF.231.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Saturated mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.d.)
Alliance	<i>Picea rubens</i> - <i>Acer rubrum</i> Saturated Forest Alliance (A.450)
Alliance (English name)	Red Spruce - Red Maple Saturated Forest Alliance
Association	<i>Picea rubens</i> / <i>Vaccinium erythrocarpum</i> / <i>Sphagnum</i> spp. - <i>Bazzania trilobata</i> Forest
Association (English name)	Red Spruce / Southern Mountain Cranberry / Peatmoss species - Three-lobed Bazzania Forest
Ecological System(s)	North-Central Appalachian Acidic Swamp (CES202.604) High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic conifer woodland or forested swamp occurs on saturated and temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1140 and 1400 m above sea level. It is a small-patch community maintained by slow seepage, low-energy overflow inundation, and rainfall. It occupies gently sloping land (0- to 6-degree slopes) on the margins between upland spruce forest and open beaver-influenced headwater wetlands, and in alluvial bottoms along high-elevation meandering streams. Standing snags are common, the result of inundation stress during wet years and beaver-influenced water table fluctuations. Microtopography is characterized by irregular hummocks formed over tree roots, tip-up mounds, decaying wood, and around woody stem clusters. Soils are somewhat poorly to poorly drained peat, muck, or organic-rich mottled silt loam, generally underlain by clay. The canopy is open to closed and strongly dominated by *Picea rubens* (red spruce). The subcanopy is also dominated by *Picea rubens* (red spruce), with lower cover by *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is similar in composition to the subcanopy, with the occasional low cover by *Ilex montana* (mountain holly), *Rhododendron maximum* (great laurel), or *Sorbus americana* (American mountain ash). The short-shrub layer is dominated by *Vaccinium erythrocarpum* (southern mountain cranberry), with locally abundant *Kalmia latifolia* (mountain laurel). The herbaceous ground layer is variable and sparse; *Dryopteris intermedia* (intermediate woodfern) or *Thelypteris noveboracensis* (New York fern) may be locally abundant. Species with high constancy but low cover include *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Maianthemum canadense* (Canada mayflower), *Clintonia* (bluebead) spp., and *Carex trisperma* var. *trisperma* (threeseeded sedge). Nonvascular plants are dominated by *Bazzania trilobata*, which blankets the abundant downfall, and *Sphagnum* ssp. (*Sphagnum girgensohnii*, *Sphagnum fallax*, *Sphagnum palustre*, and *Sphagnum rubellum*), which carpet the mucky hollows; *Polytrichum* spp. and *Hypnum imponens* are also common. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Vaccinium erythrocarpum* (southern mountain cranberry), *Bazzania trilobata*, *Maianthemum canadense* (Canada

mayflower), and *Clintonia* (bluebead) spp. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> <u>Rank</u>	<u>Type</u>	<u>Note</u>
<i>Ilex collina</i> (longstalk holly)	G3	plant	

**DISTRIBUTION**

**Range:** The known distribution of this community is restricted to the higher elevations (1140-1400 m) of the Allegheny Mountains region of West Virginia.

**States/Provinces:** WV:S2

**Federal Lands:** USFS (Monongahela)

**CONSERVATION STATUS**

**Rank:** G2 (30-Mar-2007)

**Reasons:** This is a small-patch community that is restricted in known distribution to five occurrences in the Allegheny Mountains region of West Virginia. It is limited by its requirement for temporarily flooded or saturated conditions along flat or gently sloping bottomland between 1140 and 1400 m elevation. The community is further limited in extent by the range of *Vaccinium erythrocarpum* (southern mountain cranberry), a southern Appalachian species that reaches its northern range limit in West Virginia. The expected range has been surveyed in West Virginia, and more than five additional occurrences are not expected to be found.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

**Similar Associations:**

- *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest (CEGL006590)-- has a more open canopy and shrub layer and lacks *Vaccinium erythrocarpum*.
- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588)--has a well-developed evergreen shrub layer.

**Related Concepts:** Information not available.

**SOURCES**

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d.

## Red Spruce - Three-seeded Sedge Peat Woodland

<b>Scientific Name:</b>	<i>Picea rubens</i> / <i>Carex trisperma</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. High Elevation Peat Woodland
<b>Translated Name:</b>	Red Spruce / Three-seed Sedge / Peatmoss - Haircap Moss High Elevation Peat Woodland
<b>NVC Name:</b>	CEGL006590: <i>Picea rubens</i> / <i>Carex trisperma</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. Forest
<b>Conservation Rank:</b>	S2 / G2

### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic conifer woodland swamp occurs on saturated and temporarily flooded organic soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1000 and 1430 m. It is a small-patch community that occupies flat to very gently sloping land (0- to 2-degree slopes) along the margins of open peatlands, forming narrow "spits," fingers, or islands. It also occurs in peaty depressions within high plateau spruce forests. Seepage from adjacent upland spruce forest and the high water table in the open peatland keep the community wet enough to kill trees during wet years, leaving numerous snags. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, tip-up mounds, nurse logs, and decaying wood. Bedrock is typically sandstone or occasionally shale, and may be encountered at less than 20 cm depth. Soils are poorly drained muck, peat, or organic-rich silt/clay loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, 2-cm muck, sandy redox, depleted matrix, redox depressions, and thick dark surface. Depth of organic soil varies greatly from 5-120 cm (n=7). Soil pH averages 3.5 (n=6). Mean pore water pH is 4.5 and electrical conductivity averages 67 micromhos/cm (n=4). Soil chemistry is characterized by high Na, P, S, exchangeable nitrogen, total exchange capacity, and organic matter; and low Al, B, Ca, Cu, Fe, K, Mg, Mn, and Zn (n=6). The unvegetated surface is predominantly litter, with an average of 3% downed wood and 2% standing water.

**Vegetation Description:** This conifer woodland swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open or occasionally closed canopy of *Picea rubens* (red spruce) and fairly sparse shrub layer growing on irregular hummocks, with swales and hollows occupied by *Carex trisperma* var. *trisperma* (three-seeded sedge) and peat-forming bryophytes. The canopy is dominated by *Picea rubens* (red spruce), and one high-quality stand is codominated by *Pinus strobus* (eastern white pine). Canopy species that occur occasionally with low cover include *Acer rubrum* (red maple), *Amelanchier laevis* (Allegheny serviceberry), *Pinus rigida* (pitch pine), *Sorbus americana* (American mountain ash), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). Mean canopy cover is 35%. The subcanopy averages 15% cover and is dominated by the same set of species, sometimes including low cover of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer averages 10% cover and is also dominated by *Picea rubens* (red spruce). Other species that occasionally occur with low cover in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), and *Photinia melanocarpa* (black chokeberry). The short-shrub layer averages 20% cover. Dominant species are *Picea rubens* (red spruce), *Vaccinium myrtilloides* (velvetleaf huckleberry), and *Vaccinium angustifolium* (lowbush blueberry), with

lower cover by *Viburnum nudum* var. *cassinoides* (northern wild raisin) and *Photinia melanocarpa* (black chokeberry). The herbaceous layer, with mean 30% cover, is dominated by *Carex trisperma* var. *trisperma* (threeseeded sedge). Species with high constancy but low cover include *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Gaultheria hispidula* (creeping snowberry), *Vaccinium oxycoccos* (small cranberry), and *Carex debilis* (white edge sedge). Nonvascular plants average 60% cover and are dominated by *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum fallax*, *Sphagnum capillifolium*, *Sphagnum papillosum*), *Polytrichum strictum*, *Polytrichum commune*, *Hypnum imponens*, and *Leucobryum glaucum*. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Photinia melanocarpa* (black chokeberry), *Gaultheria hispidula* (creeping snowberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Rubus hispidus* (bristly dewberry). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Coptis trifolia* (threeleaf goldthread) (S2G5), *Cornus canadensis* (bunchberry dogwood) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Glyceria laxa* (limp mannagrass) (S1G5), *Lycopodiella inundata* (inundated clubmoss) (S2?G5), *Vaccinium oxycoccos* (small cranberry) (S2G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S2G4Q). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 31 taxa per 400 square meters, with about 20% of the diversity occurring in the bryophyte layer.

**Fauna observed:** Small mammals observed in this community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Microtus pensylvanicus* (meadow vole), and *Clethrionomys gapperi* (southern red-backed vole). *Speyeria cybele cybele* (great spangled butterfly) was observed. Odonates include *Amphiagrion saucium* (eastern red damselfly), *Cordulegaster diastatops* (delta-spotted spiketail), *Cordulia shurtleffii* (American emerald), *Enallagma hageni* (Hagen's bluet), *Ischnura verticalis* (common forktail), and *Sympetrum obtrusum* (white-faced meadowhawk). Spiders collected include *Argiope trifasciata* (banded garden spider), *Argiope aurantia* (yellow garden spider), *Pityohyphantes* sp. (hammock spider), *Pardosa moesta* (thinlegged wolf spider), *Pirata* sp. (pirate wolf spider), *Eris militaris* (bronze jumper), *Naphrys pulex* and *Sitticus palustris* (jumping spiders), *Leucauge venusta* (orchard orbweaver), *Neoscona arabesca* (arabesque orbweaver), *Xysticus* sp. (ground crab spider), and *Leiobunum* sp., *Leiobunum calcar*, and *Odiellus pictus* (harvestmen). Insects were collected from five orders. From Coleoptera (beetles), *Tricholochmaea* sp. (a leaf beetle) and *Cyphon* sp. (a marsh beetle) were noted. Dipterans (true flies) included *Hybos reversus* (a dance fly), *Lonchoptera* sp. (a spear-winged fly), *Mycomya* sp. (a fungus gnat), *Cordilura* sp. (a dung fly), *Copromyza* sp. (a small dung fly), *Sargus* sp. (a soldier fly), and species from Tipulidae (craneflies), Fanniidae (lesser houseflies), Anthomyiidae (root-maggot flies), and Dolichopodidae (long-legged flies). The order Hemiptera (true bugs) included *Clastoptera* sp. (a spittlebug), *Phlepsius* sp. (a leafhopper), *Phytocoris* sp. (a plant bug), *Oedancala dorsalis* (a seed bug), *Ligyrocoris* sp. (a seed bug), and Pentatomidae (stink bugs). Specimens from the order Hymenoptera (bees, wasps, and ants) include Braconidae (parasitoid wasps), Formicidae (ants) and Ichneumonidae (ichneumon wasps). A specimen of Leuctridae (rolled-wing stoneflies) was noted from the order Plecoptera (stoneflies).

### Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Coptis trifolia</i> (threeleaf goldthread)	-	plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 1000 and 1430 m. Within this region, the community is known from Dolly Sods (Breathed Mountain Bog, Dobbins Slashing, Fisher Spring Run), Mt. Porte Crayon, Big Run south of Spruce Knob Lake, and Big Glade at Cranberry Glades.

**Classification Comments:** Seven plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. It differs from the more northern *Picea rubens* - *Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Forest (CEGL006312) in that it does not contain *Abies balsamea* (balsam fir), except in very occasional low cover amounts, and it does contain low cover of a number of characteristic central Appalachian shrub swamp species, including *Rhododendron maximum* (great laurel), *Menziesia pilosa* (minniebush), *Vaccinium erythrocarpum* (southern mountain cranberry), and *Hypericum densiflorum* (bushy St. Johnswort). It differs from the similar high-elevation *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593) in its more open canopy and acidic peat substrate. It differs from the dwarf peat woodland *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588) in its taller, denser canopy cover and sparse shrub layer.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.135, MONF.136, MONF.147, MONF.180, MONF.187, TUCK.21, TUCK.23.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen forest (I.A.8.N.g.)
Alliance	<i>Picea rubens</i> Saturated Forest Alliance (A.198)
Alliance (English name)	Red Spruce Saturated Forest Alliance

Association	<i>Picea rubens</i> / <i>Carex trisperma</i> / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. Forest
Association (English name)	Red Spruce / Three-seed Sedge / Peatmoss species - Haircap Moss species Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic conifer woodland swamp occurs on saturated and temporarily flooded organic soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1000 and 1430 m. It is a small-patch community that occupies flat to very gently sloping land (0- to 2-degree slopes) along the margins of open peatlands, forming narrow "spits," fingers, or islands. It also occurs in peaty depressions within high plateau spruce forests. Microtopography is characterized by a mix of rounded peat hummocks and irregular moss-covered hummocks formed over tree roots, woody stem clusters, tip-up mounds, nurse logs, and decaying wood. Bedrock is typically sandstone or occasionally shale, and may be encountered at less than 20 cm depth. Soils are poorly drained muck, peat, or organic-rich silt/clay loam. Depth of organic soil varies greatly from 5-120 cm. Soil pH averages 3.5. The community is characterized by an open canopy of *Picea rubens* (red spruce) and fairly sparse shrub layer growing on irregular hummocks, with swales and hollows occupied by *Carex trisperma* var. *trisperma* (threeseeded sedge) and peat-forming bryophytes. Additional canopy species that occur occasionally include *Pinus strobus* (eastern white pine), *Acer rubrum* (red maple), *Amelanchier laevis* (Allegheny serviceberry), *Pinus rigida* (pitch pine), *Sorbus americana* (American mountain ash), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The tall-shrub layer is also dominated by *Picea rubens* (red spruce) with occasional low cover by *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), and *Photinia melanocarpa* (black chokeberry). The short-shrub layer includes *Picea rubens* (red spruce), *Vaccinium myrtilloides* (velvetleaf huckleberry), and *Vaccinium angustifolium* (lowbush blueberry). The herbaceous layer is dominated by *Carex trisperma* var. *trisperma* (threeseeded sedge) and may include low cover by *Rubus hispidus* (bristly dewberry), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Gaultheria hispidula* (creeping snowberry), *Vaccinium oxycoccos* (small cranberry), and *Carex debilis* (white edge sedge). Nonvascular plants are dominated by *Sphagnum* spp. with lesser amounts of *Polytrichum* spp., *Hypnum imponens*, and *Leucobryum glaucum*. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 31 taxa per 400 square meters, with about 20% of the diversity occurring in the bryophyte layer.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 1000 and 1430 m.

**States/Provinces:** WV:S2

**Federal Lands:** USFS (Monongahela)

### CONSERVATION STATUS

**Rank:** G2 (30-Mar-2007)

**Reasons:** This is a small-patch community that is restricted in known distribution to six occurrences within the Allegheny Mountains region of West Virginia. It is limited by its requirement for saturated peat/organic soil conditions along flat or very gently sloping headwater basins between 1000-1430 m elevation. It has a small area of occupancy and high intrinsic vulnerability.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

**Similar Associations:**

- *Picea rubens* - *Abies balsamea* / *Gaultheria hispidula* / *Osmunda cinnamomea* / *Sphagnum* spp. Forest (CEGL006312)--occurs in New England and lacks species of southern distribution such as *Rhododendron maximum* or *Hypericum densiflorum*.
- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588)--has a more closed canopy and relatively dense evergreen shrub cover.
- *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593)--has a more closed canopy and dominance of *Vaccinium erythrocarpum* in the low-shrub layer.

**Related Concepts:**

- Bog Forest Association (Darlington 1943) B

**SOURCES**

**Description Author:** E.A. Byers

**References:** Darlington 1943, Eastern Ecology Working Group n.d.

## I.B.2.N.d. Temporarily flooded cold-deciduous forest

### Quaking Aspen Swamp

**Scientific Name:** *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Swamp

**Translated Name:** Quaking Aspen / Velvetleaf Blueberry / Bog Goldenrod Swamp

**NVC Name:** CEGL006594: *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Forest

**Conservation Rank:** S3 / GNR

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This successional deciduous swamp occurs on moist to temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 950 and 1200 m. It is a small-patch clonal type that occupies flat to very gently sloping land (0- to 1-degree slopes) in larger wetland mosaics, often surrounded by successional shrub swamps or peatlands. It is part of a natural (beaver-influenced) disturbance regime, although its natural extent would be less than the current extent, which has been enlarged due to extensive logging and burning about 100 years ago, and subsequent grazing. Significant

increases in stand initiation may have been related to changes in land use and reductions in herbivory pressures after the 1950s. Median stand age ranges from 30-40 years. This type represents important habitat that was once covered by *Picea rubens* (red spruce) swamps and is likely to eventually recover if natural succession is allowed to proceed unhindered. Bedrock may be limestone, shale, or sandstone. Soils are poorly drained, mottled silt or clay loam, underlain by clay or clay loam. Organic horizons are absent, although a few centimeters of litter or duff cover the soil surface. Hydric soil indicators include depleted matrix and redox depressions. Soil pH averages 4.0 (n=2). Pore water pH in one stand was 5.4 and electrical conductivity was 17 micromhos/cm. Soil chemistry is characterized by high Al, Fe, K, P; moderate B, Ca, Cu, and total exchange capacity; and low Mg, Mn, N, Na, S, Zn, and organic matter (n=2). The unvegetated surface is predominantly litter, with an average of 4% downed wood and a trace of standing water. Standing dead trees often comprise more than 20% of live basal area.

**Vegetation Description:** This successional deciduous forest or woodland swamp occurs in the Allegheny Mountains region of West Virginia. The community is an outlier that occurs well south of the primary range of *Populus tremuloides* (quaking aspen) wetlands. It is characterized by an open to closed canopy of clonal *Populus tremuloides* (quaking aspen) with diverse shrub and herb layers. The canopy is strongly dominated by *Populus tremuloides* (quaking aspen), occasionally including very low cover of *Crataegus punctata* (dotted hawthorn), *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), and *Crataegus macrosperma* (bigfruit hawthorn). Canopy cover ranges from 30-100% (mean = 55%). Canopy height is less than 20 m and sometimes it is as low as 5 m, essentially crossing the transition between woodland and shrubland physiognomy. The shrub strata average 35% cover, dominated by young *Populus tremuloides* (quaking aspen), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Viburnum recognitum* (southern arrowwood). *Spiraea alba* (white meadowsweet) or *Photinia melanocarpa* (black chokeberry) may be locally abundant. The herbaceous layer, with mean 70% cover, is typically diverse, with high cover and constancy by *Solidago uliginosa* (bog goldenrod), *Rubus hispidus* (bristly dewberry), *Danthonia compressa* (flattened oatgrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Potentilla simplex* (common cinquefoil), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), and *Juncus effusus* (common rush). The non-native species *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass) is often present with low cover. Nonvascular plants average 20% cover with high constancy of *Polytrichum commune*, *Sphagnum* spp., and *Callicladium haldanianum*. Indicator species that help to distinguish this community from others within the forest/woodland physiognomies for high-elevation wetlands of the Allegheny Mountains region include *Danthonia compressa* (flattened oatgrass), *Doellingeria umbellata* (parasol whitetop), *Populus tremuloides* (quaking aspen), and *Solidago uliginosa* (bog goldenrod). This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5T5), *Equisetum sylvaticum* (woodland horsetail) (S1G5), *Geum rivale* (purple avens) (S1G5), *Glyceria laxa* (limp mannagrass) (S1G5), *Juncus filiformis* (thread rush) (S2G5), *Luzula bulbosa* (bulbous woodrush) (S1G5), *Pedicularis lanceolata* (swamp lousewort) (S2G5), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), and *Scirpus microcarpus* (panicked bulrush) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 14-57 (mean=29) taxa per 400 square meters, with most of the diversity in the herb layer.

**Fauna observed:** *Leiobunum* sp. (a harvestmen spider) was noted in this community.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Equisetum sylvaticum</i> (woodland horsetail)	-	plant	WV species of concern
<i>Geum rivale</i> (purple avens)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Juncus filiformis</i> (thread rush)	-	plant	WV species of concern
<i>Luzula bulbosa</i> (bulbous woodrush)	-	plant	WV species of concern
<i>Pedicularis lanceolata</i> (swamp lousewort)	-	plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Scirpus microcarpus</i> (panicled bulrush)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 950 and 1200 m. Within this region, the community is known from Canaan Valley and Dolly Sods.

**Classification Comments:** Sixteen plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. Thirteen of the plots were sampled by Rentch and Anderson (2005). The type clusters and ordines extremely well and has been sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.22, CVWR.13, GRAN.9, RENT.1, RENT.2, RENT.3, RENT.4, RENT.5, RENT.6, RENT.7, RENT.8, RENT.9, RENT.10, RENT.11, RENT.12, RENT.13.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus tremuloides</i> Temporarily Flooded Forest Alliance (A.300)
Alliance (English name)	Quaking Aspen Temporarily Flooded Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Vaccinium myrtilloides</i> / <i>Solidago uliginosa</i> Forest
Association (English name)	Quaking Aspen / Velvetleaf Blueberry / Bog Goldenrod Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

**GLOBAL DESCRIPTION**

**Concept Summary:** This successional deciduous forested swamp occurs on moist to temporarily flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 950 and 1200 m. This community is an outlier that occurs well

south of the primary range of *Populus tremuloides* (quaking aspen) wetlands. It is a small-patch clonal type that occupies flat to very gently sloping land (0- to 1-degree slopes) in larger wetland mosaics, often surrounded by successional shrub swamps or peatlands. It is part of a natural (beaver-influenced) disturbance regime, although its natural extent would be less than the current extent, which has been enlarged due to extensive logging and burning about 1900, and subsequent grazing. Median stand age ranges from 30-40 years. This type represents important habitat that was once covered by *Picea rubens* (red spruce) swamps and is likely to eventually recover if natural succession is allowed to proceed unhindered. Soils are poorly drained, mottled silt or clay loam, underlain by clay or clay loam. Organic soils are absent, although a few centimeters of litter or duff cover the soil surface. The community is characterized by an open to closed canopy of clonal *Populus tremuloides* (quaking aspen) with diverse shrub and herb layers. The canopy is strongly dominated by *Populus tremuloides* (quaking aspen), occasionally including very low cover of *Crataegus punctata* (dotted hawthorn), *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), and *Crataegus macrosperma* (bigfruit hawthorn). Canopy height is less than 20 m, and sometimes it is as low as 5 m, essentially crossing the transition between woodland and shrubland physiognomy. The shrub strata are dominated by young *Populus tremuloides* (quaking aspen), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Viburnum recognitum* (southern arrowwood). *Spiraea alba* (white meadowsweet) or *Photinia melanocarpa* (black chokeberry) may be locally abundant. The herbaceous layer is typically diverse, with high cover and constancy by *Solidago uliginosa* (bog goldenrod), *Rubus hispidus* (bristly dewberry), *Danthonia compressa* (flattened oatgrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Potentilla simplex* (common cinquefoil), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), and *Juncus effusus* (common rush). The non-native species *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass) is often present with low cover. Nonvascular plants typically include *Polytrichum commune*, *Sphagnum* spp., and *Callicladium haldanianum*. Mean species richness of all vascular plants and any nonvascular plants with cover >1% ranges from 14-57 (mean=29) taxa per 400 square meters, with most of the diversity in the herb layer.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4		plant

**DISTRIBUTION**

**Range:** This community is currently known from the Allegheny Mountains region of West Virginia, at elevations between 950 and 1200 m.

**States/Provinces:** WV

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (2-Apr-2007)

**Reasons:** This is a small-patch successional swamp that is an outlier to northern *Populus tremuloides* (quaking aspen) swamps. It is restricted in known distribution to two occurrences (perhaps 100 patches) within the Allegheny Mountains region of West Virginia, between 950

and 1200 m elevation. The expected range has been searched in West Virginia, and more than two additional occurrences are not expected to be found. It has not been ranked because of its successional status; however, this type represents important habitat that was once covered by *Picea rubens* (red spruce) swamps and is likely to eventually recover if natural succession is allowed to proceed unhindered. Also, the type probably occurs in small patches as a result of natural disturbance, e.g., stand-replacing inundation by beaver.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

**Similar Associations:** Information not available.

#### Related Concepts:

- *Populus (tremuloides, grandidentata)* bottomland forest (Fortney 1975) B
- *Populus tremuloides* grove forest (Fortney et al. 2005) =

#### SOURCES

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d., Fortney 1975, Fortney et al. 2005, Rentch and Anderson 2005

## I.B.2.N.g. Saturated cold-deciduous forest

### Balsam Fir - Black Ash Swamp

**Scientific Name:** *Fraxinus nigra* - *Abies balsamea* / *Alnus incana* ssp. *rugosa* / *Rhamnus alnifolia* / *Carex bromoides* ssp. *bromoides* Rich Swamp

**Translated Name:** Black Ash - Balsam Fir / Speckled Alder / Alderleaf Buckthorn / Brome-like Sedge Rich Swamp

**NVC Name:** CEG1006003: *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* Forest

**Conservation Rank:** S1 / G1

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This community occurs on temporarily to semi-permanently flooded, flat headwater basins and backswamps along small streams on the Mississippian Greenbrier limestone in Canaan Valley, in the Allegheny Mountains region of West Virginia, at elevations of 962-989 m above sea level. Microtopography is characterized by irregular mossy hummocks formed over tip-up mounds, nurse logs, decaying wood, and live tree roots. Historic logging and fires around the year 1900 damaged this community. Its wetland setting and stunted (no commercial value) trees offered some protection, and it has recovered well. The rich substrate required by this swamp type has also attracted significant agricultural (grazing and hayfields) pressure in the past. Most stands are adjacent to mowed meadows on at least one side, although cattle grazing pressure has now been removed. Typically, adjacent natural communities include alluvial shrub swamp and upland forest. Current fluctuations in hydrologic regime occur

as a result of beaver activity, but do not appear to immediately threaten this community. Excessive deer browse appears to have significant negative impact on regeneration of canopy species and on some rare herbaceous species, e.g., *Polemonium vanbruntiae* (Vanbrunt's polemonium). Most *Abies balsamea* (balsam fir) show damage from *Adelges piceae* (balsam woolly adelgid), including bark infestation and gout damage. Combined with excessive deer herbivory, the adelgid damage may be severe enough to eliminate *Abies balsamea* (balsam fir) and change the dominant species composition of this community in the future. Minor invasion of exotic plants, particularly *Iris pseudacorus* (pale yellow iris) and *Rosa multiflora* (multiflora rose), has occurred in a few stands and should be monitored carefully. Soils are poorly drained muck or organic-rich silt loam over mottled or gleyed silty clay, with stoniness <0.1%. Hydric soil indicators include hydrogen sulphide, depleted matrix, redox depressions, and thick dark surface 2/1. Soil chemistry is characterized by high organic matter, Al, Ca, Fe, K, Mg, N, Na, Zn, and total exchange capacity; moderate Cu, P; and low B, H, Mn (n=12). Soil pH averages 5.3 (n=12). Pore water is high in pH (6.4, n=2) and electrical conductivity (322, n=2). The unvegetated surface is variable, with litter and bare ground dominant. Standing water averages 2% and downed wood averages 3%.

**Vegetation Description:** The community is a lush circumneutral evergreen/deciduous woodland or forested swamp with graminoids dominant in the understory. This rich swamp provides rare habitat for shade-tolerant calciphile wetland species. The canopy is open to closed and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir), *Fraxinus nigra* (black ash), and *Tsuga canadensis* (eastern hemlock). The canopy rarely exceeds 20 m in height and is generally less than 15 m in height, with 20-60% cover. Other tree species occurring in the canopy include *Acer rubrum* (red maple), *Picea rubens* (red spruce), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). The subcanopy ranges from 5-30% cover and is dominated by *Abies balsamea* (balsam fir) with varying amounts of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce), and *Fraxinus nigra* (black ash). *Acer rubrum* (red maple), *Amelanchier* (serviceberry) spp., *Crataegus* (hawthorn) spp., and *Sorbus americana* (American mountain ash) may be present with very low cover in the subcanopy. The tall-shrub layer ranges from 10-100% cover and is dominated by *Alnus incana* ssp. *rugosa* (speckled alder) with locally abundant *Ilex verticillata* (common winterberry) and sometimes vigorous *Picea rubens* (red spruce) regeneration in this stratum. *Rhododendron maximum* (great laurel) may be present with low cover. The short-shrub layer covers 5-30% and is dominated by *Rhamnus alnifolia* (alderleaf buckthorn) or rarely by *Cornus amomum* (silky dogwood). The herbaceous ground layer is extensive and diverse, ranging from 50-100% cover and typically including over 50 species. The most abundant species are *Carex bromoides* ssp. *bromoides* (bromelike sedge) and *Glyceria striata* (fowl mannagrass). Other common species include *Arisaema triphyllum* (Jack in the pulpit), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Carex gynandra* (nodding sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Maianthemum canadense* (Canada mayflower), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Packera aurea* (golden ragwort), *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus hispidus* (bristly dewberry), and *Solidago rugosa* (wrinkleleaf goldenrod). *Poa alsodes* (grove bluegrass) is locally abundant. Nonvascular plants have 3-50% cover in this community. Dominant bryophytes are *Sphagnum* spp., *Hypnum imponens*, *Thuidium delicatulum*, and *Bazzania trilobata*, with 12 other bryophyte species occasionally

noted. The community is characterized by a large number of indicator species within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region. They include *Carex bromoides* ssp. *bromoides* (bromelike sedge), *Carex crinita* (fringed sedge), *Clematis virginiana* (virgin's bower), *Cornus amomum* (silky dogwood), *Dryopteris cristata* (crested woodfern), *Epilobium coloratum* (purpleleaf willowherb), *Euphorbia purpurea* (Darlington's glade spurge) (G3), *Fraxinus nigra* (black ash), *Galium asprellum* (rough bedstraw), *Geum rivale* (purple avens), *Milium effusum* var. *cisatlanticum* (American milletgrass), *Onoclea sensibilis* (sensitive fern), *Oxypolis rigidior* (stiff cowbane), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (G3), *Polygonum sagittatum* (arrowleaf tearthumb), *Rhamnus alnifolia* (alderleaf buckthorn), *Smilax tamnoides* (bristly greenbrier), and *Viola cucullata* (marsh blue violet). Mean species richness of all vascular plants and any non-vascular plants with cover >1% is 70 taxa per 400 square meters.

**Fauna observed:** *Libellula pulchella* (twelve-spotted skimmer), a dragonfly, was observed in this community. Spiders collected in this community include *Clubiona abboti* (leafcurling sac spider), and *Tetragnatha laboriosa* (silver longjawed orbweaver). Insects were collected from the order Coleoptera (beetles) including *Pyropyga* sp. (a firefly). Those from the order Diptera (true flies) included unidentified species from Drosophilidae (vinegar and fruit flies), *Hybos reversus* (a dance fly), and *Toxorhina* sp. (a crane fly). Representing the order Hemiptera (true bugs) were *Protenor belfragei* (a broad-headed bug), *Eucanthus acuminatus* (a leafhopper), *Lygus* sp. (a plant bug), *Oedancala dorsalis* (Pachygronthidae family), and *Corythucha* sp. (a lace bug). From the order Lepidoptera was an unidentified species from Pyralidae (grass moths). *Melanoplus* sp. (a grasshopper) was noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex projecta</i> (necklace sedge)	-	plant	WV species of concern
<i>Dalibarda repens</i> (robin runaway)	-	plant	WV species of concern
<i>Euphorbia purpurea</i> (Darlington's glade spurge)	G3	plant	WV species of concern
<i>Fraxinus nigra</i> (black ash)	-	plant	WV species of concern
<i>Geum rivale</i> (purple avens)	-	plant	WV species of concern
<i>Glyceria grandis</i> (American mannagrass)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	WV species of concern
<i>Rhamnus alnifolia</i> (alderleaf buckthorn)	-	plant	WV species of concern
<i>Rubus pubescens</i> var. <i>pubescens</i> (dwarf blackberry)	-	plant	WV species of concern

**West Virginia Range:** The known distribution of this community is restricted to frost-pocket, high-elevation wetlands on the Mississippian Greenbrier limestone in Canaan Valley, in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1000 m above sea level. This type may have historically occurred at a second site with similar geologic and climatic conditions at Blister Swamp in Pocahontas County, WV.

**Classification Comments:** Eleven plots were used in modifying the classification of this type as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordinales well and has been sampled throughout its small range. It has a large number of indicator species. Seven of the plots were sampled by Ceperley (2002) and used in the initial development of the type. Only two occurrences have been documented, both in Tucker County, West Virginia. It is worth noting that the logged and grazed habitat at Blister Swamp in Pocahontas County, WV, is in a similar geologic and climatic setting and currently has many of the same herbaceous and understory plants as this community. It may eventually develop into this community type within the 40-acre cattle enclosure constructed in 1999, where the dominant physiognomy is currently open wetlands and shrub swamps.

**Local Description Author:** E.A. Byers

**Plots:** TUCK.17, TUCK.15, CASP.7, CASP.6, CASP.15, CASP.13, CASP.19, TUCK.2, CASP.5, CASP.4, CASP.3.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Saturated cold-deciduous forest (I.B.2.N.g.)
Alliance	<i>Fraxinus nigra</i> - <i>Acer rubrum</i> Saturated Forest Alliance (A.347)
Alliance (English name)	Black Ash - Red Maple Saturated Forest Alliance
Association	<i>Fraxinus nigra</i> - <i>Abies balsamea</i> / <i>Rhamnus alnifolia</i> Forest
Association (English name)	Black Ash - Balsam Fir / Alderleaf Buckthorn Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This community is a lush, circumneutral, seepage-fed, mixed woodland or forested swamp of the Allegheny Mountains region of West Virginia. It is a late-successional, small-patch community limited to frost-pocket wetlands on the Mississippian Greenbrier limestone, at elevations between 960 and 1000 m. The community occurs on temporarily to semi-permanently flooded, flat headwater basins and backswamps along small streams. Microtopography is characterized by irregular hummocks formed over buttressed tree roots, tip-up mounds, nurse logs, and decaying wood. Soils are poorly drained muck or organic-rich silt loam over mottled or gleyed silty clay. This rich swamp provides habitat for a number of rare shade-tolerant calciphile wetland species. The canopy is open to closed and dominated by stunted, inundation-stressed *Abies balsamea* (balsam fir), *Fraxinus nigra* (black ash), and *Tsuga canadensis* (eastern hemlock). The subcanopy is dominated by *Abies balsamea* (balsam fir) with varying amounts of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Tsuga canadensis* (eastern hemlock), *Picea rubens* (red spruce), and *Fraxinus nigra* (black ash). The tall-shrub layer is dominated by *Alnus incana* ssp. *rugosa* (speckled alder) with locally abundant *Ilex verticillata* (common winterberry) and sometimes vigorous *Picea rubens* (red spruce) regeneration in this stratum. The short-shrub layer is dominated by *Rhamnus alnifolia* (alderleaf buckthorn) or rarely by *Cornus amomum* (silky dogwood). The herbaceous ground layer is extensive and diverse, typically including over 50 species. The most abundant species are *Carex*

*bromoides* ssp. *bromoides* (bromelike sedge) and *Glyceria striata* (fowl mannagrass). Other common species include *Arisaema triphyllum* (Jack in the pulpit), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Carex gynandra* (nodding sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Maianthemum canadense* (Canada mayflower), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Packera aurea* (golden ragwort), *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus hispidus* (bristly dewberry), and *Solidago rugosa* (wrinkleleaf goldenrod). *Poa alsodes* (grove bluegrass) is locally abundant. Dominant bryophytes are *Sphagnum* spp., *Hypnum imponens*, *Thuidium delicatulum*, and *Bazzania trilobata*. The community has a large number of diagnostic species, including *Carex bromoides* ssp. *bromoides* (bromelike sedge), *Carex crinita* (fringed sedge), *Clematis virginiana* (virgin's bower), *Cornus amomum* (silky dogwood), *Dryopteris cristata* (crested woodfern), *Epilobium coloratum* (purpleleaf willowherb), *Euphorbia purpurea* (Darlington's glade spurge) (G3), *Fraxinus nigra* (black ash), *Galium asprellum* (rough bedstraw), *Geum rivale* (purple avens), *Milium effusum* var. *cisatlanticum* (American milletgrass), *Oxypolis rigidior* (stiff cowbane), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (G3), *Rhamnus alnifolia* (alderleaf buckthorn), and *Smilax tamnoides* (bristly greenbrier). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 70 taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies balsamea</i> (balsam fir)
Tree canopy	Broad-leaved deciduous tree	<i>Fraxinus nigra</i> (black ash)
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Alnus incana</i> ssp. <i>rugosa</i> (speckled alder), <i>Ilex verticillata</i> (common winterberry)
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus amomum</i> (silky dogwood), <i>Rhamnus alnifolia</i> (alderleaf buckthorn)
Herb (field)	Forb	<i>Polygonum sagittatum</i> (arrowleaf tearthumb), <i>Viola cucullata</i> (marsh blue violet)
Herb (field)	Graminoid	<i>Glyceria melicaria</i> (melic mannagrass)

**Characteristic Species:** *Abies balsamea* (balsam fir), *Cornus amomum* (silky dogwood), *Fraxinus nigra* (black ash), *Glyceria melicaria* (melic mannagrass), *Polygonum sagittatum* (arrowleaf tearthumb), *Rhamnus alnifolia* (alderleaf buckthorn), *Viola cucullata* (marsh blue violet)

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>Rank</u>	<u>Type</u>	<u>Note</u>
<i>Euphorbia purpurea</i> (Darlington's glade spurge)	G3		plant	
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4		plant	

**USFWS Wetland System:** Palustrine

## DISTRIBUTION

**Range:** The known distribution of this community is restricted to frost-pocket, high-elevation wetlands on the Mississippian Greenbrier limestone in Canaan Valley, in the Allegheny Mountains region of West Virginia, at elevations between 960-1000 m above sea level. This type may have historically occurred at a second site with similar geologic and climatic conditions at Blister Swamp in Pocahontas County, WV. A probable occurrence on the unglaciated High Allegheny Plateau, in northeastern McKean County, Pennsylvania (G. Podniesinski pers. comm.), shares many of the same diagnostic species.

**States/Provinces:** MD?, PA?, WV:S1

**Federal Lands:** USFWS (Canaan Valley)

## CONSERVATION STATUS

**Rank:** G1 (10-Nov-1997)

**Reasons:** This is a small-patch type that is restricted in known distribution to seven patches (two occurrences) in a single high-elevation headwater basin in Tucker County, West Virginia. It is limited by its requirement for a circumneutral seepage flow in flat, frost-pocket headwater basins. The community is further limited in extent by the range of *Abies balsamea* (balsam fir), which is disjunct and reaches its southern range limit in West Virginia and Virginia. The expected range has been searched in West Virginia, and additional occurrences are not expected to be found, although one possible historic occurrence is now under partial protection and may recover to this type. Similar vegetation occurs on the unglaciated High Allegheny Plateau, in northeastern McKean County, Pennsylvania (G. Podniesinski pers. comm.), shares many of the same diagnostic species. Additional data are required to determine the classification of the Pennsylvania occurrence.

## CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Eleven plots were used in modifying the classification of this type as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its small range. It has a large number of indicator species. Seven of the plots were sampled by Ceperley (2002) and used in the initial development of the type. Only two occurrences have been documented, both in Tucker County, West Virginia. It is worth noting that the logged and grazed habitat at Blister Swamp in Pocahontas County, WV, is in a similar geologic and climatic setting and currently has many of the same herbaceous and understory plants as this community. It may eventually develop into this community type within the 40-acre cattle enclosure constructed in 1999, where the dominant physiognomy is currently open wetlands and shrub swamps. A probable occurrence on the unglaciated High Allegheny Plateau, in northeastern McKean County, Pennsylvania (G. Podniesinski pers. comm.), shares many of the same diagnostic species.

**Similar Associations:** Information not available.

### Related Concepts:

- *Abies balsamea* - *Fraxinus nigra* - *Tsuga canadensis* / *Rhamnus alnifolia* seepage wetland (Ceperley 2002) =
- *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* woodland (TNC 1994) =
- *Picea rubens* - *Tsuga canadensis* - *Abies balsamea* - *Acer rubrum* - *Betula alleghaniensis* (*Fraxinus nigra*) swamp forest (Fortney 1975) =

## SOURCES

**Description Author:** E.A. Byers

**References:** Ceperley 2002, Eastern Ecology Working Group n.d., Fortney 1975, Fortney 1997, Fortney et al. 2005, Rentch et al. 2002, Stephenson and Adams 1986, TNC 1994

## Cinnamon Fern Seep

**Scientific Name:** *Acer rubrum* / *Osmunda cinnamomea* var. *cinnamomea* / *Sphagnum* spp. Forest Seep

**Translated Name:** Red Maple / Cinnamon Fern / Peatmoss Forest Seep

**NVC Name:** CEG006132: *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest

**Conservation Rank:** S3 / GNR

## WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic forested seep is known from saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations of 850-1200 m. It occupies gently sloping concave linear "fingers" (1- to 4-degree slopes) in upland forest, sometimes feeding into mixed wetland mosaics. Microtopography is characterized by *Sphagnum* spp. hummocks and sedge tussocks. Bedrock is typically shale or sandstone. Soils are poorly drained muck or organic-rich sandy loam. Hydric soil indicators include histic epipedon, black histic, 2 cm muck, dark surface, and depleted matrix. Soil pH averages 4.2 (n=3). Pore water pH ranges from 4.3-6.1, with an average of 5.4 (n=3). Soil chemistry is characterized by high Mg; moderate B, P, S, and exchangeable nitrogen; and low Al, Ca, Cu, Fe, K, Mn, Zn, organic matter, and total exchange capacity (n=3). Electrical conductivity averages 26 micromhos/cm. The unvegetated surface is predominantly litter, with an average of 2% downed wood and 3% standing water.

**Vegetation Description:** This forested seep is known from the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with an abundant herbaceous layer dominated by *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) and sedges, on hummocks of *Sphagnum* spp. Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. The canopy also includes lower cover of *Picea rubens* (red spruce), and occasional presence of *Quercus rubra* (northern red oak), *Magnolia acuminata* (cucumber-tree), *Quercus prinus* (chestnut oak), and *Amelanchier laevis* (Allegheny serviceberry). Mean canopy cover is 25%. The subcanopy averages 11% cover and is comprised of the same species as the canopy. The tall-shrub layer averages 5% cover, with *Kalmia latifolia* (mountain laurel) and *Ilex verticillata* (common winterberry) typically present. Other species occasionally occurring in the tall-shrub layer include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), *Magnolia fraseri* (mountain magnolia), *Picea rubens* (red spruce), *Acer pensylvanicum* (striped maple), *Hamamelis virginiana* (American witchhazel), *Oxydendrum arboreum* (sourwood), and *Ilex montana* (mountain holly). The short-shrub layer is sparse, averaging 3% cover, with variable species composition that may include low cover of *Ilex verticillata* (common winterberry), *Kalmia latifolia* (mountain laurel), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Picea rubens* (red spruce), *Spiraea alba* (white meadowsweet), *Hypericum densiflorum* (bushy St. Johnswort), *Photinia* (chokeberry) spp.,

*Amelanchier arborea* var. *arborea* (common serviceberry), *Fagus grandifolia* (American beech), *Hamamelis virginiana* (American witchhazel), *Menziesia pilosa* (minniebush), *Nyssa sylvatica* (blackgum), *Quercus rubra* (northern red oak), *Salix sericea* (silky willow), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The herbaceous layer averages 47% cover and is dominated by *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Other herbaceous species with high constancy include *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Rubus hispidus* (bristly dewberry), *Acer rubrum* (red maple), *Impatiens* (touch-me-not) spp., *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Carex atlantica* ssp. *atlantica* (prickly bog sedge), *Carex folliculata* (northern long sedge), *Viola cucullata* (marsh blue violet), *Carex echinata* ssp. *echinata* (star sedge), *Maianthemum canadense* (Canada mayflower), *Solidago uliginosa* (bog goldenrod), *Dennstaedtia punctilobula* (eastern hayscented fern), *Oxalis montana* (mountain woodsorrel), *Tiarella cordifolia* (heartleaf foamflower), *Trillium undulatum* (painted trillium), *Chrysosplenium americanum* (American golden saxifrage), *Lycopodium obscurum* (rare clubmoss), and *Parnassia asarifolia* (kidneyleaf grass of Parnassus). Nonvascular plants average 60% cover and are dominated by *Sphagnum palustre*, *Sphagnum recurvum*, and *Sphagnum capillifolium*. Low cover of a variety of bryophyte species may be present, including *Rhizomnium appalachianum*, *Bazzania trilobata*, *Hypnum* spp., *Plagiomnium cuspidatum*, *Plagiothecium denticulatum*, *Thuidium* spp., *Brachythecium rivulare*, *Dicranum* spp., *Hylocomium splendens*, *Leucobryum* spp., and *Philonotis fontana*. The indicator species that helps to distinguish this community from others within the forested seep physiognomy in West Virginia is *Osmunda cinnamomea* var. *cinnamomea*. This community provides habitat for species of conservation concern in West Virginia including *Cornus canadensis* (S3G5), *Parnassia asarifolia* (S2G4), and *Viola appalachiensis* (S2S3G3). Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 33 taxa per 400 square meters.

**Fauna observed:** *Papilio* sp. (tiger swallowtail butterfly) and an unidentified species from Pyralidae (pyralid moths) were observed in this community. Odonates observed include *Lestes disjunctus* (common spreadwings) and *Enallagma hageni* (Hagen's bluet). Spiders collected include *Tetragnatha guatemalensis* (longjawed orbweaver) and *Xysticus* sp. (ground crab spider). Other insects representing five orders and eleven families were collected in this community type. Species noted from the order Coleoptera (beetles) included *Pidonia aurata* (a longhorn beetle), *Plateumaris* sp. (a leaf beetle), *Scelolyperus meracus* (a leaf beetle) and a species from Elateridae (click beetles). Insects from the order Diptera (true flies) include *Ectecephala* sp. (a frit fly), *Scathophaga* sp. (a dung fly) as well as unidentified insects from the Muscidae (house fly) and Tipulidae (cranefly) families. Insects from the order Hemiptera (true bugs) include unidentified species from Aphididae (aphids). Insects from the order Hymenoptera (bees, wasps, and ants) included *Lasius alienus* (cornfield ant) and species from Ichneumonidae (ichneumon wasps). From the order Plecoptera (stoneflies), a species from the family Leuctridae (Rolled-winged stoneflies) was noted.

#### Other Noteworthy Species:

<u>Species</u>	<u>G</u>	<u>Rank</u>	<u>Type</u>	<u>Note</u>
<i>Cornus canadensis</i> (bunchberry dogwood)	-		plant	WV species of concern
<i>Parnassia asarifolia</i> (kidneyleaf grass of Parnassus)-			plant	WV species of concern
<i>Viola appalachiensis</i> (Appalachian violet)	G3		plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations ranging from 850-1200 m above sea level. Within this region, it is known from Beaverdam Run, Big Run south of Spruce Knob Lake, and Cranberry Flats. This type occurs within upland forest matrix types and is difficult to see on air photos. Its potential range is not yet clearly defined and has not been thoroughly searched.

**Classification Comments:** Four plots represent this type (CEGL006132), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well within the forested seep physiognomy, but in the statewide dataset the clade breaks up. More samples are needed to fully define this type in West Virginia. The community fits reasonably well with the NVC type, although it should be noted that the West Virginia expression is a linear, shaded forested seep, with open woodland physiognomy, rather than a forest. This is the least well-documented of three high-elevation forested seep types in West Virginia. The other two types differ from this type in floristic composition, and one of them also differs in its steeply sloping environmental setting.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.106, MONF.179, RAND.7, RAND.13.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Saturated cold-deciduous forest (I.B.2.N.g.)
Alliance	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> Saturated Forest Alliance (A.348)
Alliance (English name)	Red Maple - Blackgum Saturated Forest Alliance
Association	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> High Allegheny Plateau, Central Appalachian Forest
Association (English name)	Red Maple - Blackgum High Allegheny Plateau, Central Appalachian Forest
Ecological System(s)	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Central and Southern Appalachian Spruce-Fir Forest (CES202.028) Central Appalachian Dry Oak-Pine Forest (CES202.591) North-Central Appalachian Acidic Swamp (CES202.604) Northeastern Interior Dry-Mesic Oak Forest (CES202.592)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic deciduous swamp occurs in the central Appalachian Mountains north of the Cumberland drainage in the Central Appalachians and High Allegheny regions, as well as the adjacent Cumberlands and Western Allegheny Plateau. This community occurs on substrates which are saturated for extended periods during the growing season but which rarely have standing water, including forested seeps, hillsides, streamheads, floodplain edges, and poorly drained depressions. Occurrences tend to be small. Characteristic trees are *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with other associates including *Tsuga canadensis*

(eastern hemlock) and *Betula alleghaniensis* (yellow birch). The shrub stratum includes *Alnus serrulata* (hazel alder), *Photinia pyrifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron maximum* (great laurel), and *Rubus hispidus* (bristly dewberry). Characteristic herbs include *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Carex folliculata* (northern long sedge), *Carex trisperma* (threeseeded sedge), *Carex intumescens* (greater bladder sedge), *Carex stricta* (tussock sedge), and *Poa trivialis* (rough bluegrass). *Sphagnum* spp. are typical.

**Vegetation Description:** Characteristic trees are *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with other associates including *Tsuga canadensis* (eastern hemlock) and *Betula alleghaniensis* (yellow birch). The shrub stratum includes *Alnus serrulata* (hazel alder), *Photinia pyrifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron maximum* (great laurel), and *Rubus hispidus* (bristly dewberry). Characteristic herbs include *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Carex folliculata* (northern long sedge), *Carex trisperma* (threeseeded sedge), *Carex intumescens* (greater bladder sedge), *Carex stricta* (tussock sedge), and *Poa trivialis* (rough bluegrass). *Sphagnum* spp. are typical.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Viola appalachiensis</i> (Appalachian violet)	G3	plant	

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** Information not available.

**States/Provinces:** KY, MD, PA, VA?, WV:S3

**Federal Lands:** USFS (Monongahela)

**CONSERVATION STATUS**

**Rank:** GNR (1-Dec-1997)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Information not available.

**Similar Associations:**

- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014)
- *Acer rubrum* - *Nyssa sylvatica* / *Ilex verticillata* - *Vaccinium fuscatum* / *Osmunda cinnamomea* Forest (CEGL007853)

**Related Concepts:**

- Red maple-black gum swamp (CAP pers. comm. 1998) ?

**SOURCES**

**Description Authors:** Eastern Ecology Group

**References:** Anderson et al. 1998, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Fike 1999, Harrison 2004

## Tamarack Swamp

<b>Scientific Name:</b>	<i>Larix laricina</i> / <i>Ilex verticillata</i> / <i>Symplocarpus foetidus</i> – <i>Osmunda cinnamomea</i> / <i>Sphagnum</i> spp. Woodland Swamp
<b>Translated Name:</b>	Tamarack / Winterberry / Skunk Cabbage – Cinnamon Fern / Peatmoss Woodland Swamp
<b>NVC Name:</b>	CEGL002472: <i>Larix laricina</i> / <i>Photinia melanocarpa</i> / <i>Sphagnum</i> spp. Forest
<b>Conservation Rank:</b>	S1 / G4

### WEST VIRGINIA INFORMATION

**Environmental Description:** This deciduous woodland swamp occurs on saturated, temporarily flooded, and semi-permanently flooded soils in a single headwater basin of the Allegheny Mountains region of West Virginia, at elevations between 770 and 785 m. It is a small-patch type that occupies a flat-lying floodplain along a low-gradient meandering stream with an intact natural flood regime. The community typically occurs as a young woodland with many inundation-killed snags, but approaches forest physiognomy in a few drier patches farther from the active stream channel. Microtopography is characterized by irregular mossy hummocks formed over tree roots, woody stem clusters, and decaying wood. Bedrock is Mississippian age sandstone or limestone, but does not significantly influence the community, due to the depth of organic soil overlying the bedrock. Soils are more than 1 m deep, poorly to very poorly drained muck (partially decomposed peat), containing about 10% decomposing woody fragments. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, and 2 cm muck. Soil pH averages 4.2 (n=2). Mean pore water pH is 4.8 and electrical conductivity averages 160 micromhos/cm (n=2). Soil chemistry is characterized by high N, Zn and organic matter; moderate Mg and total exchange capacity; and low Al, B, Ca, Cu, Fe, K, Mn, Na, P, and S (n=1). The unvegetated surface is predominantly litter, with an average of 1% downed wood, 4% standing water, and occasional patches of bare soil.

**Vegetation Description:** This deciduous woodland swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of *Larix laricina* (tamarack) and various woody species growing on hummocks, with hollows occupied by *Symplocarpus foetidus* (skunk cabbage) and peat-forming bryophytes over deep muck soils. The canopy averages 30% cover and is dominated by *Larix laricina* (tamarack), with lower cover by *Acer rubrum* (red maple) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch). *Pinus rigida* (pitch pine) and *Pinus strobus* (eastern white pine) are sometimes present in the canopy. The subcanopy averages 15% cover and includes the same set of species, with the occasional addition of *Amelanchier arborea* var. *arborea* (common serviceberry), *Sorbus americana* (American mountain ash), or *Tsuga canadensis* (eastern hemlock). The tall-shrub layer averages 30% cover and is dominated by *Ilex verticillata* (common winterberry) with *Rhododendron maximum* (great laurel) and *Nemopanthus mucronatus* (catberry). Other species that often occur with low cover in the tall-shrub layer include *Larix laricina* (tamarack), *Alnus incana* ssp. *rugosa* (speckled alder), and *Viburnum recognitum* (southern arrowwood). The short-shrub layer averages 6% cover. Typical species are *Vaccinium myrtilloides* (velvetleaf huckleberry), *Photinia melanocarpa* (black chokeberry), and *Ilex verticillata* (common winterberry). The herbaceous layer, with mean 45% cover, is dominated by *Symplocarpus foetidus* (skunk cabbage) with *Osmunda cinnamomea*

var. *cinnamomea* (cinnamon fern) and *Rubus hispidus* (bristly dewberry). Nonvascular plants average 35% cover with abundant *Sphagnum fallax*, *Sphagnum palustre*, *Polytrichum juniperinum*, and *Aulacomnium palustre*. This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5T5), *Carex interior* (inland sedge) (S1G5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Glyceria laxa* (limp mannagrass) (S1G5), and *Larix laricina* (tamarack) (S1G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters.

**Fauna observed:** Spiders collected within the community include *Neoscona arabesca* (arabesque orbweaver), *Erigone brevidentata* (dwarf sheetweb weaver), and a species of Opiliones (harvestmen). Insects noted include *Scirtes orbiculatus* (a marsh beetle) and species from the order Diptera (true flies), including *Thaumatomyia* sp. (a frit fly), *Hybos reversus* (a dance fly), *Ptychoptera* sp. (a phantom crane fly), *Toxorhina* sp. (a crane fly), Dolichopodidae (long-legged flies), Muscidae (houseflies), and Tachinidae (tachinid flies).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-		plant	WV species of concern
<i>Carex interior</i> (inland sedge)	-		plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Larix laricina</i> (tamarack)	-		plant	WV species of concern

**West Virginia Range:** This community is restricted to a single occurrence of about 15 hectares in the northern section of Cranesville Swamp (Preston County) in the Allegheny Mountains region of West Virginia, at elevations between 770 and 785 m.

**Classification Comments:** Four plots represent this type (CEGL002472), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its extremely limited range (one occurrence) in West Virginia. It differs from the globally described type in that (a) the shrub layer is dominated by *Ilex verticillata* (common winterberry) and *Rhododendron maximum* (great laurel), (b) the herbaceous layer is dominated by *Symplocarpus foetidus* (skunk cabbage), (c) the community occurs on deep muck soils rather than on shallow peat, and (d) the *Sphagnum* spp. mat is discontinuous (with muck hollows) rather than continuous.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.10, CRSW.21, CRSW.22, ROBI.20.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)

Formation	Saturated cold-deciduous forest (I.B.2.N.g.)
Alliance	<i>Larix laricina</i> Saturated Forest Alliance (A.349)
Alliance (English name)	Tamarack Saturated Forest Alliance
Association	<i>Larix laricina</i> / <i>Photinia melanocarpa</i> / <i>Sphagnum</i> spp. Forest
Association (English name)	Tamarack / Black Chokeberry / Peatmoss species Forest
Ecological System(s)	North-Central Interior and Appalachian Acid Peatland (CES202.606) High Allegheny Wetland (CES202.069)

## GLOBAL DESCRIPTION

**Concept Summary:** This community is found in the upper midwestern United States and adjacent Canada, with an outlier in the central Appalachian Mountains. Stands contain shallow peat in sites along rivers and in shallow lake basins, and may form a zone in a larger peatland site. The tree canopy is variable, with stands containing 25-100% cover. *Larix laricina* (tamarack) is either the sole dominant, or often mixed with *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Pinus strobus* (eastern white pine), *Fraxinus nigra* (black ash), and occasional *Picea mariana* (black spruce) in the west and *Nyssa sylvatica* (blackgum) in the east. The shrub layer may contain *Betula pumila* (bog birch) and *Chamaedaphne calyculata* (leatherleaf), as well as other more minerotrophic species, such as *Alnus incana* (gray alder), *Photinia melanocarpa* (black chokeberry), *Ilex verticillata* (common winterberry), *Toxicodendron vernix* (poison sumac), *Vaccinium corymbosum* (highbush blueberry) (in the eastern part of its range), and *Rhododendron maximum* (great laurel) (in the Central Appalachians). The dwarf-shrub *Vaccinium macrocarpon* (cranberry) may also be present. The herbaceous layer contains a diverse mix of species, including *Carex lasiocarpa* (woollyfruit sedge), *Caltha palustris* (yellow marsh marigold), *Coptis trifolia* (threeleaf goldthread), *Drosera rotundifolia* (roundleaf sundew), *Impatiens capensis* (jewelweed), *Osmunda cinnamomea* (cinnamon fern), *Sarracenia purpurea* (purple pitcherplant), and, in the Central Appalachians, *Symplocarpus foetidus* (skunk cabbage). A nearly complete *Sphagnum* spp. mat covers the ground. Diagnostic features may include dominance by *Larix laricina* (tamarack) and the presence of *Toxicodendron vernix* (poison sumac).

**Environmental Description:** Stands contain shallow peat in sites along poorly drained river systems and in shallow kettle lake basins, and may form a zone in a larger peatland site.

**Vegetation Description:** The tree canopy is variable, with stands containing 25-100% cover. *Larix laricina* (tamarack) is either the sole dominant, or often mixed with *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Pinus strobus* (eastern white pine), *Fraxinus nigra* (black ash), and occasional *Picea mariana* (black spruce) in the west and *Nyssa sylvatica* (blackgum) in the east. The shrub layer may contain *Betula pumila* (bog birch) and *Chamaedaphne calyculata* (leatherleaf), as well as other more minerotrophic species, such as *Alnus incana* (gray alder), *Photinia melanocarpa* (black chokeberry), *Ilex verticillata* (common winterberry), *Toxicodendron vernix* (poison sumac), *Vaccinium corymbosum* (highbush blueberry) (in the eastern part of its range), and *Rhododendron maximum* (great laurel) (in the Central Appalachians). The dwarf-shrub *Vaccinium macrocarpon* (cranberry) may also be present. The herbaceous layer contains a diverse mix of species, including *Carex lasiocarpa* (woollyfruit sedge), *Caltha palustris* (yellow marsh marigold), *Coptis trifolia* (threeleaf goldthread), *Drosera rotundifolia* (roundleaf sundew), *Impatiens capensis* (jewelweed),

*Osmunda cinnamomea* (cinnamon fern), *Sarracenia purpurea* (purple pitcherplant), and, in the Central Appalachians, *Symplocarpus foetidus* (skunk cabbage). A nearly complete *Sphagnum* spp. mat covers the ground (Brewer 1966, Catana 1967, Anderson 1982, MNNHP 1993).

**USFWS Wetland System:** Palustrine

#### **DISTRIBUTION**

**Range:** This community is found in the midwestern United States and adjacent Canada, ranging from south-central Minnesota east to southern Ontario, with disjunct occurrences to the southeast in Ohio and West Virginia.

**States/Provinces:** IL:S2, IN, MI, MN, OH, ON, WI:S3, WV

**Federal Lands:** NPS (Indiana Dunes)

#### **CONSERVATION STATUS**

**Rank:** G4? (3-Oct-1996)

**Reasons:** Information not available.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** This type occurs south of the tension zone in the Great Lakes states and Ontario and has a few, isolated stands in Ohio and West Virginia. The more southern occurrences contain little or no *Picea mariana* (black spruce). *Toxicodendron vernix* (poison sumac) may be typical, but it may not be very constant. Note also that the canopy can have a woodland character. Stands of this type are sometimes referred to as conifer bog "relicts," being south of the main distribution of conifer bogs following the most recent glaciation, but their origin may actually be more recent. Their classification needs additional study to determine whether a distinct type in the southeastern portion of the range is warranted. The absence of *Picea mariana* (black spruce) is a possible means to separate it from vegetation in the northern range.

#### **Similar Associations:**

- *Larix laricina* - *Acer rubrum* / (*Rhamnus alnifolia*, *Vaccinium corymbosum*) Forest (CEGL005232)--is a tamarack/minerotrophic type. In Ohio, it is distinguished by the presence of minerotrophic indicators, such as *Dasiphora fruticosa* ssp. *floribunda* and *Rhamnus alnifolia*, and the lack of more acid species, such as *Chamaedaphne calyculata*, and a continuous *Sphagnum* spp. layer.
- *Larix laricina* / *Alnus incana* Forest (CEGL002471)--is similar northward, but has more boreal species, such as *Andromeda polifolia* var. *glaucophylla*.

#### **Related Concepts:**

- Stand 7 (Catana 1967) ?
- Tamarack Forest (Brewer 1966) ?
- WV larch - sedge meadow (Robinette 1966) =

#### **SOURCES**

**Description Authors:** D. Faber-Langendoen, mod. E.A. Byers

**References:** Anderson 1982, Brewer 1966, Catana 1967, MNNHP 1993, Midwestern Ecology Working Group n.d., Robinette 1966, WNHIP unpubl. data, White and Madany 1978

### **I.C.3.N.d. Saturated mixed needle-leaved evergreen - cold-deciduous**

## forest

### Red Spruce - Yellow Birch - Mannagrass Swamp

**Scientific Name:** *Picea rubens* – *Betula alleghaniensis* var. *alleghaniensis* – *Tsuga canadensis* / *Glyceria melicaria* / *Sphagnum* spp. Swamp  
**Translated Name:** Red Spruce – Yellow Birch – Hemlock / Melic Mannagrass / Peatmoss Swamp  
**NVC Name:** C EGL006556: *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Forest  
**Conservation Rank:** S2S3 / G3

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This mixed woodland or forested swamp occurs on saturated and temporarily to semi-permanently flooded soils of the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. It is a small-patch type that occupies flat to very gently sloping land (0- to 2-degree slopes) in floodplains of streams and on the margins between upland forest and open wetland. When this community occurs in a floodplain setting, it often is characterized by fluvial morphological features such as backwater sloughs, levees and meander scrolls. Microtopography is characterized by irregular moss-covered hummocks formed over buttressed tree roots, woody stem clusters, tip-up mounds, nurse logs, and decaying wood. Soils are poorly drained muck, peat, or silt/clay loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, 2 cm muck, depleted matrix, depleted below dark surface, redox dark surface, and redox depressions. Depth of organic soil varies greatly from 0-120 cm (n=20). Soil pH averages 4.2 (n=15). Mean pore water pH is 5.5 and electrical conductivity averages 86 micromhos/cm (n=15). Soil chemistry is characterized by high Ca, N, Fe, Mg, Na, P, S, organic matter, and total exchange capacity; moderate B, H, K, Mn; and low Al, Cu, Zn (n=15). The unvegetated surface is predominantly litter, with an average of 4% downed wood, 4% standing water, and 10% bare soil.

**Vegetation Description:** This mixed woodland or forested swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open to closed canopy of *Picea rubens* (red spruce), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with occasional additions of *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), *Abies balsamea* (balsam fir), *Pinus strobus* (eastern white pine), or *Nyssa sylvatica* (blackgum). Mean canopy cover is 40%. The subcanopy is similar in composition to the canopy and averages 25% cover. The tall-shrub layer averages 30% cover and is characterized by *Alnus incana* ssp. *rugosa* (speckled alder), *Rhododendron maximum* (great laurel), the regenerating canopy species, and occasionally *Ilex verticillata* (common winterberry). The short-shrub layer is sparse, averaging only 5% cover, with species composition similar to the tall-shrub layer. The herbaceous layer, with mean 45% cover, is diverse and variable, with a number of characteristic seep species. Herbaceous species with high constancy include *Glyceria melicaria* (melic mannagrass), *Impatiens capensis* (jewelweed), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Chrysosplenium americanum* (American golden saxifrage), *Polygonum sagittatum* (arrowleaf tearthumb), *Leersia oryzoides* (rice cutgrass), *Chelone glabra* (white turtlehead), *Symplocarpus foetidus* (skunk cabbage), *Maianthemum*

*canadense* (Canada mayflower), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Onoclea sensibilis* (sensitive fern), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Oxalis montana* (mountain woodsorrel), and *Dryopteris intermedia* (intermediate woodfern). *Glyceria melicaria* (melic mannagrass) is an indicator species that helps to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region. Nonvascular plants average 45% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum fallax*, *Sphagnum squarrosum*, *Sphagnum magellanicum*, *Sphagnum girgensohnii*) carpeting the mucky hollows, *Rhizomnium appalachianum* in the seepy areas, and *Hypnum imponens* and *Dicranum scoparium* blanketing the woody hummocks. This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex projecta* (necklace sedge) (S3G5), *Cornus canadensis* (bunchberry dogwood) (S3G5), *Fraxinus nigra* (black ash) (S2S3G5), *Glyceria grandis* var. *grandis* (American mannagrass) (S2G5T5), *Hasteola suaveolens* (false Indian plaintain) (S3G3), *Ilex collina* (longstalk holly) (S2G3), *Listera cordata* var. *cordata* (heartleaf twayblade) (S2G5T5), *Listera smallii* (kidneyleaf twayblade) (S2G4), *Menyanthes trifoliata* (buckbean) (S1G5), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3), and *Taxus canadensis* (Canada yew) (S2S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 43 taxa per 400 square meters, with nearly 20% of the diversity in the bryophyte layer.

**Fauna observed:** Small mammals observed in this community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Microtus pennsylvanicus* (meadow vole), *Clethrionomys gapperi* (southern red-backed vole) and the *Sorex fumeus* (smoky shrew). *Limnitis arthemis astyanax* (red-spotted purple) butterfly and a species of Pyralidae (grass moths) was observed. Odonates noted include *Sympetrum* sp. (meadow hawk) and *Ischnura verticalis* (common forktail). Spiders collected include *Clubiona abboti* (leafcurling sac spider), *Frontinella pyramitela* (weaver spider), *Pityohyphantes* sp. (hammock spider), *Pirata seminola* and *Pirata insularis* (pirate wolf spiders), *Mangora gibberosa* (lined orbweaver), *Neoscona arabesca* (arabesque orbweaver), *Leucauge venusta* (orchard orbweaver), *Pachygnatha tristriata* (thickjawed orbweaver), *Tetragnatha* sp. and *Tetragnatha versicolor* (longjawed orbweavers), *Theridion frondeum* (cobweb weaver), *Theridiosoma gemmosum* (ray orbweaver), and *Leiobunum* sp. and *Oligolophus tridens* (harvestmen). Insects from seven orders were collected within this community. From Coleoptera (beetles), species include *Rhagonycha* sp. (a soldier beetle), *Plateumaris* sp. (a leaf beetle), *Harmonia axyridis* (a ladybug), Elateridae (click beetles), *Ellychnia* sp. (a firefly), and *Cyphon* sp. (a marsh beetle). The order Collembola (springtails) included Entomobryidae (slender springtails). Species found from Diptera (true flies) include *Chlorops* sp. and *Elachiptera* sp. (frit flies), *Psorophora* sp. (a mosquito), *Hybos reversus* (a dance fly), *Lonchoptera* sp. (a spear-winged fly), *Mycomya* sp. (a fungus gnat), *Sciara* sp. (a dark-winged fungus gnat), *Sargus* sp. (a soldier fly), *Erioptera* sp. (a crane fly), Ceratopogonidae (biting midges), Dolichopodidae (long-legged flies), Drosophilidae (vinegar and fruit flies), Fanniidae (lesser houseflies), and Psychodidae (moth flies). From the order Hemiptera (true bugs) were *Balclutha* sp. (a leafhopper) and species from Miridae (houseflies). Representing the order Hymenoptera (bees, wasps, and ants) were *Arge* sp. (an argid sawfly), Braconidae (parasitoid wasps), and Ichneumonidae (ichneumon wasps). From the order Plecoptera (stoneflies), a species of Nemouridae (brown stonefly) was collected.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>Rank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-		plant	WV species of concern
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-		plant	WV species of concern
<i>Carex projecta</i> (necklace sedge)	-		plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-		plant	WV species of concern
<i>Fraxinus nigra</i> (black ash)	-		plant	WV species of concern
<i>Glyceria grandis</i> var. <i>grandis</i> (Amer. mannagrass)	-		plant	WV species of concern
<i>Hasteola suaveolens</i> (false Indian plaintain)	-		plant	WV species of concern
<i>Ilex collina</i> (longstalk holly)	G3		plant	WV species of concern
<i>Listera cordata</i> var. <i>cordata</i> (heartleaf twayblade)	-		plant	WV species of concern
<i>Listera smallii</i> (kidneyleaf twayblade)	-		plant	WV species of concern
<i>Menyanthes trifoliata</i> (buckbean)	-		plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4		plant	WV species of concern
<i>Taxus canadensis</i> (Canada yew)	-		plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. Within this region, the community is known from Canaan Valley, Cranberry Glades, Cranesville Swamp, Difficult Creek, Dolly Sods, Glady Fork and Laurel Fork of the Shavers, Little River and Old Road Run on West Fork Greenbrier, Laurel Fork Wilderness South, Piney Swamp, Red Creek Plains, and Glade Run below Gaudineer Knob.

**Classification Comments:** Twenty-six plots (12 occurrences) represent this type (CEGL006556), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines consistently but broadly in the "messy middle" of the forested swamps of the study area. It has been sampled throughout its range in West Virginia. It differs from the global description of this type in that *Tsuga canadensis* (eastern hemlock) and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) share canopy dominance with *Picea rubens* (red spruce), with only occasional canopy presence of *Acer rubrum* (red maple). In the tall-shrub layer, *Alnus incana* ssp. *rugosa* (speckled alder) and *Rhododendron maximum* (great laurel) are dominant, with much lower constancy and cover by *Ilex verticillata* (common winterberry).

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.6, CRSW.23, CVWR.24, CVWR.31, CVWR.33, CVWR.39, FRAN.88, FRAN.89, GRAN.6, MINE.1, MONF.97, MONF.123, MONF.148, MONF.163, MONF.165, MONF.181, MONF.183, MONF.191, MONF.197, MONF.198, MONF.205, MONF.224, MONF.238, TUCK.24, USFS.332, USFS.333.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)

Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Saturated mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.d.)
Alliance	<i>Picea rubens</i> - <i>Acer rubrum</i> Saturated Forest Alliance (A.450)
Alliance (English name)	Red Spruce - Red Maple Saturated Forest Alliance
Association	<i>Picea rubens</i> - <i>Acer rubrum</i> / <i>Ilex verticillata</i> Forest
Association (English name)	Red Spruce - Red Maple / Common Winterberry Forest
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This mixed woodland or forested swamp occurs in higher elevation (260-1220 m) valleys, basins, floodplains, and seepage areas along streams and wetland margins in the Central Appalachians. It is a small-patch community maintained by seepage, rainfall, and occasional low-energy overflow from streams. Slopes are gentle (0-5 degrees). The canopy is closed or occasionally open and dominated by *Picea rubens* (red spruce), *Acer rubrum* (red maple), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with associates *Pinus strobus* (eastern white pine), *Nyssa sylvatica* (blackgum), and *Fraxinus nigra* (black ash). The shrub layer is variable and may include *Ilex verticillata* (common winterberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Rhododendron maximum* (great laurel), *Vaccinium angustifolium* (lowbush blueberry), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum nudum* var. *cassinoides* (northern wild raisin). The herbaceous layer is diverse and variable, typically including *Glyceria melicaria* (melic mannagrass), *Carex trisperma* (threeseeded sedge), *Glyceria striata* (fowl mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Carex leptalea* (bristlystalked sedge), *Impatiens capensis* (jewelweed), *Chelone glabra* (white turtlehead), and *Caltha palustris* (yellow marsh marigold). Well-drained hummocks may support mesophytes such as *Maianthemum canadense* (Canada mayflower), *Dryopteris intermedia* (intermediate woodfern), and *Oxalis montana* (mountain woodsorrel). *Sphagnum* spp. and other mosses are abundant in the mucky hollows and blanket the irregular hummocks between braided seepage rills or streamlets.

**Environmental Description:** Sites are located in valleys, basins, floodplains, and seepage areas along the headwaters of streams. Slopes are gentle (0-5 degrees), and habitats are characterized by strong hummock-and-hollow microtopography, with *Sphagnum*-covered mounds, mucky pools, and braided seepage rills or streamlets. Soils may have shallow to deep organic horizons and are acidic, with variable base status.

**Vegetation Description:** In Pennsylvania, stands of this community type have a closed canopy of *Acer rubrum* (red maple) and *Picea rubens* (red spruce), with associates of *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), *Nyssa sylvatica* (blackgum), *Betula alleghaniensis* (yellow birch), *Betula populifolia* (gray birch), *Fraxinus nigra* (black ash), and *Larix laricina* (tamarack). The shrub layer is often dense and may include *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), and *Rhododendron viscosum* (swamp azalea). The herb layer is typically dominated by ferns and graminoids, particularly *Carex trisperma* (threeseeded sedge), *Carex folliculata* (northern long sedge), *Glyceria striata* (fowl mannagrass), *Osmunda regalis* var. *spectabilis* (royal fern), and *Osmunda*

*cinnamomea* (cinnamon fern); *Gaultheria hispidula* (creeping snowberry), *Coptis trifolia* (threeleaf goldthread), and *Viola* (violet) spp. are frequent forbs. Well-drained hummocks may support mesophytes such as *Maianthemum canadense* (Canada mayflower) and *Trientalis borealis* (starflower). Some pools may be dominated by bryophytes of the genera *Sphagnum*, *Mnium*, *Fissidens*, and *Thuidium*. Virginia examples are very small (<2 ha or 5 acres) and lack several species of pronounced northern distribution. Canopies are generally codominated by *Picea rubens* (red spruce), *Acer rubrum* (red maple), and *Tsuga canadensis* (eastern hemlock), with *Picea rubens* (red spruce) usually the most abundant of the three. *Betula alleghaniensis* (yellow birch) is the only other canopy tree recorded in plots. Shrub layers are very sparse, although *Vaccinium angustifolium* (lowbush blueberry) locally forms dense, low patches on better-drained hummocks and flats. Except in the more deeply flooded pools, herbaceous cover is moderately dense to dense. Variably dominant herbs include *Glyceria melicaria* (melic mannagrass), *Osmunda cinnamomea* (cinnamon fern), *Viola cucullata* (marsh blue violet), *Carex leptalea* (bristlystalked sedge), *Impatiens capensis* (jewelweed), *Glyceria striata* (fowl mannagrass), and *Packera aurea* (golden ragwort). Other frequent or locally important herbs are *Caltha palustris* (yellow marsh marigold), *Cardamine pensylvanica* (Pennsylvania bittercress), *Carex baileyi* (Bailey's sedge), *Carex prasina* (drooping sedge), *Carex stipata* (owlfruit sedge), *Carex trisperma* (threeseeded sedge), *Chelone glabra* (white turtlehead), *Cinna latifolia* (drooping woodreed), *Platanthera clavellata* (small green wood orchid), *Veratrum viride* (green false hellebore), and *Viola macloskeyi* ssp. *pallens* (smooth white violet). Well-drained hummocks and mounds may support extensive colonies of *Dryopteris intermedia* (intermediate woodfern), *Lycopodium dendroideum* (tree groundpine), *Maianthemum canadense* (Canada mayflower), *Oxalis montana* (mountain woodsorrel), *Thelypteris noveboracensis* (New York fern), and *Schizachne purpurascens* (false melic). Species richness in five plot-sampled Virginia stands ranged from 39 to 55 taxa per 400 square meters (mean = 48). In West Virginia, canopies are open to closed and dominated by *Picea rubens* (red spruce), *Tsuga canadensis* (eastern hemlock), and *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with occasional additions of *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), *Abies balsamea* (balsam fir), *Pinus strobus* (eastern white pine), or *Nyssa sylvatica* (blackgum). Mean canopy cover is 40%. The subcanopy is similar in composition to the canopy and averages 25% cover. The shrub layer averages 30% cover and is characterized by *Alnus incana* ssp. *rugosa* (speckled alder), *Rhododendron maximum* (great laurel), the regenerating canopy species, and occasionally *Ilex verticillata* (common winterberry). The herbaceous layer, with mean 45% cover, is diverse and variable, with a number of characteristic seep species. Herbaceous species with high constancy include *Glyceria melicaria* (melic mannagrass), *Impatiens capensis* (jewelweed), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Chrysosplenium americanum* (American golden saxifrage), *Polygonum sagittatum* (arrowleaf tearthumb), *Leersia oryzoides* (rice cutgrass), *Chelone glabra* (white turtlehead), *Symplocarpus foetidus* (skunk cabbage), *Maianthemum canadense* (Canada mayflower), *Caltha palustris* var. *palustris* (yellow marsh marigold), *Onoclea sensibilis* (sensitive fern), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Oxalis montana* (mountain woodsorrel), and *Dryopteris intermedia* (intermediate woodfern). Nonvascular plants average 45% cover and are dominated by *Sphagnum* spp. carpeting the mucky hollows, *Rhizomnium appalachianum* in the seepy areas, and *Hypnum imponens* and *Dicranum scoparium* blanketing the woody hummocks. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 43 taxa per 400 square meters for 26 plots in West Virginia, with nearly 20% of the diversity in the bryophyte layer.

**Characteristic Species:** *Cardamine pensylvanica* (Pennsylvania bittercress), *Carex baileyi* (Bailey's sedge), *Carex stipata* (owlfruit sedge), *Cinna latifolia* (drooping woodreed), *Glyceria melicaria* (melic mannagrass), *Lycopodium dendroideum* (tree groundpine), *Picea rubens* (red spruce), *Schizachne purpurascens* (false melic), *Viola cucullata* (marsh blue violet).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Hasteola suaveolens</i> (false Indian plintain)	-	plant	
<i>Hypericum mitchellianum</i> (Blue Ridge St. Johnswort)	G3	plant	
<i>Ilex collina</i> (longstalk holly)	G3	plant	
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	
<i>Pyrola elliptica</i> (waxflower shinleaf)	-	plant	VA S2; dwarf-shrub

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This community is scattered throughout the Allegheny Plateau and high Allegheny Mountains from Pennsylvania to West Virginia and extreme west-central Virginia (Highland County). Outliers are reported from the Pocono Plateau and Ridge and Valley provinces of Pennsylvania (Fike 1999). Elevation ranges are 280-670 m on glacial deposits of the Allegheny Plateau in Pennsylvania, 770-1220 m in the unglaciated Allegheny Mountains of West Virginia, and above 1060 m in the unglaciated Allegheny Mountains of Virginia.

**States/Provinces:** PA, VA:S1, WV:S2S3

**Federal Lands:** USFS (George Washington, Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** G3 (7-May-2007)

**Reasons:** Twelve occurrences are known from West Virginia, where the range has been searched, and this type has a state rank of S2S3. Less than six occurrences are known from Virginia, where the type is ranked S1. Pennsylvania reports 25-30 occurrences and a probable state rank of S3. It is unlikely that more than 30 additional occurrences will be found, and the typical patch size is small to very small. This vegetation type has probably always been quite rare due to the scarcity of requisite, higher-elevation wetland habitats in the Central Appalachian region. The *Tsuga canadensis* (eastern hemlock) component of this community is highly threatened throughout the Central Appalachians by outbreaks of the exotic insect pest hemlock woolly adelgid (*Adelges tsugae*).

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:**

**Comments:** Information not available.

**Similar Associations:**

- *Picea rubens* - *Acer rubrum* / *Nemopanthus mucronatus* Forest (CEGL006198)

**Related Concepts:**

- *Picea rubens* - *Tsuga canadensis* - *Acer rubrum* / *Glyceria melicaria* Forest (Fleming and Coulling 2001) ?
- *Picea rubens* / *Vaccinium angustifolium* - *Epilobium leptophyllum* Association (Fleming and Moorhead 1996) ?

- Bog forest association (Darlington 1943) B
- Mixed northern swamp forest community (Robinette 1966) =

#### SOURCES

**Description Authors:** G. Fleming and P. Coulling, mod. E.A. Byers

**References:** Darlington 1943, DeMeo et al. 1998, Eastern Ecology Working Group n.d., Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Franci 2003, Robinette 1964, Robinette 1966, VDNH 2003

## II.A.4.N.f. Saturated temperate or subpolar needle-leaved evergreen woodland

### Pitch Pine - Heath Peat Woodland

**Scientific Name:** *Pinus rigida* - *Picea rubens* / *Nemopanthus mucronata* - *Kalmia latifolia* / *Sphagnum* spp. - *Polytrichum* spp. Peat Woodland

**Translated Name:** Pitch Pine - Red Spruce / Wild Holly - Mountain Laurel / Peatmoss - Haircap Moss Peat Woodland

**NVC Name:** CEG1006587: *Pinus rigida* - *Picea rubens* / *Viburnum nudum* var. *cassinoides* / *Sphagnum* spp. Woodland

**Conservation Rank:** S1 / G1G2

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic dwarf woodland swamp occurs on saturated and temporarily flooded soils in the Allegheny Mountains region of West Virginia, at elevations between 1010 and 1220 m. This community occurs in narrow bands (10-200 m wide) immediately west of the Allegheny Front, between the upland forest of the summit ridge and open peatlands. It is a small-patch type that occupies flat-lying land (less than 1-degree slope). Microtopography is characterized by irregular moss-covered hummocks formed over tree roots, woody stem clusters, tip-up mounds, and decaying wood. Soils are poorly drained peat. The underlying acidic sandstone bedrock (Pennsylvanian Allegheny Formation) is generally encountered at less than 70 cm depth. Hydric soil indicators include histisol and histic epipedon. Depth of organic soil is 20-70 cm (n=3). Soil pH averages 3.5 (n=3). Pore water pH is 4.5 and electrical conductivity is 43 micromhos/cm (n=1). Soil chemistry is characterized by high N, organic matter, and total exchange capacity; moderate Na; and low Al, B, Ca, Cu, Fe, K, Mg, Mn, P, S, Zn (n=1). The unvegetated surface is predominantly litter, with an average of 1% downed wood and 2% large sandstone rocks.

**Vegetation Description:** This acidic conifer woodland swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of *Pinus rigida* (pitch pine) and *Picea rubens* (red spruce), with an understory of ericaceous shrubs over a mat of *Sphagnum* spp. The dwarfed canopy has a mean cover of 35% and is dominated by *Picea rubens* (red spruce) and *Pinus rigida* (pitch pine), with low cover of *Acer rubrum* (red maple) and *Tsuga canadensis* (eastern hemlock). The tall-shrub layer averages 35% cover with abundant

*Nemopanthus mucronatus* (catberry) and *Kalmia latifolia* (mountain laurel), and lower cover by *Rhododendron maximum* (great laurel) and the regenerating canopy species. The short-shrub layer, averaging 45% cover, is similar in composition to the tall-shrub layer, with the addition of abundant *Vaccinium myrtilloides* (velvetleaf huckleberry) and low but consistent cover of *Gaylussacia baccata* (black huckleberry), *Photinia melanocarpa* (black chokeberry), *Vaccinium angustifolium* (lowbush blueberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and the dwarf-shrub *Vaccinium oxycoccos* (small cranberry). The herbaceous layer is sparse, with mean 10% cover. Herbaceous species with high constancy include *Rubus hispidus* (bristly dewberry), *Gaultheria procumbens* (eastern teaberry), *Coptis trifolia* (threeleaf goldthread), *Dalibarda repens* (robin runaway), *Eriophorum virginicum* (tawny cottongrass), *Epigaea repens* (trailing arbutus), *Lycopodium obscurum* (rare clubmoss), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Rhynchospora alba* (white beaksedge), *Carex trisperma* var. *trisperma* (threeseeded sedge), and *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew). Nonvascular plants average 75% cover and are dominated by peat-forming *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum magellanicum*, *Sphagnum fallax*, *Sphagnum papillosum*), *Polytrichum commune*, and *Polytrichum pallidisetum*. Indicator species that help to distinguish this community from others within the forest/woodland physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Coptis trifolia* (threeleaf goldthread), *Dalibarda repens* (robin runaway), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Eriophorum virginicum* (tawny cottongrass), *Gaylussacia baccata* (black huckleberry), *Gaultheria procumbens* (eastern teaberry), *Nemopanthus mucronatus* (catberry), *Rhynchospora alba* (white beaksedge), and *Vaccinium oxycoccos* (small cranberry). This community provides habitat for species of conservation concern in West Virginia, including *Coptis trifolia* (threeleaf goldthread) (S2G5), *Cornus canadensis* (bunchberry dogwood) (S3G5), *Dalibarda repens* (robin runaway) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Lycopodiella inundata* (inundated clubmoss) (S3G5), and *Vaccinium oxycoccos* (small cranberry) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 35 taxa per 400 square meters.

**Fauna observed:** Spiders collected within the community included *Neoscona arabesca* (arabesque orbweaver), *Bathyphantes pullatus* (dwarf /sheetweb weaver), *Tetragnatha* sp. (longjawed orbweaver), *Misumenops* sp. (flower crab spider), and *Xysticus* sp. (ground crab spider). Insects were collected and include the Dipterans (true flies) *Diplotoxa* sp. (a frit fly), *Minettia* sp. (a lauxaniid fly) and Scathophagidae (dung flies). Hemipterans (true bugs) found include *Graphocephala* sp. (a leafhopper), *Oliarus* sp. (a cixiid planthopper), Pentatomidae (stink bugs), *Livia* sp. (a jumping plant louse) and *Ligyrocoris* sp. (a seed bug). *Dolichoderus pustulatus* and *Formica* sp. (ants), species of Ichneumonidae (ichneumon wasps), and species from the order Psocoptera (barklice) were collected.

#### Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Coptis trifolia</i> (threeleaf goldthread)	-	plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern
<i>Dalibarda repens</i> (robin runaway)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern

*Vaccinium oxycoccos* (small cranberry) - plant WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 1010 and 1220 m. Within this region, the community is known only from the Allegheny Front (Red Creek Plains in Tucker County and Helmick Run in Grant County). This community occurs in fairly narrow bands (10-200 m wide) along the flat expanse of the Allegheny Front. It is situated between the upland forest of the summit ridge and open peatlands.

**Classification Comments:** Four plots (2 occurrences) represent this type (CEGL006022), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This community is only known from two locations to date, both of which have been sampled. It is distinctive in habitat and floristics, and clusters and ordines compactly.

**West Virginia Description Author:** E.A. Byers

**Plots:** GRAN.14, GRAN.18, MONF.201, MONF.204.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.f.)
Alliance	<i>Pinus rigida</i> Saturated Woodland Alliance (A.580)
Alliance (English name)	Pitch Pine Saturated Woodland Alliance
Association	<i>Pinus rigida</i> - <i>Picea rubens</i> / <i>Viburnum nudum</i> var. <i>cassinoides</i> / <i>Sphagnum</i> spp. Woodland
Association (English name)	Pitch Pine - Red Spruce / Northern Wild Raisin / Peatmoss species Woodland
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This coniferous swamp of the Allegheny Mountains of West Virginia and the Catskills of New York occurs on saturated peat deposits over acidic bedrock. The open dwarfed canopy is characterized by *Pinus rigida* (pitch pine) and *Picea rubens* (red spruce). The shrub layers are characterized by *Nemopanthus mucronatus* (catberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Vaccinium myrtilloides* (velvetleaf huckleberry), and in West Virginia, *Rhododendron maximum* (great laurel). The herbaceous layer supports *Gaultheria procumbens* (eastern teaberry), *Coptis trifolia* (threeleaf goldthread), *Dalibarda repens* (robin runaway), *Carex trisperma* (threeseeded sedge), and in West Virginia examples, *Eriophorum virginicum* (tawny cottongrass), *Epigaea repens* (trailing arbutus), *Rhynchospora alba* (white beaksedge), and *Vaccinium oxycoccos* (small cranberry). The nonvascular layer is well-developed and comprised of *Sphagnum* species.

**DISTRIBUTION**

**Range:** This vegetation is known from the Allegheny Mountains in West Virginia and the Catskill Mountains of New York.

**States/Provinces:** NY, WV:S1

**Federal Lands:** USFS (Monongahela)

**CONSERVATION STATUS**

**Rank:** G1G2 (21-May-2007)

**Reasons:** This vegetation is restricted to the Allegheny Front in West Virginia and to the Catskill Mountains of New York. The likelihood of the discovery of many new occurrences is low, as the habitat and range of this type are naturally restricted; however, similar habitat in the adjacent New Jersey Highlands (also naturally restricted) may support this vegetation. The habitat along the Allegheny Front in West Virginia has been thoroughly searched, and it is unlikely that additional occurrences will be found.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** The current description is based largely on data from the West Virginia portion of the range. Additional data are needed for New York examples.

**Similar Associations:**

- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194)
- *Pinus rigida* / *Vaccinium myrtilloides* / *Sphagnum* spp. Woodland (CEGL006022)

**Related Concepts:** Information not available.

**SOURCES**

**Description Authors:** L.A. Sneddon and E.A. Byers

**References:** Eastern Ecology Working Group n.d., Edinger et al. 2002

### III. Shrubland

#### III.B.2.N.e. Seasonally flooded cold-deciduous shrubland

##### Meadowsweet Shrub Swamp

**Scientific Name:** *Spiraea alba* Shrub Swamp  
**Translated Name:** Meadowsweet Shrub Swamp  
**NVC Name:** CEG1006595: *Spiraea alba* Shrubland [Provisional]  
**Conservation Rank:** S3 / GNR

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This successional shrub swamp occurs on temporarily to semi-permanently flooded soils in the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. It is a small-patch type that occupies flat to gently sloping floodplains (0- to 0.5-degree slopes) with occasional discontinuous fingers extending up tributary streams with slopes as steep as 7 degrees. It occurs on recovering beaver meadows and along low-gradient headwater streams that were logged, grazed, or burned within the last 80 years. Entrenched meandering stream channels and overflow channels bisect the community. This type persists on the landscape as a result of beaver activity and (to a lesser extent) natural flood regimes. It is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested swamps of high conservation value. Bedrock may be shale, limestone, or sandstone. Soil texture is variable and may consist of moderately to poorly drained silt loam, sandy loam, clay, or shallow peat, underlain by alluvial deposits, including woody debris. Hydric soil indicators include histisol, hydrogen sulphide, 2 cm muck, sandy redox and redox depressions. Mean soil pH is 4.2 (n=4). Mean pore water pH is 6.2 and electrical conductivity averages 80 micromhos/cm (n=3). Soil chemistry is characterized by high Na, P, S; moderate Al, B, Ca, Cu, Fe, K, Mn, exchangeable nitrogen, organic matter, and total exchange capacity; and low Mg and Zn (n=4). The unvegetated surface is predominantly litter, with an average of 8% standing water and 10% bare soil.

**Vegetation Description:** This successional shrub swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by a dense tall-shrub layer (mean cover = 75%) strongly dominated by *Spiraea alba* (white meadowsweet) with occasional presence of *Salix sericea* (silky willow), *Viburnum recognitum* (southern arrowwood), *Ilex verticillata* (common winterberry), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Alnus incana* ssp. *rugosa* (speckled alder). The short-shrub layer is sparse or absent. The herbaceous layer, with mean 25% cover, is typically concentrated in small openings. It is variable in composition but often includes *Juncus effusus* (common rush), *Carex scoparia* var. *scoparia* (broom sedge), *Galium tinctorium* (stiff marsh bedstraw), *Dichanthelium clandestinum* (deertongue), *Carex gynandra* (nodding sedge), *Impatiens capensis* (jewelweed), *Hypericum mutilum* (dwarf St. Johnswort), *Hypericum ellipticum* (pale St. Johnswort), *Lycopus*

*uniflorus* var. *uniflorus* (northern bugleweed), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Rubus hispidus* (bristly dewberry), and *Glyceria striata* (fowl mannagrass). Nonvascular plants average only 1% cover, usually including *Sphagnum* spp. Indicator species that help to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region are *Spiraea alba* (white meadowsweet), *Dichanthelium clandestinum* (deertongue), and *Hypericum ellipticum* (pale St. Johnswort). This community provides habitat for species of conservation concern in West Virginia, including *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex projecta* (necklace sedge) (S3G5), *Carex utriculata* (beaked sedge) (S2G5), *Glyceria grandis* var. *grandis* (American mannagrass) (S2G5T5), *Glyceria laxa* (limp mannagrass) (S1G5), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), and *Scirpus microcarpus* (panicked bulrush) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 26 taxa per 400 square meters.

**Fauna observed:** *Libellula pulchella* (twelve-spotted skimmer), a dragonfly, was noted in this community. A spider, *Neoscona arabesca* (the arabesque orbweaver), was collected. Insects from the order Diptera (true flies) include *Ectecephala* sp. (a fly) and unidentified species from Sepsidae (black scavenger flies) and Ulidiidae (picture-winged flies). From the order Hemiptera (true bugs), the families Cicadellidae (leafhoppers) and Miridae (plant bugs) were observed. From Orthoptera (grasshoppers and crickets), a *Conocephalus* sp. (a conehead) was noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-	plant	WV species of concern
<i>Carex projecta</i> (necklace sedge)	-	plant	WV species of concern
<i>Carex utriculata</i> (beaked sedge)	-	plant	WV species of concern
<i>Glyceria grandis</i> var. <i>grandis</i> (Amer. mannagrass)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Scirpus microcarpus</i> (panicked bulrush)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. Within this region, there are occurrences in Beaverdam Run, Canaan Valley, and Dolly Sods (Red Creek). This type may occur at lower elevations but has not yet been sampled.

**Classification Comments:** Seven plots (3 occurrences) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters together fairly well. The ordination shows a fairly compact grouping in the drier, *Sphagnum*-poor portion of species space. The type has been adequately sampled above 700 m in elevation, but its distribution at lower elevations in West Virginia is uncertain.

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.19, CVWR.37, CVWR.48, FRAN.13, MONF.104, MONF.235, TUCK.16.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Spiraea (alba, tomentosa) - Rubus</i> spp. Seasonally Flooded Shrubland Alliance (A.3022)
Alliance (English name)	(White Meadowsweet, Steeplebush) - Blackberry species Seasonally Flooded Shrubland Alliance
Association	<i>Spiraea alba</i> Shrubland [Provisional]
Association (English name)	White Meadowsweet Shrubland
Ecological System(s)	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This successional shrub swamp occurs on temporarily to semi-permanently flooded soils in the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. It is a small-patch type that occupies flat to gently sloping floodplains (0- to 0.5-degree slopes) with occasional discontinuous fingers extending up tributary streams with slopes as steep as 7 degrees. It occurs on recovering beaver meadows and along low-gradient headwater streams that were logged, grazed, or burned within the last 80 years. Entrenched meandering stream channels and overflow channels bisect the community. This type persists on the landscape as a result of beaver activity and (to a lesser extent) natural flood regimes. It is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested swamps of high conservation value. Soil texture is variable and may consist of moderately to poorly drained silt loam, sandy loam, clay, or shallow peat, underlain by alluvial deposits, including woody debris. Mean soil pH is 4.2, and mean pore water pH is 6.2. The unvegetated surface is predominantly litter, with an average of 8% standing water and 10% bare soil. The community is characterized by a dense tall-shrub layer strongly dominated by *Spiraea alba* (white meadowsweet) with occasional presence of *Salix sericea* (silky willow), *Viburnum recognitum* (southern arrowwood), *Ilex verticillata* (common winterberry), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Alnus incana* ssp. *rugosa* (speckled alder). The short-shrub layer is sparse or absent. The herbaceous layer is typically concentrated in small openings. It is variable in composition but often includes *Juncus effusus* (common rush), *Carex scoparia* var. *scoparia* (broom sedge), *Galium tinctorium* (stiff marsh bedstraw), *Dichanthelium clandestinum* (deertongue), *Carex gynandra* (nodding sedge), *Impatiens capensis* (jewelweed), *Hypericum mutilum* (dwarf St. Johnswort), *Hypericum ellipticum* (pale St. Johnswort), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Rubus hispidus* (bristly dewberry), and *Glyceria striata* (fowl mannagrass). Nonvascular plants are present in trace amounts, usually including *Sphagnum* spp. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 26 taxa per 400 square meters for seven plots in West Virginia.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank Type</u>
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4 plant

**DISTRIBUTION**

**Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. It may occur in surrounding states and at lower elevations.

**States/Provinces:** WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (3-Apr-2007)

**Reasons:** This is a small-patch successional community which is known from the Allegheny Mountains region of West Virginia, at elevations between 900 and 1130 m. It occurs on recovering beaver meadows and along low-gradient headwater streams that were logged, grazed, or burned within the last 80 years. This type persists on the landscape as a result of beaver activity and (to a lesser extent) natural flood regimes. It is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested swamps of high conservation value. More information is needed from surrounding states to determine its global rank.

**CLASSIFICATION INFORMATION**

**Status:** Provisional

**Confidence:** 1 - Strong

**Comments:** Seven plots (3 occurrences) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters together fairly well. The ordination shows a fairly compact grouping in the drier, *Sphagnum*-poor portion of species space. The distribution and/or characteristics of this type outside the West Virginia study area are unknown.

**Similar Associations:** Information not available.

**Related Concepts:**

- *Spiraea alba* thicket community (Fortney 1975) =

**SOURCES**

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d., Fortney 1975, Francl 2003

## **Silky Willow Shrub Swamp**

<b>Scientific Name:</b>	<i>Salix sericea</i> Shrub Swamp
<b>Translated Name:</b>	Silky Willow Shrub Swamp
<b>NVC Name:</b>	CEGL006305: <i>Salix sericea</i> Shrubland
<b>Conservation Rank:</b>	S3 / GNR

## WEST VIRGINIA INFORMATION

**Environmental Description:** This successional shrub swamp occurs on temporarily to semi-permanently flooded or saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0- to 2-degree slopes) along seepage zones in open wetlands and in headwater drainages with intermittent overland flow. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters. This type persists on the landscape as a result of natural flood regimes and beaver activity, although it is probably more widespread now than in the past, when forests covered much of its current habitat. Bedrock may be shale, limestone, or sandstone. Soil texture is variable and may consist of moderately to very poorly drained peat, muck, silt, or silty clay. Organic soils average 20 cm depth and are underlain by alluvial sediments, with a clay-rich layer generally encountered within the top 60 cm. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, stratified layers, loamy gleyed matrix, depleted matrix, redox depressions, and alluvial depleted matrix. Mean soil pH is 4.2 (n=6). Mean pore water pH is 5.5 and electrical conductivity averages 60 micromhos/cm (n=7). Soil chemistry is characterized by high Al, Mg, Na, P, S, exchangeable nitrogen, and total exchange capacity; moderate Ca, Fe, and organic matter; and low B, Cu, K, Mn, and Zn (n=6). The unvegetated surface is predominantly litter, with an average of 16% standing water and 13% bare soil.

**Vegetation Description:** This shrub swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by a tall-shrub layer (mean cover = 50%) dominated by *Salix sericea* (silky willow) with occasional *Hypericum densiflorum* (bushy St. Johnswort) and *Alnus incana* ssp. *rugosa* (speckled alder). The short-shrub layer averages 8% cover, and in addition to the tall-shrub species, it may include minor cover by *Vaccinium myrtilloides* (velvetleaf huckleberry), *Ilex verticillata* (common winterberry), *Picea rubens* (red spruce), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Populus tremuloides* (quaking aspen), and *Sambucus canadensis* (common elderberry). The herbaceous layer, with mean 70% cover, typically has high cover by *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), and *Polygonum sagittatum* (arrowleaf tearthumb). Other herbaceous species with high constancy include *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Symphotrichum puniceum* var. *puniceum* (purplestem aster), *Juncus effusus* (common rush), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Dryopteris cristata* (crested woodfern), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Glyceria laxa* (limp mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Glyceria striata* (fowl mannagrass), *Galium tinctorium* (stiff marsh bedstraw), *Carex lurida* (shallow sedge), *Typha latifolia* (broadleaf cattail), *Glyceria canadensis* (rattlesnake mannagrass), and *Leersia oryzoides* (rice cutgrass). Nonvascular plants average 30% cover and are dominated by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum girgensohnii*, *Sphagnum affine* and *Sphagnum flexuosum*). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Glyceria laxa* (limp mannagrass) (S1G5), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3), *Salix discolor* (pussy willow) (S2G5), *Vaccinium macrocarpon* (cranberry) (S2G4), and *Vaccinium oxycoccos* (small cranberry) (S2G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 31 taxa per 400 square meters.

**Fauna observed:** Spiders observed in this community included *Mangora placida* (tuftlegged orbweaver), *Neoscona arabesca* (arabesque orbweaver), *Clubiona* sp. (leafcurling sac spiders), and *Pardosa moesta* (thinlegged wolf spider). Insects were collected from four orders. In Coleoptera (beetles), *Rhagonycha* sp. (a soldier beetle) and *Cyphon* sp. (a marsh beetle) were noted. Dipterans (true flies) include *Ectecephala* sp. (a frit fly), *Tachina* sp. (a tachinid fly), and unidentified species from the families Fanniidae (flies), Limnophila (craneflies), Sciomyzidae (marsh flies), and Tipulidae (craneflies). In the order Hemiptera (true bugs) specimens were identified as *Ponana* sp. (a leafhopper), *Collaria meilleurii* (a plant bug) and unidentified species from Cicadellidae (leafhoppers). Finally in the order Hymenoptera (ants, bees, and wasps), species were collected from the Braconidae (parasitoid wasps) family.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-		plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4		plant	WV species of concern
<i>Salix discolor</i> (pussy willow)	-		plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-		plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-		plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. Within this region, the community is known from Canaan Valley, Cranesville Swamp, Dobbins Slashing, Dolly Sods (Alder Run Bog), Laurel Run of Stony River, Little River, Stack Rock Preserve, and Tub Run.

**Classification Comments:** Eleven plots (7 occurrences) represent this type (CEGL006305), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters together fairly well. The ordination shows very broad ecological amplitude, which is not surprising since most stands occur in successional settings. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.1, CRSW.24, CVWR.28, CVWR.29, GRAN.4, MONF.237, MONF.99, TUCK.13, WALB.18, WALB.19, WALB.29.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Salix sericea</i> Seasonally Flooded Shrubland Alliance (A.3028)
Alliance (English name)	Silky Willow Seasonally Flooded Shrubland Alliance
Association	<i>Salix sericea</i> Shrubland
Association (English name)	Silky Willow Shrubland

Ecological System(s)      Central Appalachian River Floodplain (CES202.608)  
   Central Appalachian Stream and Riparian (CES202.609)  
   High Allegheny Wetland (CES202.069)

#### **GLOBAL DESCRIPTION**

**Concept Summary:** This willow shrub swamp is known from the Central Appalachians of Pennsylvania and West Virginia. This vegetation, or a related type dominated by *Salix sericea* (silky willow), is also known from Connecticut, New York, and New Jersey. The vegetation occurs in topographic basins, floodplain backswamps, along slow-moving streams, or on lakeshores. *Salix sericea* (silky willow) is dominant, forming a tall-shrub canopy 2-3 m in height. Associated shrubs in the Central Appalachian region are *Hypericum densiflorum* (bushy St. Johnswort) and *Alnus incana* ssp. *rugosa* (speckled alder). The herbaceous layer is often dense and variable, including *Solidago rugosa* (wrinkleleaf goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Glyceria striata* (fowl mannagrass), *Glyceria canadensis* (rattlesnake mannagrass), *Juncus effusus* (common rush), *Carex stipata* (owlfruit sedge), *Carex lurida* (shallow sedge), and other herbs. In West Virginia, hummocks are typically covered by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum girgensohnii*, *Sphagnum affine* and *Sphagnum flexuosum*). For eleven plots in West Virginia, mean species richness of all vascular plants and any nonvascular plants with cover >1% is 31 taxa per 400 square meters.

**Environmental Description:** The vegetation occurs in topographic basins, floodplain backswamps, along slow-moving streams, or on lakeshores. In West Virginia, it occurs as a successional shrub swamp on temporarily to semi-permanently flooded or saturated soils in the Allegheny Mountains region at elevations between 770 and 1210 m. Here it is a small-patch type that occupies flat to gently sloping land (0- to 2-degree slopes) along seepage zones in open wetlands and in headwater drainages with intermittent overland flow. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters. This type persists on the landscape as a result of natural flood regimes and beaver activity, although it is probably more widespread now than in the past, when forests covered much of its current habitat. Bedrock may be shale, limestone, or sandstone. Soil texture is variable and may consist of moderately to very poorly drained peat, muck, silt, or silty clay.

**Vegetation Description:** *Salix sericea* (silky willow) is dominant, forming a tall-shrub canopy 2-3 m in height. Associated shrubs in the Central Appalachian region are *Hypericum densiflorum* (bushy St. Johnswort) and *Alnus incana* ssp. *rugosa* (speckled alder), with the following species occasionally present: *Vaccinium myrtilloides* (velvetleaf huckleberry), *Ilex verticillata* (common winterberry), *Picea rubens* (red spruce), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Populus tremuloides* (quaking aspen), and *Sambucus canadensis* (common elderberry). The herbaceous layer is often dense and variable, including *Solidago rugosa* (wrinkleleaf goldenrod), *Euthamia graminifolia* (flat-top goldentop), *Rubus hispidus* (bristly dewberry), *Solidago uliginosa* (bog goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Glyceria striata* (fowl mannagrass), *Glyceria canadensis* (rattlesnake mannagrass), *Juncus effusus* (common rush), *Carex stipata* (owlfruit sedge), *Carex lurida* (shallow sedge), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Symphyotrichum puniceum* var. *puniceum* (purplestem aster), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Dryopteris cristata* (crested woodfern), *Glyceria laxa* (limp

mannagrass), *Solidago rugosa* (winkleleaf goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Galium tinctorium* (stiff marsh bedstraw), *Typha latifolia* (broadleaf cattail), and *Leersia oryzoides* (rice cutgrass). In West Virginia, hummocks are typically covered by *Sphagnum* spp. (*Sphagnum palustre*, *Sphagnum girgensohnii*, *Sphagnum affine* and *Sphagnum flexuosum*). For eleven plots in West Virginia, mean species richness of all vascular plants and any nonvascular plants with cover >1% is 31 taxa per 400 square meters.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix sericea</i> (silky willow)
Herb (field)	Forb	<i>Euthamia graminifolia</i> (flat-top goldentop), <i>Solidago rugosa</i> (winkleleaf goldenrod)
Herb (field)	Graminoid	<i>Carex lurida</i> (shallow sedge), <i>Carex stipata</i> (owlfruit sedge), <i>Glyceria striata</i> (fowl mannagrass), <i>Juncus effusus</i> (common rush)

**Characteristic Species:** *Salix sericea* (silky willow)

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3	G4	plant

**DISTRIBUTION**

**Range:** This vegetation occurs in the Central Appalachians and the Allegheny Mountains region of West Virginia and may extend into New York and Connecticut.

**States/Provinces:** CT, NJ, NY, PA, WV:S3

**Federal Lands:** NPS (Johnstown Flood); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (10-Mar-2005)

**Reasons:** Much more information is needed about this vegetation across its range to assign a global rank.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Information not available.

**Similar Associations:** Information not available.

**Related Concepts:**

- *Salix sericea* shrub community (Walbridge and Lang 1982) =
- *Salix sericea* tall shrub community (Walbridge 1982) =
- *Salix* shrub thicket (Fortney 1975) =

**SOURCES**

**Description Authors:** L.A. Sneddon, mod. E.A. Byers

**References:** Eastern Ecology Working Group n.d., Egler and Niering 1976, Fortney 1975, Gordon 1937b, Niering 1953, WVNHP unpubl. data b, Walbridge 1982, Walbridge and Lang 1982

## Speckled Alder Shrub Swamp

**Scientific Name:** *Alnus incana* ssp. *rugosa* Shrub Swamp  
**Translated Name:** Speckled Alder Shrub Swamp  
**NVC Name:** CEG1002381: *Alnus incana* Swamp Shrubland  
**Conservation Rank:** S3 / G5

### WEST VIRGINIA INFORMATION

**Environmental Description:** This shrub swamp occurs on temporarily to semi-permanently flooded organic soils in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1040 m, with most occurrences above 950 m. It is a small-patch type that most often occupies flat to very gently sloping floodplains (0- to 1-degree slopes) along meandering, low-gradient streams. It also occurs as a successional type in old beaver meadows and on former forested swamplands that are fed by abundant seepage. The community was probably less widespread in presettlement times prior to clearing of forested swamps and subsequent accelerated beaver activity. Where natural succession is allowed to proceed, some stands will likely return to forested swamps of exceptionally high conservation value. Microtopography is characterized by graminoid tussocks and hummocks formed by woody stem clusters and decaying wood. Bedrock may be sandstone, shale, or limestone. Soils are moderately to very poorly drained muck, peat, or organic-rich silt loam. Organic soil averages 30 cm (n=12) depth, underlain by clay. Hydric soil indicators are histisol, histic epipedon, black histic, hydrogen sulphide, 2 cm muck, depleted matrix, thick dark surface, redox dark surface, redox depressions, iron/manganese masses, and alluvial depleted matrix. Average soil pH is 4.3 (n=9). Mean pore water pH is 5.6 and electrical conductivity averages 100 micromhos/cm (n=8). Soil chemistry is characterized by high Ca, Fe, Na, P, S, Zn, exchangeable nitrogen, total exchange capacity, and organic matter; moderate B and Mg; and low Al, Cu, K, and Mn (n=9). The unvegetated surface is predominantly litter, with an average of 15% bare soil, 10% standing water and 3% downed wood.

**Vegetation Description:** This shrub swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by a dense and often diverse tall-shrub layer (mean cover = 65%) dominated by *Alnus incana* ssp. *rugosa* (speckled alder) and *Ilex verticillata* (common winterberry), with occasional lower cover by *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Viburnum recognitum* (southern arrowwood), *Tsuga canadensis* (eastern hemlock), *Sambucus canadensis* (= *Sambucus nigra* ssp. *canadensis*), *Abies balsamea* (balsam fir), *Salix sericea* (silky willow), *Picea rubens* (red spruce), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Rhododendron maximum* (great laurel), *Amelanchier* (serviceberry) spp., *Photinia melanocarpa* (black chokeberry), *Lindera benzoin* (northern spicebush), and *Sorbus americana* (American mountain ash). At the southern range limit of this type in West Virginia, shrub layers may be dominated or codominated by the central Appalachian endemic *Ilex collina* (longstalk holly). The short-shrub layer averages 5% cover and, in addition to the tall-shrub species, may include *Hypericum densiflorum* (bushy St. Johnswort), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Spiraea alba* (white meadowsweet), *Rosa multiflora* (multiflora rose), *Kalmia latifolia* (mountain laurel), and *Rosa palustris* (swamp rose). In circumneutral, high-elevation stands, clonal patches of *Rhamnus alnifolia* (alderleaf buckthorn) may be locally abundant. The herbaceous layer is diverse, with mean 80% cover. Herbaceous

species with high cover and constancy include *Glyceria striata* (fowl mannagrass), *Glyceria melicaria* (melic mannagrass), *Symplocarpus foetidus* (skunk cabbage), *Leersia oryzoides* (rice cutgrass), *Rubus hispidus* (bristly dewberry), *Polygonum sagittatum* (arrowleaf tearthumb), and *Impatiens capensis* (jewelweed). Herbaceous species with high constancy but lower cover include *Dryopteris cristata* (crested woodfern), *Galium tinctorium* (stiff marsh bedstraw), *Viola cucullata* (marsh blue violet), *Scutellaria lateriflora* var. *lateriflora* (blue skullcap), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Carex gynandra* (nodding sedge), *Carex echinata* ssp. *echinata* (star sedge), *Carex stipata* (owlfruit sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Carex folliculata* (northern long sedge), *Solidago uliginosa* (bog goldenrod), *Galium asprellum* (rough bedstraw), *Agrostis perennans* (upland bentgrass), *Juncus effusus* (common rush), *Carex scoparia* var. *scoparia* (broom sedge), and *Dryopteris intermedia* (intermediate woodfern). Nonvascular plants average 10% cover, typically consisting of *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum henryense*, *Sphagnum fimbriatum*, *Sphagnum papillosum*, and *Sphagnum recurvum*) growing on hummocks and woody stem clusters. Indicator species that help to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region are *Cinna latifolia* (drooping woodreed), *Dryopteris intermedia* (intermediate woodfern), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (jewelweed), *Scutellaria lateriflora* var. *lateriflora* (blue skullcap), and *Viola cucullata* (marsh blue violet). This community provides habitat for a large number of species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex canescens* (S3G5T5), *Carex comosa* (S2G5), *Carex leptonevia* (S2G4), *Carex projecta* (S3G5), *Cornus canadensis* (S3G5), *Drosera rotundifolia* var. *rotundifolia* (S3G5T5), *Fraxinus nigra* (S2S3G5), *Glyceria grandis* var. *grandis* (S2G5T5), *Glyceria laxa* (S1G5), *Hasteola suaveolens* (S3G3), *Ilex collina* (S2G3), *Polemonium vanbruntiae* (S2G3), *Rhamnus alnifolia* (S1G5), *Scirpus atrocinctus* (S3G5), and *Scirpus microcarpus* (S3G5). Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 30 taxa per 400 square meters.

**Fauna observed:** Small mammals found within the community included *Sorex cinereus* (masked shrew), *Synaptomys cooperi* (southern bog lemming), *Peromyscus* sp. (deer mouse or white-footed mouse), *Microtus pensylvanicus* (meadow vole), *Zapus hudsonicus* (meadow jumping mouse), and *Blarina brevicauda* (northern short-tailed shrew). Butterfly species observed within this community include *Papilio glaucus* (eastern tiger), Lycaenidae (hairstreak), *Colias interior* (pink-edged sulphur) and *Battus philenor* (pipevine swallowtail). *Amphiagrion saucium* (An eastern red damselfly) was noted. Spiders collected include *Neoscona arabesca* (arabesque orbweaver), *Leucauge venusta* (orchard orbweaver), and *Tetragnatha* sp. (longjawed orbweaver). Insects representing five orders were collected. The order Coleoptera (beetles) included *Cantharis* sp. (a soldier beetle) and *Plateumaris* sp. (a leaf beetle). Species from Diptera (true flies) included those from families Muscidae (house flies), Sciomyzidae (marsh flies), and Syrphidae (hoverflies) including *Toxomerus* sp. (a hoverfly). Species from the order Hemiptera (true bugs) were *Nabis* sp. (a damselbug), *Pilaenus spumarius* (a meadow spittlebug), *Lygus* sp. (a plant bug) and *Slaterocoris* sp. (a plant bug). From the order Orthoptera (grasshoppers and crickets), a specimen of *Melanoplus* sp. (a spur-throated grasshopper) was collected. From the order Plecoptera (stoneflies), a species within Leuctridae (rolled-wing stoneflies) was noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-	plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex comosa</i> (longhair sedge)	-	plant	WV species of concern
<i>Carex leptoneuria</i> (nerveless woodland sedge)	-	plant	WV species of concern
<i>Carex projecta</i> (necklace sedge)	-	plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Fraxinus nigra</i> (black ash)	-	plant	WV species of concern
<i>Glyceria grandis</i> var. <i>grandis</i> (Amer. mannagrass)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Hasteola suaveolens</i> (false Indian plaintain)	-	plant	WV species of concern
<i>Ilex collina</i> (longstalk holly)	G3	plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	WV species of concern
<i>Rhamnus alnifolia</i> (alderleaf buckthorn)	-	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Scirpus microcarpus</i> (panicled bulrush)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1040 m, with most occurrences above 950 m. Within this region, the community is known from Canaan Valley, Cranberry Glades, Cranesville Swamp, Cupp Run, East Fork Greenbrier, Glade Run of Abram Creek, and Little Laurel Creek near Richwood.

**Classification Comments:** Twenty-seven plots (8 occurrences) represent this type (CEGL002381), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This is a broad group which holds together well in clusters and ordinations. It has been well-sampled. It is the most common *Alnus incana* (gray alder) community in West Virginia and includes stands that are nutrient-rich with lower *Sphagnum* cover and stands at higher elevations. *Alnus incana* (gray alder) thickets that are lowest in flood energy and elevation and have greater *Sphagnum* cover sometimes have *Viburnum recognitum* (southern arrowwood) as a codominant and classify as *Alnus incana* - *Viburnum recognitum* / *Calamagrostis canadensis* Shrubland [Provisional] (CEGL006546).

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.2, CASP.28, CASP.29, CVWR.14, CVWR.7, CVWR.8, GRAN.2, GREE.2, MONF.120, MONF.125, MONF.221, MONF.225, RENT.14, RENT.15, RENT.16, RENT.17, RENT.18, RENT.20, RENT.21, RENT.22, RENT.24, ROBI.16, TUCK.14, USFS.329, USFS.335, WALB.51, WALB.52.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class           Shrubland (III)  
 Physiognomic Subclass       Deciduous shrubland (III.B.)

Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Alnus incana</i> Seasonally Flooded Shrubland Alliance (A.986)
Alliance (English name)	Speckled Alder Seasonally Flooded Shrubland Alliance
Association	<i>Alnus incana</i> Swamp Shrubland
Association (English name)	Speckled Alder Swamp Shrubland
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609)
	High Allegheny Wetland (CES202.069)
	Laurentian-Acadian Floodplain Forest (CES201.587)
	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)
	Western Great Plains Open Freshwater Depression Wetland (CES303.675)

### GLOBAL DESCRIPTION

**Concept Summary:** This alder swamp community type is widespread in the midwestern and northeastern United States and southern Canada. Stands occur on shores, edges of beaver meadows in stream floodplains, swales associated with small streams in peatlands, or upland forests. Soils are well-decomposed peat, muck or mineral soils. The hydrology is typically seasonally flooded, with most sites remaining saturated. The vegetation is dominated by tall shrubs, 2-8 m in height, with a moderately open to dense shrub canopy. There is an understory of shorter shrubs and herbaceous species. The density of the understory varies inversely with the tall-shrub canopy. The overstory is usually overwhelmingly dominated by *Alnus incana* (gray alder), but in the more southeastern portions of this type's range, *Alnus serrulata* (hazel alder) can occur with *Alnus incana* (gray alder). Where alder is not as dominant, other shrubs, such as *Cornus sericea* (redosier dogwood), *Ilex verticillata* (common winterberry), *Rubus idaeus* (American red raspberry), *Salix* (willow) spp., *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steplebush), and *Viburnum* (viburnum) spp., can be found. At the southern range limit of this type in West Virginia, shrub layers may be dominated or codominated by the central Appalachian endemic *Ilex collina* (longstalk holly). The herbaceous layer contains species such as *Symphyotrichum lanceolatum* var. *lanceolatum* (white panicle aster), *Symphyotrichum puniceum* (purplestem aster), *Calamagrostis canadensis* (bluejoint), *Caltha palustris* (yellow marsh marigold), *Carex lacustris* (lake sedge), *Carex prairea* (prairie sedge), *Carex trisperma* (threeseeded sedge), *Doellingeria umbellata* (parasol whitetop), *Eupatorium maculatum* (spotted joepyeweed), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Rubus pubescens* (dwarf red blackberry), *Scirpus atrovirens* (green bulrush), *Symplocarpus foetidus* (skunk cabbage), *Thelypteris palustris* (eastern marsh fern), *Typha* (cattail) spp., and *Viola* (violet) spp. Mosses include *Climacium dendroides* (tree climacium moss) and *Sphagnum* spp. Where the tall-shrub canopy is open, the graminoids can become dense. Scattered trees are found in many stands, including *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), and *Thuja occidentalis* (arborvitae).

**Environmental Description:** Sites are typically along streams, lakeshores, edges of beaver meadows, swales associated with small streams in peatlands or upland forests, or near seeps. Most have little to no slope, but some sites are on moderate slopes. Hydrologic conditions can range from temporarily flooded to seasonally flooded, or even saturated, but are typically

seasonally flooded/saturated. The water ranges from non-stagnant, nutrient-rich, and often slightly calcareous (Curtis 1959) to rather stagnant and nutrient-poor where over acidic bedrock or till. Soils are wet, often mucks or peats (Anderson 1982, Chapman et al. 1989). In the upper Midwest, this community is found on Precambrian Shield bedrock that is overlaid with sandy loam soils, which are moderately well-drained and deep (>60 cm). In northeastern Minnesota stands can occur on northeast- and south-facing slopes that are moderate to steep, with slopes ranging from 4 to 45% (Ohmann and Ream 1971). The climate is highly variable, with temperature extremes between -46 and 38 degrees C and 58-91 cm precipitation.

**Vegetation Description:** The vegetation is dominated by tall shrubs, 2-8 m in height, with a moderately open to dense shrub canopy. There is an understory of shorter shrubs and herbaceous species. The density of the understory varies inversely with the tall-shrub canopy. The overstory is usually overwhelmingly dominated by *Alnus incana* (gray alder), but in the more southeastern portions of this type's range, *Alnus serrulata* (hazel alder) can occur with *Alnus incana* (gray alder). Where alder is not as dominant, other shrubs, such as *Cornus sericea* (redosier dogwood), *Ilex verticillata* (common winterberry), *Rubus idaeus* (American red raspberry), *Salix* (willow) spp., *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steeplebush), and *Viburnum* (viburnum) spp., can be found. The herbaceous layer contains species such as *Symphyotrichum lanceolatum* var. *lanceolatum* (white panicle aster), *Symphyotrichum puniceum* (purplestem aster), *Calamagrostis canadensis* (bluejoint), *Caltha palustris* (yellow marsh marigold), *Carex lacustris* (lake sedge), *Carex prairiea* (prairie sedge), *Carex trisperma* (threeseeded sedge), *Doellingeria umbellata* (parasol whitetop), *Eupatorium maculatum* (spotted joeypyeweed), *Impatiens capensis* (jewelweed), *Lycopus uniflorus* (northern bugleweed), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Rubus pubescens* (dwarf red blackberry), *Scirpus atrovirens* (green bulrush), *Symplocarpus foetidus* (skunk cabbage), *Thelypteris palustris* (eastern marsh fern), *Typha* (cattail) spp., and *Viola* (violet) spp. Mosses include *Climacium dendroides* (tree climacium moss) and *Sphagnum* spp. Where the tall-shrub canopy is open, the graminoids can become dense. Scattered trees are found in many stands, including *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), and *Thuja occidentalis* (arborvitae) (Curtis 1959, Anderson 1982, MNNHP 1993, Harris et al. 1996, Sperduto 2000b, Thompson and Sorenson 2000, Gawler 2002). Where stands border on saturated conditions with peaty soils, peatland species such as *Chamaedaphne calyculata* (leatherleaf), *Rhododendron canadense* (rhodora), and *Sphagnum* spp. may be present.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus incana</i> (gray alder)

**Characteristic Species:** *Alnus incana* (gray alder)

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This alder swamp community type is widespread in the midwestern and northeastern United States and southern Canada, ranging from Maine west to Manitoba, south to Iowa, and east to New York and perhaps northern New Jersey.

**States/Provinces:** IA:S3?, IL, IN?, MA, MB?, ME, MI:S5, MN:S5, ND:S2?, NH:S3S4, NJ?:S2S4, NY, OH, ON, PA, VT, WI:S4, WV:S3

**Federal Lands:** NPS (Acadia, Isle Royale, Pictured Rocks, Upper Delaware, Voyageurs); USFWS (Aroostook, Assabet River, Carlton Pond, Moosehorn?, Nulhegan Basin)

## CONSERVATION STATUS

**Rank:** G5 (23-Jun-2006)

**Reasons:** This association is widely distributed and considered secure in many states.

## CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Type has a very broad distribution, and there may be a need to separate a northern (more boreal) type from a southern (more temperate) type, or perhaps an enriched versus lower-nutrient type, based on floristic differences. Hydrology may be quite variable, ranging from temporarily flooded to semi-permanently flooded. In Ohio, this association sometimes merges with *Alnus serrulata* (hazel alder) stands in *Alnus serrulata* Swamp Shrubland (CEGL005082); that association is distinguished by somewhat more southern associates, including *Rhododendron viscosum* (swamp azalea), *Lindera benzoin* (northern spicebush), *Peltandra virginica* (green arrow arum), etc.. With increasing tree canopy cover, this association can be similar to *Larix laricina* (tamarack) forest types, *Thuja occidentalis* (arborvitae) saturated forest types, and *Fraxinus nigra* - *Acer rubrum* saturated forest types.

### Similar Associations:

- *Alnus incana* - *Cornus* (*amomum*, *sericea*) / *Clematis virginiana* Shrubland (CEGL006062)
- *Alnus incana* ssp. *rugosa* - *Nemopanthus mucronatus* / *Sphagnum* spp. Shrubland (CEGL006158)
- *Alnus serrulata* Swamp Shrubland (CEGL005082)

### Related Concepts:

- *Alnus incana* - *Sambucus canadensis* shrub community (Darlington 1943) F
- *Alnus incana* - *Viburnum cassinoides* shrub community (Darlington 1943) F
- *Alnus incana* ssp. *rugosa* tall shrub thicket (Fortney et al. 2005) =
- *Alnus rugosa* shrub (Walbridge and Lang 1982) =
- *Alnus rugosa* tall shrub community (Robinette 1966) =
- *Alnus rugosa* tall shrub community (Walbridge 1982) =
- *Alnus rugosa* thicket community (Fortney 1975) =
- Alder Shrub Swamp (Anderson and Barren 1991) =
- Alder Thicket (Curtis 1959) =
- Thicket Swamp: Speckled Alder / Bluejoint Grass type , W35 (Harris et al. 1996) =

## SOURCES

**Description Authors:** D. Faber-Langendoen, mod. S.C. Gawler

**References:** Anderson 1982, Anderson and Barren 1991, Breden et al. 2001, Chapman 1986, Curtis 1959, Darlington 1943, DeMeo et al. 1998, Fortney 1975, Fortney et al. 2005, Gawler 2002, Greenall 1996, Harris et al. 1996, INAI unpubl. data, MNNHP 1993, Midwestern Ecology Working Group n.d., NDNHI n.d., Ohmann and Ream 1971, Rentch unpubl. data 2003, Robinette 1966, Sperduto 2000b, Swain and Kearsley 2001, Thompson and Sorenson 2000, WNHP unpubl. data, Walbridge 1982, Walbridge and Lang 1982

## Speckled Alder - Arrowwood Shrub Swamp

<b>Scientific Name:</b>	<i>Alnus incana</i> ssp. <i>rugosa</i> – <i>Viburnum recognitum</i> / ( <i>Symplocarpus foetidus</i> ) / <i>Sphagnum</i> spp. Shrub Swamp
<b>Translated Name:</b>	Speckled Alder - Northern Arrowwood / (Skunk Cabbage) / Peatmoss Shrub Swamp
<b>NVC Name:</b>	CEGL006546: <i>Alnus incana</i> - <i>Viburnum recognitum</i> / <i>Calamagrostis canadensis</i> Shrubland [Provisional]
<b>Conservation Rank:</b>	S3 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This alluvial shrub swamp occurs on temporarily to semi-permanently flooded organic soils the Allegheny Mountains region of West Virginia, at elevations between 770 and 1030 m. It is a small-patch type that occupies flat-lying floodplains directly adjacent to low-gradient streams. The community is maintained by natural flooding and beaver disturbance regimes. It was probably less widespread in presettlement times prior to clearing of forested swamps and subsequent accelerated beaver activity. Where natural succession is allowed to proceed, some stands will likely return to forested swamps of exceptionally high conservation value. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters and decaying wood. Bedrock may be shale, limestone, or sandstone. The substrate in one sampled plot was peat (1 m depth) underlain by clay. Hydric soil indicators were histisol, histic epipedon, and hydrogen sulphide. Soil pH was 4.3. Mean pore water pH is 5.0 and electrical conductivity averages 40 micromhos/cm (n=9). Soil chemistry in one sampled plot was characterized by high Na and P; moderate Cu and exchangeable nitrogen; and low B, Ca, Fe, K, Mg, Mn, S, Zn, total exchange capacity, and organic matter. The unvegetated surface is predominantly litter, with an average of 25% standing water and 3% downed wood.

**Vegetation Description:** This alluvial shrub swamp occurs in the Allegheny Mountains region of West Virginia. It is characterized by a dense tall-shrub layer (mean cover = 60%) dominated by *Alnus incana* ssp. *rugosa* (speckled alder) and *Viburnum recognitum* (southern arrowwood), with occasional presence of *Ilex verticillata* (common winterberry), *Sambucus canadensis* (common elderberry), *Rhododendron maximum* (great laurel), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), *Spiraea alba* (white meadowsweet), *Tsuga canadensis* (eastern hemlock), and *Viburnum nudum* var. *cassinoides* (northern wild raisin). The short-shrub layer is sparse or absent. The herbaceous layer, with mean 70% cover, typically has high cover by *Rubus hispidus* (bristly dewberry), *Symplocarpus foetidus* (skunk cabbage), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Leersia oryzoides* (rice cutgrass). Other herbaceous species with high constancy include *Impatiens capensis* (jewelweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Agrostis perennans* (upland bentgrass), *Dryopteris carthusiana* (spinulose woodfern), *Carex gynandra* (nodding sedge), *Juncus effusus* (common rush), *Carex folliculata* (northern long sedge), *Carex stricta* (tussock sedge), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Hypericum mutilum* (dwarf St. Johnswort), and *Dichanthelium clandestinum* (deertongue). *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Carex stipata* var. *stipata* (owlfruit sedge), or *Glyceria laxa* (limp mannagrass) may

be locally abundant. Nonvascular plants average 25% cover and are dominated by *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum palustre*, *Sphagnum papillosum*, and *Sphagnum recurvum*). Indicator species that help to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region are *Viburnum recognitum* (southern arrowwood) and *Symplocarpus foetidus* (skunk cabbage). This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5T5), *Carex comosa* (longhair sedge) (S2G5), *Glyceria grandis* var. *grandis* (American mannagrass) (S2G5T5), *Glyceria laxa* (limp mannagrass) (S1G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Viburnum lentago* (nannyberry) (S1S2G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 27 taxa per 400 square meters.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex comosa</i> (longhair sedge)	-	plant	WV species of concern
<i>Glyceria grandis</i> var. <i>grandis</i> (Amer. mannagrass)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Viburnum lentago</i> (nannyberry)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1030 m. Within this region, the community is known from Canaan Valley National Wildlife Refuge, Cranberry Glades, Cranesville Swamp, and Cupp Run.

**Classification Comments:** Thirteen plots (4 occurrences) represent this type (CEGL006546), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. These plots cluster as a fairly reliable clade within the broader *Alnus incana* (gray alder) Swamp Shrubland (CEGL002381) and ordinate on one side of the broader group. This type is lower in flood energy and has greater *Sphagnum* cover than CEGL002381, which is more common in high-elevation settings in West Virginia, and includes more nutrient-rich sites with lower *Sphagnum* cover, and higher elevation sites. The West Virginia expression of CEGL006546 differs from the global description of this type in that it often includes high cover by *Symplocarpus foetidus* (skunk cabbage), and it only occasionally has appreciable cover by *Calamagrostis canadensis* (bluejoint).

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.1, CVWR.2, RENT.19, RENT.23, RENT.25, WALB.49, WALB.50, WALB.53, WALB.54, WALB.55, WALB.57, WALB.64, WALB.65.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)

Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Alnus incana</i> Seasonally Flooded Shrubland Alliance (A.986)
Alliance (English name)	Speckled Alder Seasonally Flooded Shrubland Alliance
Association	<i>Alnus incana</i> - <i>Viburnum recognitum</i> / <i>Calamagrostis canadensis</i> Shrubland [Provisional]
Association (English name)	Speckled Alder - Northern Arrow-wood / Bluejoint Shrubland
Ecological System(s)	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

## GLOBAL DESCRIPTION

**Concept Summary:** This tall-shrub swamp association occurs in temporarily flooded to semi-permanently flooded and saturated sites along streams, lakeshores, old beaver meadows and seepage edges. Soils are wet mucks or peats. Vegetation can be highly variable with no single dominant species but can include *Alnus incana* (gray alder), *Viburnum recognitum* (southern arrowwood), *Cornus sericea* (redosier dogwood), *Cornus amomum* (silky dogwood), *Ilex verticillata* (common winterberry), *Spiraea alba* var. *latifolia* (white meadowsweet), and/or *Salix* (willow) spp. *Spiraea tomentosa* (steeplesh), *Vaccinium corymbosum* (highbush blueberry), and *Chamaedaphne calyculata* (leatherleaf) can occur sporadically in some examples, especially former beaver meadows. Herbaceous species are inversely proportional to shrub cover; they can be dense where the shrub canopy is open. Species can include *Calamagrostis canadensis* (bluejoint), *Caltha palustris* (yellow marsh marigold), *Carex lacustris* (lake sedge), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), *Lycopus uniflorus* (northern bugleweed), *Lysimachia terrestris* (earth loosestrife), *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus hispidus* (bristly dewberry), *Symplocarpus foetidus* (skunk cabbage), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Thelypteris palustris* (eastern marsh fern), and *Typha* (cattail) spp. Nonvascular species are common in the Central Appalachians and are dominated by *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum palustre*, *Sphagnum papillosum*, and *Sphagnum recurvum*). In New England, nonvascular species tend to be infrequent, although *Drepanocladus* spp. and/or *Sphagnum* spp. can occur occasionally, and most often in pools or mudflats or on shrub hummocks, respectively. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 27 taxa per 400 square meters, for 13 plots in West Virginia.

**Environmental Description:** This tall-shrub swamp association occurs in temporarily flooded to semi-permanently flooded and saturated sites along streams, lakeshores, old beaver meadows and seepage edges on flat to moderate slopes. Soils are wet mucks or peats. In West Virginia, this alluvial shrub swamp occurs in the Allegheny Mountains region at elevations between 770 and 1030 m. The community is maintained by natural flooding and beaver disturbance regimes. It was probably less widespread in presettlement times prior to clearing of forested swamps and subsequent accelerated beaver activity. Where natural succession is allowed to proceed, some stands will likely return to forested swamps of high conservation value. Microtopography is characterized by moss-covered hummocks formed over woody stem clusters and decaying wood.

**Vegetation Description:** Vegetation can be highly variable with no single dominant species but can include *Alnus incana* (gray alder), *Viburnum recognitum* (southern arrowwood), *Cornus sericea* (redosier dogwood), *Cornus amomum* (silky dogwood), *Ilex verticillata* (common

winterberry), *Spiraea alba* var. *latifolia* (white meadowsweet), and/or *Salix* (willow) spp. *Spiraea tomentosa* (steeplebush), *Vaccinium corymbosum* (highbush blueberry), and *Chamaedaphne calyculata* (leatherleaf) can occur sporadically in some examples, especially former beaver meadows. Herbaceous species are inversely proportional to shrub cover; they can be dense where the shrub canopy is open. Species can include *Calamagrostis canadensis* (bluejoint), *Caltha palustris* (yellow marsh marigold), *Carex lacustris* (lake sedge), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), *Lycopus uniflorus* (northern bugleweed), *Lysimachia terrestris* (earth loosestrife), *Polygonum sagittatum* (arrowleaf tearthumb), *Rubus hispidus* (bristly dewberry), *Symplocarpus foetidus* (skunk cabbage), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Thelypteris palustris* (eastern marsh fern), and *Typha* (cattail) spp. Nonvascular species are common in the Central Appalachians and are dominated by *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum palustre*, *Sphagnum papillosum*, and *Sphagnum recurvum*). In New England, nonvascular species tend to be infrequent, although *Drepanocladus* spp. and/or *Sphagnum* spp. can occur occasionally, and most often in pools or mudflats or on shrub hummocks, respectively. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 27 taxa per 400 square meters, for 13 plots in West Virginia.

#### **USFWS Wetland System:** Palustrine

##### **DISTRIBUTION**

**Range:** This association is currently described from the Central Appalachians and Lower New England/Northern Piedmont regions.

**States/Provinces:** MA, NH, WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

##### **CONSERVATION STATUS**

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

##### **CLASSIFICATION INFORMATION**

**Status:** Provisional

**Confidence:**

**Comments:** Information not available.

**Similar Associations:** Information not available.

##### **Related Concepts:**

- *Alnus rugosa* - *Viburnum recognitum* community (Edens 1973) =
- *Viburnum recognitum* shrub community (Walbridge and Lang 1982) =
- *Viburnum recognitum* tall shrub community (Walbridge 1982) =

##### **SOURCES**

**Description Authors:** S.L. Neid, mod. E.A. Byers

**References:** Eastern Ecology Working Group n.d., Edens 1973, McMaster and McMaster 2000, Rentch unpubl. data 2003, Swain and Kearsley 2000, Walbridge 1982, Walbridge and Lang 1982

## Steeplebush Shrub Swamp

**Scientific Name:** *Spiraea tomentosa* / *Sphagnum palustre* Shrub Peatland  
**Translated Name:** Steeplebush / Peatmoss Shrub Peatland  
**NVC Name:** CEG1006571: *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland  
**Conservation Rank:** S2 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This shrub peatland occurs on saturated soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 1040 and 1220 m. It is a small-patch type that occupies very gently sloping (1-2 degrees), beaver-influenced wetlands, including old oxbows along meandering streams. It is an early-successional wetland type and patches may be ephemeral, but it is likely to be present on the landscape as long as a beaver-influenced disturbance regime persists. Microtopography is characterized by tussocks and mossy hummocks formed over downed wood. Bedrock is sandstone or shale. Soils are moderately poorly to poorly drained peat or mucky sand. Hydric soil indicators include sandy mucky matrix. Depth of organic soil in one sample is 13 cm. Soil pH is 4.3, pore water pH is 6.1, and electrical conductivity is 80 micromhos/cm (n=1). Soil chemistry is characterized by high Al, Fe, Na; moderate B, Cu, S; and low organic matter, Ca, K, Mg, Mn, P, Zn, exchangeable nitrogen, and total exchange capacity (n=1). The unvegetated surface is predominantly litter, with 5% downed wood and 1% standing water.

**Vegetation Description:** This shrub peatland occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open shrub layer over an abundant herbaceous layer and dense bryophytes. The tall-shrub layer averages 30% cover and is dominated by *Spiraea tomentosa* (steeplebush). Other commonly occurring species in the tall-shrub layer include *Picea rubens* (red spruce) and *Rubus allegheniensis* var. *allegheniensis* (Allegheny blackberry). The short-shrub layer averages 16% cover, with species composition similar to that of the tall-shrub stratum. The herbaceous ground layer is variable, with mean 60% cover, and typically includes *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Scirpus cyperinus* (woolgrass), and *Carex scoparia* var. *scoparia* (broom sedge). Locally abundant species may include *Carex trisperma* var. *trisperma* (threeseeded sedge), *Carex atlantica* (prickly bog sedge), *Agrostis perennans* (upland bentgrass), *Thelypteris noveboracensis* (New York fern), and *Dichanthelium clandestinum* (deertongue). Nonvascular plants average 90% cover and are dominated by *Sphagnum palustre* (prairie sphagnum), with lesser amounts of *Polytrichum commune* (polytrichum moss). The indicator species that helps to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region is *Spiraea tomentosa* (steeplebush). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 20 taxa per 400 square meters.

**Fauna observed:** Spiders collected in this community include *Argiope trifasciata* (banded garden spider), *Neoscona arabesca* (arabesque orbweaver), *Naphrys pulex* (jumping spider), and *Tetragnatha* sp. (longjawed orbweaver). Insects representing five orders were collected. Within the Coleoptera (beetles), the species *Luperaltica senilis* (a leaf beetle) and *Cycloneda* sp. (a ladybug) were noted. In Diptera (true flies), collections were made of *Minettia* sp. (an

acalyprate fly) and species from Tachinidae (tachinid flies). Representing the order Hemiptera (true bugs) were *Coelidia olitoria* and *Paraulacizes irrorata* (leafhoppers), *Collaria oculata* (a plant bug), *Hoplistocelis sordidus* (a damsel bug), and species from Pentatomidae (stink bugs). In Hymenoptera (ants, bees, and wasps), Braconidae (parasitoid wasps) and *Camponotus* sp. (an ant) were noted. An unidentified species of Psocoptera (barklice) was also noted.

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 1040 and 1220 m. Within this region, it occurs along the Upper Shavers Fork River and in Kumbrabow State Forest. It is possible that the community may occur at lower elevations in West Virginia, where a thorough search has not yet been made.

**Classification Comments:** Two plots represent this type (CEGL006571), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. It fits reasonably well within the broadly defined NVC type; however, *Phalaris arundinacea* (reed canarygrass) does not occur in the West Virginia type.

**West Virginia Description Author:** E.A. Byers

**Plots:** KUMB.19, MONF.232.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Spiraea (alba, tomentosa) - Rubus</i> spp. Seasonally Flooded Shrubland Alliance (A.3022)
Alliance (English name)	(White Meadowsweet, Steeplebush) - Blackberry species Seasonally Flooded Shrubland Alliance
Association	<i>Spiraea tomentosa - Rubus</i> spp. / <i>Phalaris arundinacea</i> Shrubland
Association (English name)	Steeplebush - Blackberry species / Reed Canarygrass Shrubland
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa* (steeplebush), *Spiraea alba* var. *alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (bristly dewberry), *Salix* (willow) spp., and others. *Hypericum densiflorum* (bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's honeysuckle) and *Rosa multiflora* (multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (reed canarygrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea*

(giant goldenrod), *Solidago canadensis* (Canada goldenrod), *Juncus effusus* (common rush), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Leersia oryzoides* (rice cutgrass), *Calamagrostis canadensis* (bluejoint), *Carex scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex lupulina* (hop sedge), *Carex vulpinoidea* (fox sedge), *Carex trichocarpa* (hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joe-pyeweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Eleocharis* (spikerush) spp., and others. The invasive species *Microstegium vimineum* (Nepalese browntop), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) can be abundant or form monocultures in these wetlands.

**Environmental Description:** This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. These wetlands typically flood early in the growing season and may be saturated to near the surface for some of the growing season, but they are generally dry for much of the year. The substrate is typically mineral soil with a layer of muck at the surface.

**Vegetation Description:** The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Within each wetland, species may be locally abundant and often have patchy distribution. Shrub species usually include *Spiraea tomentosa* (steepleshrub), *Spiraea alba* var. *alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (bristly dewberry), *Salix* (willow) spp., and others. *Hypericum densiflorum* (bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's honeysuckle) and *Rosa multiflora* (multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (reed canarygrass), *Solidago rugosa* (wrinkleleaf goldenrod), *Solidago gigantea* (giant goldenrod), *Solidago canadensis* (Canada goldenrod), *Juncus effusus* (common rush), *Scirpus cyperinus* (woolgrass), *Scirpus expansus* (woodland bulrush), *Leersia oryzoides* (rice cutgrass), *Calamagrostis canadensis* (bluejoint), *Carex scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex lurida* (shallow sedge), *Carex lupulina* (hop sedge), *Carex vulpinoidea* (fox sedge), *Carex trichocarpa* (hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joe-pyeweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Eleocharis* (spikerush) spp., and others. *Sphagnum* spp. are often abundant along with lesser amounts of other nonvascular species. The invasive species *Microstegium vimineum* (Nepalese browntop), *Lythrum salicaria* (purple loosestrife), and *Phragmites australis* (common reed) can be abundant or form monocultures in these wetlands.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus allegheniensis</i> (Allegheny blackberry), <i>Spiraea alba</i> var. <i>alba</i>

Herb (field)	Forb	(white meadowsweet), <i>Spiraea tomentosa</i> (steeplebush) <i>Solidago canadensis</i> (Canada goldenrod), <i>Solidago rugosa</i> (wrinkleleaf goldenrod)
Herb (field)	Graminoid	<i>Leersia oryzoides</i> (rice cutgrass), <i>Phalaris arundinacea</i> (reed canarygrass)

**Characteristic Species:** *Rubus allegheniensis* (Allegheny blackberry), *Spiraea tomentosa* (steeplebush)

#### DISTRIBUTION

**Range:** Although this vegetation is widespread, its range has not been evaluated. It is known from the Central Appalachian ecoregion, the High Allegheny Plateau, Western Allegheny Plateau, North Atlantic Coast, and the Lower New England / Northern Piedmont ecoregions, and is likely in others.

**States/Provinces:** CT, MA, NJ, NY, PA, WV:S2

**Federal Lands:** NPS (Allegheny Portage Railroad, Boston Harbor Islands, Cape Cod, Delaware Water Gap, Gateway, Johnstown Flood, Upper Delaware, Weir Farm); USFS (Monongahela); USFWS (Assabet River?, Erie, Great Meadows?, Great Swamp, Parker River?)

#### CONSERVATION STATUS

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Information not available.

#### Similar Associations:

- *Cornus (amomum, sericea)* - *Viburnum dentatum* - *Rosa multiflora* Shrubland (CEGL006576)

**Related Concepts:** Information not available.

#### SOURCES

**Description Authors:** L.A. Sneddon, mod. S.C. Gawler

**References:** Decker 1955, Eastern Ecology Working Group n.d., Fike 1999, NatureServe and Russell 2003

### III.B.2.N.g. Saturated cold-deciduous shrubland

## Blueberry - Bracken Fern Shrub Swamp

<b>Scientific Name:</b>	<i>Vaccinium myrtilloides</i> / <i>Pteridium aquilinum</i> / <i>Polytrichum</i> spp. Shrub Swamp
<b>Translated Name:</b>	Velvetleaf Blueberry / Bracken Fern / Haircap Moss Shrub Swamp
<b>NVC Name:</b>	CEGL006596: <i>Vaccinium myrtilloides</i> / <i>Pteridium aquilinum</i> / <i>Polytrichum</i> spp. Shrubland
<b>Conservation Rank:</b>	S3 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This successional shrubland occurs on temporarily flooded or saturated acidic soils in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. It is a small-patch type that occupies flat to mildly inclined (0- to 5-degree) slopes in headwater basins. It occupies slightly drier positions in open wetland mosaics, either on the margins of the wetland, as drier lenses in the middle of the wetland, or interfingering with wetter shrub swamps or herbaceous wetlands in an irregular pattern related to moisture availability. Where conditions are favorable, for example in Canaan Valley, individual stands may be as large as 20 ha. This community is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested wetlands that were logged or burned within the last 120 years. It is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested wetlands of high conservation value, although the recovery rate is slow (perhaps a century) in these frost-pocket habitats. Hummock-and-hollow microtopography is moderately developed, with moss-covered hummocks formed over woody stem clusters, decayed wood, and roots. Bedrock may be sandstone, shale, or limestone. Soil texture is moderately poorly to very poorly drained silt loam or clay loam, with peat developing in some older stands. Hydric soil indicators include histisol, depleted matrix, depleted below dark surface, and redox depressions. Mean soil pH is 3.7 (n=9), mean pore water pH is 4.6 (n=7), and electrical conductivity averages 50 micromhos/cm (n=3). Soil chemistry is characterized by high Al, Fe, total exchange capacity, and organic matter; moderate K and exchangeable nitrogen; and low B, Ca, Cu, Mg, Mn, Na, P, S, and Zn (n=9). The unvegetated surface is predominantly litter, with an average of 3% bare soil, 1% downed wood, and 0.5% standing water.

**Vegetation Description:** This successional shrubland occurs in the Allegheny Mountains region of West Virginia. The tall-shrub layer averages 10% cover and typically includes *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Viburnum nudum* var. *cassinoides* (northern wild raisin). Less common species in the tall-shrub layer include *Hypericum densiflorum* (bushy St. Johnswort), *Picea rubens* (red spruce), *Populus tremuloides* (quaking aspen), *Amelanchier* (serviceberry) spp., *Prunus serotina* var. *serotina* (black cherry), *Viburnum recognitum* (southern arrowwood), *Acer rubrum* (red maple), and *Abies balsamea* (balsam fir). The short-shrub stratum averages 50% cover and is strongly dominated by *Vaccinium myrtilloides* (velvetleaf huckleberry), *Photinia melanocarpa* (black chokeberry), and *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The herbaceous layer, with mean 60% cover, typically includes a component of acidophilic upland species. Species with high cover and constancy are *Pteridium aquilinum* (western brackenfern), *Solidago uliginosa* (bog goldenrod), and *Danthonia compressa*

(flattened oatgrass). Herbaceous species with high constancy but lower cover include *Lycopodium obscurum* (rare clubmoss), *Juncus effusus* (common rush), and *Carex debilis* (white edge sedge). Species with lower constancy that are sometimes abundant include *Gaultheria procumbens* (eastern teaberry), *Eriophorum virginicum* (tawny cottongrass), *Carex folliculata* (northern long sedge), *Brachyelytrum erectum* (bearded shorthusk), *Solidago rugosa* (wrinkleleaf goldenrod), *Apocynum androsaemifolium* (spreading dogbane), and *Lycopodium clavatum* (running clubmoss). Nonvascular plants average 60% cover, dominated by *Polytrichum* spp. (*Polytrichum juniperinum*, *Polytrichum commune*, *Polytrichum strictum*, *Polytrichum pallidisetum*) and often including moderate cover by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum girgensohnii*, *Sphagnum rubellum*). *Cladonia* (cup lichen) spp. are often present with low cover. Indicator species that help to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region are *Danthonia compressa* (flattened oatgrass), *Polytrichum* (polytrichum moss) spp., and *Pteridium aquilinum* (western brackenfern). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Coptis trifolia* (threeleaf goldthread) (S2G5), and *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 22 taxa per 400 square meters.

**Fauna observed:** Spiders collected within this community include *Neoscona arabesca* (arabesque orbweaver), *Tetragnatha laboriosa* (silver longjawed orbweaver), and *Xysticus* sp. (ground crab spider).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-		plant	WV species of concern
<i>Coptis trifolia</i> (threeleaf goldthread)	-		plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-		plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. Within this region, there are occurrences at Canaan Mountain, Canaan Valley, Cranesville Swamp, Dobbins Slashing, Dolly Sods, and Beaverdam Run.

**Classification Comments:** Thirty-three plots (8 occurrences) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters well together considering that it is a fairly broad group. The ordination shows a fairly good grouping in the drier, acidic, *Sphagnum*-poor portion of species space. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CVIN.7, CVIN.8, CVIN.15, CVIN.16, CVIN.17, CVIN.18, CVIN.19, CVIN.20, CVIN.22, CVIN.23, CVIN.24, CVIN.26, CVIN.41, CVWR.9, CVWR.12, CVWR.26, FRAN.80, FRAN.82, FRAN.83, FRAN.86, FRAN.92, FRAN.96, MONF.105, ROBI.10, ROBI.12, ROBI.13, ROBI.14, ROBI.15, TUCK.5, TUCK.6, TUCK.7, TUCK.11, TUCK.12.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Saturated cold-deciduous shrubland (III.B.2.N.g.)
Alliance	<i>Vaccinium corymbosum</i> Saturated Shrubland Alliance (A.1018)
Alliance (English name)	Highbush Blueberry Saturated Shrubland Alliance
Association	<i>Vaccinium myrtilloides</i> / <i>Pteridium aquilinum</i> / <i>Polytrichum</i> spp. Shrubland
Association (English name)	Velvetleaf Blueberry / Bracken Fern / Haircap Moss species Shrubland
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This successional shrubland occurs on temporarily flooded or saturated acidic soils in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. It is a small-patch type that occupies flat to mildly inclined (0- to 5-degree) slopes in headwater basins. It occupies slightly drier positions in open wetland mosaics, either on the margins of the wetland, as drier lenses in the middle of the wetland, or interfingering with wetter shrub swamps or herbaceous wetlands in an irregular pattern related to moisture availability. This community is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested wetlands that were logged or burned within the last 120 years. Hummock-and-hollow microtopography is moderately developed, with moss-covered hummocks formed over woody stem clusters, decayed wood, and roots. Soil texture is moderately poorly to very poorly drained silt loam or clay loam, with peat developing in some older stands. Mean soil pH is 3.7 (n=9). The tall-shrub layer typically includes *Vaccinium myrtilloides* (velvetleaf huckleberry) and *Viburnum nudum* var. *cassinoides* (northern wild raisin). Less common species in the tall-shrub layer include *Hypericum densiflorum* (bushy St. Johnswort), *Picea rubens* (red spruce), *Populus tremuloides* (quaking aspen), *Amelanchier* (serviceberry) spp., *Prunus serotina* var. *serotina* (black cherry), *Viburnum recognitum* (southern arrowwood), *Acer rubrum* (red maple), and *Abies balsamea* (balsam fir). The short-shrub stratum is fairly dense and strongly dominated by *Vaccinium myrtilloides* (velvetleaf huckleberry), *Photinia melanocarpa* (black chokeberry), and *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The herbaceous layer typically includes a component of acidophilic upland species. Species with high cover and constancy are *Pteridium aquilinum* (western brackenfern), *Solidago uliginosa* (bog goldenrod), and *Danthonia compressa* (flattened oatgrass). Herbaceous species with high constancy but lower cover include *Lycopodium obscurum* (rare clubmoss), *Juncus effusus* (common rush), and *Carex debilis* (white edge sedge). Species with lower constancy that are sometimes abundant include *Gaultheria procumbens* (eastern teaberry), *Eriophorum virginicum* (tawny cottongrass), *Carex folliculata* (northern long sedge), *Brachyelytrum erectum* (bearded shorthusk), *Solidago rugosa* (wrinkleleaf goldenrod), *Apocynum androsaemifolium* (spreading dogbane), and *Lycopodium clavatum* (running clubmoss). The nonvascular stratum is dominated by *Polytrichum* spp. (*Polytrichum juniperinum*, *Polytrichum commune*, *Polytrichum strictum*, *Polytrichum pallidisetum*) and often

includes moderate cover by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum girgensohnii*, *Sphagnum rubellum*). *Cladonia* (cup lichen) spp. are often present with low cover. Indicator species that help to distinguish this community from others within the shrubland physiognomy for high-elevation wetlands of the Allegheny Mountains region are *Danthonia compressa* (flattened oatgrass), *Polytrichum* (polytrichum moss) spp., and *Pteridium aquilinum* (western brackenfern). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 22 taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### DISTRIBUTION

**Range:** This community occurs in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m.

**States/Provinces:** WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### CONSERVATION STATUS

**Rank:** GNR (3-Apr-2007)

**Reasons:** This is a small-patch successional type, which is known from the Allegheny Mountains region of West Virginia, at elevations between 770 and 1220 m. It occurs on recovering beaver meadows and as part of larger open wetland mosaics in headwater basins that were logged or burned within the last 120 years. The type is probably more widespread now than in the past when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested wetlands of high conservation value. More information is needed from surrounding states to determine its global rank.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

**Similar Associations:** Information not available.

**Related Concepts:**

- *Vaccinium myrtilloides* thicket community (Fortney 1975) =

#### SOURCES

**Description Author:** E.A. Byers

**References:** CVI 2005, Eastern Ecology Working Group n.d., Fortney 1975, Francl 2003, Robinette 1964

## Bushy St. Johnswort Shrub Swamp

**Scientific Name:** *Hypericum densiflorum* / *Juncus effusus* / *Sphagnum* spp. Shrub Swamp

**Translated Name:** Bushy St. Johnswort / Common Rush / Peatmoss Shrub Swamp

**NVC Name:** CEGL006464: *Hypericum densiflorum* / *Rubus hispidus* Shrubland

**Conservation Rank:** S3 / GNR

## WEST VIRGINIA INFORMATION

**Environmental Description:** This successional shrub peatland occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region, New River Gorge National River, Meadow River wetlands, and probably elsewhere in West Virginia, at elevations from 700-1200 m. It is a small-patch type that occupies very gently sloping land (0- to 2-degree slopes) in beaver-influenced wetlands, drying oxbows, and on former pastureland or disturbed ground. It is likely to be present on the landscape as long as natural (beaver or flooding) and man-made disturbance regimes persist. Its present distribution is probably much larger than its presettlement distribution, when disturbances were less widespread. Microtopography may or may not include hummock-and-hollow development, depending on the amount of decaying woody debris and peat formation. Bedrock is highly variable and may consist of sandstone, shale, limestone, or Quaternary alluvium. Soils are variable, including poorly drained peat, clay loam, silt loam, or sandy loam. Hydric soil indicators include histisol, sandy redox, stripped matrix, depleted matrix, redox depressions, and alluvial depleted matrix. Depth of organic soil varies from 0-40 cm (n=9). Soil pH averages 4.2 (n=6). Pore water pH ranges from 4.1-6.3, with an average of 4.5, and electrical conductivity of pore water averages 49 (n=10). Soil chemistry is characterized by high Cu, Fe, Na; moderate Al, B, H, K; and low organic matter, Ca, N, Mg, Mn, P, S, total exchange capacity, Zn (n=6). The unvegetated surface is predominantly litter, with an average of 4% downed wood, 10% standing water, and occasional patches of bare soil.

**Vegetation Description:** This shrub swamp occurs in naturally or anthropogenically disturbed headwater wetlands in West Virginia. It is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* spp. Cover by *Hypericum densiflorum* (bushy St. Johnswort) in plots ranges from 5 to 80% in the tall-shrub layer (1-2 m tall) and from 5 to 80% cover in the short-shrub layer (<1 m tall). Additional shrub species with relatively high constancy but less cover include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing, trailing vine *Rubus hispidus* (bristly dewberry) has high constancy and cover in the plots. The herbaceous stratum averages 65% cover with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). Locally abundant herbaceous species include *Carex intumescens* (greater bladder sedge) and *Onoclea sensibilis* (sensitive fern). Nonvascular plants average 50% cover and are typically dominated by *Sphagnum recurvum*, *Sphagnum affine*, *Sphagnum* spp., and *Polytrichum commune*. Indicator species that help to distinguish this community from others within the shrubland physiognomy in West Virginia include *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush), and *Scirpus cyperinus* (woolgrass). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Andropogon glomeratus* var. *glomeratus* (bushy bluestem) (S2G5T5), *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex canescens* (silvery sedge) (S3G5T5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Lycopodiella inundata* (inundated clubmoss)

(S2?G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Vaccinium macrocarpon* (cranberry) (S2G4), *Vaccinium oxycoccos* (small cranberry) (S2G5), and *Viburnum lentago* (nannyberry) (S1S2G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

**Fauna observed:** *Papilio* sp. (tiger swallowtail butterfly) was observed within this community. Odonates observed include *Somatochlora tenebrosa* (clamp-tipped emerald) and *Sympetrum obtrusum* (white-faced meadowhawk).

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Andropogon glomeratus</i> var. <i>glomeratus</i> (broomsedge)-		plant	WV species of concern
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge) -		plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Viburnum lentago</i> (nannyberry)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region, the New River, and the Meadow River, at elevations between 700 and 1200 m. It probably also occurs elsewhere in the state. Specific occurrences are known from Canaan Mountain, Canaan Valley, Tub Run of Blackwater River, Cupp Run, Fisher Spring Run on Dolly Sods, Laurel Run of Stony River, Condon Run and Moore Run in Otter Creek Wilderness, Kates Branch of New River, and Meadow River.

**Classification Comments:** Thirty-one plots represent this type (CEGL006464), which was classified as part of a 2006 analysis of palustrine plots statewide. The type clusters and ordinales very loosely, indicating its broad ecological amplitude and successional status. It has been sampled across a fairly wide range of environments in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.25, CVWR.17, CVWR.27, FRAN.14, FRAN.15, FRAN.27, FRAN.38, FRAN.39, FRAN.40, FRAN.42, FRAN.49, FRAN.81, FRAN.84, FRAN.85, FRAN.109, FRAN.112, FRAN.113, GREE.4, MERI.121, MERI.155, NERI.16, NERI.296, NERI.300, NERI.301, WALB.20, WALB.23, WALB.24, WALB.32, WALB.33, WALB.39, WALB.42, WALB.68.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)

Formation	Saturated cold-deciduous shrubland (III.B.2.N.g.)
Alliance	<i>Alnus serrulata</i> Saturated Shrubland Alliance (A.1014)
Alliance (English name)	Smooth Alder Saturated Shrubland Alliance
Association	<i>Hypericum densiflorum</i> / <i>Rubus hispidus</i> Shrubland
Association (English name)	Bushy St. Johnswort / Bristly Dewberry Shrubland
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

## GLOBAL DESCRIPTION

**Concept Summary:** This shrub swamp occurs in naturally or anthropogenically disturbed headwater wetlands in the Central Appalachians, Cumberlands, and perhaps adjacent ecoregions. It is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* spp. Shrub associates include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing trailing vine *Rubus hispidus* (bristly dewberry) is characteristic in the ground layer. The herbaceous stratum is well-developed with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). *Sphagnum* spp. and *Polytrichum commune* are the dominant bryophytes, averaging around 50% cover.

**Environmental Description:** This successional shrub peatland occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountain region, New River Gorge National River, Meadow River wetlands, and probably elsewhere in the region, at elevations from 700-1200 m. It is a small-patch type that occupies very gently sloping (0- to 2-degree slopes) land in beaver-influenced wetlands, drying oxbows, and on former pastureland or disturbed ground. It is fed primarily by seepage flow and rainfall, and it may occasionally receive low-energy flooding from meandering headwater streams. Microtopography may or may not include hummock-and-hollow development, depending on the amount of decaying woody debris and peat formation. Bedrock is highly variable and may consist of sandstone, shale, limestone, or Quaternary alluvium. Soils are variable, including poorly drained peat, clay loam, silt loam, or sandy loam. Hydric soil indicators include histosol, sandy redox, stripped matrix, depleted matrix, redox depressions, and alluvial depleted matrix. Depth of organic soil varies from 0-40 cm (n=9). Soil pH averages 4.2 (n=6). Pore water pH ranges from 4.1-6.3, with an average of 4.5, and electrical conductivity of pore water averages 49 (n=10). Soil chemistry is characterized by high Cu, Fe, Na; moderate Al, B, H, K; and low organic matter, Ca, ENR, Mg, Mn, P, S, TEC, Zn (n=6). The unvegetated surface is predominantly litter, with an average of 4% downed wood, 10% standing water, and occasional patches of bare soil.

**Vegetation Description:** This shrub swamp is dominated by *Hypericum densiflorum* (bushy St. Johnswort) over a variable, disturbance-tolerant herbaceous layer and *Sphagnum* spp. Cover by *Hypericum densiflorum* (bushy St. Johnswort) in plots ranges from 5 to 80% in the tall-shrub layer and from 5 to 80% cover in the short-shrub layer. Additional shrub species with relatively

high constancy but less cover include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* (white meadowsweet), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The low-growing trailing vine *Rubus hispidus* (bristly dewberry) has high constancy and cover in the plots. The herbaceous stratum averages 65% cover with *Juncus effusus* (common rush) and *Solidago uliginosa* (bog goldenrod) generally present. Other herbaceous species with fairly high constancy include *Scirpus cyperinus* (woolgrass), *Carex stipata* (owlfruit sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Eriophorum virginicum* (tawny cottongrass), *Carex scoparia* var. *scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Carex gynandra* (nodding sedge), and *Gentiana linearis* (narrowleaf gentian). Locally abundant herbaceous species include *Carex intumescens* (greater bladder sedge) and *Onoclea sensibilis* (sensitive fern). Nonvascular plants average 50% cover and are typically dominated by *Sphagnum recurvum*, *Sphagnum affine*, other *Sphagnum* spp., and *Polytrichum commune*. Indicator species that help to distinguish this community from others within the shrubland physiognomy in West Virginia include *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush), and *Scirpus cyperinus* (woolgrass). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Hypericum densiflorum</i> (bushy St. Johnswort)
Herb (field)	Vine/Liana	<i>Rubus hispidus</i> (bristly dewberry)

**Characteristic Species:** *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush)

**DISTRIBUTION**

**Range:** Currently this association is documented only from West Virginia, but it may be more widely distributed in the Central Appalachians and adjacent ecoregions.

**States/Provinces:** WV:S3

**Federal Lands:** NPS (New River Gorge); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (6-Jun-2006)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** This description is based on 31 West Virginia plots, classified as part of a 2006 analysis of palustrine plots statewide. The type clusters and ordines very loosely, indicating its broad ecological amplitude and successional status. It has been sampled across a fairly wide range of environments in West Virginia. Indicator species that help to distinguish this community from other West Virginia shrublands include *Hypericum densiflorum* (bushy St. Johnswort), *Juncus effusus* (common rush), and *Scirpus cyperinus* (woolgrass).

**Similar Associations:**

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912)

**Related Concepts:**

- *Hypericum densiflorum* low shrub community (Walbridge 1982) F

- *Hypericum densiflorum* thicket community (Fortney 1975) =
- *Sphagnum recurvum* - *Polytrichum commune* - *Hypericum densiflorum* hummock hollow community (Walbridge 1982) F

#### SOURCES

**Description Authors:** E. Byers, mod. S.C. Gawler

**References:** Eastern Ecology Working Group n.d., Fortney 1975, Vanderhorst 2001b, Vanderhorst et al. 2007, Walbridge 1982, Walbridge and Lang 1982

### Chokeberry - Northern Wild Raisin Shrub Peatland

**Scientific Name:** *Photinia (melanocarpa, pyrifolia) – Viburnum nudum var. cassinoides / Eriophorum virginicum / Sphagnum spp.* Shrub Peatland

**Translated Name:** Chokeberry - Northern Wild Raisin / Cottongrass / Peatmoss Shrub Peatland

**NVC Name:** CEG1006545: *Photinia pyrifolia - Ilex verticillata - Nemopanthus mucronatus / Osmunda cinnamomea* Saturated Shrubland

**Conservation Rank:** S3 / GNR

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This successional shrubland occurs on saturated, temporarily flooded, or semi-permanently flooded acidic peatlands in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0-2 degrees) in headwater basins. Where conditions are favorable, for example in Canaan Valley, individual stands may be as large as 12 ha. It is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested peatlands that were logged or burned within the last 120 years. It is probably more widespread now than in the past, when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested peatlands of high conservation value, although the recovery rate is slow (perhaps a century) in these frost-pocket habitats. Hummock-and-hollow microtopography is well-developed, with rounded peat-covered hummocks formed over woody stem clusters, decayed wood, and roots. Bedrock may be sandstone or, less commonly, limestone. Soil texture is moderately to very poorly drained peat, with a depth greater than one meter, although in earlier successional stands the peat may be only a few centimeters thick. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, stratified layers, and 2 cm muck. Mean soil pH is 3.8 (n=7). Mean pore water pH is 4.6 and electrical conductivity averages 80 micromhos/cm (n=17). Soil chemistry is characterized by high Na, exchangeable nitrogen, total exchange capacity, and organic matter; and low Al, B, Ca, Cu, Fe, K, Mg, Mn, P, S, and Zn (n=7). The unvegetated surface is predominantly litter, with an average of 5% standing water.

**Vegetation Description:** This successional shrub peatland occurs in the Allegheny Mountains region of West Virginia. It may occur with either tall-shrub or short-shrub physiognomy, depending on the age of the stand. The tall-shrub layer averages 20% cover, growing mostly on hummocks, and typically includes *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia*

(red chokeberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (common winterberry), *Nemopanthus mucronatus* (catberry), and *Kalmia latifolia* (mountain laurel). Less frequent, but sometimes locally abundant, shrub species are *Vaccinium corymbosum* (highbush blueberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry). The short-shrub stratum averages 35% cover and is similar in composition to the tall-shrub layer. Dwarf-shrub species with high constancy include *Rubus hispidus* (bristly dewberry), *Vaccinium oxycoccos* (small cranberry), and *Vaccinium macrocarpon* (cranberry). The herbaceous layer, with mean 60% cover, typically occupies hollows and the sides of hummocks. Species with high cover and constancy are *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Species with lower constancy that are sometimes abundant include *Symplocarpus foetidus* (skunk cabbage), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Juncus effusus* (common rush), *Lycopodium obscurum* (rare clubmoss), *Carex trisperma* var. *trisperma* (three-seeded sedge), *Pteridium aquilinum* (western brackenfern), *Gaultheria procumbens* (eastern teaberry), *Carex canescens* (silvery sedge), *Carex gynandra* (nodding sedge), and *Juncus brevicaudatus* (narrowpanicle rush). Nonvascular plants average 70% cover, dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum fallax*, *Sphagnum magellanicum*, *Sphagnum papillosum*, *Sphagnum capillifolium*, *Sphagnum flexuosum*) and often including high cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum juniperinum*, *Polytrichum strictum*, *Polytrichum ohioense*). This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5T5), *Carex interior* (inland sedge) (S1G5), *Carex pauciflora* (fewflower sedge) (S1G5), *Coptis trifolia* (threeleaf goldthread) (S2G5), *Dalibarda repens* (robin runaway) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Glyceria laxa* (limp mannagrass) (S1G5), *Larix laricina* (tamarack) (S1G5), *Lycopodiella inundata* (inundated clubmoss) (S2?G5), *Vaccinium macrocarpon* (cranberry) (S2G4), *Vaccinium oxycoccos* (small cranberry) (S2G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S2G4Q). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters.

**Fauna observed:** *Colias interior* (pink-edged sulphur) butterfly was observed within this community. Spiders collected include *Araniella displicata* (six-spotted orbweaver), *Argiope trifasciata* (banded garden spider), *Neoscona arabesca* (arabesque orbweaver), *Tetragnatha* sp. (longjawed orbweaver), *Synema parvulum* (crab spider), and *Xysticus* sp. (ground crab spider). Insects from the order Coleoptera (beetles) include *Plateros* sp. (a net-winged beetle), *Cyphon* sp. (a marsh beetle), and species from the families Curculionidae (weevils) and Elateridae (click beetles). From the order Diptera (true flies), specimens were noted including *Diplotoxa* sp. (a frit fly), *Hybos reversus* (a dance fly), *Toxomerus* sp. (a hoverfly), *Chrysops* sp. (a deer fly), and species from the families Ceratopogonidae (biting midges), and Drosophilidae (vinegar and fruit flies). The order Hemiptera (true bugs) included *Oliarus* sp. (a cixiid planthopper) and *Sinea diadema* (an assassin bug). *Bombus* sp. (a bee), *Myrmica* sp. (an ant), and *Conocephalus* sp. (a conehead katydid) were noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex interior</i> (inland sedge)	-	plant	WV species of concern
<i>Carex pauciflora</i> (fewflower sedge)	-	plant	WV species of concern
<i>Coptis trifolia</i> (threeleaf goldthread)	-	plant	WV species of concern
<i>Dalibarda repens</i> (robin runaway)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Larix laricina</i> (tamarack)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. Within this region, there are occurrences in Big Run Bog, Canaan Mountain, Canaan Valley, Cranesville Swamp, Fisher Spring Run and Alder Run on Dolly Sods, and Red Creek Plains. It is also known from The Glades, Maryland.

**Classification Comments:** Sixty-two plots (10 occurrences) represent this type (CEGL006545), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters well together considering that it is a fairly broad group. The ordination shows a fairly good grouping in the saturated, *Sphagnum*-rich portion of species space. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.8, CRSW.11, CRSW.16, CRSW.20, CRSW.25, CVIN.6, CVIN.25, CVIN.27, CVIN.28, CVIN.29, CVIN.31, CVIN.32, CVIN.33, CVIN.37, CVWR.15, CVWR.30, CVWR.32, FRAN.10, FRAN.11, FRAN.18, FRAN.20, FRAN.29, FRAN.32, FRAN.33, FRAN.35, FRAN.45, FRAN.47, FRAN.48, FRAN.50, FRAN.51, FRAN.52, FRAN.53, FRAN.61, FRAN.67, FRAN.69, FRAN.71, FRAN.73, FRAN.99, FRAN.100, FRAN.101, FRAN.102, FRAN.104, FRAN.105, FRAN.110, FRAN.116, FRAN.117, FRAN.127, FRAN.129, MONF.156, MONF.241, ROBI.11, ROBI.17, ROBI.18, ROBI.19, ROBI.34, WALB.3, WALB.4, WALB.7, WALB.8, WALB.9, WALB.13.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Saturated cold-deciduous shrubland (III.B.2.N.g.)
Alliance	<i>Vaccinium corymbosum</i> Saturated Shrubland Alliance (A.1018)
Alliance (English name)	Highbush Blueberry Saturated Shrubland Alliance

Association	<i>Photinia pyrifolia</i> - <i>Ilex verticillata</i> - <i>Nemopanthus mucronatus</i> / <i>Osmunda cinnamomea</i> Saturated Shrubland
Association (English name)	Red Chokeberry - Common Winterberry - Catberry / Cinnamon Fern Saturated Shrubland
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This successional shrubland occurs on saturated, temporarily flooded, or semi-permanently flooded acidic peatlands in the Allegheny Mountains region of West Virginia and Maryland, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0-2 degrees) in headwater basins. Where conditions are favorable, individual stands may be as large as 12 ha. It is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested peatlands that were logged or burned within the last 120 years. It is probably more widespread now than in the past, when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested peatlands of high conservation value, although the recovery rate is slow (perhaps a century) in these frost-pocket habitats. Hummock-and-hollow microtopography is well-developed, with rounded peat-covered hummocks formed over woody stem clusters, decayed wood, and roots. Bedrock may be sandstone or, less commonly, limestone. Soil texture is moderately to very poorly drained peat, with a depth greater than one meter, although in earlier successional stands the peat may be only a few centimeters thick. Mean soil pH is 3.8. The unvegetated surface is predominantly litter, with an average of 5% standing water. This community may occur with either tall-shrub or short-shrub physiognomy, depending on the age of the stand. The shrub species favor hummock tops and typically include *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (common winterberry), *Nemopanthus mucronatus* (catberry), and *Kalmia latifolia* (mountain laurel). Less frequent, but sometimes locally abundant, shrub species are *Vaccinium corymbosum* (highbush blueberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry). Dwarf-shrub species with high constancy include *Rubus hispidus* (bristly dewberry), *Vaccinium oxycoccos* (small cranberry), and *Vaccinium macrocarpon* (cranberry). The herbaceous layer typically occupies hollows and the sides of hummocks. Species with high cover and constancy are *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Species with lower constancy that are sometimes abundant include *Symplocarpus foetidus* (skunk cabbage), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Juncus effusus* (common rush), *Lycopodium obscurum* (rare clubmoss), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Pteridium aquilinum* (western brackenfern), *Gaultheria procumbens* (eastern teaberry), *Carex canescens* (silvery sedge), *Carex gynandra* (nodding sedge), and *Juncus brevicaudatus* (narrowpanicle rush). Nonvascular plants are abundant, dominated by *Sphagnum* spp. and often including high cover by *Polytrichum* spp. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters.

**Environmental Description:** This successional shrubland occurs on saturated, temporarily flooded, or semi-permanently flooded acidic peatlands in the Allegheny Mountains region of West Virginia and Maryland, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat to gently sloping land (0-2 degrees) in headwater basins. Where conditions are favorable, individual stands may be as large as 12 ha. It is part of the natural disturbance mosaic of beaver-influenced vegetation types at high elevations in the Alleghenies, and also occurs on formerly forested peatlands that were logged or burned within the last 120 years. It is probably more widespread now than in the past, when forests covered much of its current habitat. Where natural succession is unhindered, some stands will likely recover to forested peatlands of high conservation value, although the recovery rate is slow (perhaps a century) in these frost-pocket habitats. Hummock-and-hollow microtopography is well-developed, with rounded peat-covered hummocks formed over woody stem clusters, decayed wood, and roots. Bedrock may be sandstone or less commonly limestone. Soil texture is moderately to very poorly drained peat, with a depth greater than one meter, although in earlier successional stands the peat may be only a few centimeters thick.

**Vegetation Description:** This successional shrub peatland occurs in the Allegheny Mountains region of West Virginia and Maryland. It may occur with either tall-shrub or short-shrub physiognomy, depending on the age of the stand. The tall-shrub layer averages 20% cover, growing mostly on hummocks, and typically includes *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Ilex verticillata* (common winterberry), *Nemopanthus mucronatus* (catberry), and *Kalmia latifolia* (mountain laurel). Less frequent, but sometimes locally abundant, shrub species are *Vaccinium corymbosum* (highbush blueberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Vaccinium angustifolium* (lowbush blueberry), and *Gaylussacia baccata* (black huckleberry). The short-shrub stratum averages 35% cover and is similar in composition to the tall-shrub layer. Dwarf-shrub species with high constancy include *Rubus hispidus* (bristly dewberry), *Vaccinium oxycoccos* (small cranberry), and *Vaccinium macrocarpon* (cranberry). The herbaceous layer, with mean 60% cover, typically occupies hollows and the sides of hummocks. Species with high cover and constancy are *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern). Species with lower constancy that are sometimes abundant include *Symplocarpus foetidus* (skunk cabbage), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Juncus effusus* (common rush), *Lycopodium obscurum* (rare clubmoss), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Pteridium aquilinum* (western brackenfern), *Gaultheria procumbens* (eastern teaberry), *Carex canescens* (silvery sedge), *Carex gynandra* (nodding sedge), and *Juncus brevicaudatus* (narrowpanicle rush). Nonvascular plants average 70% cover, dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum fallax*, *Sphagnum magellanicum*, *Sphagnum papillosum*, *Sphagnum capillifolium*, *Sphagnum flexuosum*) and often including high cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum juniperinum*, *Polytrichum strictum*, *Polytrichum ohioense*). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters.

## DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia and Maryland, at elevations between 770 and 1210 m.

**States/Provinces:** MD, WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

## CONSERVATION STATUS

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

## CLASSIFICATION INFORMATION

**Status:** Standard

### Confidence:

**Comments:** Sixty-three plots (10 occurrences) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters well together considering that it is a fairly broad group. The ordination shows a fairly good grouping in the saturated, *Sphagnum*-rich portion of species space. The type has been adequately sampled throughout its range in West Virginia, and nine plots have been sampled in Maryland.

**Similar Associations:** Information not available.

### Related Concepts:

- *Polytrichum* - *Pyrus melanocarpa* - *Vaccinium myrtilloides* hummock bog (Fortney 1975) B
- *Polytrichum* - shrub community (Wieder et al. 1981) =
- *Pyrus melanocarpa* - *Vaccinium myrtilloides* - *Hypericum densiflorum* low shrub community (Robinette 1964) B
- *Viburnum cassinoides* - *Rubus hispidus* - *Pyrus melanocarpa* hummock community (Edens 1973) =

## SOURCES

**Description Authors:** E.A. Byers

**References:** CVI 2005, Eastern Ecology Working Group n.d., Edens 1973, Fortney 1975, Robinette 1964, Walbridge 1982, Wieder et al. 1981

## IV. Dwarf-shrubland

### IV.A.1.N.g. Saturated needle-leaved or microphyllous evergreen dwarf-shrubland

#### Cranberry - Beakrush Peatland

Scientific Name:	<i>Vaccinium oxycoccos</i> - ( <i>Vaccinium macrocarpon</i> ) / <i>Rhynchospora alba</i> / <i>Sphagnum</i> spp. Dwarf Shrub Peatland
Translated Name:	Small Cranberry - (Large Cranberry) / White Beaksedge / Peatmoss Dwarf Shrub Peatland
NVC Name:	CEGL007856: <i>Vaccinium oxycoccos</i> - ( <i>Vaccinium macrocarpon</i> ) / <i>Rhynchospora alba</i> - <i>Drosera rotundifolia</i> / <i>Sphagnum</i> spp. Dwarf-shrubland
Conservation Rank:	S2 / G2

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This dwarf-shrubland occurs on temporarily flooded, semi-permanently flooded, or saturated peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 780 and 1210 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 5-50 cm in height. Bedrock is typically acidic sandstone, and less commonly shale or limestone. The substrate is poorly to very poorly drained peat. Peat deposits are greater than one meter deep in late-successional stands, which typically contain decaying wood fragments within the peat. According to carbon dating of peat at Big Run Bog and Cranberry Glades, some sites have been characterized by bog vegetation for more than 10,000 years. Younger stands often have shallower peat and may contain alluvial lenses of sand or buried clay layers from former beaver ponds. Younger stands sometimes occupy wetter zones within successional shrub peatlands. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, stratified layers, 2 cm muck, depleted matrix, and redox depressions. Mean soil pH is 3.7 (n=10), mean pore water pH is 4.7 (n=14), and electrical conductivity averages 50 micromhos/cm (n=10). Soil chemistry is characterized by high exchangeable nitrogen, total exchange capacity, and organic matter; moderate Al, P, S; and low B, Ca, Cu, Fe, K, Mg, Mn, Na, and Zn (n=10). The unvegetated surface is predominantly litter, with an average of 2% standing water.

**Vegetation Description:** This dwarf-shrubland occurs in the Allegheny Mountains region of West Virginia. It is characterized by a hummocky mat of *Vaccinium oxycoccos* (small cranberry) with *Rhynchospora alba* (white beaksedge) in the hollows on an uneven bed of peat-forming mosses. The short-shrub stratum averages 5% cover and may include *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub layer averages 25% cover and is dominated by *Vaccinium oxycoccos* (small cranberry) with occasional dominance or codominance by *Vaccinium macrocarpon* (cranberry). *Rubus hispidus* (bristly dewberry) has high constancy in this stratum.

The herbaceous layer, with mean 30% cover, is characterized by ombrotrophic bog vegetation with typically northern distribution. Dominant species are *Rhynchospora alba* (white beaksedge) and *Eriophorum virginicum* (tawny cottongrass), with lower cover by *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and *Gentiana linearis* (narrowleaf gentian). This community is subject to invasion by introduced *Sarracenia purpurea* ssp. *gibbosa* (purple pitcherplant). Nonvascular plants average 90% cover, dominated by *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum fallax*, *Sphagnum papillosum*, *Sphagnum flexuosum*, *Sphagnum cuspidatum*, *Sphagnum recurvum*, *Sphagnum magellanicum*) and often including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Indicator species that help to distinguish this community from others within the high-elevation wetlands of the Allegheny Mountains region are *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Rhynchospora alba* (white beaksedge), *Vaccinium macrocarpon* (cranberry), and *Vaccinium oxycoccos* (small cranberry). This community provides habitat for species of conservation concern in West Virginia, including *Calopogon tuberosus* var. *tuberosus* (tuberous grasspink) (S1G5T5), *Carex canescens* (silvery sedge) (S3G5T5), *Carex haydenii* (Hayden's sedge) (S1G5), *Carex pauciflora* (fewflower sedge) (S1G5), *Carex utriculata* (beaked sedge) (S3G5), *Coptis trifolia* (threeleaf goldthread) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Juncus filiformis* (thread rush) (S2G5), *Larix laricina* (tamarack) (S1G5), *Lycopodiella inundata* (inundated clubmoss) (S2?G5), *Platanthera ciliaris* (yellow fringed orchid) (S3G5), *Pogonia ophioglossoides* (snakemouth orchid) (S2G5), *Vaccinium macrocarpon* (cranberry) (S3G4), *Vaccinium oxycoccos* (small cranberry) (S3G5), *Xyris torta* (slender yelloweyed grass) (S2G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S3G4Q). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters.

**Fauna observed:** Small mammals observed within the community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Microtus pensylvanicus* (meadow vole), *Sorex fumeus* (smoky shrew), and *Clethrionomys gapperi* (southern red-backed vole), *Zapus hudsonius* (meadow jumping mouse), and *Blarina brevicauda* (northern short tailed shrew). *Colias philodice* (clouded sulphur) and *Colias interior* (pink-edged sulphur) butterflies were observed within this community. *Cordulegaster maculata* (twin-spotted spiketail), a dragonfly, was collected. Spiders found here included *Neoscona arabesca* (arabesque orbweaver), *Pirata insularis* (pirate wolf spider), *Tetragnatha versicolor* (silver longjawed orbweaver), *Tetragnatha laboriosa* (longjawed orbweaver), and *Misumenops* sp. (flower crab spider).

#### Other Noteworthy Species:

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Calopogon tuberosus</i> var. <i>tuberosus</i> (grasspink)	-		plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-		plant	WV species of concern
<i>Carex haydenii</i> (Hayden's sedge)	-		plant	WV species of concern
<i>Carex pauciflora</i> (fewflower sedge)	-		plant	WV species of concern
<i>Carex utriculata</i> (beaked sedge)	-		plant	WV species of concern
<i>Coptis trifolia</i> (threeleaf goldthread)	-		plant	WV species of concern

<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Juncus filiformis</i> (thread rush)	-	plant	WV species of concern
<i>Larix laricina</i> (tamarack)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern
<i>Platanthera ciliaris</i> (yellow fringed orchid)	-	plant	WV species of concern
<i>Pogonia ophioglossoides</i> (snakemouth orchid)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Xyris torta</i> (slender yelloweyed grass)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region within West Virginia, at elevations between 780 and 1210 m. Within this region, there are occurrences at Big Run Bog, Canaan Mountain, Canaan Valley, Cranberry Glades, Cranesville Swamp, Dolly Sods (Alder Run, Bear Rocks, Dobbins Slashing, Fisher Spring Run), Droop Mountain Bog, and Tub Run.

**Classification Comments:** Twenty-six plots (11 occurrences) represent this type (CEGL007856), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters consistently together and ordines in a close grouping in the ombrotrophic portion of species space. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.5, CRSW.26, CVWR.42, CVWR.43, CVWR.44, DMBG.1, DMBG.2, FRAN.21, FRAN.97, GRAN.11, MONF.116, MONF.122, MONF.128, MONF.129, MONF.130, MONF.132, MONF.158, MONF.159, MONF.233, MONF.234, ROBI.1, ROBI.2, ROBI.3, ROBI.4, TUCK.9, TUCK.10.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Saturated needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.g.)
Alliance	<i>Vaccinium macrocarpon</i> Saturated Dwarf-shrubland Alliance (A.1094)
Alliance (English name)	Large Cranberry Saturated Dwarf-shrubland Alliance
Association	<i>Vaccinium oxycoccos</i> - ( <i>Vaccinium macrocarpon</i> ) / <i>Rhynchospora alba</i> - <i>Drosera rotundifolia</i> / <i>Sphagnum</i> spp. Dwarf-shrubland

Association (English name) Small Cranberry - (Large Cranberry) / White Beaksedge -  
Roundleaf Sundew / Peatmoss species Dwarf-shrubland  
Ecological System(s) Central Interior Highlands and Appalachian Sinkhole and  
Depression Pond (CES202.018)  
High Allegheny Wetland (CES202.069)

#### GLOBAL DESCRIPTION

**Concept Summary:** This dwarf-shrubland occurs on temporarily flooded, semi-permanently flooded, or saturated peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 780 and 1210 m, with a low-elevation outlier in the Great Valley of Virginia at 460 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 5-50 cm in height. The substrate is poorly to very poorly drained peat. Peat deposits are greater than one meter deep in late-successional stands. According to carbon dating of peat at Big Run Bog and Cranberry Glades, some sites have been characterized by bog vegetation for more than 10,000 years. Carbon dating of peat at the Virginia site indicates the presence of wetland vegetation for at least 15,000 years. Younger stands often have shallower peat and may contain alluvial lenses of sand or buried clay layers from former beaver ponds. These younger stands sometimes occupy wetter zones within successional shrub peatlands. Mean soil pH is 3.7. Vegetation is characterized by a hummocky mat of *Vaccinium oxycoccos* (small cranberry) with *Rhynchospora alba* (white beaksedge) in the hollows on an uneven bed of peat-forming mosses. The sparse short-shrub stratum may include *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub layer is dominated by *Vaccinium oxycoccos* (small cranberry) with occasional dominance or codominance by *Vaccinium macrocarpon* (cranberry). *Rubus hispidus* (bristly dewberry) has high constancy in this stratum. The herbaceous layer is characterized by ombrotrophic bog vegetation with typically northern distribution. Dominant species are *Rhynchospora alba* (white beaksedge) and *Eriophorum virginicum* (tawny cottongrass), with lower cover by *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), and *Gentiana linearis* (narrowleaf gentian). Nonvascular plants form a hummocky mat dominated by *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum fallax*, *Sphagnum papillosum*, *Sphagnum flexuosum*, *Sphagnum cuspidatum*, *Sphagnum recurvum*, *Sphagnum magellanicum*) and often including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Indicator species that help to distinguish this community from others within the high-elevation wetlands of the Allegheny Mountains region are *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Rhynchospora alba* (white beaksedge), *Vaccinium macrocarpon* (cranberry), and *Vaccinium oxycoccos* (small cranberry). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters. In Virginia, this community occurs on groundwater-saturated, locally floating peat and sphagnum mats along the shoreline of depression ponds developed by solution and collapse of carbonate rocks underlying acidic colluvial materials deposited on the eastern edge of the Great Valley of Virginia, in Augusta, Rockingham, and southern Page counties, Virginia. This community is dominated by dense mats of *Vaccinium macrocarpon* (cranberry). Associated species include *Calopogon tuberosus* (tuberous grasspink), *Drosera rotundifolia* (roundleaf sundew), *Dulichium arundinaceum* (threeway sedge), *Eriophorum virginicum* (tawny cottongrass), *Juncus canadensis* (Canadian rush), *Pogonia ophioglossoides* (snakemouth orchid), *Rubus hispidus* (bristly

dewberry), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Xyris torta* (slender yelloweyed grass).

**Environmental Description:** This dwarf-shrubland occurs on temporarily flooded, semi-permanently flooded, or saturated peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 780 and 1210 m, with a low-elevation outlier in the Great Valley of Virginia at 460 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 5-50 cm in height. Bedrock is typically acidic sandstone, and less commonly shale or limestone. The substrate is poorly to very poorly drained peat. Peat deposits are greater than one meter deep in late-successional stands, which typically contain decaying wood fragments within the peat. According to carbon dating of peat at Big Run Bog and Cranberry Glades, some sites have been characterized by bog vegetation for more than 10,000 years (Darlington 1943, Wieder 1982). Carbon dating of peat at the Virginia site indicates the presence of wetland vegetation for at least 15,000 years (Craig 1969). Younger stands often have shallower peat and may contain alluvial lenses of sand or buried clay layers from former beaver ponds. These younger stands sometimes occupy wetter zones within successional shrub peatlands. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, stratified layers, 2 cm muck, depleted matrix, and redox depressions. Mean soil pH is 3.7 (n=10), mean pore water pH is 4.7 (n=14), and electrical conductivity averages 50 micromhos/cm (n=10). Soil chemistry is characterized by high exchangeable nitrogen, total exchange capacity, and organic matter; moderate Al, P, S; and low B, Ca, Cu, Fe, K, Mg, Mn, Na, and Zn (n=10). The unvegetated surface is predominantly litter, with an average of 2% standing water. In Virginia, this community is limited to the southern border of Spring Pond at Maple Flats (Buhlmann et al. 1999), a 2-ha (5-acre), cold, permanently flooded pond with water levels constantly replenished by groundwater inputs. The habitat consists of groundwater-saturated, locally floating peat and *Sphagnum* mats along the shoreline [see *Orontium aquaticum* - *Schoenoplectus subterminalis* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL007859) for a description of aquatic vegetation occupying the flooded pond itself].

**Vegetation Description:** This dwarf-shrubland occurs in the Allegheny Mountains region of West Virginia with a low-elevation outlier in the Great Valley of Virginia. In West Virginia, it is characterized by a hummocky mat of *Vaccinium oxycoccos* (small cranberry) with *Rhynchospora alba* (white beaksedge) in the hollows on an uneven bed of peat-forming mosses. The short-shrub stratum averages 5% cover and may include *Photinia melanocarpa* (black chokeberry), *Photinia pyrifolia* (red chokeberry), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub layer averages 25% cover and is dominated by *Vaccinium oxycoccos* (small cranberry) with occasional dominance or codominance by *Vaccinium macrocarpon* (cranberry). *Rubus hispidus* (bristly dewberry) has high constancy in this stratum. The herbaceous layer, with mean 30% cover, is characterized by ombrotrophic bog vegetation with typically northern distribution. Dominant species are *Rhynchospora alba* (white beaksedge) and *Eriophorum virginicum* (tawny cottongrass), with lower cover by *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Solidago uliginosa* (bog goldenrod), *Gentiana linearis* (narrowleaf gentian), *Calopogon tuberosus* var. *tuberosus* (tuberous grasspink), *Carex pauciflora* (fewflower sedge), *Gaultheria hispidula* (creeping snowberry), *Juncus filiformis* (thread rush), *Lycopodiella inundata* (inundated

clubmoss), *Platanthera ciliaris* (yellow fringed orchid), *Pogonia ophioglossoides* (snakemouth orchid), *Xyris torta* (slender yelloweyed grass), and *Zigadenus leimanthoides* (pinebarren deathcamas). This community is subject to invasion by introduced *Sarracenia purpurea* ssp. *gibbosa* (purple pitcherplant). Nonvascular plants average 90% cover, dominated by *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum fallax*, *Sphagnum papillosum*, *Sphagnum flexuosum*, *Sphagnum cuspidatum*, *Sphagnum recurvum*, *Sphagnum magellanicum*) and often including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Indicator species that help to distinguish this community from others within the high-elevation wetlands of the Allegheny Mountains region are *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Rhynchospora alba* (white beaksedge), *Vaccinium macrocarpon* (cranberry), and *Vaccinium oxycoccos* (small cranberry). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters for 26 plots in West Virginia. In Virginia, the vegetation is dominated by dense mats of the dwarf-shrub *Vaccinium macrocarpon* (cranberry) rooted in *Sphagnum* mosses. Associated species include *Calopogon tuberosus* (tuberous grasspink), *Drosera rotundifolia* (roundleaf sundew), *Dulichium arundinaceum* (threeway sedge), *Eriophorum virginicum* (tawny cottongrass), *Juncus canadensis* (Canadian rush), *Platanthera ciliaris* (yellow fringed orchid), *Pogonia ophioglossoides* (snakemouth orchid), *Rubus hispidus* (bristly dewberry), *Triadenum virginicum* (Virginia marsh St. Johnswort), and *Xyris torta* (slender yelloweyed grass).

**Characteristic Species:** *Calopogon tuberosus* (tuberous grasspink), *Drosera rotundifolia* (roundleaf sundew), *Eriophorum virginicum* (tawny cottongrass), *Pogonia ophioglossoides* (snakemouth orchid), *Vaccinium macrocarpon* (cranberry), *Xyris torta* (slender yelloweyed grass)

**USFWS Wetland System:** Palustrine

#### **DISTRIBUTION**

**Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 780 and 1210 m, and from the Maple Flats Pond complex in Augusta County, Virginia, at an elevation of 460 m.

**States/Provinces:** VA, WV:S2

**Federal Lands:** USFS (George Washington, Monongahela); USFWS (Canaan Valley)

#### **CONSERVATION STATUS**

**Rank:** G2 (11-May-2007)

**Reasons:** This is a small-patch type with about a dozen known viable occurrences, five of which occur in protected settings including a TNC nature preserve, USFS Research Botanical Area, USFS Wilderness Area, or USFWS refuge. It has very narrow environmental specificity and high intrinsic vulnerability.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Twenty-six plots (11 occurrences) represent this type in West Virginia, where it was classified as part of a 2004-2006 study of high-elevation wetlands in the Allegheny Mountains region. This type clusters consistently together and ordinales in a close grouping in the ombrotrophic portion of species space. The type has been adequately sampled throughout its

range in West Virginia. The Virginia occurrence is probably a low-elevation (460 m) outlier of the high Allegheny type. In Virginia, beaver activity in recent years has raised water levels as much as 0.7 m in Spring Pond and has damaged, but not destroyed, the peat mats supporting this community (G.P. Fleming pers. comm.). *Sarracenia purpurea* (purple pitcherplant) has been introduced to this habitat in Virginia and West Virginia. This community needs to be compared to possibly related communities. It shows considerable affinities to other boggy communities with abundant *Vaccinium macrocarpon* (cranberry), recognized for areas north of Virginia, as well as cranberry zones in "bogs" of the Southern Blue Ridge (which have not been recognized separately in the National Vegetation Classification).

**Similar Associations:**

- *Carex oligosperma* - *Carex pauciflora* - *Eriophorum vaginatum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL005256)--was formerly CEG002539.
- *Cladium mariscoides* / *Vaccinium macrocarpon* - *Morella pensylvanica* Dwarf-shrubland (CEGL006141)
- *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570)
- *Sphagnum (cuspidatum, torreyanum)* - *Vaccinium macrocarpon* Nonvascular Vegetation (CEGL006394)
- *Sphagnum rubellum* - *Vaccinium oxycoccos* Nonvascular Vegetation (CEGL006135)

**Related Concepts:**

- *Polytrichum* - *Sphagnum* hummocks, wet type (Gibson 1982b) =
- *Sphagnum* - *Vaccinium oxycoccos* - *Rhynchospora alba* association (Darlington 1943) =
- *Sphagnum* - beakrush community (Robinette 1966) F
- *Sphagnum* - cranberry community (Robinette 1966) F
- *Vaccinium macrocarpon* - *Pogonia ophioglossoides* community (Fleming and Van Alstine 1999) ?
- *Vaccinium macrocarpon* / *Pogonia ophioglossoides* Dwarf-Shrubland [Provisional] (Fleming and Coulling 2001) ?

**SOURCES**

**Description Authors:** G. Fleming and P. Coulling, mod. E.A. Byers and G. Fleming

**References:** Buhlmann et al. 1999, Craig 1969, Darlington 1943, Fleming and Coulling 2001, Fleming and Van Alstine 1999, Fleming et al. 2001, Francl 2003, Gibson 1982b, Robinette 1966, Southeastern Ecology Working Group n.d., Wieder 1982

## V. Herbaceous vegetation

### V.A.5.N.j. Temporarily flooded temperate or subpolar grassland

#### Hairy-fruit Sedge Floodplain Prairie

**Scientific Name:** *Carex trichocarpa* Floodplain Prairie  
**Translated Name:** Hairy-fruit Sedge Floodplain Prairie  
**NVC Name:** CEG1006447: *Carex trichocarpa* Herbaceous Vegetation  
**Conservation Rank:** S1 / G3

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous floodplain prairie occurs on temporarily flooded alluvial deposits in the Allegheny Mountains region of West Virginia, at elevations between 830 and 890 m. It is a small-patch type that occupies flat to gently sloping (0- to 3-degree slopes) depositional bars along mid- to high-gradient, third- or fourth-order streams. Occasional flood deposition keeps this community open and prevents build-up of organic material in the substrate. Flooding can occur at any time of year. Ice-scour may also affect this community during high winter flows. Bedrock at the 4 sampled sites is Devonian shale (Hampshire Formation). The community occurs on moderately poorly to well-drained sandy loam or silt loam with pH averaging 4.8 (n=4), underlain by fluvial deposits including stratified sediments, cobbles, and organic inclusions. Hydric soil indicators include alluvial depleted matrix and iron/manganese masses. Soil chemistry is characterized by high Cu, Mn, Zn; moderate Ca, Fe, P; and low Al, B, K, Mg, Na, S, exchangeable nitrogen, total exchange capacity, and organic matter (n=4). The unvegetated surface averages 65% litter and 35% bare ground, with a trace amount of woody debris.

**Vegetation Description:** This herbaceous floodplain prairie occurs in the Allegheny Mountains region of West Virginia. The community is characterized by dense rhizomatous stands of *Carex trichocarpa* (hairyfruit sedge), which can tolerate annual sediment deposition and occasional high-energy ice-scour. A trace amount of shrub cover may be present, including *Hypericum densiflorum* (bushy St. Johnswort), *Hypericum prolificum* (shrubby St. Johnswort), or *Salix sericea* (silky willow). The herbaceous layer, averaging 95% cover, is strongly dominated by *Carex trichocarpa* (hairyfruit sedge). This type is susceptible to invasion by *Phalaris arundinacea* (reed canarygrass), which has dominance in one sampled plot. Along the river edge, this community typically abuts a strip of *Carex torta* (twisted sedge). Away from the river, this community may interfinger with drier tall-herb floodplain types. Species with high constancy but low cover include *Dichanthelium clandestinum* (deertongue), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Verbena hastata* var. *hastata* (swamp verbena), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Asclepias syriaca* (common milkweed), *Clematis virginiana* (virgin's bower), *Arisaema triphyllum* (Jack in the pulpit), *Onoclea sensibilis* (sensitive fern), *Lilium superbum* (turk's-cap lily), *Carex projecta* (necklace sedge), *Thalictrum pubescens* (king of the meadow), *Veratrum viride* (green false hellebore), *Elymus riparius* (riverbank wildrye), and *Solidago rugosa* (winkleleaf goldenrod). Cover by nonvascular plants is insignificant. This community provides habitat for species of conservation concern in West

Virginia, including *Carex projecta* (necklace sedge) (S3G5), *Carex trichocarpa* (hairyfruit sedge) (S1G4), and *Scirpus microcarpus* (panicled bulrush) (S3G5). Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Asclepias syriaca* (common milkweed), *Carex trichocarpa* (hairyfruit sedge), and *Phalaris arundinacea* (reed canarygrass). Mean species richness of vascular plants is 27 taxa per 400 square meters.

**Fauna observed:** Butterfly species observed in this community include *Papilio* sp. (a tiger swallowtail). Insects noted were from the order Diptera (true flies). They included species of Asilidae (robber Flies), *Condylostylus* sp. (a long-legged fly), and *Lonchoptera* sp. (a spear-winged fly).

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Carex projecta</i> (necklace sedge)	-	plant	WV species of concern
<i>Carex trichocarpa</i> (hairyfruit sedge)	-	plant	WV species of concern
<i>Scirpus microcarpus</i> (panicled bulrush)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia at elevations between 830 and 890 m. The two known occurrences are along the West Fork of the Greenbrier River and the Glady Fork of the Cheat River.

**Classification Comments:** Four plots (2 occurrences) represent this type (CEGL006447), which was classified as part of a 2006 analysis of palustrine plots statewide. This type clusters consistently together, adjacent to the West Virginia riverscour clades but never mixing with them. It ordinales in its own section of species space, near the riverscour and tall-herb floodplain types. The community is known from only 4 locations to date, all of which have been sampled, but it almost certainly repeats along less-visited reaches of the two rivers where it has been found.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.98, MONF.100, MONF.190, MONF.193.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	<i>Carex torta</i> Temporarily Flooded Herbaceous Alliance (A.1340)
Alliance (English name)	Twisted Sedge Temporarily Flooded Herbaceous Alliance
Association	<i>Carex trichocarpa</i> Herbaceous Vegetation
Association (English name)	Hairy-fruit Sedge Herbaceous Vegetation
Ecological System(s)	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609)

## GLOBAL DESCRIPTION

**Concept Summary:** This association occurs 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* (hairyfruit sedge) is the dominant species in this association. Shrubs may be present but at less than 25% cover, including *Rosa multiflora* (multiflora rose), *Cornus amomum* (silky dogwood), and *Rubus allegheniensis* (Allegheny blackberry). This type is susceptible to invasion by *Phalaris arundinacea* (reed canarygrass). Other common herbaceous species include *Solidago gigantea* (giant goldenrod), *Boehmeria cylindrica* (smallspike false nettle), *Dichanthelium clandestinum* (deertongue), *Urtica dioica* (stinging nettle), *Polygonum* (knotweed) spp., *Scirpus cyperinus* (woolgrass), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Verbena hastata* var. *hastata* (swamp verbena), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Asclepias syriaca* (common milkweed), *Arisaema triphyllum* (Jack in the pulpit), *Onoclea sensibilis* (sensitive fern), and *Lilium superbum* (turk's-cap lily). Vines may be present at low cover, including *Polygonum convolvulus* (black bindweed) and *Clematis virginiana* (virgin's bower).

**Environmental Description:** This association is found occasionally in small patches on floodplain edges, deposition bars, and islands where tree canopy is lacking. It occurs along 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. In New Jersey and Pennsylvania, typical soils include coarse loamy to sandy, somewhat poorly to very poorly drained glacio-fluvial deposits. In West Virginia, the community occurs on moderately poorly to well-drained sandy loam or silt loam with pH averaging 4.8 (n=4), underlain by fluvial deposits including stratified sediments, cobbles, and organic inclusions. Hydric soil indicators include alluvial depleted matrix and iron/manganese masses.

**Vegetation Description:** This herbaceous floodplain prairie occurs in the mid-Atlantic region and Central Appalachians. The community is dominated by dense rhizomatous stands of *Carex trichocarpa* (hairyfruit sedge), which can tolerate annual sediment deposition and occasional high-energy ice-scour. Shrubs may be present but at less than 25% cover, including *Rosa multiflora* (multiflora rose), *Cornus amomum* (silky dogwood), and *Rubus allegheniensis* (Allegheny blackberry). This type is susceptible to invasion by *Phalaris arundinacea* (reed canarygrass). Other common herbaceous species include *Solidago gigantea* (giant goldenrod), *Boehmeria cylindrica* (smallspike false nettle), *Dichanthelium clandestinum* (deertongue), *Urtica dioica* (stinging nettle), *Polygonum* (knotweed) spp., *Scirpus cyperinus* (woolgrass), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Verbena hastata* var. *hastata* (swamp verbena), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Asclepias syriaca* (common milkweed), *Arisaema triphyllum* (Jack in the pulpit), *Onoclea sensibilis* (sensitive fern), *Lilium*

*superbum* (turk's-cap lily), *Carex projecta* (necklace sedge), *Thalictrum pubescens* (king of the meadow), *Veratrum viride* (green false hellebore), *Elymus riparius* (riverbank wildrye), and *Solidago rugosa* (wrinkleleaf goldenrod). Vines may be present at low cover, including *Polygonum convolvulus* (black bindweed) and *Clematis virginiana* (virgin's bower). Cover by nonvascular plants is insignificant. Mean species richness of vascular plants is 27 taxa per 400 square meters for 4 plots in West Virginia.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex trichocarpa</i> (hairyfruit sedge)

**Characteristic Species:** *Boehmeria cylindrica* (smallspike false nettle), *Carex trichocarpa* (hairyfruit sedge), *Cornus amomum* (silky dogwood), *Dichantheium clandestinum* (deertongue), *Solidago gigantea* (giant goldenrod)

**DISTRIBUTION**

**Range:** This community occurs in northern New Jersey, northeastern Pennsylvania, southeastern New York, and the Allegheny Mountains region of West Virginia.

**States/Provinces:** NJ, NY, PA:S3, WV:S1

**Federal Lands:** NPS (Delaware Water Gap, Upper Delaware)

**CONSERVATION STATUS**

**Rank:** G3 (15-May-2007)

**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* (reed canarygrass) invasion) in West Virginia. Its status north and east of Pennsylvania is unknown.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** This community is described from the Delaware Water Gap, where it is distinct although often narrow and linear, and from the Central Appalachians of West Virginia. In West Virginia, it is represented by 4 plots (2 occurrences), which cluster consistently and ordinate closely, near the high-elevation riverscours and tall-herb floodplain types. Occurrence elsewhere in the northeastern U.S. needs to be documented.

**Similar Associations:** Information not available.

**Related Concepts:** Information not available.

**SOURCES**

**Description Authors:** S.C. Gawler, mod. E.A. Byers

**References:** Eastern Ecology Working Group n.d., Podniesinski pers. comm.

## Twisted Sedge Riverscour Prairie

**Scientific Name:** *Carex torta* Riverscour Prairie  
**Translated Name:** Twisted Sedge Riverscour Prairie  
**NVC Name:** CEG1004103: *Carex torta* Herbaceous Vegetation  
**Conservation Rank:** S3 / G3G4

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous riverscour prairie occurs in small, discontinuous linear patches along streambanks and channel bars in high-gradient streams in the Allegheny Mountains region, the New River, and probably elsewhere in West Virginia. It is known to occur at elevations from 390 to 1200 m above sea level. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Tough-rooted perennial sedges are rooted in rock crevices and between cobbles, where sediments accumulate during floods. Large floods likely wipe out individual patches from time to time, but the community will persist as long as the natural flood regime is maintained. The community is often partially shaded by overhanging trees. It occurs on temporarily flooded, moderately to poorly drained sand with pH averaging 6.5 (n=5). Organic soils are not present. Soil chemistry is characterized by high Cu, Mn; moderate B, Ca, Mg; and low Al, N, Fe, K, Na, P, S, total exchange capacity, Zn, and organic matter (n=3). The unvegetated surface averages 35% large rocks, 14% small rocks, 22% sand, 15% litter, 1% wood, and 13% water.

**Vegetation Description:** This community is characterized by the tough-rooted herbaceous perennial *Carex torta* (twisted sedge), which is tolerant of high-energy flood-scouring. An overhanging canopy with an average 20% cover typically may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Overhanging shrubs have an average 10% cover and often include *Rhododendron maximum* (great laurel). The herbaceous layer, averaging 53%, is strongly dominated by *Carex torta* (twisted sedge). Species with high constancy but much lower cover include *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Symphotrichum prenanthoides* (crookedstem aster), *Prunella vulgaris* (common selfheal), *Thalictrum* (meadow-rue) spp., *Hypericum perforatum* (common St. Johnswort), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Solidago rugosa* (wrinkleleaf goldenrod), *Dichanthelium clandestinum* (deertongue), *Verbesina alternifolia* (wingstem), and *Polygonum sagittatum* (arrowleaf tearthumb). Cover by nonvascular plants is insignificant. This community provides habitat for *Glyceria grandis* var. *grandis* (American mannagrass) (S2G5T5), a species of conservation concern in West Virginia. Mean species richness of vascular plants is 36 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

**Fauna observed:** A spider of the order Opiliones (harvestmen) was noted.

### Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Glyceria grandis</i> var. <i>grandis</i> (Amer. mannagrass)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region and the New River at elevations between 390 and 1200 m. Its range probably extends along high-

gradient streams throughout the state. Specific occurrences are known from the Williams River, Upper Shavers Fork River, Mann's Creek, and Glade Creek.

**Classification Comments:** Six plots represent this type (CEGL004103), which was classified as part of a 2006 analysis of palustrine plots statewide. The type clusters in three disparate groups: (1) three closely related plots from the high-elevation wetlands of the Allegheny Mountains region; (2) two very closely related plots from Mann's Creek in the New River; and (3) a third isolated plot from Glade Creek in the New River. Eventual sampling of this type in other parts of the state will likely reveal more of a continuum between floristic assemblages.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.67, MONF.69, MONF.149, NERI.38, NERI.311, NERI.313.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	<i>Carex torta</i> Temporarily Flooded Herbaceous Alliance (A.1340)
Alliance (English name)	Twisted Sedge Temporarily Flooded Herbaceous Alliance
Association	<i>Carex torta</i> Herbaceous Vegetation
Association (English name)	Twisted Sedge Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) Cumberland Riverscour (CES202.036) Central Appalachian River Floodplain (CES202.608) South-Central Interior Large Floodplain (CES202.705) South-Central Interior Small Stream and Riparian (CES202.706)

### GLOBAL DESCRIPTION

**Concept Summary:** This association accommodates herbaceous alluvial wetlands in which *Carex torta* (twisted sedge) is a dominant or characteristic species. It occupies sand, gravel, and rock bars along small rivers and streams in valleys and gorges in the Southern Appalachians, ranging west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. This association is characterized by light-requiring, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* (twisted sedge) often forms dense, extensive colonies. Associated species vary with geography but can include *Polygonum sagittatum* (arrowleaf tearthumb), *Dichanthelium clandestinum* (deertongue), *Solidago rugosa* ssp. *aspera* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Equisetum arvense* (field horsetail), *Onoclea sensibilis* (sensitive fern), *Vernonia noveboracensis* (New York ironweed), *Lycopus virginicus* (Virginia water horehound), *Lobelia cardinalis* (cardinalflower), *Symphotrichum dumosum* (rice button aster), *Lycopus virginicus* (Virginia water horehound), *Osmunda regalis* (royal fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eupatorium fistulosum* (trumpetweed), *Solidago patula* (roundleaf goldenrod), *Boehmeria cylindrica* (smallspike false nettle), *Amphicarpaea bracteata* (American hogpeanut), *Acalypha rhomboidea* (Virginia threeseed mercury), *Hypericum mutilum*

(dwarf St. Johnswort), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), and *Symphyotrichum lateriflorum* (calico aster). Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop), *Polygonum caespitosum* var. *longisetum* (oriental ladysthumb), and other weedy exotics.

**Environmental Description:** This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Flooding duration is probably similar to that documented along Passage Creek in Shenandoah County, Virginia, by Hupp (1982). In that drainage, the channel shelf was inundated approximately 15% of the time. Elevations in West Virginia range from 390-1200 m. Soils are moderately to poorly drained sand with pH averaging 6.5 (n=5). Organic soils are not present. Soil chemistry is characterized by high Cu, Mn; moderate B, Ca, Mg; and low Al, ENR, Fe, H, K, Na, P, S, TEC, Zn, and organic matter (n=3).

**Vegetation Description:** Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* (twisted sedge) is usually the dominant species and typically forms dense, extensive colonies. Associated species vary with geography. *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod), and *Dichanthelium clandestinum* (deertongue) are typical; others include *Acalypha rhomboidea* (Virginia threeseed mercury), *Amphicarpaea bracteata* (American hogpeanut), *Boehmeria cylindrica* (smallspike false nettle), *Equisetum arvense* (field horsetail), *Eupatorium fistulosum* (trumpetweed), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Juncus effusus* (common rush), *Hypericum mutilum* (dwarf St. Johnswort), *Hypericum perforatum* (common St. Johnswort), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Prunella vulgaris* (common selfheal), *Solidago patula* (roundleaf goldenrod), *Symphyotrichum dumosum* (rice button aster), *Symphyotrichum lateriflorum* (calico aster), *Symphyotrichum prenanthoides* (crookedstem aster), *Thalictrum* (meadow-rue) spp., *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Verbesina alternifolia* (wingstem), and *Vernonia noveboracensis* (New York ironweed). Cover by nonvascular plants is insignificant. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), *Cornus amomum* (silky dogwood), *Alnus serrulata* (hazel alder), and *Carpinus caroliniana* (American hornbeam) are present in some stands. An overhanging canopy with an average cover of 20% may include *Platanus occidentalis* (American sycamore), *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), or *Acer rubrum* (red maple). Sparse overhanging shrubs often include *Rhododendron maximum* (great laurel). Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum* (Nepalese browntop),

*Polygonum caespitosum* var. *longisetum* (oriental ladythumb), and other weedy exotics. Mean species richness of vascular plants in six West Virginia plots was 36 taxa per 400 square meters, with most of the diversity in the herbaceous stratum.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex torta</i> (twisted sedge)

**Characteristic Species:** *Carex torta* (twisted sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Solidago rugosa* (wrinkleleaf goldenrod)

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont.

**States/Provinces:** AL, DE:S1?, GA, KY, MD, NC, PA, SC, TN, VA:S2?, WV:S3

**Federal Lands:** NPS (Blue Ridge Parkway?, C&O Canal, Catoctin Mountain, Great Smoky Mountains, New River Gorge, Prince William); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont))

**CONSERVATION STATUS**

**Rank:** G3G4 (21-Jan-2000)

**Reasons:** This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. Although this community has a moderately large geographic range, it is uncommon within its range and occurrences are small. This community is more common than the number of documented occurrences would suggest, since it is often overlooked in inventories.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Information not available.

**Similar Associations:**

- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation (CEGL006536)

**Related Concepts:**

- *Carex torta* Association (Fleming and Moorhead 1996) ?
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001) ?
- *Carex torta* riparian herbaceous vegetation (Vanderhorst 2001b) =
- *Carex torta* riverscour prairie =
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B
- Riverine Upper and Lower Perennial Beach/Bar, Cobble/Gravel, Seasonally Flooded (R2and3BB1C) (Cowardin et al. 1979) ?
- Riverine Upper and Lower Perennial Beach/Bar, Sand, Seasonally Flooded (R2and3BB2C) (Cowardin et al. 1979) ?
- Rocky Bar and Shore (Twisted Sedge Subtype) (Schafale 1998b) ?

- Sedge - spotted joe pye weed riverine herbaceous vegetation (Perles et al. 2004) =
- Torturous sedge gravel rivershore (CAP pers. comm. 1998) ?

#### SOURCES

**Description Authors:** G. Fleming and P. Coulling, mod. G. Fleming and S.C. Gawler

**References:** Allard 1990, Bowman 2000, CAP pers. comm. 1998, Cowardin et al. 1979, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Fleming et al. 2004, Hupp 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, Palmer-Ball et al. 1988, Peet et al. unpubl. data 2002, Perles et al. 2004, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Schafale pers. comm., Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007

### V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

#### American Bur-reed Marsh

**Scientific Name:** *Sparganium (americanum, chlorocarpum)* Marsh

**Translated Name:** (American Bur-reed, Small Bur-reed) Marsh

**NVC Name:** CEG1004510: *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation

**Conservation Rank:** S2 / G2G3

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This early-successional marsh occurs on temporarily to permanently flooded soils in West Virginia's Allegheny Mountains region, New River Gorge National River, and Short Mountain, at elevations between 630 and 1300 m. It probably occurs elsewhere in the state within this approximate altitudinal range. The type occurs in small patches in wetlands influenced by beaver activity. While individual patches may be ephemeral, this community is likely to be present on the landscape as long as a beaver-influenced disturbance regime persists. It occurs in the most poorly drained areas of these wetlands, and there is usually standing water and/or saturated soils throughout the year. There are often dead standing trees in this community which indicate past forest physiognomy prior to inundation by beaver damming. Soils are variable and may consist of poorly to very poorly drained muck, or organic-rich loamy soils of varying texture. Average depth of organic soil is 35 cm. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, 2 cm muck, sandy gleyed matrix, depleted matrix, redox depressions, and iron/manganese masses. Soil pH averages 4.4 (n=7). Mean pore water pH is 6.1 and electrical conductivity averages 360 micromhos/cm (n=3). Soil chemistry is characterized by high Al, B, Fe, Na, S; moderate Ca, Cu, H, K, Mg, Zn, exchangeable nitrogen, and total exchange capacity; and low Mn, P, and organic matter (n=7). The average unvegetated surface is 40% litter, 30% standing water, 5% downed wood, and 25% bare soil (n=9).

**Vegetation Description:** This successional herbaceous marsh occurs in beaver-influenced wetlands throughout the state. It is strongly dominated by *Sparganium americanum* (American bur-reed), which is generally replaced by *Sparganium chlorocarpum* (small bur-reed) at elevations above 900 m. A sparse shrub layer (average 7% cover) often includes *Hypericum*

*densiflorum* (bushy St. Johnswort). The herbaceous layer averages 75% cover. In addition to the dominant *Sparganium* (bur-reed) spp., species with high constancy are *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and *Lycopus uniflorus* (northern bugleweed). Additional herbaceous species that commonly occur in this type include *Scirpus cyperinus* (woolgrass) and other *Scirpus* (bulrush) spp. or *Schoenoplectus* (bulrush) spp., *Ludwigia palustris* (marsh seedbox), *Carex lurida* (shallow sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Callitriche heterophylla* ssp. *heterophylla* (twoheaded water-starwort), *Impatiens capensis* (jewelweed), and *Agrostis hyemalis* (winter bentgrass). Nonvascular plants average only 4% cover, typically including *Sphagnum* spp. The indicator species that help to distinguish this community from others within the herbaceous physiognomy in West Virginia are *Sparganium americanum* (American bur-reed), *Callitriche* (water-starwort) spp., *Eleocharis obtusa* (blunt spikerush), and *Sparganium chlorocarpum* (small bur-reed). This community provides habitat for plant species of conservation concern in West Virginia, including *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), *Carex canescens* (silvery sedge) (S3G5T5), *Carex seorsa* (weak stellate sedge) (S1G4), *Glyceria laxa* (limp mannagrass) (S1G5), *Schoenoplectus purshianus* (weakstalk bulrush) (S3G4G5), and *Torreyochloa pallida* var. *fernaldii* (Fernald's false mannagrass) (S2G5?T4Q). Species richness ranges from 2 to 45, with the mean species richness of vascular plants and any nonvascular plants with cover >1% equal to 20 taxa per 400 square meters.

**Fauna observed:** *Papilio* sp. (tiger swallowtail) butterflies were observed within this community. Odonates observed include *Sympetrum* sp. (meadow hawk), *Libellula lydia* (common whitetail), *Libellula pulchella* (twelve-spotted skimmer), *Aeshna umbrosa* (shadow darter), *Anax junius* (green darter), *Ischnura verticalis* (common forktail), and *Nehalennia Irene* (sedge sprite). Spiders include *Neoscona arabesca* (arabesque orbweaver), *Trochosa terricola* (wolf spider), and *Misumenops* sp. (flower crab spider). Insects from four orders were collected in this community type. In the order Diptera (true flies), *Lonchoptera* sp. and shore flies including Anthomyiidae, Dolichopodidae, *Ochthera* sp. were collected. From the order Hemiptera (true bugs), *Philaenus spumarius* (a spittlebug), *Helochara communis* (a leafhopper), and *Trigonotylus* sp. (a plant bug) were noted. The order Hymenoptera (ants, bees, and wasps) included *Lasioglossum* sp. (a sweat bee). Species from Trichoptera (caddisflies) include *Banksiola dossuaria*, *Platycentropus radiatus*, and the nearctic species *Nemotaulius hostilis* (Stout and Stout 1989).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-		plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-		plant	WV species of concern
<i>Carex seorsa</i> (weak stellate sedge)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Schoenoplectus purshianus</i> (weakstalk bulrush)	-		plant	WV species of concern
<i>Torreyochloa pallida</i> var. <i>fernaldii</i> (mannagrass)	-		plant	WV species of concern

**West Virginia Range:** This community is known from West Virginia's Allegheny Mountains region, Ridge and Valley region, and the New River Gorge National River, at elevations between

630 and 1300 m. It probably occurs elsewhere in the state as well. Specific occurrences are known from the Allegheny Mountains region at Big Clear Creek, Big Cove and Glade Run in Canaan Valley, Difficult Creek in Grant County, Piney Swamp, Tea Creek, and the Upper Shavers Fork of the Cheat River. In the New River Gorge National River, occurrences are known from Kate's Branch and Dowdy Creek. The community is also known from Meadow Run at Short Mountain in the Ridge and Valley region.

**Classification Comments:** Fourteen plots represent this type (CEGL004510), which was classified as part of a 2006 analysis of palustrine plots statewide. The type in West Virginia differs from the globally described type in that it does not contain *Epilobium leptophyllum* (bog willowherb). The West Virginia type clusters consistently but ordinales fairly loosely, reflecting its successional nature. Two subtypes are present in West Virginia: (1) a higher elevation subtype dominated by *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed), and (2) a lower elevation, more broadly distributed subtype dominated by *Sparganium americanum* (American bur-reed). Taxonomic placement of *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed) is problematic. Traditionally called *Sparganium chlorocarpum* (simplestem bur-reed) by Strausbaugh and Core (1978) in West Virginia, it has since been treated as a subspecies of *Sparganium erectum* (simplestem bur-reed) and also as part of *Sparganium emersum* and *Sparganium angustatum* (FNA Editorial Committee 2000).

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.11, CVWR.41, GRAN.7, GREE.3, MINE.5, MONF.111, MONF.139, MONF.153, NERI.21, NERI.83, NERI.89, NERI.291, NERI.302, SHMO.95.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Sparganium americanum</i> Seasonally Flooded Herbaceous Alliance (A.1388)
Alliance (English name)	American Bur-reed Seasonally Flooded Herbaceous Alliance
Association	<i>Sparganium americanum</i> - ( <i>Sparganium erectum</i> ssp. <i>stoloniferum</i> ) - <i>Epilobium leptophyllum</i> Herbaceous Vegetation
Association (English name)	American Bur-reed - (Simple-stem Bur-reed) - Bog Willowherb Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018) High Allegheny Wetland (CES202.069) South-Central Interior Small Stream and Riparian (CES202.706)

## GLOBAL DESCRIPTION

**Concept Summary:** This vegetation occupies marshes and small streams with seasonal flooding, especially in areas currently or formerly flooded by beavers. *Sparganium americanum* (American bur-reed) strongly dominates the dense herb layer, although at elevations above 900 m in the Allegheny Mountains, it is generally replaced by *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed). Other species vary with geography and may include *Epilobium leptophyllum* (bog willowherb), *Epilobium coloratum* (purpleleaf willowherb), *Hypericum mutilum* (dwarf St. Johnswort), *Juncus effusus* (common rush), *Lycopus uniflorus* (northern bugleweed), *Polygonum punctatum* (dotted smartweed), *Potamogeton* (pondweed) sp., *Ludwigia palustris* (marsh seedbox), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and others. A very sparse shrub layer may be present.

**Environmental Description:** This vegetation occupies marshes and small streams with seasonal flooding, especially in areas currently or formerly flooded by beavers. In the Allegheny Mountains area, it occurs within northern hardwood or red spruce forest zones at 600 to 1300 m elevation. In Virginia, it is restricted to gentle, upper-slope streamhead valleys above 1060 m (3500 feet) elevation, where it occurs in patch-mosaics with wet spruce forests, sphagnum seepage bogs, and open to scrubby meadows. Most sites were heavily altered by logging in the late 1800s through the early 1900s, and this disturbance may have altered the distribution, cover, and physiognomy of these wetlands. Soils are variable and may consist of poorly to very poorly drained muck, or organic-rich loamy soils of varying texture. Average depth of organic soil is 35 cm. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, 2 cm muck, sandy gleyed matrix, depleted matrix, redox depressions, and iron/manganese masses. Soil pH averages 4.4 (n=7) and can be as low as 3.9. Soil chemistry is characterized by high Al, B, Fe, Na, S; moderate Ca, Cu, K, Mg, Zn, exchangeable nitrogen, and total exchange capacity; and low Mn, P, and organic matter (n=7).

**Vegetation Description:** Vegetation of this community type is almost entirely herbaceous, although some stands may have a sparse (<10%) shrub layer. *Sparganium americanum* (American bur-reed) strongly dominates the dense herb layer. Associated species include *Epilobium leptophyllum* (bog willowherb), *Epilobium coloratum* (purpleleaf willowherb), *Polygonum punctatum* (dotted smartweed), *Potamogeton* (pondweed) sp., *Ludwigia palustris* (marsh seedbox), and others. In the Allegheny Mountains, *Sparganium americanum* (American bur-reed) and *Scirpus expansus* (woodland bulrush) dominate in variable proportions. At elevations above 900 m in the Allegheny Mountains, *Sparganium americanum* (American bur-reed) is generally replaced by *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed). Common associates include *Carex scoparia* (broom sedge), *Carex gynandra* (nodding sedge), *Carex stipata* (owlfruit sedge), *Epilobium leptophyllum* (bog willowherb), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Hydrocotyle americana* (American marshpennywort), *Impatiens capensis* (jewelweed), *Poa palustris* (fowl bluegrass), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus hattorianus* (mosquito bulrush), *Scutellaria lateriflora* (blue skullcap), *Solidago rugosa* (wrinkleleaf goldenrod), *Sphenopholis pennsylvanica* (swamp wedgescale), and *Symphotrichum prenanthoides* (crookedstem aster). More locally, *Glyceria grandis* (American mannagrass) is an abundant grass. In West Virginia, species (in addition to *Sparganium americanum* (American

bur-reed) and *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed)) with high constancy are *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), *Eleocharis obtusa* (blunt spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), and *Lycopus uniflorus* (northern bugleweed); other common herbs include *Scirpus cyperinus* (woolgrass) and other *Scirpus* (bulrush) spp. or *Schoenoplectus* (bulrush) spp., *Ludwigia palustris* (marsh seedbox), *Carex lurida* (shallow sedge), *Polygonum sagittatum* (arrowleaf tearthumb), *Callitriche heterophylla* ssp. *heterophylla* (twoheaded water-starwort), *Impatiens capensis* (jewelweed), and *Agrostis hyemalis* (winter bentgrass).

**Characteristic Species:** *Carex gynandra* (nodding sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Epilobium leptophyllum* (bog willowherb), *Glyceria grandis* (American mannagrass), *Hydrocotyle americana* (American marshpennywort), *Scirpus expansus* (woodland bulrush), *Sparganium americanum* (American bur-reed)

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Aeshna canadensis</i> (canada darner)	-	animal	
<i>Aeshna tuberculifera</i> (black-tipped darner)	-	animal	
<i>Aeshna verticalis</i> (green-striped darner)	-	animal	
<i>Arigomphus furcifer</i> (lilypad clubtail)	-	animal	
<i>Colias interior</i> (pink-edged sulphur)	-	animal	
<i>Cordulegaster diastatops</i> (delta-spotted spiketail)	-	animal	
<i>Cordulia shurtleffii</i> (american emerald)	-	animal	
<i>Enallagma annexum</i> (northern bluet)	-	animal	
<i>Enallagma hageni</i> (hagen's bluet)	-	animal	
<i>Epitheca canis</i> (beaverpond baskettail)	-	animal	
<i>Gomphus borealis</i> (beaverpond clubtail)	-	animal	
<i>Juncus brevicaudatus</i> (narrowpanicle rush)	-	plant	VA S2
<i>Ladona julia</i> (chalk-fronted corporal)	-	animal	
<i>Lanthus parvulus</i> (northern pygmy clubtail)	-	animal	
<i>Lestes disjunctus</i> (northern spreadwing)	-	animal	
<i>Leucorrhinia frigida</i> (frosted whiteface)	-	animal	
<i>Leucorrhinia hudsonica</i> (hudsonian whiteface)	-	animal	
<i>Nehalennia irene</i> (sedge sprite)	-	animal	
<i>Nemotaulius hostilis</i> (a limnephilid caddisfly)	-	animal	
<i>Poa palustris</i> (fowl bluegrass)	-	plant	VA S1S2
<i>Rhionaeschna mutata</i> (spatterdock darner)	-	animal	
<i>Somatochlora elongata</i> (ski-tipped emerald)	-	animal	
<i>Somatochlora williamsoni</i> (williamson's emerald)	-	animal	
<i>Sympetrum obtrusum</i> (white-faced meadowhawk)	-	animal	

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This community is known from a few high-elevation sites in the Southern Blue Ridge of North Carolina, the Southern Cumberland/ Ridge and Valley of Georgia, and the greater Allegheny Mountains area of Virginia and West Virginia.

**States/Provinces:** GA, NC, TN, VA:S1?, WV:S2

**Federal Lands:** NPS (Chickamauga-Chattanooga, New River Gorge); USFS (George Washington, Monongahela, Pisgah); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** G2G3 (1-Mar-2001)

**Reasons:** This association is known from only a few sites, each very small. It is dependent on periodic re-establishment by beaver flooding.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Similar vegetation may occur in the Ridge and Valley of Virginia in abandoned beaver ponds. [See VDNH's Laurel Fork report, *Carex stipata* - *Sparganium americanum* subassociation (Fleming and Morehead 1996).]

**Similar Associations:** Information not available.

**Related Concepts:**

- *Picea rubens* / *Vaccinium angustifolium* - *Epilobium leptophyllum* Association: *Carex stipata* - *Sparganium americanum* Subassociation (Fleming and Moorhead 1996) ?
- *Sparganium americanum* - *Epilobium leptophyllum* Herbaceous Vegetation (Fleming and Coulling 2001) ?
- *Sparganium americanum* - *Scirpus* spp. herbaceous wetland (Vanderhorst 2001b) =
- *Sparganium americanum* herbaceous vegetation (Hall 2005) =
- IID6a. Natural Impoundment Pond (Allard 1990) B
- Piedmont/Mountain Semipermanent Impoundment (Montane Boggy Subtype) (Schafale 1998b) ?

**SOURCES**

**Description Authors:** G. Fleming and P. Coulling, mod. S.C. Gawler and E.A. Byers

**References:** Allard 1990, Allard and Leonard 1952, FNA Editorial Committee 2000, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Fleming et al. 2004, Hall 2005, Peet et al. unpubl. data 2002, Putnam 1995, Schafale 1998b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Strausbaugh and Core 1978, Suiter 1995, Suiter and Evans 1999, TDNH unpubl. data, Vanderhorst 2001b, Vanderhorst et al. 2007

## Beaked Sedge Fen

**Scientific Name:** *Carex utriculata* / *Sphagnum* spp. Fen

**Translated Name:** Beaked Sedge / Peatmoss Fen

**NVC Name:** CEG1002257: *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation

**Conservation Rank:** S2 / G4G5

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous hummocky sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1160 m. It is a small-patch type that occupies flat to very gently sloping land (0- to 1-degree slopes) in headwater basins. It typically occurs in

dense clonal patches on the seepage-fed margins of open bogs and in seepage meadows or oxbows adjacent to the floodplains of slow-moving streams. The water table is usually near the surface for most of the growing season. In certain locations between open bog and undisturbed upland forest, e.g., at Cranberry Glades, this type probably persists on the landscape for many thousands of years. Other stands are much younger and may form part of successional beaver-influenced wetland mosaics. Fortney and Rentch (2003) documented increases in the areal extent of *Carex utriculata* (beaked sedge) clones in Canaan Valley between 1945 and 2000. Hummock-and-hollow microtopography is well-developed, with moss-covered hummocks 5-50 cm high. Bedrock may be sandstone, shale, or limestone. Soil texture is poorly to very poorly drained peat or muck extending to 10-100 cm depth and underlain by silt loam, sand, or clay-rich layers. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, 2 cm muck, depleted matrix, and depleted below dark surface. Mean soil pH is 3.8, mean pore water pH is 4.7, and electrical conductivity averages 45 micromhos/cm (n=6). Soil chemistry is characterized by high Al, exchangeable nitrogen, total exchange capacity, and organic matter; moderate Cu, Fe, S; and low B, Ca, K, Mg, Mn, Na, and Zn (n=6). Phosphorus ranges from moderate to high (19-95 ppm). The unvegetated surface is predominantly litter, with 5% standing water.

**Vegetation Description:** This herbaceous hummocky sedge fen occurs in the Allegheny Mountains region of West Virginia. The short-shrub stratum averages 5% cover and may include *Vaccinium myrtilloides* (velvetleaf huckleberry), *Hypericum densiflorum* (bushy St. Johnswort), *Photinia melanocarpa* (black chokeberry), and *Photinia pyrifolia* (red chokeberry). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The herbaceous layer, with mean 60% cover, is strongly dominated by dense clonal mats of *Carex utriculata* (beaked sedge). Herbaceous species with high constancy but low cover include *Solidago uliginosa* (bog goldenrod), *Symplocarpus foetidus* (skunk cabbage), *Carex folliculata* (northern long sedge), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Juncus effusus* (common rush), and *Eriophorum virginicum* (tawny cottongrass). Locally abundant species may include *Vaccinium macrocarpon* (cranberry), *Hypericum ellipticum* (pale St. Johnswort), *Vaccinium oxycoccos* (small cranberry), *Carex stipata* (owlfruit sedge), and *Menyanthes trifoliata* (buckbean). Nonvascular plants average 70% cover, are dominated by *Sphagnum* spp. (*Sphagnum magellanicum*, *Sphagnum fallax*), and often include moderate to high cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5), *Carex normalis* (greater straw sedge) (S3G5), *Carex utriculata* (beaked sedge) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Menyanthes trifoliata* (buckbean) (S1G5), *Pogonia ophioglossoides* (snakemouth orchid) (S2G5), *Scirpus microcarpus* (panicled bulrush) (S3G5), *Vaccinium macrocarpon* (cranberry) (S3G4), *Vaccinium oxycoccos* (small cranberry) (S3G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S3G4Q). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 15 taxa per 400 square meters.

**Fauna observed:** Small mammals observed in this community include *Microtus pensylvanicus* (meadow vole), *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Sorex fumeus* (smoky shrew) and *Clethrionomys gapperi* (southern red-backed vole). Butterfly species were observed including *Colias philodice* (clouded sulphur), *Polygonia comma* (eastern comma) and *Colias interior* (pink-edged sulphur). Spiders noted include *Araneus*

*pratensis* (an orbweaver), *Neoscona arabesca* (arabesque orbweaver), and *Misumenoides formosipes* (whitebanded crab spider).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Carex normalis</i> (greater straw sedge)	-	plant	WV species of concern
<i>Carex utriculata</i> (beaked sedge)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Menyanthes trifoliata</i> (buckbean)	-	plant	WV species of concern
<i>Pogonia ophioglossoides</i> (snakemouth orchid)	-	plant	WV species of concern
<i>Scirpus microcarpus</i> (panicled bulrush)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 770 and 1160 m. Within this region, there are occurrences at Canaan Valley, Cranberry Glades, Cranesville Swamp, and Dolly Sods. It is also known from The Glades in Maryland.

**Classification Comments:** Eleven plots (5 occurrences) represent this type (CEGL002257), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters strongly together, and ordinales in a compact grouping in the bryophyte-rich, somewhat ombrotrophic portion of species space. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.20, CRSW.7, CRSW.13, CVWR.16, FRAN.34, FRAN.56, FRAN.87, MONF.117, MONF.131, ROBI.7, TUCK.18.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex (rostrata, utriculata)</i> Seasonally Flooded Herbaceous Alliance (A.1403)
Alliance (English name)	(Swollen-beak Sedge, Beaked Sedge) Seasonally Flooded Herbaceous Alliance
Association	<i>Carex (rostrata, utriculata)</i> - <i>Carex lacustris</i> - ( <i>Carex vesicaria</i> ) Herbaceous Vegetation
Association (English name)	(Swollen-beak Sedge, Beaked Sedge) - Lake Sedge - (Inflated Sedge) Herbaceous Vegetation
Ecological System(s)	Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687)

High Allegheny Wetland (CES202.069)  
Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)  
North-Central Interior Floodplain (CES202.694)  
North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)  
Northern Great Lakes Coastal Marsh (CES201.722)  
Western Great Plains Open Freshwater Depression Wetland (CES303.675)

## GLOBAL DESCRIPTION

**Concept Summary:** This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes region and north into Canada, with outliers in the Allegheny Mountains region of West Virginia and Maryland. Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semi-permanently flooded. Substrate is mineral soil or well-decomposed peat. Tall coarse-leaved sedges dominate the vegetation layer, often creating a tussocky hummock microtopography. Shrubs can cover up to 25% of the area. Pools with submergents may also be present. Dominant graminoids include a number of Carices, including *Carex aquatilis* (water sedge), *Carex lacustris* (lake sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex rostrata* (swollen-beak sedge), *Carex utriculata* (Beaked sedge), *Carex vesicaria* (blister sedge), and locally *Carex stricta* (tussock sedge). Other graminoids include *Calamagrostis canadensis* (bluejoint), *Scirpus atrovirens* (green bulrush), *Scirpus cyperinus* (woolgrass), and in wetter areas, *Eleocharis palustris* (common spikerush) and *Equisetum fluviatile* (water horsetail). Forbs include *Acorus calamus* (calamus), *Symphyotrichum lanceolatum* var. *lanceolatum* (white panicle aster), *Campanula aparinoides* (marsh bellflower), *Eupatorium maculatum* (spotted joeypyeweed), *Iris virginica* var. *shrevei* (Shreve's iris), *Lycopus uniflorus* (northern bugleweed), *Poa palustris* (fowl bluegrass), *Polygonum amphibium* (water knotweed), *Comarum palustre* (purple marshlocks), and others. Diagnostic features include the general dominance by coarse-leaved sedges, wet, somewhat peaty soil conditions, and the mix of sub-boreal herbs with more temperate herbs.

**Environmental Description:** Sites are found on floodplains, shallow bays of lakes and streams, beaver meadows, ditches, and occasionally in isolated basins, or on semi-floating mats. Hydrology is seasonally to semi-permanently flooded. Substrate is mineral soil or well-decomposed peat (Curtis 1959, Harris et al. 1996).

**Vegetation Description:** Tall coarse-leaved sedges dominate the vegetation layer, often creating a tussocky hummock microtopography. Shrubs can cover up to 25% of the area. Pools with submergents may also be present. Dominant graminoids include a number of Carices, including *Carex aquatilis* (water sedge), *Carex lacustris* (lake sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex rostrata* (swollen-beak sedge), *Carex vesicaria* (blister sedge), and locally *Carex stricta* (tussock sedge). Other graminoids include *Calamagrostis canadensis* (bluejoint), *Scirpus atrovirens* (green bulrush), *Scirpus cyperinus* (woolgrass), and in wetter areas, *Eleocharis palustris* (common spikerush) and *Equisetum fluviatile* (water horsetail). Forbs include *Acorus calamus* (calamus), *Symphyotrichum lanceolatum* var. *lanceolatum* (white panicle aster), *Campanula aparinoides* (marsh bellflower), *Eupatorium maculatum* (spotted joeypyeweed), *Iris virginica* var. *shrevei* (Shreve's iris), *Lycopus uniflorus* (northern bugleweed), *Poa palustris* (fowl bluegrass), *Polygonum amphibium* (water knotweed), *Comarum palustre* (purple marshlocks), and others (Curtis 1959, Harris et al. 1996).

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This northern tall sedge community is found in the mixed conifer - hardwood zone of the Great Lakes and northeastern region of the United States and north into Canada, extending from Maine to Manitoba, south to Michigan and Iowa.

**States/Provinces:** IA, MB:SU, ME, MI, MN, ND, ON, SD, WI:S3, WV:S2

**Federal Lands:** NPS (Isle Royale, Pictured Rocks, Voyageurs); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** G4G5 (17-Jun-1999)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Expansion of the range of this type eastward to Massachusetts and West Virginia is based on the ambiguous application of *Carex utriculata* (beaked sedge) in past studies. Taxonomy and distribution of *Carex utriculata* (beaked sedge) versus *Carex rostrata* (swollen-beak sedge) needs to be resolved. In Gleason and Cronquist (1991), *Carex rostrata* (swollen-beak sedge) is circumboreal and only occurs in northern Michigan and northern Minnesota, whereas *Carex utriculata* (beaked sedge) is boreal but extends south to Delaware, Indiana, Nebraska, New Mexico and California. (*Carex vesicaria* (blister sedge) has a similar distribution to *Carex utriculata* (beaked sedge).) *Carex rostrata* (swollen-beak sedge) has also been reported from extreme northern Wisconsin, e.g., on the Apostle Islands (E. Judziewicz pers. comm. 1999). However, all of the atlases and floras in the Midwest (Voss 1972, Mohlenbrock and Ladd 1978, Ownbey and Morley 1991) do not make such a distinction, so the species are essentially treated as synonymous in this type. Curtis (1959) suggested that differential species for northern sedge meadows in Wisconsin may be *Symphytichum puniceum* (purplestem aster), *Campanula aparinoides* (marsh bellflower), *Glyceria canadensis* (rattlesnake mannagrass), *Scirpus atrovirens* (green bulrush), and *Solidago uliginosa* (bog goldenrod), among others, but this list needs further study.

**Similar Associations:**

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174)-- This type is more heavily grass- and forb-dominated, sedges <25%?
- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)
- *Chamaedaphne calyculata* / *Carex oligosperma* / *Sphagnum* spp. Dwarf-shrubland (CEGL005091)
- *Cornus sericea* - *Salix* (*bebbiana*, *discolor*, *petiolaris*) / *Calamagrostis stricta* Shrubland (CEGL002187)
- *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex* (*lasiocarpa*, *utriculata*) - *Utricularia* spp. Shrub Herbaceous Vegetation (CEGL006302)

**Related Concepts:**

- *Carex rostrata* - *Rubus hispidus* - *Pyrus melanocarpa* community (Edens 1973) =
- *Carex rostrata* - *Sphagnum* spp. community (Darlington 1943) =
- *Carex rostrata* sedge-meadow community (Robinette 1966) =
- *Polytrichum* - *Carex* (*rostrata*, *stricta*) hummock bog (Fortney 1975) =
- Meadow marsh: tall sedge (W12) (Harris et al. 1996) =
- Northern Sedge Meadow (Curtis 1959) =

**SOURCES**

**Description Authors:** D. Faber-Langendoen, mod. E.A. Byers

**References:** Curtis 1959, Damman and French 1987, Darlington 1943, Edens 1973, Fortney 1975, Fortney and Rentch 2003, Francl et al. 2004, Gawler 2002, Gleason and Cronquist 1991, Greenall 1996, Harris et al. 1996, INAI unpubl. data, Midwestern Ecology Working Group n.d., Mohlenbrock and Ladd 1978, NDNHI n.d., Ownbey and Morley 1991, Robinette 1966, Voss 1972, WNHIP unpubl. data

**Bluejoint Grass Wet Meadow**

**Scientific Name:** *Calamagrostis canadensis* Wet Meadow

**Translated Name:** Bluejoint Grass Wet Meadow

**NVC Name:** CEG1005174: *Calamagrostis canadensis* - *Phalaris arundinacea*  
Herbaceous Vegetation

**Conservation Rank:** S2 / G4G5

**WEST VIRGINIA INFORMATION**

**Environmental Description:** This wet meadow occurs on temporarily flooded soils of levees and floodplains of slow-moving headwater streams, and in seepage meadows within level headwater basins of the Allegheny Mountains region of West Virginia, at elevations of 700-1200 m. This type may have first been described in West Virginia by the pioneer Meshach Browning, who considered it the finest natural pasture and hunting ground in the area, covering "hundreds, if not thousands of acres" in the late 1700s (Browning 1859). It occupies very gently sloping areas (0.5- to 1-degree slopes). Microtopography is characterized by tussocks and low mossy hummocks. Bedrock may be limestone, sandstone, or occasionally shale. Soils are poorly to moderately poorly drained peat or peaty silt loam, often underlain by clay. Hydric soil indicators include histosol, histic epipedon, black histic, hydrogen sulphide, sandy redox, loamy gleyed matrix, depleted matrix, redox depressions, and alluvial depleted matrix. Soil pH averages 4.3 (n=8). Pore water pH is variable from 3.7-6.2, with an average of 5.2, and electrical conductivity averages 95 micromhos/cm (n=9). Soil chemistry is characterized by high Ca, Fe, Na, P, S; moderate organic matter, Al, B, K, Mg, exchangeable nitrogen, and total exchange capacity; and low Cu, Mn, Zn (n=8). The unvegetated surface is predominantly litter.

**Vegetation Description:** This herbaceous wet meadow occurs in the Allegheny Mountains region of West Virginia. Typical vegetation consists of relatively pure stands of *Calamagrostis canadensis* (bluejoint). The shrub strata are sparse and variable in composition, with the tall-shrub layer averaging 6% cover and the short-shrub averaging only 2% cover. Shrub species may include *Spiraea alba* (white meadowsweet), *Viburnum recognitum* (southern arrowwood), *Hypericum densiflorum* (bushy St. Johnswort), *Alnus incana* ssp. *rugosa* (speckled alder),

*Viburnum nudum* var. *cassinoides* (northern wild raisin), *Sambucus canadensis* (common elderberry), *Populus tremuloides* (quaking aspen), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Ilex verticillata* (common winterberry), *Rhododendron maximum* (great laurel), and others species with very low frequency and cover. The herbaceous layer averages 90% cover and is dominated by *Calamagrostis canadensis* (bluejoint). Other herbaceous species with fairly high constancy but low cover include *Rubus hispoides* (bristly dewberry), *Carex stricta* (tussock sedge), *Carex utriculata* (beaked sedge), *Juncus effusus* (common rush), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus cyperinus* (woolgrass), *Symplocarpus foetidus* (skunk cabbage), *Solidago uliginosa* (bog goldenrod), *Galium tinctorium* (stiff marsh bedstraw), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Impatiens capensis* (jewelweed), *Glyceria striata* (fowl mannagrass), *Glyceria canadensis* (rattlesnake mannagrass), *Dryopteris cristata* (crested woodfern), *Scirpus microcarpus* (panicled bulrush), *Leersia oryzoides* (rice cutgrass), *Dryopteris intermedia* (intermediate woodfern), and *Verbena hastata* var. *hastata* (swamp verbena). Nonvascular plants average 17% cover and are dominated by *Sphagnum palustre*, *Sphagnum fimbriatum*, *Sphagnum henryense*, *Sphagnum recurvum*, *Polytrichum commune*, and *Polytrichum strictum*. The indicator species that help to distinguish this community from others within the herbaceous physiognomy in West Virginia are *Calamagrostis canadensis* (bluejoint), *Spiraea alba* (white meadowsweet), *Viburnum recognitum* (southern arrowwood), and *Juncus filiformis* (thread rush). This community provides habitat for species of conservation concern in West Virginia including *Carex canescens* (silvery sedge) (S3G5), *Carex lacustris* (lake sedge) (S2G5), *Carex utriculata* (beaked sedge) (S2G5), *Glyceria laxa* (limp mannagrass) (S1G5), *Juncus filiformis* (thread rush) (S2G5), *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3), *Polygonum amphibium* var. *emersum* (longroot smartweed) (S2S3G5T5), *Salix discolor* (pussy willow) (S2G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Scirpus microcarpus* (panicled bulrush) (S3G5), and *Scutellaria galericulata* (marsh skullcap) (S1G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 22 taxa per 400 square meters.

**Fauna observed:** Small mammals found within the community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Microtus pensylvanicus* (meadow vole). Butterfly species observed within this community include *Danaus plexippus* (monarch), *Papilio* sp. (tiger swallowtail), and *Polites peckius* (a skipper). Spiders collected in the community include *Neoscona arabesca* (arabesque orbweaver), *Clubionoides excepta* and *Elaver excepta* (sac spiders), and *Tibellus* sp. (slender crab spider). Insects in the order Coleoptera (beetles) were collected including *Anisosticta bitriangularis* (a ladybug). From the order Diptera (true flies), specimens were collected of Anthomyiidae (root-maggot flies), *Leucopis* sp. (an aphid fly), *Meromyza* sp. (a frit fly), and Dolichopodidae (long-legged flies). Insects from the order Hemiptera (true bugs) were noted including *Protenor belfragei* (a broad-headed bug), *Philaenus spumarius* (a spittlebug), and *Collaria meilleurii* and *Lygus* sp. (plant bugs).

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations of 700-1200 m. Within this region, the community is known from Canaan Valley, Cranberry Glades, Cranesville Swamp, Dolly Sods, Glade Run of Abram Creek, and Tub Run. It is also known from two sites in Garrett County, Maryland: Hammel Glade and The Glades.

**Classification Comments:** Fourteen plots represent this type (CEGL005174), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. An additional nine plots from Maryland's Allegheny Mountains region are also included in this type. The type clusters consistently in both statewide and local analyses, but ordines somewhat loosely, indicating fairly broad ecological amplitude. It fits within the broadly defined NVC type; however, *Phalaris arundinacea* (reed canarygrass) is unimportant in our stands (occurs in only 3 of 23 plots, with <5% cover). Since *Phalaris arundinacea* (reed canarygrass) is considered invasive in West Virginia, it does not belong in the name of the West Virginia natural vegetation type.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.2, CASP.23, CASP.26, CVWR.23, CVWR.38, CVWR.45, FRAN.12, GRAN.3, GRAN.10, MINE.6, MONF.124, MONF.245, TUCK.19, WALB.31. The following plots from Maryland also represent this type: FRAN.63, FRAN.65, FRAN.66, FRAN.74, FRAN.75, FRAN.76, FRAN.77, FRAN.78, FRAN.79.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Calamagrostis canadensis</i> Seasonally Flooded Herbaceous Alliance (A.1400)
Alliance (English name)	Bluejoint Seasonally Flooded Herbaceous Alliance
Association	<i>Calamagrostis canadensis</i> - <i>Phalaris arundinacea</i> Herbaceous Vegetation
Association (English name)	Bluejoint - Reed Canarygrass Herbaceous Vegetation
Ecological System(s)	Central Appalachian River Floodplain (CES202.608) Central Appalachian Stream and Riparian (CES202.609) Eastern Boreal Floodplain (CES103.588) Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687) High Allegheny Wetland (CES202.069) Laurentian-Acadian Floodplain Forest (CES201.587) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)

### GLOBAL DESCRIPTION

**Concept Summary:** This wet meadow vegetation is widespread in the northeastern and midwestern United States and central and eastern Canada. Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat, with a thick root mat. Water regime varies between temporarily and seasonally flooded. Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* (bluejoint) is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis* (water sedge), *Carex lacustris*

(lake sedge), *Carex utriculata* (beaked sedge), and *Carex stricta* (tussock sedge). In fen transitions, *Carex lasiocarpa* (woollyfruit sedge) can be present. *Agrostis gigantea* (redtop), *Glyceria grandis* (American mannagrass), *Poa palustris* (fowl bluegrass), *Poa compressa* (Canada bluegrass), *Scirpus cyperinus* (woolgrass), and *Typha latifolia* (broadleaf cattail) are sometimes abundant. Forbs include *Campanula aparinoides* (marsh bellflower), *Epilobium leptophyllum* (bog willowherb), *Eupatorium maculatum* (spotted joepeyeweed), *Eupatorium perfoliatum* (common boneset), *Impatiens capensis* (jewelweed), *Iris versicolor* (harlequin blueflag), *Polygonum amphibium* (water knotweed), and *Comarum palustre* (purple marshlocks). Scattered shrubs, such as *Viburnum nudum* (possumhaw), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Alnus incana* (gray alder), or *Alnus serrulata* (hazel alder), may be present. *Phalaris arundinacea* (reed canarygrass) and/or *Lythrum salicaria* (purple loosestrife) may be present, especially in disturbed examples.

**Environmental Description:** Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, levees and lakeshores. Soils are typically mineral soil or well-decomposed peat or peat silt loam with a thick root mat. Water regime varies between temporarily and seasonally flooded.

**Vegetation Description:** Graminoid cover is typically dense and can form hummocky microtopography. *Calamagrostis canadensis* (bluejoint) is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis* (water sedge), *Carex lacustris* (lake sedge), *Carex rostrata* (swollen-beak sedge), and *Carex stricta* (tussock sedge). In fen transitions, *Carex lasiocarpa* (woollyfruit sedge) can be present. *Agrostis gigantea* (redtop), *Glyceria grandis* (American mannagrass), *Poa palustris* (fowl bluegrass), *Poa compressa* (Canada bluegrass), *Scirpus cyperinus* (woolgrass), and *Typha latifolia* (broadleaf cattail) are sometimes abundant. Forbs include *Campanula aparinoides* (marsh bellflower), *Epilobium leptophyllum* (bog willowherb), *Eupatorium maculatum* (spotted joepeyeweed), *Eupatorium perfoliatum* (common boneset), *Iris versicolor* (harlequin blueflag), *Polygonum amphibium* (water knotweed), and *Comarum palustre* (purple marshlocks). Scattered shrubs, such as *Viburnum nudum* (possumhaw), *Viburnum dentatum* (southern arrowwood), *Spiraea alba* (white meadowsweet), *Cornus amomum* (silky dogwood), *Alnus incana* (gray alder), or *Alnus serrulata* (hazel alder), may be present. *Lythrum salicaria* (purple loosestrife) may be present, especially in disturbed examples.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)

**Characteristic Species:** *Calamagrostis canadensis* (bluejoint)

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4	plant	

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This wet meadow vegetation is widely distributed in the northeastern and midwestern United States and south-central and southeastern Canada. It ranges from Maine south to West Virginia and possibly Virginia and west to Minnesota.

**States/Provinces:** CT, DE, MA, MD, ME, MI, MN, NH, NJ, NY, ON, PA, RI, VA?, VT, WI, WV:S2

**Federal Lands:** NPS (Cape Cod, Isle Royale, Minute Man, Pictured Rocks, Saint-Gaudens, Valley Forge, Voyageurs); USFS (Monongahela); USFWS (Assabet River?, Canaan Valley, Great Meadows?)

#### CONSERVATION STATUS

**Rank:** G4G5 (31-Mar-2000)

**Reasons:** This type is widespread throughout the northeastern and upper midwestern United States and central/southern Canada.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** This type can grade into sedge meadows. A guideline of <50% sedges may be suggested as a criterion for the definition of this type compared to sedge meadow types. Harris et al. (1996) suggest that the bluejoint meadow type is drier than sedge meadows and less peaty than shore fens.

#### Similar Associations:

- *Calamagrostis canadensis* - *Doellingeria umbellata* - *Spartina pectinata* Herbaceous Vegetation (CEGL006427)
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)--Dominance of sedges versus grasses is much higher.
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474)
- *Phleum pratense* - (*Calamagrostis canadensis*) Semi-natural Herbaceous Vegetation (CEGL005249)

#### Related Concepts:

- *Calamagrostis canadensis* herbaceous community (Walbridge and Lang 1982) =
- *Calamagrostis canadensis* meadow (Walbridge 1982) =
- *Calamagrostis canadensis* wet meadow (Fortney 1975) =
- Canada bluejoint-tussock sedge meadow (CAP pers. comm. 1998) ?
- Meadow marsh: bluejoint grass (W13) (Harris et al. 1996) =
- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979) ?
- SNE low-energy riverbank community (Rawinski 1984) ?
- Shallow Emergent Marsh (Thompson 1996) ?

#### SOURCES

**Description Author:** S.C. Gawler

**References:** Breden et al. 2001, Browning 1859, CAP pers. comm. 1998, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Fike 1999, Fortney 1975, Francl et al. 2004, Gawler 2002, Harris et al. 1996, Harrison 2004, NAP pers. comm. 1998, Rawinski 1984, Swain and Kearsley 2001, TDNH unpubl. data, Thompson 1996, Thompson and Sorenson 2000, WNHIP unpubl. data, Walbridge 1982, Walbridge and Lang 1982

## Lake Sedge Fen

**Scientific Name:** *Carex lacustris* Fen  
**Translated Name:** Lake Sedge Fen  
**NVC Name:** CEG1002256: *Carex lacustris* Herbaceous Vegetation  
**Conservation Rank:** S1 / G4G5

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1220 m. It is a small-patch type that occupies flat to gently sloping land (0- to 2-degree slopes) in headwater basins. It typically occurs in dense clonal patches in seepage areas on the margins of open wetlands or in the floodplain of slow-moving headwater streams. Microtopography is characterized by low rounded tussocks. Bedrock may be shale, limestone, or Quaternary alluvium. Soil texture is poorly to very poorly drained peat or mottled silt loam, underlain by circumneutral clay-rich layers. The sedge has a deep taproot and can take advantage of the circumneutral soil at depth. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, depleted matrix, and redox depressions. Mean surface soil pH is 4.3, mean pore water pH is 5.9, and electrical conductivity averages 125 micromhos/cm (n=3). Soil chemistry is characterized by high Fe and Na; moderate P and exchangeable nitrogen; and low Al, B, Cu, K, Mg, Mn, S, and Zn (n=3). Calcium, organic matter, and total exchange capacity vary from moderate to very high. The unvegetated surface is predominantly litter, with 30% standing water.

**Vegetation Description:** This herbaceous sedge fen occurs in the Allegheny Mountains region of West Virginia. The shrub stratum averages 3% cover and may include *Populus tremuloides* (quaking aspen), *Picea rubens* (red spruce), *Spiraea alba* (white meadowsweet), *Alnus incana* ssp. *rugosa* (speckled alder), *Ilex montana* (mountain holly), *Salix sericea* (silky willow), or *Viburnum recognitum* (southern arrowwood). The herbaceous layer, with mean 90% cover, is strongly dominated by dense clonal mats of *Carex lacustris* (lake sedge), which has a bright green-blue aspect. Herbaceous species with high constancy but low cover include *Galium tinctorium* (stiff marsh bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus cyperinus* (woolgrass), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Epilobium leptophyllum* (bog willowherb). Nonvascular plants average 20% cover and may include *Sphagnum recurvum* or *Calliargon cordifolium*. This community provides habitat for species of conservation concern in West Virginia, including *Carex lacustris* (lake sedge) (S2G5), *Carex utriculata* (beaked sedge) (S3G5), and *Polemonium vanbruntiae* (Vanbrunt's polemonium) (S2G3). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 20 taxa per 400 square meters.

**Fauna observed:** Small mammals observed within the community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Zapus hudsonicus* (meadow jumping mouse), *Microtus pennsylvanicus* (meadow vole), and the *Synaptomys cooperi* (southern bog lemming). *Pachydiplax longipennis* (blue dasher), a dragonfly, and *Neoscona arabesca* (arabesque orbweaver), a spider, were observed. Insects were noted from the order

Diptera (true flies) including Fanniidae (lesser houseflies), Muscidae (house flies), Sciomyzidae (marsh flies), *Toxorhina* sp. (a crane fly), and *Chaetopsis* sp. (a picture-winged fly). The order Hemiptera (true bugs) included *Cicadula* sp. (a leafhopper). A species from the order Hymenoptera (bees, wasps, and ants), family Ichneumonidae (ichneumon wasps) was noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex lacustris</i> (lake sedge)	-		plant	WV species of concern
<i>Carex utriculata</i> (beaked sedge)	-		plant	WV species of concern
<i>Polemonium vanbruntiae</i> (Vanbrunt's polemonium)	G3G4		plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 960 and 1220 m. Within this region, there are occurrences at Canaan Valley, Cranberry Glades, and First Fork of Upper Shavers Fork.

**Classification Comments:** Three plots (3 occurrences) represent this type (CEGL002256), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters robustly, but ordination shows plots scattered rather broadly across species space. There are only three known occurrences in the state, all of which have been sampled. This type is more minerotrophic than the broad-leaved *Carex utriculata* (beaked sedge) fen in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.34, MONF.112, MONF.143.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex lacustris</i> Seasonally Flooded Herbaceous Alliance (A.1367)
Alliance (English name)	Lake Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex lacustris</i> Herbaceous Vegetation
Association (English name)	Lake Sedge Herbaceous Vegetation
Ecological System(s)	Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687) High Allegheny Wetland (CES202.069) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)

**GLOBAL DESCRIPTION**

**Concept Summary:** This broad-leaved wet sedge meadow type occurs in the upper central midwestern and northeastern regions of the United States. Stands occur on floodplains, shallow bays of lakes and streams, and upland depressions. Soils are mineral or well-decomposed peat. Flooding is variable but typically is seasonal. The vegetation is dominated by tall sedges. Shrubs may have up to 25% cover. *Carex lacustris* (lake sedge) forms almost mono-dominant stands. Occasionally other emergents, such as *Typha latifolia* (broadleaf cattail) or *Sagittaria*

(arrowhead) spp., may codominate. In Wisconsin this type is common in the northwest, where it typically intermingles with tall shrubs, especially *Salix* (willow) spp. (e.g., *Salix petiolaris* (meadow willow)). Common herbaceous associates at low cover include *Doellingeria umbellata* (parasol whitetop), *Calamagrostis canadensis* (bluejoint), *Carex stricta* (tussock sedge), *Solidago canadensis* (Canada goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Verbena hastata* (swamp verbena), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joeypyeweed), and *Muhlenbergia glomerata* (spiked muhly).

**Environmental Description:** Stands occur on floodplains, shallow bays of lakes and streams, and upland depressions. Soils are mineral or well-decomposed peat. Flooding is variable but typically is seasonal.

**Vegetation Description:** The vegetation is dominated by tall sedges. Shrubs may have up to 25% cover. *Carex lacustris* (lake sedge) forms almost mono-dominant stands. Occasionally other emergents, such as *Typha latifolia* (broadleaf cattail) or *Sagittaria* (arrowhead) spp., may codominate. In Wisconsin this type is common in the northwest, where it typically intermingles with tall shrubs, especially *Salix* (willow) spp. (e.g., *Salix petiolaris* (meadow willow)). Common herbaceous associates at low cover include *Doellingeria umbellata* (parasol whitetop), *Calamagrostis canadensis* (bluejoint), *Carex stricta* (tussock sedge), *Solidago canadensis* (Canada goldenrod), *Polygonum sagittatum* (arrowleaf tearthumb), *Verbena hastata* (swamp verbena), *Impatiens capensis* (jewelweed), *Eupatorium maculatum* (spotted joeypyeweed), and *Muhlenbergia glomerata* (spiked muhly) (E. Epstein pers. comm. 1999).

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex lacustris</i> (lake sedge)

**Characteristic Species:** *Carex lacustris* (lake sedge)

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This broad-leaved wet sedge meadow type occurs in the north-central and northeastern regions of the United States, extending from New England, Ohio and Ontario to Iowa, the Dakotas, and Manitoba.

**States/Provinces:** IA:SU, IL, IN, MA, MB:SU, MN, NY?, OH, WI, WV:S1

**Federal Lands:** NPS (Minute Man); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** G4G5 (3-Oct-1996)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Further characterization of this type is needed to determine whether it is a good type. It may represent a mono-dominant variant of a more broadly defined mixed broad-leaved sedge type (e.g., Bakowsky and Lee 1996). *Carex stricta* (tussock sedge), by contrast, is a narrow-leaved sedge. Geographic distribution of this type versus *Carex rostrata* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257) also needs to be clarified. In

Ohio, stands can be very large, especially in northeastern Ohio. *Carex hyalinolepis* (shoreline sedge) can also occur over large areas in Ohio (Greg Schneider pers. comm. 1996). Charles Umbanhowar should be consulted for examples of this type in southeastern Minnesota.

**Similar Associations:**

- *Carex (rostrata, utriculata) - Carex lacustris - (Carex vesicaria)* Herbaceous Vegetation (CEGL002257)--a more northern coarse-sedge type.
- *Carex stricta - Carex spp.* Herbaceous Vegetation (CEGL002258)--a narrow-leaved sedge type.

**Related Concepts:** Information not available.

**SOURCES**

**Description Authors:** D. Faber-Langendoen, mod. S.C. Gawler

**References:** Bakowsky and Lee 1996, Epstein pers. comm., Greenall 1996, INAI unpubl. data, Midwestern Ecology Working Group n.d., WNHIP unpubl. Data

## Rice Cutgrass Marsh

**Scientific Name:** *Leersia oryzoides - Sagittaria latifolia* Marsh

**Translated Name:** Rice Cutgrass - Broadleaf Arrowhead Marsh

**NVC Name:** CEGL006461: *Leersia oryzoides - Sagittaria latifolia* Herbaceous Vegetation

**Conservation Rank:** S3 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This early-successional marsh occurs on temporarily and semi-permanently flooded soils in the Allegheny Mountains region, Meadow River, Tygart Valley, Camp Dawson, New River Gorge National River, and Ohio River, at elevations between 170 and 1300 m. It probably also occurs elsewhere in the state. It is a very small-patch type that occupies flat-lying land in inactive beaver ponds, the margins of active beaver ponds, oxbows, streamside sloughs, overflow depressions, and disturbed flat ground. Although individual patches are ephemeral, it is likely to be present on the landscape as long as natural (beaver or flooding) and man-made disturbance regimes persist. Its present distribution is probably larger than its presettlement distribution, when disturbances were less widespread. Soils tend to have a large clay component and may consist of somewhat to very poorly drained clay, clay loam, muck, sandy clay, sandy loam, or silty clay. Hydric soil indicators include histisol, histic epipedon, depleted matrix, and redox depressions. Soil pH averages 4.0 (n=2). The unvegetated surface is predominantly litter, with an average of 2% downed wood, 1% standing water, and frequent patches of bare soil.

**Vegetation Description:** This early-successional marsh has a broad distribution in beaver-influenced wetlands and streamside overflow depressions throughout the state. It is dominated by *Leersia oryzoides* (rice cutgrass) (30-90% cover) in a variable, disturbance-tolerant herbaceous layer. The herbaceous layer averages 95% cover. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover but drops out at the highest elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional herbaceous species with relatively high constancy include *Boehmeria cylindrica* (smallspike false nettle), *Polygonum sagittatum* (arrowleaf tearthumb), *Juncus effusus* (common rush), *Impatiens capensis* (jewelweed), *Galium tinctorium* (stiff marsh

bedstraw), *Ludwigia palustris* (marsh seedbox), *Typha latifolia* (broadleaf cattail), *Dulichium arundinaceum* (threeway sedge), *Cephalanthus occidentalis* (common buttonbush), *Carex gynandra* (nodding sedge), *Eupatorium fistulosum* (trumpetweed), and *Lysimachia terrestris* (earth loosestrife). Cover by nonvascular plants is generally insignificant. Indicator species that help to distinguish this community from others within the herbaceous physiognomy in West Virginia are *Sagittaria latifolia* (broadleaf arrowhead) and *Boehmeria cylindrica* (smallspike false nettle). Mean species richness of vascular plants is 16 taxa per 400 square meters.

**Fauna observed:** *Sympetrum* sp. (meadowhawk), a dragonfly, was observed in this community.

**West Virginia Range:** This community is known from the Allegheny Mountains region, Meadow River, Tygart Valley, New River Gorge National River, the Ohio River, and Camp Dawson, at elevations between 170 and 1300 m. It probably also occurs elsewhere in the state. Specific occurrences are known from Big Run Bog, Upper Shavers Fork, Meadow River wetland complex, Kate's Branch of the New River, Volkstone tract at Camp Dawson, and the Ohio River at the following locations: Tim Rock Farm, Ice Creek, Lee Creek, Bellville, Bull Creek, and Tomlinson Run Embayment.

**Classification Comments:** Nineteen plots represent this type (CEGL006461), which was classified as part of a 2006 analysis of palustrine plots statewide. The type clusters and ordines into two groups: a fairly close group consisting of most of the plots statewide, and a second group that contains only the two Camp Dawson plots. The heavily disturbed Camp Dawson plots are differentiated by the indicator species *Fraxinus pennsylvanica* (green ash), *Lobelia siphilitica* var. *siphilitica* (great blue lobelia), *Toxicodendron radicans* (eastern poison ivy), *Rosa multiflora* (multiflora rose), and *Phalaris arundinacea* (reed canarygrass). The type has been sampled fairly well across a range of elevations in West Virginia. The state type differs from the named CEGL006461 (developed for Camp Dawson) in that *Callitriche heterophylla* (twoheaded water-starwort) is rarely present; rather, codominants are *Sagittaria latifolia* (broadleaf arrowhead) and *Scirpus cyperinus* (woolgrass), with *Boehmeria cylindrica* (smallspike false nettle) as an indicator species. CEGL006461 might appropriately be renamed simply *Leersia oryzoides* (rice cutgrass) Herbaceous Vegetation. This type may be somewhat similar to *Leersia oryzoides* - *Boehmeria cylindrica* - *Ranunculus flabellaris* Herbaceous Vegetation (CEGL006903), although it does not contain *Ranunculus flabellaris* (yellow water buttercup).

**West Virginia Description Author:** E.A. Byers

**Plots:** DAWS.57, DAWS.61, MERI.12, MERI.35, MERI.44, MERI.62, MERI.64, MERI.74, MERI.94, MONF.152, NERI.44, OHRI.24, OHRI.33, OHRI.47, OHRI.48, OHRI.62, OHRI.69, OHRI.86, WALB.16.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)

Alliance	<i>Leersia oryzoides</i> - <i>Glyceria striata</i> Seasonally Flooded Herbaceous Alliance (A.1399)
Alliance (English name)	Rice Cutgrass - Fowl Mannagrass Seasonally Flooded Herbaceous Alliance
Association	<i>Leersia oryzoides</i> - <i>Sagittaria latifolia</i> Herbaceous Vegetation
Association (English name)	Rice Cutgrass - Broadleaf Arrowhead Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

## GLOBAL DESCRIPTION

**Concept Summary:** This community occupies wet alluvial bottomlands and beaver ponds in the Central Appalachians and adjacent ecoregions. Parent materials are alluvium derived mainly from acidic sandstones and shales. Surface soils are poorly drained, acidic clay loams. This small-patch wetland community is dominated by grasses and forbs, with scattered trees and shrubs. The dominant grasses are *Leersia oryzoides* (rice cutgrass) and *Phalaris arundinacea* (reed canarygrass) with *Leersia* (cutgrass) strongly dominant at most sites. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover, except at higher elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional characteristic herbs include *Boehmeria cylindrica* (smallspike false nettle), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex baileyi* (Bailey's sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Eupatorium fistulosum* (trumpetweed), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lobelia siphilitica* (great blue lobelia), *Ludwigia palustris* (marsh seedbox), *Lycopus uniflorus* (northern bugleweed), *Lycopus virginicus* (Virginia water horehound), *Lysimachia terrestris* (earth loosestrife), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus atrovirens* (green bulrush), and *Typha latifolia* (broadleaf cattail). Areas with longer standing water may have aquatic species, including *Callitriche heterophylla* (twoheaded water-starwort) and *Sparganium* (bur-reed) spp. Scattered small trees include *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), and *Fraxinus pennsylvanica* (green ash). The exotic shrub *Rosa multiflora* (multiflora rose) is sometimes invasive in this community. *Cornus amomum* (silky dogwood) is a characteristic native shrub.

**Environmental Description:** This community occupies wet alluvial bottomlands, beaver ponds, and disturbed flats in the Central Appalachians and adjacent ecoregions. Parent materials at documented sites are alluvium derived mainly from acidic sandstones and shales. Surface soils described from sampled plots are somewhat to very poorly drained clay, clay loam, muck, sandy clay, sandy loam, or silty clay. Hydric soil indicators include histosol, histic epipedon, depleted matrix, and redox depressions. Soil pH averages 4.0 (n=2). The unvegetated surface is predominantly litter, with small amounts of downed wood and standing water, and frequent patches of bare soil. Elevations of documented stands range up to 1300 m.

**Vegetation Description:** This small-patch wetland community is dominated by grasses and forbs, with scattered trees and shrubs. The dominant grasses are *Leersia oryzoides* (rice cutgrass) and *Phalaris arundinacea* (reed canarygrass). Both of these are native species, however, introduction of Eurasian ecotypes and cultivars of *Phalaris arundinacea* (reed canarygrass) and subsequent hybridization with native stock have been blamed for the current invasive capacity of

this species. *Leersia* (cutgrass) is strongly dominant at most sites. *Sagittaria latifolia* (broadleaf arrowhead) has high constancy and cover but drops out at the highest elevations. *Scirpus cyperinus* (woolgrass) has high constancy. Additional characteristic herbs include *Boehmeria cylindrica* (smallspike false nettle), *Carex gynandra* (nodding sedge), *Carex intumescens* (greater bladder sedge), *Carex baileyi* (Bailey's sedge), *Dichanthelium clandestinum* (deertongue), *Dulichium arundinaceum* (threeway sedge), *Eupatorium fistulosum* (trumpetweed), *Galium tinctorium* (stiff marsh bedstraw), *Impatiens capensis* (jewelweed), *Juncus effusus* (common rush), *Lobelia siphilitica* (great blue lobelia), *Ludwigia palustris* (marsh seedbox), *Lycopus uniflorus* (northern bugleweed), *Lycopus virginicus* (Virginia water horehound), *Lysimachia terrestris* (earth loosestrife), *Mimulus ringens* (Allegheny monkeyflower), *Polygonum sagittatum* (arrowleaf tearthumb), *Scirpus atrovirens* (green bulrush), and *Typha latifolia* (broadleaf cattail). Cover by nonvascular plants is generally insignificant. Scattered small trees include *Robinia pseudoacacia* (black locust), *Salix nigra* (black willow), and *Fraxinus pennsylvanica* (green ash). The exotic shrub *Rosa multiflora* (multiflora rose) may be invasive in this community. *Cornus amomum* (silky dogwood) and *Cephalanthus occidentalis* (common buttonbush) are characteristic native shrubs. Areas with longer standing water may have aquatic species, including *Callitriche heterophylla* (twoheaded water-starwort) and *Sparganium* (bur-reed) spp. Mean species richness of vascular plants in 19 WV plots was 16 taxa per 400 square meters.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Leersia oryzoides</i> (rice cutgrass)
Herb (field)	Forb	<i>Sagittaria latifolia</i> (broadleaf arrowhead)
Herb (field)	Graminoid	<i>Phalaris arundinacea</i> (reed canarygrass)

**Characteristic Species:** *Cephalanthus occidentalis* (common buttonbush), *Cornus amomum* (silky dogwood), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass)

**DISTRIBUTION**

**Range:** This association is currently documented from several areas in West Virginia; it is likely in other parts of the Central Appalachians from Pennsylvania to Virginia.

**States/Provinces:** MD, PA, VA, WV:S3

**Federal Lands:** DOD (Camp Dawson); NPS (New River Gorge); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (5-Jun-2006)

**Reasons:** Need more complete information on range and occurrences before ranking.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** This association is based on 19 plots and anecdotal data from West Virginia, but it is likely wider ranging.

**Similar Associations:**

- *Leersia oryzoides* - *Boehmeria cylindrica* - *Ranunculus flabellaris* Herbaceous Vegetation (CEGL006903)--sinkhole ponds in New Jersey.

**Related Concepts:**

- *Leersia oryzoides* - *Phalaris arundinacea* - *Juncus effusus* herbaceous wetland (Vanderhorst and Streets 2006) =
- *Leersia oryzoides* community (Walbridge 1982) F
- *Leersia oryzoides* herbaceous wetland (Vanderhorst 2001b) =
- Herbaceous wetland (Vanderhorst 2001a) ?
- Rice cutgrass marsh (Putnam 1995) =

**SOURCES****Description Author:** S.C. Gawler**References:** Eastern Ecology Working Group n.d., Grafton and Eye 1982, Putnam 1995, Vanderhorst 2001a, Vanderhorst 2001b, Vanderhorst and Streets 2006, Vanderhorst et al. 2007, Walbridge 1982, Walbridge and Lang 1982, Walton et al. 1996**Tussock Sedge Wet Meadow**

**Scientific Name:** *Carex stricta* Wet Meadow  
**Translated Name:** Tussock Sedge - Inflated Sedge Herbaceous Vegetation  
**NVC Name:** CEG1006412: *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation  
**Conservation Rank:** S3 / G4G5

**WEST VIRGINIA INFORMATION**

**Environmental Description:** This herbaceous sedge meadow occurs on temporarily flooded, semi-permanently flooded, and saturated soils throughout West Virginia, at elevations between 150 and 1020 m. It is a small-patch type that occupies flat to very gently sloping land (0-1 degree) in headwater basins. It typically occurs in discontinuous, repeating patches along the margins of slow-moving streams and in old, drying impoundments. It is maintained by low-energy inundation and frequently forms part of successional beaver-influenced wetland mosaics. Small seep and tributary channels often cross the community. During dry years, woody vegetation invades the community, and it is common to find blowdown and inundation-killed snags. Microtopography is characterized by well-developed tussocks. Bedrock may be sandstone or shale. Soil texture is moderately poorly to very poorly drained peat, muck, silt loam, or sandy clay loam, underlain by stratified alluvial layers. Hydric soil indicators include 2 cm muck, depleted matrix, redox depressions, red parent material, and alluvial depleted matrix. Mean soil pH is 4.4, mean pore water pH is 4.8, and electrical conductivity averages 35 micromhos/cm (n=11). Soil chemistry is characterized by high Fe; moderate B, Mg, Na, and exchangeable nitrogen; and low Ca, Cu, Mn, P, S, Zn, total exchange capacity, and organic matter (n=7). Aluminum and potassium range from moderate to high. The unvegetated surface is predominantly litter, with 20% standing water.

**Vegetation Description:** This herbaceous sedge meadow occurs throughout West Virginia. The shrub layer averages 6% cover and may include *Viburnum recognitum* (southern arrowwood), *Hypericum densiflorum* (bushy St. Johnswort), *Sambucus canadensis* (common elderberry), *Alnus incana* ssp. *rugosa* (speckled alder), *Alnus serrulata* (hazel alder), *Ilex verticillata* (common winterberry), *Acer rubrum* (red maple), and *Salix sericea* (silky willow). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high constancy in this type. The herbaceous

layer, with mean 90% cover, is strongly dominated by tussock-forming *Carex stricta* (tussock sedge). Common herbaceous species with lower cover include *Juncus effusus* (common rush), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), *Leersia oryzoides* (rice cutgrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Carex atlantica* (prickly bog sedge), *Impatiens capensis* (jewelweed), *Carex scoparia* var. *scoparia* (broom sedge), *Carex folliculata* (northern long sedge), *Juncus brevicaudatus* (narrowpanicle rush), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Sparganium* (bur-reed) spp., *Solidago rugosa* (wrinkleleaf goldenrod), *Hypericum mutilum* (dwarf St. Johnswort), *Glyceria striata* (fowl mannagrass), *Eleocharis obtusa* (blunt spikerush), and *Carex stipata* (owlfruit sedge). Nonvascular plants average 10% cover, generally including *Sphagnum* spp. (*Sphagnum affine*, *Sphagnum fimbriatum*, *Sphagnum recurvum*) and less commonly *Polytrichum commune* and other bryophytes. Indicator species that help to distinguish this community from other herbaceous wetlands in the Allegheny Mountains of West Virginia include *Carex stricta* (tussock sedge), *Eleocharis palustris* (common spikerush), *Galium tinctorium* (stiff marsh bedstraw), *Hypericum mutilum* (dwarf St. Johnswort), *Asclepias incarnata* (swamp milkweed), and *Polygonum sagittatum* (arrowleaf tearthumb). This community provides habitat for species of conservation concern in West Virginia, including *Carex interior* (inland sedge) (S1G5), *Carex utriculata* (beaked sedge) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Eleocharis palustris* (common spikerush) (S3G5), and *Sanguisorba canadensis* (Canadian burnet) (S2S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 24 taxa per 400 square meters.

**Fauna observed:** Small mammals observed within the community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew) and the *Microtus pennsylvanicus* (meadow vole). Odonates include *Libellula pulchella* (twelve-spotted skimmer), *Calypteryx maculata* (ebony jewelwing), and *Libellula lydia* (common whitetail). *Dolomedes striatus* (a fishing spider) was noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex interior</i> (inland sedge)	-		plant	WV species of concern
<i>Carex utriculata</i> (beaked sedge)	-		plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-		plant	WV species of concern
<i>Eleocharis palustris</i> (common spikerush)	-		plant	WV species of concern
<i>Sanguisorba canadensis</i> (Canadian burnet)	-		plant	WV species of concern

**West Virginia Range:** This community is known from West Virginia at elevations between 150 and 1020 m. There are documented occurrences at Short Mountain, Alton Marsh, Cranberry Glades, Cranesville Swamp, Cupp Run, and Meadow River.

**Classification Comments:** Twenty plots (6 occurrences) represent this type (CEGL006412), which was classified as part of a statewide analysis of palustrine plots in 2006. The type clusters well, sometimes mixing slightly with the *Leersia oryzoides* (rice cutgrass) herbaceous type. The cluster is close to the *Calamagrostis canadensis* (bluejoint) clade but does not intermix with it. The plots ordinate reasonably well, overlapping in species space with the *Leersia oryzoides* (rice

cutgrass) type and some miscellaneous seepy herbaceous plots. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CRSW.12, MERI.103, MERI.120, MONF.126, SHMO.7, SHMO.29, SHMO.38, SHMO.64, SHMO.65, SHMO.66, WALB.56, WALB.58, WALB.59, WALB.60, WALB.61, WALB.62, WALB.63, WALB.66, WALB.67, WALB.72.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex stricta</i> Seasonally Flooded Herbaceous Alliance (A.1397)
Alliance (English name)	Tussock Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex stricta</i> - <i>Carex vesicaria</i> Herbaceous Vegetation
Association (English name)	Tussock Sedge - Inflated Sedge Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

### GLOBAL DESCRIPTION

**Concept Summary:** These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended. The physiognomy is strongly herbaceous or, in some cases, herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta* (tussock sedge), in its tussock form, is the usual dominant. *Carex vesicaria* (blister sedge), *Carex utriculata* (beaked sedge), and *Calamagrostis canadensis* (bluejoint) may also be locally abundant. Associated graminoids include *Carex atlantica* (prickly bog sedge), *Carex canescens* (silvery sedge), *Carex comosa* (longhair sedge), *Carex folliculata* (northern long sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Carex vulpinoidea* (fox sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass); forbs and ferns include *Asclepias incarnata* (swamp milkweed), *Thelypteris palustris* (eastern marsh fern), *Eupatorium maculatum* (spotted joeypyeweed), *Campanula aparinoides* (marsh bellflower), *Osmunda regalis* (royal fern), *Comarum palustre* (purple marshlocks), *Lysimachia terrestris* (earth loosestrife), *Angelica atropurpurea* (purplestem angelica), *Eupatorium perfoliatum* (common boneset), *Lycopus americanus* (American water horehound), *Polygonum hydropiperoides* (swamp smartweed), *Galium obtusum* (bluntleaf bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), and others. *Lythrum salicaria* (purple loosestrife) may be invasive in some settings.

Shrub associates vary with geography. In the northern part of the range, *Alnus incana* (gray alder), *Myrica gale* (sweetgale), *Ilex verticillata* (common winterberry), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* (white meadowsweet) are often present. Bryophytes, where present, include *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum girgensohnii* (Girgensohn's sphagnum), *Sphagnum palustre* (prairie sphagnum), *Drepanocladus aduncus* (drepanocladus moss), and others. This association is differentiated from other wet meadows by the strong dominance of *Carex stricta* (tussock sedge).

**Environmental Description:** These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended.

**Vegetation Description:** The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta* (tussock sedge), in its tussock form, is the usual dominant. *Carex vesicaria* (blister sedge), *Carex utriculata* (beaked sedge), and *Calamagrostis canadensis* (bluejoint) may also be locally abundant. Associated graminoids include *Carex atlantica* (prickly bog sedge), *Carex canescens* (silvery sedge), *Carex comosa* (longhair sedge), *Carex folliculata* (northern long sedge), *Carex scoparia* (broom sedge), *Carex stipata* (owlfruit sedge), *Carex vulpinoidea* (fox sedge), *Glyceria canadensis* (rattlesnake mangrass), *Dulichium arundinaceum* (threeway sedge), *Juncus effusus* (common rush), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass); forbs and ferns include *Asclepias incarnata* (swamp milkweed), *Thelypteris palustris* (eastern marsh fern), *Eupatorium maculatum* (spotted joepeyeweed), *Campanula aparinoides* (marsh bellflower), *Osmunda regalis* (royal fern), *Comarum palustre* (purple marshlocks), *Lysimachia terrestris* (earth loosestrife), *Angelica atropurpurea* (purplestem angelica), *Eupatorium perfoliatum* (common boneset), *Lycopus americanus* (American water horehound), *Galium obtusum* (bluntleaf bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Galium tinctorium* (stiff marsh bedstraw), and others. *Lythrum salicaria* (purple loosestrife) may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana* (gray alder), *Myrica gale* (sweetgale), *Ilex verticillata* (common winterberry), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* (white meadowsweet) are often present. Bryophytes, where present, include *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum girgensohnii* (Girgensohn's sphagnum), *Sphagnum palustre* (prairie sphagnum), *Sphagnum affine* (sphagnum), *Drepanocladus aduncus* (drepanocladus moss), and others.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint), <i>Carex stricta</i> (tussock sedge), <i>Carex utriculata</i> (beaked sedge), <i>Carex vesicaria</i> (blister sedge)

**Characteristic Species:** *Carex stricta* (tussock sedge), *Leersia oryzoides* (rice cutgrass)

## Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Scirpus ancistrochaetus</i> (barbedbristle bulrush)	G3		plant

**USFWS Wetland System:** Palustrine

## DISTRIBUTION

**Range:** This tussock sedge meadow is found in northern New England, the Adirondack Mountains, and parts of the Appalachians (over an estimated 356,000 square km based on acreage of subsections).

**States/Provinces:** CT, DE, MA, MD, ME:S3, NH, NJ, NY:S4, PA, RI, VT:S4, WV:S3

**Federal Lands:** NPS (Acadia, Delaware Water Gap, Fort Necessity, Minute Man); USFS (Monongahela); USFWS (Aroostook?, Assabet River?, Carlton Pond?, Great Meadows?, Great Swamp, Moosehorn?, Oxbow, Parker River?)

## CONSERVATION STATUS

**Rank:** G4G5 (31-Jan-2007)

**Reasons:** This association is widely distributed throughout New England and northern New York in its small-patch setting and extends sporadically southward.

## CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Information not available.

## Similar Associations:

- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258)

## Related Concepts:

- *Carex (stricta - atlantica)* Herbaceous Vegetation (Hall 2005) F
- *Carex (stricta - folliculata)* - (*C. atlantica*) Herbaceous Vegetation (Hall 2005) F
- *Carex stricta* herbaceous community (Walbridge and Lang 1982) =
- *Carex stricta* meadow (Walbridge 1982) =
- *Carex stricta* wet meadow (CAP pers. comm. 1998) ?
- *Carex stricta* wet meadow (Bartgis 1983) F
- Coastal Plain Intermittent Pond (Breden 1989) B
- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979) ?
- Sedge (*Carex stricta* / *Carex emoryi*) wet meadow (Putnam 1995) =
- Sedge Meadow (Thompson 1996) ?
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984) ?
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984) ?
- Tussock sedge meadow (NAP pers. comm. 1998) ?

## SOURCES

**Description Authors:** S.C. Gawler, mod. E.A. Byers

**References:** Bartgis 1983, Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Curtis 1959, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Hall 2005, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Putnam 1995, Rawinski 1984, Sperduto

2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000, Walbridge 1982, Walbridge and Lang 1982

## Woolgrass Wet Meadow

**Scientific Name:** *Scirpus cyperinus* Wet Meadow  
**Translated Name:** Woolgrass Wet Meadow  
**NVC Name:** CEG1006349: *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation  
**Conservation Rank:** S3 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous community occurs on temporarily flooded, semi-permanently flooded, and saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 830 and 1220 m. It is a small-patch type that occupies flat to very gently sloping land (0-2 degrees) in headwater basins. It occurs in beaver-influenced wetland mosaics and oxbows. The community often contains dead snags and downed wood, indicating former forested physiognomy prior to inundation by beaver. Microtopography is characterized by dense tussocks of *Scirpus* (bulrush) spp. The community sometimes occurs as a peatland with pronounced hummocks of *Polytrichum* (polytrichum moss) spp. up to 60 cm tall. Bedrock is commonly sandstone or shale and, less frequently, limestone. Soil texture is variable and may be poorly to very poorly drained peat, muck, silt loam, clay loam, or sandy loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, sandy mucky mineral, depleted matrix, and alluvial depleted matrix. Mean soil pH is 4.0 (n=6), mean pore water pH is 5.0 (n=8), and electrical conductivity averages 80 micromhos/cm (n=8). Soil chemistry is characterized by high Al; moderate Na, P, Zn, and exchangeable nitrogen; and low B, K, and Mn (n=6). Ca, Cu, Fe, Mg, S, and total exchange capacity are variable, with low values in the peatland expression and moderate-high values in the wet meadow expression. The unvegetated surface is predominantly litter, with 15% standing water and 1% downed wood.

**Vegetation Description:** This herbaceous community occurs in the Allegheny Mountains region of West Virginia. The short-shrub stratum averages 5% cover and often includes *Hypericum densiflorum* (bushy St. Johnswort), with less common species *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Rhododendron maximum* (great laurel), *Photinia pyrifolia* (red chokeberry), *Spiraea tomentosa* (steeplebush), *Viburnum recognitum* (southern arrowwood), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high constancy in this type. The herbaceous layer, with mean 80% cover, is dominated by *Scirpus cyperinus* (woolgrass), or, in higher pH settings, by *Scirpus microcarpus* (panicked bulrush). Herbaceous species with high constancy but low cover include *Juncus effusus* (common rush), *Agrostis hyemalis* (winter bentgrass), *Leersia oryzoides* (rice cutgrass), *Carex scoparia* var. *scoparia* (broom sedge), *Agrostis perennans* (upland bentgrass), *Juncus brevicaudatus* (narrowpanicle rush), *Galium tinctorium* (stiff marsh bedstraw), *Polygonum sagittatum* (arrowleaf tearthumb), *Carex lurida* (shallow sedge), *Sparganium chlorocarpum* (small bur-reed), *Eriophorum virginicum* (tawny cottongrass), *Hypericum mutilum* (dwarf St. Johnswort), and *Solidago uliginosa* (bog goldenrod). Nonvascular plants may be absent or abundant. When abundant, they may have up to 80% cover, dominated by *Polytrichum commune*

(polytrichum moss) with moderate cover by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum papillosum*). *Aulacomnium palustre* is frequently present with low cover. This community provides habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), and *Scirpus microcarpus* (panicled bulrush) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 23 taxa per 400 square meters.

**Fauna observed:** *Limenitis arthemis* (red-spotted purple) butterfly was observed within this community. The following odonates were collected in this community: *Amphiagrion saucium* (eastern red damsel), *Cordulegaster diastatops* (delta-spotted spiketail), *Cordulia shurtleffii* (American emerald), *Enallagma hageni* (Hagen's bluet), *Ischnura verticalis* (common forktail), *Lestes rectangularis* (elegant spreadwings), and *Sympetrum obtrusum* (white-faced meadowhawk). Spiders were collected including *Cyclosa turbinata* (trashline orbweaver), *Neoscona arabesca* (arabesque orbweaver), *Naphrys pulex* (jumping spider), *Tetragnatha versicolor* (longjawed orbweaver), and *Xysticus* sp. (ground crab spider). Insects from five orders were found within this community type. Within the order Coleoptera (beetles), specimens were collected from the Staphylinidae family (rove beetles). Collections from the order Diptera (true flies) include *Elachiptera* sp. (a frit fly), *Lonchoptera* sp. (a spear fly), *Chaetopsis* sp. (a picture-winged fly) and unidentified species from families Dolichopodidae (long-legged flies) and Drosophilidae (vinegar and fruit flies). Species from Hemiptera (true bugs) include *Lepyronia quadrangularis* (a spittlebug), *Helochara communis* (a leafhopper), *Oliarus* sp. (a planthopper), *Cymus* sp. (a plant bug), *Stobaera* sp. (a planthopper), *Lygus* sp. (a plant bug), *Oedancala dorsalis* (fat-legged seed bug), Pentatomidae (stink bugs), *Ligyrocoris* sp. (a seed bug), and *Homaemus aeneifrons* (a shield-backed bug). Species from the order Hymenoptera (ants, bees, and wasps) include *Dolichoderus pustulatus* (an ant). From the order Orthoptera (grasshoppers and crickets), a *Conocephalus* sp. (a conehead) was collected.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-		plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-		plant	WV species of concern
<i>Scirpus microcarpus</i> (panicled bulrush)	-		plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 830 and 1220 m. Within this region, there are occurrences at Big Run Bog, Breathed Mountain Bog, Canaan Valley, Desert Branch, Falls Run on Cheat Mountain, First Fork of Upper Shavers Fork, Gandy Creek, Glady Fork of the Cheat River, Potatohole Fork in Kumbrabow, and Tub Run. This community may occur in other parts of the state.

**Classification Comments:** Fourteen plots (10 occurrences) represent this type (CEGL006349), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters in two separate clades, a wet meadow with few

bryophytes (5 plots) and a peatland with *Polytrichum* (polytrichum moss) spp. dominance (9 plots). The wet meadow ordinated near *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275). The peatland ordinated close to *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570).

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.35, KUMB.20, MONF.101, MONF.113, MONF.188, MONF.196, MONF.227, MONF.250, WALB.6, WALB.34, WALB.35, WALB.40, WALB.41, WALB.43.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Scirpus cyperinus</i> Seasonally Flooded Herbaceous Alliance (A.1386)
Alliance (English name)	Woolgrass Bulrush Seasonally Flooded Herbaceous Alliance
Association	<i>Scirpus cyperinus</i> Seasonally Flooded Herbaceous Vegetation
Association (English name)	Woolgrass Bulrush Seasonally Flooded Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582) Laurentian-Acadian Freshwater Marsh (CES201.594) High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This seasonally flooded marsh occurs in the northeastern United States. It is dominated or characterized by *Scirpus cyperinus* (woolgrass), but composition is variable. Associates include *Glyceria* (mannagrass) spp., *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush) including *Scirpus microcarpus* (panicked bulrush) and *Scirpus atrovirens* (green bulrush).

**Environmental Description:** These are seasonally flooded marshes.

**Vegetation Description:** This community is dominated or characterized by *Scirpus cyperinus* (woolgrass). Composition is variable. Associates include *Glyceria* (mannagrass) spp., *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush), including *Scirpus microcarpus* (panicked bulrush) and *Scirpus atrovirens* (green bulrush).

### Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Scirpus cyperinus</i> (woolgrass)

**Characteristic Species:** *Scirpus cyperinus* (woolgrass)

**USFWS Wetland System:** Palustrine

## DISTRIBUTION

**Range:** This seasonally flood marsh occurs throughout the northeastern U.S. from Maine to West Virginia.

**States/Provinces:** CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT, WV:S3

**Federal Lands:** NPS (Cape Cod, Gateway, Thomas Stone); USFS (Monongahela); USFWS (Assabet River?, Canaan Valley, Chincoteague, Erie, Great Meadows?)

## CONSERVATION STATUS

**Rank:** GNR (1-Dec-1997)

**Reasons:** Information not available.

## CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Information not available.

## Similar Associations:

- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519)

## Related Concepts:

- Shallow emergent marsh (Cowardin et al. 1979) ?

## SOURCES

**Description Authors:** R.E. Zaremba and L.A. Sneddon

**References:** Breden et al. 2001, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Fike 1999, Gawler 2002, Harrison 2004, Walbridge 1982

## V.A.5.N.I. Semi-permanently flooded temperate or subpolar grassland

### Softstem Bulrush Marsh

**Scientific Name:** *Schoenoplectus tabernaemontani* Marsh

**Translated Name:** Softstem Bulrush Marsh

**NVC Name:** CEGL006275: *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation

**Conservation Rank:** S2 / GNR

## WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous marsh occurs on semi-permanently flooded soils in the Allegheny Mountains and Great Valley regions of West Virginia, and possibly elsewhere in the state, at elevations between 150 and 1080 m. It is a small-patch type that occupies flat-lying land in headwater basins. Stands occur where circumneutral seepage and overbank flow is impounded in old oxbows or behind natural stream levees. Standing water is present for most of the year. The type occurs on rich flat-lying limestone bedrock, and sites on private land may be impacted by heavy grazing pressure. The substrate is poorly to very poorly drained peat or silt loam. Hydric soil indicators include histisol, histic epipedon, depleted matrix, and redox depressions. Soil pH in one plot was 4.4, mean pore water pH was 6.5 (n=2), and electrical

conductivity in one plot was 200 micromhos/cm. Soil chemistry in one plot indicated high Al, Ca, Fe, Mn, P, S, Zn, exchangeable nitrogen, and total exchange capacity; moderate B, K, Na, and organic matter; and low Cu and Mg. The unvegetated surface averages 40% litter and 60% standing water.

**Vegetation Description:** This herbaceous marsh occurs in the Allegheny Mountains and Great Valley regions of West Virginia, and possibly elsewhere in the state. The community averages 70% herbaceous cover, dominated by *Schoenoplectus tabernaemontani* (softstem bulrush), *Schoenoplectus acutus* (hardstem bulrush), and *Scirpus cyperinus* (woolgrass). Other common herbaceous species include *Leersia oryzoides* (rice cutgrass), *Thelypteris palustris* (eastern marsh fern), *Ludwigia palustris* (marsh seedbox), *Galium tinctorium* (stiff marsh bedstraw), *Carex lurida* (shallow sedge), *Scirpus microcarpus* (panicled bulrush), *Alisma subcordatum* (American water plantain), and *Verbena hastata* var. *hastata* (swamp verbena). This type is vulnerable to invasion by *Iris pseudacorus* (pale yellow iris). This community provides habitat for species of conservation concern in West Virginia, including *Scirpus microcarpus* (panicled bulrush) (S3G5), and *Veronica scutellata* (skullcap speedwell) (S2G5). Woody species and nonvascular plants do not have significant cover in this community. Mean species richness of vascular plants is 24 taxa per 400 square meters.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Scirpus microcarpus</i> (panicled bulrush)	-	plant	WV species of concern
<i>Veronica scutellata</i> (skullcap speedwell)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains and Great Valley regions within West Virginia, at elevations between 150 and 1080 m. It may occur elsewhere in the state as well. There are known occurrences at Altona Marsh, Mill Run in Canaan Valley, and the Sinks of Gandy.

**Classification Comments:** Two plots (2 occurrences) represent this type (CEGL006275), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The plots ordinate and cluster well together in the marshy part of species space (near *Leersia oryzoides* (rice cutgrass) types), although only 2 occurrences were found in the high-elevation study area. The type also occurs at Altona Marsh and may occur in the Ohio and Potomac drainages at lower elevations, or possibly in "weedy" stockponds.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.24, RAND.19.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)

Formation	Semi-permanently flooded temperate or subpolar grassland (V.A.5.N.1.)
Alliance	<i>Schoenoplectus acutus</i> - ( <i>Schoenoplectus tabernaemontani</i> ) Semi-permanently Flooded Herbaceous Alliance (A.1443)
Alliance (English name)	Hardstem Bulrush - (Softstem Bulrush) Semi-permanently Flooded Herbaceous Alliance
Association	<i>Schoenoplectus (tabernaemontani, acutus)</i> Eastern Herbaceous Vegetation
Association (English name)	(Softstem Bulrush, Hardstem Bulrush) Eastern Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069) Laurentian-Acadian Freshwater Marsh (CES201.594)

### GLOBAL DESCRIPTION

**Concept Summary:** These deepwater bulrush marshes occur across the northeastern United States and adjacent Canadian provinces. They are found in a variety of wetland settings, most commonly in quiet-water areas along the shores of ponds, lakes, rivers, and larger streams, but also in flooded basins and ditches. The vegetation occurs in deep water (usually 0.4-1 m deep) that is present in all but the driest of conditions. Seasonal spring flooding and heavy rainstorms provide nutrient input. The substrate is usually deep muck overlying mineral soil; where wave action is more prevalent, the mineral soil may be exposed. The vegetation is dominated by bulrushes and robust graminoids, with scattered emergent forbs. Trees and shrubs are absent. Dominant species are usually *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), and/or *Schoenoplectus americanus* (chairmaker's bulrush). Associated herbs include *Scirpus cyperinus* (woolgrass), *Carex aquatilis* (water sedge), *Carex pellita* (woolly sedge), *Carex utriculata* (beaked sedge), *Thelypteris palustris* (eastern marsh fern), *Typha latifolia* (broadleaf cattail), *Asclepias incarnata* (swamp milkweed), *Impatiens capensis* (jewelweed), *Pontederia cordata* (pickerelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Schoenoplectus fluviatilis* (river bulrush), *Scutellaria lateriflora* (blue skullcap), *Verbena hastata* (swamp verbena), *Leersia oryzoides* (rice cutgrass), *Ludwigia palustris* (marsh seedbox), and others. Floating-leaved and submerged plants (such as *Potamogeton* (pondweed) spp., *Sparganium* (bur-reed) spp., *Elodea canadensis* (Canadian waterweed), *Ceratophyllum* (hornwort) spp.) may be scattered among the emergent plants. This association is distinguished from other northeastern standing-water marsh communities by the strong dominance of tall bulrush species.

**Environmental Description:** These deepwater bulrush marshes occur across the northeastern United States and adjacent Canadian provinces. They are found in a variety of wetland settings, most commonly in quiet-water areas along the shores of ponds, lakes, rivers, and larger streams, but also in flooded basins and ditches. The vegetation occurs in deep water (usually 0.4-1 m deep) that is present in all but the driest of conditions. Seasonal spring flooding and heavy rainstorms provide nutrient input. The substrate is usually deep muck overlying mineral soil; where wave action is more prevalent, the mineral soil may be exposed.

**Vegetation Description:** The vegetation is dominated by bulrushes and robust graminoids, with scattered emergent forbs. Trees and shrubs are absent. Dominant species are usually *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), and/or *Schoenoplectus americanus* (chairmaker's bulrush). Associated herbs include *Scirpus cyperinus* (woolgrass), *Carex aquatilis* (water sedge), *Carex pellita* (woolly sedge), *Carex utriculata* (beaked sedge), *Thelypteris palustris* (eastern marsh fern), *Typha latifolia* (broadleaf cattail), *Asclepias incarnata* (swamp milkweed), *Impatiens capensis* (jewelweed), *Pontederia cordata* (pickerelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Schoenoplectus fluviatilis* (river bulrush), *Scutellaria lateriflora* (blue skullcap), *Verbena hastata* (swamp verbena), *Leersia oryzoides* (rice cutgrass), *Ludwigia palustris* (marsh seedbox), and others. Floating-leaved and submerged plants (such as *Potamogeton* (pondweed) spp., *Sparganium* (bur-reed) spp., *Elodea canadensis* (Canadian waterweed), *Ceratophyllum* (hornwort) spp.) may be scattered among the emergent plants.

**USFWS Wetland System:** Palustrine

#### **DISTRIBUTION**

**Range:** This variable deepwater marsh community occurs in the northeastern United States and adjacent Canadian provinces.

**States/Provinces:** CT, DE, MA, MD, ME:S4, NH:S4, NJ:S2S4, NY, PA, RI, VA?, VT:S4, WV:S2

**Federal Lands:** NPS (Acadia); USFWS (Assabet River, Erie, Great Meadows?, Oxbow, Parker River?)

#### **CONSERVATION STATUS**

**Rank:** GNR (1-Dec-1997)

**Reasons:** Information not available.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Information not available.

#### **Similar Associations:**

- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225)
- *Schoenoplectus acutus* - *Carex lasiocarpa* Herbaceous Vegetation (CEGL006358)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623)

#### **Related Concepts:**

- Bulrush marsh (CAP pers. comm. 1998) ?
- Deep Rush Marsh (Thompson 1996) B
- Palustrine Narrow-leaved Persistent Emergent Wetland, Permanently Flooded (PEM5H) (Cowardin et al. 1979) ?
- Spring swamp (Hill 1923) ?

#### **SOURCES**

**Description Author:** S.C. Gawler

**References:** Bartgis 1983, Bowman 2000, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Harrison 2004, Hill 1923, Northern Appalachian Ecology Working Group

2000, Sperduto 2000b, Swain and Kearsley 2000, Thompson 1996, Thompson and Sorenson 2000

## V.A.5.N.m. Saturated temperate or subpolar grassland

### Cottongrass Fen

**Scientific Name:** *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Fen  
**Translated Name:** Tawny Cotton-grass - (Northern Long Sedge) / Peatmoss - Haircap Moss Fen  
**NVC Name:** CEGL006570: *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation  
**Conservation Rank:** S3 / G3

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This acidic herbaceous community occurs on temporarily flooded, semi-permanently flooded, or saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Older stands typically occur over shallow bedrock, where they are kept open by high water tables. Younger stands often occur in beaver-influenced wetland mosaics, often behind breached dams on the site of former beaver ponds. The type also occurs as a successional community on formerly forested peatlands that have been logged and/or burned within the last century. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-30 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale or limestone. The substrate is poorly to very poorly drained peat or muck. Peat deposits are shallow, ranging from 10-75 cm in depth, underlain by clay-rich soils or bedrock. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, 2 cm muck, sandy mucky mineral, dark surface, depleted matrix, and redox depressions. Mean soil pH is 3.8 (n=5), mean pore water pH is 4.3 (n=9), and electrical conductivity averages 30 micromhos/cm (n=9). Soil chemistry is characterized by high exchangeable nitrogen and organic matter; moderate Fe, P, S, and total exchange capacity; and low B, Ca, Cu, K, Mg, Mn, Na, and Zn (n=5). Aluminum is variable, ranging from 337-1310 ppm. The unvegetated surface is predominantly litter, with an average of 4% standing water.

**Vegetation Description:** This acidic herbaceous peatland occurs in the Allegheny Mountains region of West Virginia. Stunted trees, shrubs, and snags may occupy hummock tops, averaging 8% cover and typically including *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Kalmia latifolia* (mountain laurel), and *Ilex verticillata* (common winterberry). The dwarf-shrub *Rubus hispidus* (bristly dewberry) has high cover and constancy in this type. The dwarf-shrubs *Vaccinium oxycoccos* (small cranberry) and *Vaccinium macrocarpon* (cranberry) are often present with low cover. The herbaceous layer, with mean 70% cover, is dominated by

*Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Juncus effusus* (common rush). Other common herbaceous species include *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Scirpus cyperinus* (woolgrass), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Agrostis hyemalis* (winter bentgrass), and *Agrostis perennans* (upland bentgrass). Nonvascular plants average 70% cover, dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum fallax*, and others) and generally include moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex canescens* (silvery sedge) (S3G5T5), *Carex pauciflora* (fewflower sedge) (S1G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S2S3G5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Scirpus microcarpus* (panicked bulrush) (S3G5), *Vaccinium macrocarpon* (cranberry) (S3G4), and *Vaccinium oxycoccos* (small cranberry) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 20 taxa per 400 square meters.

**Fauna observed:** *Danaus plexippus* (monarch butterfly) was observed within this community. *Libellula lydia* (common whitetail), a dragonfly, was noted, as was the spider *Tetragnatha laboriosa* (silver longjawed orbweaver).

**West Virginia Range:** This community is restricted to the Allegheny Mountains region within West Virginia, at elevations between 770 and 1210 m. Within this region, there are occurrences at Big Run Bog, Canaan Valley, Cheat Mountain (North Fork Falls Run), Cranesville Swamp, Cupp Run, Dolly Sods (Alder Run, Dobbins Slashing, Fisher Spring Run), Laurel Run of Stony River, Otter Creek (Condon Run, Moore Run, Shavers Lick Run), and Tub Run. The community also occurs at The Glades, Maryland.

**Classification Comments:** Thirty-nine plots (16 occurrences) represent this type (CEGL006570), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The plots ordinate strongly together in species space, although in cluster analysis this group appears slightly messy, with clades that sometimes break apart to join *Carex utriculata* (beaked sedge) or *Scirpus* (bulrush) peatland types. The type has been well-sampled with a large number of plots from multiple locations and researchers throughout its range in West Virginia. It is similar to, but has a lower seepage component and more ombrotrophic bog species than, *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534) and *Carex rostrata* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257). It is also similar to, but with a higher seepage component and shallower peat substrate than, *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland (CEGL007856).

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.27, CRSW.19, CVWR.10, CVWR.46, FRAN.6, FRAN.19, FRAN.22, FRAN.23, FRAN.24, FRAN.25, FRAN.26, FRAN.37, FRAN.43, FRAN.44, FRAN.46, FRAN.68, FRAN.107, FRAN.108, FRAN.122, MONF.109, MONF.169, MONF.226, MONF.229,

TUCK.8, WALB.5, WALB.10, WALB.11, WALB.12, WALB.14, WALB.15, WALB.25, WALB.26, WALB.37, WALB.38, WALB.45, WALB.46, WALB.47, WALB.48, WALB.69.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	<i>Eriophorum</i> spp. Saturated Herbaceous Alliance (A.2624)
Alliance (English name)	Cotton-grass species Saturated Herbaceous Alliance
Association	<i>Eriophorum virginicum</i> - ( <i>Carex folliculata</i> ) / <i>Sphagnum</i> spp. - <i>Polytrichum</i> spp. Herbaceous Vegetation
Association (English name)	Tawny Cotton-grass - (Northern Long Sedge) / Peatmoss species - Haircap Moss species Herbaceous Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This acidic herbaceous community occurs on temporarily flooded, semi-permanently flooded, or saturated peat in the Allegheny Mountains region of West Virginia and Maryland, at elevations between 770 and 1210 m. It is a small-patch type that occupies flat-lying land (0- to 1-degree slopes) in headwater basins. Older stands typically occur over shallow bedrock, where they are kept open by high water tables. Younger stands often occur in beaver-influenced wetland mosaics, often behind breached dams on the site of former beaver ponds. The type also occurs as a successional community on formerly forested peatlands that have been logged and/or burned within the last century. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-30 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale or limestone. The substrate is poorly to very poorly drained peat or muck. Peat deposits are shallow, ranging from 10-75 cm in depth, underlain by clay-rich soils or bedrock. Mean soil pH is 3.8. Low cover of stunted trees, shrubs, and snags may occupy hummock tops, typically including *Picea rubens* (red spruce), *Amelanchier laevis* (Allegheny serviceberry), *Rhododendron maximum* (great laurel), *Hypericum densiflorum* (bushy St. Johnswort), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Photinia pyrifolia* (red chokeberry), *Photinia melanocarpa* (black chokeberry), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Kalmia latifolia* (mountain laurel), and *Ilex verticillata* (common winterberry). The dwarf-shrub *Rubus hispida* (bristly dewberry) has high cover and constancy in this type. The dwarf-shrubs *Vaccinium oxycoccos* (small cranberry) and *Vaccinium macrocarpon* (cranberry) are often present with low cover. The herbaceous layer is dominated by *Eriophorum virginicum* (tawny cottongrass), *Solidago uliginosa* (bog goldenrod), *Carex folliculata* (northern long sedge), and *Juncus effusus* (common rush). Other common herbaceous species include *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Carex trisperma* var. *trisperma* (threeseeded sedge), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Scirpus cyperinus* (woolgrass), *Gentiana linearis* (narrowleaf gentian), *Rhynchospora alba* (white beaksedge), *Carex stipata* (owlfruit sedge), *Agrostis hyemalis* (winter bentgrass), and *Agrostis perennans* (upland bentgrass).

Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum fallax*, and others) and generally include moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum strictum*). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 20 taxa per 400 square meters for 39 plots in West Virginia and Maryland.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

**USFWS Wetland System:** Palustrine

#### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region within Maryland and West Virginia, at elevations between 770 and 1210 m.

**States/Provinces:** MD, WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### CONSERVATION STATUS

**Rank:** G3 (11-May-2007)

**Reasons:** This is a small-patch type with about 20 known viable occurrences, five of which occur in protected settings, including a TNC nature preserve, USFS Research Botanical Area, USFS Wilderness Area, or USFWS refuge. It has narrow environmental specificity and high intrinsic vulnerability.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:**

**Comments:** Information not available.

#### Similar Associations:

- *Carex (rostrata, utriculata) - Carex lacustris - (Carex vesicaria)* Herbaceous Vegetation (CEGL002257)
- *Carex echinata - Solidago uliginosa / Sphagnum* spp. Herbaceous Vegetation (CEGL008534)
- *Vaccinium oxycoccos - (Vaccinium macrocarpon) / Rhynchospora alba - Drosera rotundifolia / Sphagnum* spp. Dwarf-shrubland (CEGL007856)

#### Related Concepts:

- *Polytrichum - Eriophorum virginicum* hummock bog (Fortney 1975) F
- *Polytrichum commune - Sphagnum recurvum - Eriophorum virginicum - Solidago uliginosa* hummock hollow community (Walbridge 1982) F
- *Polytrichum commune - Sphagnum recurvum - Solidago uliginosa - Pyrus arbutifolia* hummock hollow community (Walbridge 1982) F
- *Polytrichum commune - Sphagnum recurvum / Eriophorum virginicum / Rubus hispidus* bryophyte community (Walbridge and Lang 1982) F
- *Polytrichum commune - Sphagnum recurvum / Solidago uliginosa / Rubus hispidus* bryophyte community (Walbridge and Lang 1982) F
- *Rhynchospora alba - Eriophorum virginicum / Sphagnum* herbaceous vegetation (Hall 2005)  
=
- *Sphagnum - Eriophorum virginicum* bog (Fortney 1975) F
- *Sphagnum - Eriophorum virginicum* community (Wieder et al. 1981) =

- *Sphagnum recurvum* - *Polytrichum commune* - *Eriophorum virginicum* - *Solidago uliginosa* hummock hollow community (Walbridge 1982) F
- *Sphagnum recurvum* - *Polytrichum commune* / *Solidago uliginosa* - *Eriophorum virginicum* bryophyte community (Walbridge and Lang 1982) F
- *Sphagnum recurvum* - *Rhynchospora alba* - *Eriophorum virginicum* community (Walbridge 1982) F
- *Sphagnum recurvum* / *Rhynchospora alba* - *Eriophorum virginicum* / *Rubus hispidus* bryophyte community (Walbridge and Lang 1982) F

#### SOURCES

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d., Fortney 1975, Francl 2003, Hall 2005, Walbridge 1982, Walbridge and Lang 1982, Wieder et al. 1981

### Nodding Sedge – Prickly Bog Sedge Seep

**Scientific Name:** *Carex gynandra* – *Carex atlantica* / *Sphagnum* spp. Seep  
**Translated Name:** Nodding Sedge – Prickly Bog Sedge / Peatmoss Seep  
**NVC Name:** CEG1007771: *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation  
**Conservation Rank:** S2 / G2

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous seepage fen occurs on temporarily flooded and saturated soils in the Allegheny Mountains region of West Virginia, at elevations between 800 and 1220 m. It is a small-patch type that occupies very gently sloping land (1-2 degrees) in headwater basins. Typically, this community is found on the margins of larger open wetlands, either on toeslopes, alluvial fans, or as fingers of enriched seepage extending into the wetland mosaic. It also occurs as a spring-fed seepage fen in old oxbows along low-gradient meandering streams. Rivulets a few centimeters wide may transect the community. During dry years, or during periods of reduced beaver activity in adjacent wetlands, woody species invade this type; inundation-killed snags are common. Hummock-and-hollow microtopography is fairly well-developed, with rounded peat hummocks 5-40 cm high and irregular mossy hummocks formed over decaying wood. Bedrock is commonly shale and, less frequently, sandstone. Soil texture is variable and may include poorly drained peat, muck, mottled silt loam, sandy loam, or clay loam, underlain by clay or bedrock. Hydric soil indicators include histisol, hydrogen sulphide, depleted matrix, and depleted dark surface. Mean soil pH is 4.4, mean pore water pH is 5.3, and mean electrical conductivity is 80 micromhos/cm (n=5). Soil chemistry is characterized by high Ca, Mg, P, S; moderate Al, Fe, Na, exchangeable nitrogen, organic matter and total exchange capacity; and low B, Cu, K, Mn, and Zn (n=6). The unvegetated surface is predominantly litter, with 12% standing water and 1% downed wood.

**Vegetation Description:** This herbaceous seepage fen occurs in the Allegheny Mountains region of West Virginia. The shrub layer averages 9% cover and often includes *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Hypericum densiflorum* (bushy St. Johnswort), *Salix sericea* (silky willow), and *Vaccinium myrtilloides* (velvetleaf huckleberry). The herbaceous layer, with mean 80% cover, is typically dominated by *Carex gynandra* (nodding sedge) and

*Carex atlantica* (prickly bog sedge); however, this type is susceptible to invasion by *Typha latifolia* (broadleaf cattail), which can attain dominance in some cases. The dwarf-shrub *Rubus hispida* (bristly dewberry) is often present with moderate cover. Common herbaceous species with lower cover are *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Galium tinctorium* (stiff marsh bedstraw), *Solidago uliginosa* (bog goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Juncus effusus* (common rush), *Dryopteris cristata* (crested woodfern), *Polygonum sagittatum* (arrowleaf tearthumb), *Impatiens capensis* (jewelweed), *Solidago rugosa* (wrinkleleaf goldenrod), *Carex stipata* (owlfruit sedge), *Chelone glabra* (white turtlehead), *Hypericum mutilum* (dwarf St. Johnswort), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Glyceria laxa* (limp mannagrass), *Carex echinata* ssp. *echinata* (star sedge), *Leersia oryzoides* (rice cutgrass), *Carex lurida* (shallow sedge), *Scirpus cyperinus* (woolgrass), *Glyceria striata* (fowl mannagrass), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Eriophorum virginicum* (tawny cottongrass), *Epilobium leptophyllum* (bog willowherb), *Agrostis perennans* (upland bentgrass), and *Platanthera clavellata* (small green wood orchid). Nonvascular plants average 35% cover and are dominated by *Sphagnum* spp. (*Sphagnum recurvum*, *Sphagnum fimbriatum*, *Sphagnum palustre*, *Sphagnum henryense*). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex canescens* (silvery sedge) (S3G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Eleocharis palustris* (common spikerush) (S3G5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Vaccinium oxycoccos* (small cranberry) (S3G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S3G4Q). Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Carex atlantica* (prickly bog sedge), *Carex gynandra* (nodding sedge), *Chelone glabra* (white turtlehead), *Platanthera clavellata* (small green wood orchid), *Typha latifolia* (broadleaf cattail), and *Viburnum nudum* var. *cassinoides* (northern wild raisin). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 30 taxa per 400 square meters.

**Fauna observed:** Odonates observed within the community include: *Amphiagrion saucium* (eastern red damsel), *Cordulegaster diastatops* (delta-spotted spiketail), *Cordulia shurtleffii* (American emerald), *Enallagma hageni* (Hagen's bluet), *Ischnura verticalis* (common forktail), *Sympetrum obtrusum* (white-faced meadowhawk). Spiders collected include *Neoscona arabesca* (arabesque orbweaver), *Pirata sedentarius* (pirate wolf spider), *Tetragnatha laboriosa* (silver longjawed orbweaver), and a *Tetragnatha* sp. (longjawed orbweaver). Insects were collected from three orders. From Coleoptera (beetles), *Microrhopala xerene* (a leaf beetle) was noted. Within the order Diptera (true flies), specimens were collected of *Diplotoxa* sp. (a frit fly) and species from Fanniidae (lesser houseflies) and Muscidae (house flies) families. From the order Hemiptera (true bugs), *Draeculacephala noveboracensis* (a leafhopper), *Lygus* sp. (a plant bug), and species from Pentatomidae (stink bugs) were noted.

#### Other Noteworthy Species:

Species	GRank	Type	Note
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Eleocharis palustris</i> (common spikerush)	-	plant	WV species of concern

<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 800 and 1220 m. Within this region, there are occurrences at Big Run south of Spruce Knob Lake, Canaan Valley (Big Cove), Cupp Run, Dolly Sods (Breathed Mountain, Fisher Spring Run), First Fork of Upper Shavers, and Laurel Fork north of Route 33.

**Classification Comments:** Eight plots (7 occurrences) represent this type (CEGL007771), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This herbaceous seep type seems to attract statistical outliers (*Typha latifolia* (broadleaf cattail), *Glyceria canadensis* (rattlesnake mannagrass), *Scirpus microcarpus* (panicled bulrush), and one *Dulichium arundinaceum* (threeway sedge) plot), and several were removed before it clustered consistently. It ordinales reasonably well in the "seepage" part of species space, separated from relatively ombrotrophic bogs, wetter marshes, and actively flooded alluvial types. Because of the variability of this type, it would benefit from additional sampling, especially to see if the *Typha* (cattail)-dominated plots separate out. The type grades into, but has a larger seepage component than, *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534). It also grades into *Salix* (willow) and *Alnus* (alder) shrub swamps and *Abies balsamea* - *Ilex verticillata* swamps.

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.18, CVWR.20, MONF.115, MONF.133, MONF.189, MONF.199, RAND.2, WALB.70.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	<i>Carex crinita</i> - <i>Osmunda</i> spp. / <i>Sphagnum</i> spp. Saturated Herbaceous Alliance (A.1451)
Alliance (English name)	Fringed Sedge - Royal Fern species / Peatmoss species Saturated Herbaceous Alliance
Association	<i>Carex gynandra</i> - <i>Scirpus cyperinus</i> - <i>Eriophorum virginicum</i> - <i>Osmunda cinnamomea</i> Herbaceous Vegetation
Association (English name)	Nodding Sedge - Woolgrass Bulrush - Tawny Cotton-grass - Cinnamon Fern Herbaceous Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069) Southern and Central Appalachian Bog and Fen (CES202.300)

## GLOBAL DESCRIPTION

**Concept Summary:** This association consists of patches of saturated vegetation located in areas of flat to very gently sloping topography (0-2 degrees) located near streams in the Allegheny and Cumberland mountains. This community occurs along streams, in flats away from the immediate streambed, along wetland margins, and in seepage-fed oxbow fens, at elevations of 610 to 1220 m (2000-4000 feet). It is primarily an herbaceous community, but some examples may exhibit a shrub zone. The primary herbaceous species are *Carex gynandra* (nodding sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Doellingeria umbellata* (parasol whitetop), *Polygonum sagittatum* (arrowleaf tearthumb), *Eriophorum virginicum* (tawny cottongrass), *Lygodium palmatum* (American climbing fern), *Platanthera clavellata* (small green wood orchid), *Platanthera flava* var. *flava* (palegreen orchid), *Lycopus virginicus* (Virginia water horehound), *Oxypolis rigidior* (stiff cowbane), *Chelone glabra* (white turtlehead), *Carex lurida* (shallow sedge), *Glyceria melicaria* (melic mannagrass), *Scirpus cyperinus* (woolgrass), *Carex leptalea* ssp. *harperi* (Harper's sedge), *Solidago rugosa* (wrinkleleaf goldenrod), *Galium tinctorium* (stiff marsh bedstraw), *Solidago uliginosa* (bog goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Carex stipata* (owlfruit sedge), *Hypericum mutilum* (dwarf St. Johnswort), and *Glyceria laxa* (limp mannagrass). *Sphagnum* spp. are common and include *Sphagnum palustre*. Shrubs can occur as scattered clumps or zones and include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Hypericum densiflorum* (bushy St. Johnswort), *Salix sericea* (silky willow), *Ilex opaca* (American holly), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Photinia pyrifolia* (red chokeberry).

**Environmental Description:** This herbaceous seepage fen occurs in the Allegheny and Cumberland mountains, at elevations of 610 to 1220 m (2000-4000 feet). In the Alleghenies, the community is found on very gently sloping (1- to 2-degree) margins of larger open wetlands in flat headwater basins, either on toeslopes, alluvial fans, or as fingers of enriched seepage extending into the wetland mosaic. It also occurs as a spring-fed seepage fen in old oxbows along low-gradient meandering streams. In the Cumberlands, the community occurs along streams, in flats away from the immediate streambed.

**Vegetation Description:** This herbaceous seepage fen occurs in the Allegheny and Cumberland mountains. The primary herbaceous species in this association are *Carex gynandra* (nodding sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Doellingeria umbellata* (parasol whitetop), *Polygonum sagittatum* (arrowleaf tearthumb), *Eriophorum virginicum* (tawny cottongrass), *Lygodium palmatum* (American climbing fern), *Platanthera clavellata* (small green wood orchid), *Platanthera flava* var. *flava* (palegreen orchid), *Lycopus virginicus* (Virginia water horehound), *Oxypolis rigidior* (stiff cowbane), *Chelone glabra* (white turtlehead), *Carex lurida* (shallow sedge), *Glyceria melicaria* (melic mannagrass), *Scirpus cyperinus* (woolgrass), *Carex leptalea* ssp. *harperi* (Harper's sedge), *Solidago rugosa* (wrinkleleaf goldenrod), *Galium tinctorium* (stiff marsh bedstraw), *Solidago uliginosa* (bog goldenrod), *Carex scoparia* var. *scoparia* (broom sedge), *Dryopteris cristata* (crested woodfern), *Impatiens capensis* (jewelweed), *Carex stipata* (owlfruit sedge), *Hypericum mutilum* (dwarf St. Johnswort), and *Glyceria laxa* (limp mannagrass). *Sphagnum* spp. are common and include

*Sphagnum palustre*. Shrubs can occur as scattered clumps or zones and include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Hypericum densiflorum* (bushy St. Johnswort), *Salix sericea* (silky willow), *Ilex opaca* (American holly), *Kalmia latifolia* (mountain laurel), *Rhododendron maximum* (great laurel), and *Photinia pyrifolia* (red chokeberry). This type apparently lacks many species characteristic of bogs of the Southern Blue Ridge and has some species rarely encountered in Blue Ridge bogs. The community is susceptible to invasion by *Typha latifolia* (broadleaf cattail), which attains dominance in some stands in West Virginia. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 30 taxa per 400 square meters for eight plots in West Virginia.

**USFWS Wetland System:** Palustrine

#### **DISTRIBUTION**

**Range:** This community type is restricted to the Allegheny Mountains of West Virginia and the Cumberland Mountains of Kentucky, Virginia, and possibly Tennessee, at elevations of 610-1220 m.

**States/Provinces:** KY, TN?, VA, WV:S2

**Federal Lands:** NPS (Big South Fork, Cumberland Gap); USFS (Daniel Boone?, Monongahela); USFWS (Canaan Valley)

#### **CONSERVATION STATUS**

**Rank:** G2 (11-May-2007)

**Reasons:** This community type is apparently restricted to the Allegheny Mountains of West Virginia and the Cumberland Mountains of Kentucky, Virginia, and possibly Tennessee. Examples are small in size and the total area of occupancy is very small. Inventories from Cumberland occurrences are lacking. Many examples were impacted in the past by forest clearing and the construction of farm ponds. Examples are threatened by vegetative succession in the Cumberlands and by invasion of hybrid *Typha latifolia* (broadleaf cattail) in the Alleghenies.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 2 - Moderate

**Comments:** Eight plots represent this type in West Virginia, where it was classified as part of a 2004-2006 study of wetlands in the Allegheny Mountains. Examples occur at Martins Fork (Harlan County, Kentucky) and Falling Water Gap, Virginia. The relationship and distinctiveness of this type relative to other associations in this alliance need additional consideration. This type apparently lacks many species characteristic of bogs of the Southern Blue Ridge and has some species rarely encountered in Blue Ridge bogs. Vegetation seen at an abandoned millpond in Big South Fork National River and Recreation Area (Tennessee) may fit this concept (M. Pyne pers. comm.).

#### **Similar Associations:**

- *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphyotrichum puniceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008438)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404)--is less diverse and associated with larger rivers in the Cumberland Plateau of Alabama.

**Related Concepts:** Information not available.

#### **SOURCES**

**Description Author:** E.A. Byers

**References:** Fleming et al. 2001, Pyne pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Walbridge 1982

## Silvery Sedge Fen

**Scientific Name:** *Carex canescens* / *Polytrichum* spp. - *Sphagnum* spp. Fen  
**Translated Name:** Silvery Sedge / Haircap Moss - Peatmoss Fen  
**NVC Name:** CEG1006549: *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation  
**Conservation Rank:** S2 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous hummocky sedge fen occurs on temporarily flooded, semi-permanently flooded, and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 950 and 1210 m. It is a small-patch type that occupies flat to very gently sloping land (0-0.5 degree) in headwater basins. It includes two subtypes, dominated by either *Sphagnum* or *Polytrichum* moss. The *Sphagnum*-dominated subtype occurs on the margins of active beaver ponds and on top of old beaver pond areas that have been abandoned long enough (often a decade or more) for open water to be replaced by a vegetative mat. The *Polytrichum*-dominated subtype has pronounced hummocky microtopography and occurs on the margins of low-gradient, first-order, meandering headwater streams. Both types form part of successional beaver-influenced wetland mosaics and often contain dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks about 10 cm high in *Sphagnum*-dominated stands, and 10-70 cm high in *Polytrichum*-dominated stands. Bedrock is commonly sandstone and, less frequently, shale or limestone. Soil texture is poorly to very poorly drained peat, less than half a meter in thickness and underlain by clay-rich layers mixed with silt and sand. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, stratified layers, sandy mucky mineral, and depleted matrix. Mean soil pH is 3.7, mean pore water pH is 5.0, and electrical conductivity averages 60 micromhos/cm (n=7). Soil chemistry is characterized by high Al, P, S, exchangeable nitrogen, total exchange capacity, and organic matter; and low B, Ca, Cu, K, Mg, Mn, Na, and Zn (n=6). Iron ranges from low to high (87-546 ppm). The unvegetated surface is predominantly litter, with 2% standing water.

**Vegetation Description:** This herbaceous sedge fen occurs in the Allegheny Mountains region of West Virginia. The short-shrub stratum averages 3% cover and may include *Hypericum densiflorum* (bushy St. Johnswort), *Vaccinium myrtilloides* (velvetleaf huckleberry), and *Photinia melanocarpa* (black chokeberry). The dwarf-shrub species *Rubus hispidus* (bristly dewberry) has high constancy in this type. The herbaceous layer, with mean 40% cover, is dominated by *Carex canescens* (silvery sedge). Herbaceous species with high constancy but low cover include *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Juncus brevicaudatus* (narrowpanicle rush), and *Glyceria canadensis* (rattlesnake mannagrass). Locally abundant species may include *Scirpus cyperinus* (woolgrass), *Carex atlantica* (prickly bog sedge), and *Carex echinata* ssp. *echinata* (star sedge). Nonvascular plants average 90% cover, dominated by either *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum rubellum*, *Sphagnum cuspidatum*, and other species) or by *Polytrichum* spp. (*Polytrichum*

*commune*, *Polytrichum strictum*, and *Polytrichum pallidisetum*). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Carex canescens* (silvery sedge) (S3G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Vaccinium macrocarpon* (cranberry) (S3G4), and *Vaccinium oxycoccos* (small cranberry) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters.

**Fauna observed:** *Colias interior* (pink edged sulphur) butterfly was observed within this community. Odonates observed include *Ischnura verticalis* (common forktail), *Cordulia shurtleffii* (American emerald), *Cordulegaster diastatops* (delta-spotted spiketail), *Enallagma hageni* (Hagen's bluet), *Aeshna umbrosa* (shadow darner), *Amphiagrion saucium* (eastern red damsel), *Nehalennia irene* (sedge sprite), and *Sympetrum obtrusum* (white-faced meadowhawk). Spiders collected include *Araniella displicata* (sixspotted orbweaver), *Argiope trifasciata* (banded garden spider), *Larina borealis* (orbweaver), *Neoscona arabesca* (arabesque orbweaver), *Pirata insularis* (pirate wolf spider), *Tetragnatha laboriosa* (silver longjawed orbweaver), and *Misumenoides formosipes* (whitebanded crab spider). Specimens of Chironomidae (midges) from the order Diptera (true flies) were noted.

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> Rank	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Carex canescens</i> (silvery sedge)	-	plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-	plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 950 and 1210 m. Within this region, there are occurrences at Big Run Bog, Canaan Valley, Dolly Sods (Breathed Mountain), Otter Creek Wilderness, Red Creek Plains, and Whitmeadow Run.

**Classification Comments:** Nine plots (7 occurrences) represent this type (CEGL006549), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type occurs in two separate, consistently clustering clades, one with strong *Sphagnum* dominance (3 plots) and one with *Polytrichum* dominance (6 plots). The *Sphagnum*-dominated group ordines close to West Virginia's *Dulichium arundinaceum* / *Sphagnum* fen and *Vaccinium oxycoccos* / *Rhynchospora alba* / *Sphagnum* spp. peatland. The *Polytrichum*-dominated group ordines close to West Virginia's *Eriophorum virginicum* (tawny cottongrass) peatland. The type has been adequately sampled throughout its range in West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** CASP.21, CVWR.22, CVWR.25, MONF.107, MONF.162, MONF.186, MONF.240, MONF.254, WALB.17.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	<i>Carex</i> spp. Saturated Herbaceous Alliance (A.1455)
Alliance (English name)	Sedge species Saturated Herbaceous Alliance
Association	<i>Carex canescens</i> - <i>Eriophorum virginicum</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation
Association (English name)	Silvery Sedge - Tawny Cotton-grass / Peatmoss species Herbaceous Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069) North-Central Appalachian Seepage Fen (CES202.607) Southern and Central Appalachian Bog and Fen (CES202.300)

### GLOBAL DESCRIPTION

**Concept Summary:** This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England. It is a weakly acidic fen type that occurs on temporarily flooded, semi-permanently flooded, and saturated peat. It forms part of successional beaver-influenced wetland mosaics and often contains dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed. The vegetation is dominated by low to medium-height sedges over a well-developed mat of *Sphagnum* spp. or *Polytrichum* spp. Dominant sedges include *Carex canescens* (silvery sedge) and *Eriophorum virginicum* (tawny cottongrass). Associates include *Carex utriculata* (beaked sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Juncus canadensis* (Canadian rush), *Juncus brevicaudatus* (narrowpanicle rush), *Rubus hispidus* (bristly dewberry), *Scirpus cyperinus* (woolgrass), *Glyceria canadensis* (rattlesnake mannagrass), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lysimachia terrestris* (earth loosestrife), *Thelypteris palustris* (eastern marsh fern), and *Photinia melanocarpa* (black chokeberry).

**Environmental Description:** This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England. It is a weakly acidic fen type that occurs on temporarily flooded, semi-permanently flooded, and saturated peat. It forms part of successional beaver-influenced wetland mosaics and often contains dead snags or moss-covered downed wood. Hummock-and-hollow microtopography is well-developed.

**Vegetation Description:** The vegetation is dominated by low to medium-height sedges over a well-developed mat of *Sphagnum* spp. or *Polytrichum* spp. Dominant sedges include *Carex canescens* (silvery sedge) and *Eriophorum virginicum* (tawny cottongrass). Associates include *Carex utriculata* (beaked sedge), *Carex atlantica* (prickly bog sedge), *Juncus effusus* (common rush), *Juncus brevicaudatus* (narrowpanicle rush), *Juncus canadensis* (Canadian rush), *Scirpus cyperinus* (woolgrass), *Glyceria canadensis* (rattlesnake mannagrass), *Rubus hispidus* (bristly dewberry), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lysimachia terrestris* (earth loosestrife), *Thelypteris palustris* (eastern marsh fern), and *Photinia melanocarpa* (black

chokeberry). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 16 taxa per 400 square meters for 9 plots in West Virginia.

**Most Abundant Species:**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex canescens</i> (silvery sedge), <i>Eriophorum virginicum</i> (tawny cottongrass)

**Characteristic Species:** *Carex canescens* (silvery sedge), *Carex utriculata* (beaked sedge), *Eriophorum virginicum* (tawny cottongrass)

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This mixed-sedge peatland type is known from higher elevations in the Central Appalachians and scattered northward in New England.

**States/Provinces:** MA, PA?, WV:S2

**Federal Lands:** NPS (Minute Man); USFS (Monongahela); USFWS (Canaan Valley)

**CONSERVATION STATUS**

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** Information not available.

**Similar Associations:**

- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552)

**Related Concepts:**

- *Carex canescens* herbaceous community (Walbridge and Lang 1982) =
- *Carex canescens* meadow (Walbridge 1982) =
- *Polytrichum* - *Carex canescens* community (Wieder et al. 1981) =
- *Polytrichum* - *Juncus effusus* - *Carex (canescens, brunnescens)* hummock bog (Fortney 1975) I
- *Sphagnum* - *Glyceria* - *Carex (canescens, brunnescens)* bog (Fortney 1975) I

**SOURCES**

**Description Authors:** S.C. Gawler, mod. E.A. Byers

**References:** Eastern Ecology Working Group n.d., Fortney 1975, Walbridge 1982, Walbridge and Lang 1982, Wieder et al. 1981

## Star Sedge Fen

**Scientific Name:** *Carex echinata* ssp. *echinata* / *Sphagnum* spp. Fen  
**Translated Name:** Star Sedge / Peatmoss Fen  
**NVC Name:** CEG1008534: *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp.  
Herbaceous Vegetation  
**Conservation Rank:** S2 / G2?

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous acidic seepage fen occurs on semi-permanently flooded and saturated peat in the Allegheny Mountains region of West Virginia, at elevations between 1070 and 1170 m. It is a small-patch type that occupies flat to gently sloping land (0- to 2.5-degree slopes) in headwater basins. It occurs on open peatland mosaics where there is a barely perceptible seepage component, and is generally found in areas that have been impacted by beaver in the last 5-30 years. Hummock-and-hollow microtopography is well-developed. Rounded peat hummocks are 10-30 cm high, and irregular mossy hummocks cover roots and decaying wood. Bedrock is commonly sandstone, and less frequently shale or limestone. Soil texture is poorly to very poorly drained peat with occasional layers of silt loam, less than a meter in thickness and underlain by clay or bedrock. Hydric soil indicators include histisol, histic epipedon, hydrogen sulphide, and depleted matrix. In one sampled plot, pH = 4.0, pore water pH = 5.3, and electrical conductivity = 14 micromhos/cm. Soil chemistry in this plot was characterized by high exchangeable nitrogen; moderate organic matter and total exchange capacity; and low Al, B, Ca, Cu, Fe, K, Mg, Mn, Na, P, S, and Zn. The unvegetated surface is predominantly litter, with 1% standing water.

**Vegetation Description:** This herbaceous sedge fen occurs in the Allegheny Mountains region of West Virginia. It often contains a few scattered, stunted individuals of *Picea rubens* (red spruce) in the canopy or shrub strata. In addition to stunting from inundation stress, most trees have wide "snow skirts," and saplings tend to be heavily branched below the snowpack level. *Vaccinium myrtilloides* (velvetleaf huckleberry) may be present with low cover in the short-shrub layer. The herbaceous layer, with mean 60% cover, is dominated by *Carex echinata* ssp. *echinata* (star sedge). Herbaceous species with high constancy but lower cover are *Solidago uliginosa* (bog goldenrod), *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Carex gynandra* (nodding sedge), *Juncus brevicaudatus* (narrowpanicle rush), and *Lycopus uniflorus* var. *uniflorus* (northern bugleweed). Nonvascular plants average 90% cover and are strongly dominated by *Sphagnum* spp. (*Sphagnum magellanicum*, *Sphagnum rubellum*, *Sphagnum fallax*, and *Sphagnum papillosum*). This community provides habitat for species of conservation concern in West Virginia, including *Abies balsamea* (balsam fir) (S3G5), *Cornus canadensis* (bunchberry dogwood) (S2G5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Gaultheria hispidula* (creeping snowberry) (S3G5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Lycopodiella inundata* (inundated clubmoss) (S2G5), *Vaccinium oxycoccos* (small cranberry) (S3G5), and *Zigadenus leimanthoides* (pinebarren deathcamas) (S3G4Q). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters.

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i> (balsam fir)	-	plant	WV species of concern
<i>Cornus canadensis</i> (bunchberry dogwood)	-	plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-	plant	WV species of concern
<i>Gaultheria hispidula</i> (creeping snowberry)	-	plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-	plant	WV species of concern
<i>Lycopodiella inundata</i> (inundated clubmoss)	-	plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern
<i>Zigadenus leimanthoides</i> (pinebarren deathcamas)	-	plant	WV species of concern

**West Virginia Range:** This community is restricted to the Allegheny Mountains region of West Virginia, at elevations between 1070 and 1170 m. Within this region, there are occurrences at Dolly Sods (Alder Run, Fisher Spring Run), Spruce Knob, Gandy Creek headwaters, and Sinks of Gandy.

**Classification Comments:** Four plots (4 occurrences) represent this type (CEGL008534), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters consistently and ordines in a close group in the *Sphagnum*-rich portion of species space. The type has been sampled throughout its range in West Virginia, but the number of plots is small. The sampling of two or three additional plots would be helpful to more fully characterize this type.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.134, MONF.236, MONF.252, RAND.20.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	<i>Carex (atlantica, echinata)</i> - <i>Eriophorum virginicum</i> - <i>Rhynchospora capitellata</i> - <i>Solidago patula</i> Saturated Herbaceous Alliance (A.1450)
Alliance (English name)	(Prickly Bog Sedge, Star Sedge) - Tawny Cotton-grass - Northern Beaksedge - Roundleaf Goldenrod Saturated Herbaceous Alliance
Association	<i>Carex echinata</i> - <i>Solidago uliginosa</i> / <i>Sphagnum</i> spp. Herbaceous Vegetation
Association (English name)	Star Sedge - Bog Goldenrod / Peatmoss species Herbaceous Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069) Southern and Central Appalachian Bog and Fen (CES202.300)

### GLOBAL DESCRIPTION

**Concept Summary:** This community is known from the Allegheny Mountains of Virginia and West Virginia. Stands occupy flat to gently sloping areas (0-5 degrees) on terraces and toeslopes,

and in open wetland mosaics along high-elevation (>1070 m [3500 feet]) headwater streams. Habitats typically have pronounced hummock-and-hollow microtopography. Groundwater discharge may be barely perceptible, or may appear as flowing seeps and braided streamlets. A thin but continuous cover of *Sphagnum* mosses is present on hummocks underlain by coarse gravel, mineral soil, clay, or bedrock with very low pH (about 3.7) and base status. This community type is predominantly herbaceous but contains patches of low shrubs and stunted trees, particularly *Picea rubens* (red spruce), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Vaccinium angustifolium* (lowbush blueberry), *Kalmia latifolia* (mountain laurel), *Menziesia pilosa* (minniebush), and *Acer rubrum* (red maple), on larger hummocks. Herbaceous composition is somewhat variable, but dominants usually include *Carex echinata* (star sedge) and/or *Solidago uliginosa* (bog goldenrod). Other common herbs include *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed), *Carex trisperma* (threeseeded sedge), *Doellingeria umbellata* (parasol whitetop), *Osmunda cinnamomea* (cinnamon fern), *Carex gynandra* (nodding sedge), *Epilobium leptophyllum* (bog willowherb), *Galium tinctorium* (stiff marsh bedstraw), *Viola cucullata* (marsh blue violet), *Scirpus cyperinus* (woolgrass), *Juncus subcaudatus* (woodland rush), *Juncus brevicaudatus* (narrowpanicle rush), *Rubus hispidus* (bristly dewberry), *Spiranthes cernua* (nodding ladies'-tresses), *Lycopus uniflorus* (northern bugleweed), *Lycopodium clavatum* (running clubmoss), and *Platanthera clavellata* (small green wood orchid). Additional, less frequent herbaceous associates are *Carex baileyi* (Bailey's sedge), *Carex intumescens* (greater bladder sedge), *Carex leptalea* (bristlystalked sedge), *Dryopteris cristata* (crested woodfern), *Gentiana clausa* (bottle gentian), *Isoetes valida* (strong quillwort), *Linum striatum* (ridged yellow flax), *Pycnanthemum muticum* (clustered mountainmint), and *Rhynchospora capitellata* (brownish beaksedge). In West Virginia, dominant bryophyte species are *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum rubellum* (sphagnum), *Sphagnum fallax* (sphagnum), and *Sphagnum papillosum* (papillose sphagnum).

**Environmental Description:** Stands occupy flat to gently sloping areas (0-5 degrees) on terraces and toeslopes, and in open wetland mosaics along high-elevation (>1070 m [3500 feet]) headwater streams. Habitats typically have pronounced hummock-and-hollow microtopography. Groundwater discharge may be barely perceptible, or may appear as flowing seeps and braided streamlets. A thin but continuous cover of *Sphagnum* mosses is present on hummocks underlain by coarse gravel, mineral soil, clay, or bedrock with very low pH (ca. 3.7) and base status.

**Vegetation Description:** This community type is predominantly herbaceous but contains patches of low shrubs and stunted trees, particularly *Picea rubens* (red spruce), *Vaccinium myrtilloides* (velvetleaf huckleberry), *Vaccinium angustifolium* (lowbush blueberry), *Kalmia latifolia* (mountain laurel), *Menziesia pilosa* (minniebush), and *Acer rubrum* (red maple), on larger hummocks. Herbaceous composition is somewhat variable, but dominants usually include *Carex echinata* (star sedge) and/or *Solidago uliginosa* (bog goldenrod). Other common herbs include *Eriophorum virginicum* (tawny cottongrass), *Juncus effusus* (common rush), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed), *Carex trisperma* (threeseeded sedge), *Doellingeria umbellata* (parasol whitetop), *Osmunda cinnamomea* (cinnamon fern), *Carex gynandra* (nodding sedge), *Epilobium leptophyllum* (bog willowherb), *Galium tinctorium* (stiff marsh bedstraw), *Viola cucullata*

(marsh blue violet), *Scirpus cyperinus* (woolgrass), *Juncus subcaudatus* (woodland rush), *Juncus brevicaudatus* (narrowpanicle rush), *Rubus hispidus* (bristly dewberry), *Spiranthes cernua* (nodding ladies'-tresses), *Lycopus uniflorus* (northern bugleweed), *Lycopodium clavatum* (running clubmoss), and *Platanthera clavellata* (small green wood orchid). Additional, less frequent herbaceous associates are *Carex baileyi* (Bailey's sedge), *Carex intumescens* (greater bladder sedge), *Carex leptalea* (bristlystalked sedge), *Dryopteris cristata* (crested woodfern), *Gentiana clausa* (bottle gentian), *Isoetes valida* (strong quillwort), *Linum striatum* (ridged yellow flax), *Pycnanthemum muticum* (clustered mountainmint), and *Rhynchospora capitellata* (brownish beaksedge). In West Virginia, dominant bryophyte species are *Sphagnum magellanicum* (Magellan's sphagnum), *Sphagnum rubellum* (sphagnum), *Sphagnum fallax* (sphagnum), and *Sphagnum papillosum* (papillose sphagnum). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters for 4 plots in West Virginia.

**Characteristic Species:** *Carex echinata* (star sedge), *Doellingeria umbellata* (parasol whitetop), *Epilobium leptophyllum* (bog willowherb), *Galium tinctorium* (stiff marsh bedstraw), *Juncus brevicaudatus* (narrowpanicle rush), *Solidago uliginosa* (bog goldenrod), *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed), *Vaccinium angustifolium* (lowbush blueberry)

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Aeshna canadensis</i> (canada darner)	-			animal
<i>Aeshna tuberculifera</i> (black-tipped darner)	-			animal
<i>Aeshna verticalis</i> (green-striped darner)	-			animal
<i>Arigomphus furcifer</i> (lily pad clubtail)	-			animal
<i>Colias interior</i> (pink-edged sulphur)	-			animal
<i>Cordulegaster diastatops</i> (delta-spotted spiketail)	-			animal
<i>Cordulia shurtleffii</i> (american emerald)	-			animal
<i>Enallagma annexum</i> (northern bluet)	-			animal
<i>Enallagma hageni</i> (hagen's bluet)	-			animal
<i>Epitheca canis</i> (beaverpond baskettail)	-			animal
<i>Gomphus borealis</i> (beaverpond clubtail)	-			animal
<i>Ladona julia</i> (chalk-fronted corporal)	-			animal
<i>Lanthus parvulus</i> (northern pygmy clubtail)	-			animal
<i>Lestes disjunctus</i> (northern spreadwing)	-			animal
<i>Leucorrhinia frigida</i> (frosted whiteface)	-			animal
<i>Leucorrhinia hudsonica</i> (hudsonian whiteface)	-			animal
<i>Nehalennia irene</i> (sedge sprite)	-			animal
<i>Nemotaulius hostilis</i> (a limnephilid caddisfly)	-			animal
<i>Rhionaeschna mutata</i> (spatterdock darner)	-			animal
<i>Somatochlora elongata</i> (ski-tipped emerald)	-			animal
<i>Somatochlora williamsoni</i> (williamson's emerald)	-			animal
<i>Sympetrum obtrusum</i> (white-faced meadowhawk)	-			animal

**USFWS Wetland System:** Palustrine

**DISTRIBUTION**

**Range:** This community is definitely known from the Allegheny Mountains of West Virginia and Virginia. Occurrences over a broader geographic range are possible.

**States/Provinces:** VA, WV:S2

**Federal Lands:** USFS (George Washington, Monongahela)

**CONSERVATION STATUS**

**Rank:** G2? (2-Oct-2001)

**Reasons:** This type is limited to a few very small patches (<0.25 hectare) in Virginia. It has a limited distribution within West Virginia, where it occurs at higher elevations of the Allegheny Mountains, with a narrow environmental specificity (very slow seepage areas adjacent to open peatlands).

**CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:**

**Comments:** Four plots (4 occurrences) represent this type in West Virginia, where it was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters consistently and ordinales in a close group in the *Sphagnum*-rich portion of species space. Additional inventory, data collection, and analysis are needed to clarify this type's geographic range and increase the robustness of its classification. The Virginia examples (e.g., *Solidago uliginosa* (bog goldenrod), *Sparganium erectum* ssp. *stoloniferum* (simplestem bur-reed)) do not contain *Eriophorum virginicum* (tawny cottongrass). This type has a higher seepage component than the similar, but more boggy types: *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549) and *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570).

**Similar Associations:**

- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549)
- *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570)

**Related Concepts:**

- *Carex echinata* - *Solidago uliginosa* - *Sparganium erectum* ssp. *stoloniferum* - *Epilobium leptophyllum* Herbaceous Vegetation (Fleming and Coulling 2001) =
- *Picea rubens* / *Vaccinium angustifolium* - *Epilobium leptophyllum* Association: *Carex echinata* - *Carex trisperma* Subassociation (Fleming and Moorhead 1996) ?

**SOURCES**

**Description Authors:** G. Fleming and P. Coulling, mod. E.A. Byers

**References:** Allard and Leonard 1952, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001

## Threeway Sedge Fen

**Scientific Name:** *Dulichium arundinaceum* / *Sphagnum* spp. Fen  
**Translated Name:** Threeway Sedge / Peatmoss Fen  
**NVC Name:** CEG1006552: *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation  
**Conservation Rank:** S3 / GNR

### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous fen occurs on temporarily flooded, semi-permanently flooded, or saturated peat in the Allegheny Mountains and Ridge and Valley regions of West Virginia, at elevations between 620 and 1150 m. It is a small-patch type that occupies flat-lying land in headwater basins. Many stands occur in beaver-influenced wetlands, either on the margins of active beaver ponds, or on sites that are slowly drying above abandoned beaver dams. The type also occurs on the margins of alluvial wetland mosaics, where seepage is impounded behind natural stream levees. Snags are present and indicate that some sites were formerly forested wetlands, while others are temporarily invaded by woody species during dry years and periods of reduced beaver activity. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-20 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale. The substrate is poorly to very poorly drained peat, varying in depth from 25 cm to more than 120 cm, generally underlain by deposits of sand, silt, or clay loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, and depleted matrix. Mean soil pH is 4.2 (n=4), mean pore water pH is 4.6 (n=6), and electrical conductivity averages 35 micromhos/cm (n=6). Soil chemistry is characterized by high Fe; moderate Al, B, Cu, Mg, Na, exchangeable nitrogen, and total exchange capacity; and low Ca, K, Mn, S (n=4). Organic matter, phosphorus and zinc are variable, ranging from 3%-68%, 11-102 ppm, and 1-95 ppm respectively. The unvegetated surface is predominantly litter, with an average of 14% standing water and 1% downed wood.

**Vegetation Description:** This herbaceous peatland occurs in the Allegheny Mountains and Ridge and Valley regions of West Virginia. A few stunted trees and shrubs may occupy hummock tops, averaging 2% cover and often including *Picea rubens* (red spruce), *Hypericum densiflorum* (bushy St. Johnswort), *Rhododendron maximum* (great laurel), *Ilex verticillata* (common winterberry), *Alnus incana* ssp. *rugosa* (speckled alder), and *Kalmia latifolia* (mountain laurel). The dwarf-shrub *Rubus hispidus* (bristly dewberry) has high constancy and moderate cover in this type. The herbaceous layer, with mean 65% cover, is dominated by *Dulichium arundinaceum* (threeway sedge). Other common herbaceous species include *Eriophorum virginicum* (tawny cottongrass), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass), *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Juncus effusus* (common rush), *Carex canescens* (silvery sedge), *Rhynchospora alba* (white beaksedge), *Agrostis hyemalis* (winter bentgrass), *Carex atlantica* (prickly bog sedge), *Sparganium* (bur-reed) spp., and *Juncus subcaudatus* var. *subcaudatus* (woodland rush). Nonvascular plants average 60% cover, dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum cuspidatum*, and *Sphagnum papillosum*) and generally including moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum pallidisetum*). This community provides

habitat for species of conservation concern in West Virginia, including *Carex canescens* (silvery sedge) (S3G5T5), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew) (S3G5T5), *Glyceria laxa* (limp mannagrass) (S2S3G5), *Menyanthes trifoliata* (buckbean) (S1G5), *Pogonia ophioglossoides* (snakemouth orchid) (S2G5), *Scirpus atrocinctus* (blackgirdle bulrush) (S3G5), *Vaccinium macrocarpon* (cranberry) (S3G4), and *Vaccinium oxycoccos* (small cranberry) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters.

**Fauna observed:** Small mammals observed within this community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Zapus hudsonicus* (meadow jumping mouse), *Microtus pensylvanicus* (meadow vole) and the *Blarina brevicauda* (northern short-tailed shrew). A damselfly, *Nehalennia Irene* (sedge sprite), was noted. Spiders collections include *Argiope trifasciata* (banded garden spider), *Neoscona arabesca* (arabesque orbweaver), *Tetragnatha versicolor* (longjawed orbweaver), *Elaver excepta* (sac spider), Philodromidae family (running crab spiders), and Salticidae family (jumping spiders).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u>	<u>R</u>	<u>Type</u>	<u>Note</u>
<i>Carex canescens</i> (silvery sedge)	-		plant	WV species of concern
<i>Drosera rotundifolia</i> var. <i>rotundifolia</i> (sundew)	-		plant	WV species of concern
<i>Glyceria laxa</i> (limp mannagrass)	-		plant	WV species of concern
<i>Menyanthes trifoliata</i> (buckbean)	-		plant	WV species of concern
<i>Pogonia ophioglossoides</i> (snakemouth orchid)	-		plant	WV species of concern
<i>Scirpus atrocinctus</i> (blackgirdle bulrush)	-		plant	WV species of concern
<i>Vaccinium macrocarpon</i> (cranberry)	-		plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-		plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains and Ridge and Valley regions within West Virginia, at elevations between 620 and 1150 m. Within this region, there are occurrences at Big Run Bog, Falls Run of Cheat Mountain, Cranberry Glades, Glade Run below Gaudineer Knob, Meadow Run at Short Mountain, and Tub Run.

**Classification Comments:** Nine plots (6 occurrences) represent this type (CEGL006552), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The plots ordinate well together in species space, although in cluster analysis this group mixes with the slightly more acidic *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549). The type has been well-sampled across a range of locations and successional states.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.121, MONF.138, MONF.164, MONF.230, MONF.246, SHMO.87, WALB.28, WALB.36, WALB.44

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class            Herbaceous Vegetation (V)  
 Physiognomic Subclass       Perennial graminoid vegetation (V.A.)

Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	<i>Carex</i> spp. Saturated Herbaceous Alliance (A.1455)
Alliance (English name)	Sedge species Saturated Herbaceous Alliance
Association	<i>Dulichium arundinaceum</i> - <i>Carex folliculata</i> - <i>Juncus</i> spp. Herbaceous Vegetation
Association (English name)	Threeway Sedge - Northern Long Sedge - Rush species Herbaceous Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069) Southern and Central Appalachian Bog and Fen (CES202.300)

### GLOBAL DESCRIPTION

**Concept Summary:** This community occurs in shallow basins, swales, moats of bog mats, and pondshores, sometimes with a porous substrate, where the water level drops significantly during dry years. Substrate is variously peat, muck or sandy soil. The vegetation is dominated by a mix of low grasses, sedges, rushes, and scattered shrubs such as *Dulichium arundinaceum* (threeway sedge), *Rubus hispidus* (bristly dewberry), *Carex folliculata* (northern long sedge), *Juncus canadensis* (Canadian rush), *Juncus brevicaudatus* (narrowpanicle rush), and *Juncus subcaudatus* (woodland rush). Other associates include *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Lycopodiella inundata* (inundated clubmoss), *Eriophorum virginicum* (tawny cottongrass), *Drosera* (sundew) spp., *Rhynchospora alba* (white beaksedge), and *Sphagnum* spp.

**Environmental Description:** This community occurs in shallow basins with sometimes porous substrate, where the water level drops significantly during dry years. Substrate is variously peat, muck or sandy soil. In West Virginia, this herbaceous fen occurs on temporarily flooded, semi-permanently flooded, or saturated peat in the Allegheny Mountains and Ridge and Valley regions at elevations between 620 and 1150 m. It is a small-patch type that occupies flat-lying land in headwater basins. Many stands occur in beaver-influenced wetlands, either on the margins of active beaver ponds, or on sites that are slowly drying above abandoned beaver dams. The type also occurs on the margins of alluvial wetland mosaics, where seepage is impounded behind natural stream levees. Snags are present and indicate that some sites were formerly forested wetlands, while others are temporarily invaded by woody species during dry years and periods of reduced beaver activity. Hummock-and-hollow microtopography is moderately well-developed, with hummocks ranging from 10-20 cm in height. Bedrock is typically acidic sandstone and, less commonly, shale. The substrate is poorly to very poorly drained peat, varying in depth from 25 cm to more than 120 cm, generally underlain by deposits of sand, silt, or clay loam. Hydric soil indicators include histisol, histic epipedon, black histic, hydrogen sulphide, and depleted matrix. Mean soil pH is 4.2 (n=4), mean pore water pH is 4.6 (n=6), and electrical conductivity averages 35 micromhos/cm (n=6). Soil chemistry is characterized by high Fe; moderate Al, B, Cu, Mg, Na, exchangeable nitrogen, and total exchange capacity; and low Ca, K, Mn, S (n=4). Organic matter, phosphorus and zinc are variable, ranging from 3%-68%, 11-102 ppm, and 1-95 ppm respectively. The unvegetated surface is predominantly litter, with an average of 14% standing water and 1% downed wood.

**Vegetation Description:** Vegetation is dominated by a mix of low grasses, sedges, rushes, and scattered shrubs such as *Dulichium arundinaceum* (threeway sedge), *Carex folliculata* (northern long sedge), *Juncus canadensis* (Canadian rush), *Juncus brevicaudatus* (narrowpanicle rush), and *Juncus subcaudatus* (woodland rush). Other associates include *Lycopodiella inundata* (inundated clubmoss), *Eriophorum virginicum* (tawny cottongrass), *Drosera* (sundew) spp., *Rhynchospora alba* (white beaksedge), and *Sphagnum* spp. In West Virginia, this type is an herbaceous peatland that typically has a few stunted trees and shrubs on hummock tops, including *Picea rubens* (red spruce), *Hypericum densiflorum* (bushy St. Johnswort), *Rhododendron maximum* (great laurel), *Ilex verticillata* (common winterberry), *Alnus incana* ssp. *rugosa* (speckled alder), and *Kalmia latifolia* (mountain laurel). The dwarf-shrub *Rubus hispidus* (bristly dewberry) has high constancy and moderate cover in this type. The herbaceous layer is dominated by *Dulichium arundinaceum* (threeway sedge). Other common herbaceous species include *Eriophorum virginicum* (tawny cottongrass), *Leersia oryzoides* (rice cutgrass), *Scirpus cyperinus* (woolgrass), *Juncus brevicaudatus* (narrowpanicle rush), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Triadenum fraseri* (Fraser's marsh St. Johnswort), *Drosera rotundifolia* var. *rotundifolia* (roundleaf sundew), *Juncus effusus* (common rush), *Carex canescens* (silvery sedge), *Rhynchospora alba* (white beaksedge), *Agrostis hyemalis* (winter bentgrass), *Carex atlantica* (prickly bog sedge), *Sparganium* (bur-reed) spp., and *Juncus subcaudatus* var. *subcaudatus* (woodland rush). Nonvascular plants are dominated by *Sphagnum* spp. (*Sphagnum fallax*, *Sphagnum recurvum*, *Sphagnum magellanicum*, *Sphagnum cuspidatum*, and *Sphagnum papillosum*) and generally include moderate cover by *Polytrichum* spp. (*Polytrichum commune*, *Polytrichum pallidisetum*). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 21 taxa per 400 square meters for 9 plots in West Virginia.

**USFWS Wetland System:** Palustrine

#### **DISTRIBUTION**

**Range:** This community is known from New York, Pennsylvania, and West Virginia. In West Virginia, it occurs in the Allegheny Mountains and Ridge and Valley regions at elevations between 620 and 1150 m.

**States/Provinces:** NY, PA, WV:S3

**Federal Lands:** USFS (Monongahela)

#### **CONSERVATION STATUS**

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:**

**Comments:** Nine plots (6 occurrences) represent this type in West Virginia, which was classified as part of a 2006 analysis of palustrine plots statewide. The West Virginia plots ordinate well together in species space, although in cluster analysis this group mixes with the slightly more acidic *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549).

**Similar Associations:**

- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549)

**Related Concepts:**

- *Dulichium arundinaceum* - *Vaccinium oxycoccos* - *Sphagnum* community (Edens 1973) =

**SOURCES**

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d., Edens 1973, Fike 1999, Hall 2005, Walbridge 1982

## V.B.2.N.b. Low temperate or subpolar perennial forb vegetation

### Goldenrod Wet Meadow

**Scientific Name:** *Solidago rugosa* - *Euthamia graminifolia* var. *graminifolia* Wet Meadow

**Translated Name:** Wrinkleleaf Goldenrod - Flat-top Goldentop Wet Meadow

**NVC Name:** CEGL006568: *Solidago rugosa* - *Euthamia graminifolia* Herbaceous Vegetation

**Conservation Rank:** S3 / GNR

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous tall-herb type occurs on moist to temporarily flooded floodplains in the Allegheny Mountains region of West Virginia, at elevations between 370 and 1220 m. It is a small-patch type that occupies flat to gently sloping land (0- to 3-degree slopes) adjacent to small streams. Occasional flooding keeps this community open and prevents buildup of organic material in the substrate. Flooding can occur at any time of year. This type is common in beaver-influenced wetlands and on disturbed ground. It is likely to be present on the landscape as long as natural (beaver and flooding) and man-made disturbance regimes persist. Its present distribution is probably larger than its presettlement distribution, when disturbances were less widespread. Bedrock is mapped as shale, sandstone, or Quaternary alluvium. Soil texture is variable and may include well-drained to poorly drained sandy loam, silt loam, or silty clay, with pH averaging 4.0 (n=7), underlain by alluvial deposits including stratified sediments, cobbles, and woody debris. Hydric soil indicators include hydrogen sulphide, sandy redox, depleted matrix, and alluvial depleted matrix. Pore water pH at one plot was 5.5, and electrical conductivity measured 26 micromhos/cm. Soil chemistry is characterized by high Fe, Zn; moderate Al, B, Cu, Mn, S, exchangeable nitrogen, and total exchange capacity; and low Ca, K, Mg, Na, and organic matter (n=7). Phosphorus is variable, ranging from 10-88 ppm. The unvegetated surface is dominated by litter, with 10% bare ground and a trace amount of woody debris.

**Vegetation Description:** This herbaceous tall-herb community occurs in the Allegheny Mountains region of West Virginia. A few percent cover of trees and shrubs may be present, including *Acer rubrum* (red maple), *Cornus amomum* (silky dogwood), *Crataegus* (hawthorn) spp., *Hypericum densiflorum* (bushy St. Johnswort), *Ilex montana* (mountain holly), *Picea*

*rubens* (red spruce), *Prunus serotina* var. *serotina* (black cherry), *Salix sericea* (silky willow), *Sambucus canadensis* (common elderberry), and *Spiraea alba* (white meadowsweet). The herbaceous layer, averaging 85% cover, has a number of species with fairly high constancy and cover, including *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Solidago rugosa* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Dichanthelium clandestinum* (deertongue), *Thelypteris noveboracensis* (New York fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Clematis virginiana* (virgin's bower), *Galium tinctorium* (stiff marsh bedstraw), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Carex scoparia* var. *scoparia* (broom sedge). Other frequent or locally abundant herbaceous species include *Scirpus cyperinus* (woolgrass), *Agrostis perennans* (upland bentgrass), *Impatiens capensis* (jewelweed), *Galium aparine* (stickywilly), *Eupatorium fistulosum* (trumpetweed), *Onoclea sensibilis* (sensitive fern), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Rubus hispidus* (bristly dewberry), *Poa pratensis* ssp. *pratensis* (Kentucky bluegrass), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eleocharis tenuis* (slender spikerush), *Carex atlantica* (prickly bog sedge), *Dichanthelium dichotomum* (cypress panicgrass), *Solidago canadensis* (Canada goldenrod), *Vernonia noveboracensis* (New York ironweed), *Verbesina alternifolia* (wingstem), *Symphotrichum praealtum* (willowleaf aster), *Aconitum uncinatum* (southern blue monkshood), *Stellaria longifolia* var. *longifolia* (longleaf starwort), *Carex squarrosa* (squarrose sedge), and *Carex annectens* (yellowfruit sedge). Cover by nonvascular plants ranges from none to 20% and often includes *Sphagnum* spp. In one known location on a former beaver pond with low-energy circumneutral overflow, this community provides habitat for *Gentianopsis crinita* (fringed gentian) (S1G5), a species of conservation concern in West Virginia. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 28 taxa per 400 square meters.

**Fauna observed:** *Colia interior* (pink-edged sulphur) and *Danaus plexippus* (monarch) butterflies were observed in this community. Spiders collected within the community included *Sitticus pubescens* (a jumping spider), *Zygoballus bettini* (jumper), *Tetragnatha* sp. (longjawed orbweaver), *Xysticus* sp. (ground crab spider), and *Neoscona arabesca* (arabesque orbweaver). Insects found from the order Coleoptera (beetles) included *Diabrotica undecimpunctata howardi*, *Sumitrosis* sp., and *Trirhabda* sp. (spotted cucumber beetles). Additional species include *Cycloneda* sp. (a ladybug), *Olibrus semistriatus* (a shining mold beetle), and unidentified species from Curculionidae (snout beetles). From the order Diptera (true flies), several types of hoverflies were observed including Anthomyiidae, Dolichopodidae and *Toxomerus* sp. In the order Hemiptera (true bugs), the following species were found, *Lepyronia quadrangularis* and *Philaenus spumarius* (spittlebugs), *Draeculacephala mollipes* (a leafhopper), *Lygus* sp. (a plant bug), *Nabis* sp. (a damselbug), and unidentified species from Membracidae (treehoppers) and Pentatomidae (stinkbugs). The order Hymenoptera (ants, bees, and wasps) included *Bombus* sp. (a bee), *Dolichoderus pustulatus* and *Camponotus* sp. (ants), *Augochlorella* sp. (a sweat bee), species from Ichneumonidae (ichneumon wasps) and *Dolichovespula arenaria* (a yellowjacket). The order Plecoptera (stoneflies) included unidentified species from Leuctridae (roll-winged stoneflies). There were also unidentified species from the order Psocoptera (barklice).

#### **Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Gentianopsis crinita</i>	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia at elevations between 370 and 1220 m. Within this region, the community has been sampled at Camp Dawson, Dolly Sods, East Fork of the Greenbrier River, Gandy Creek, Glady Fork of the Cheat River, Kumbrabow State Forest, Meadow River wetlands, Middle Mountain, Spice Run, Tea Creek, and the Upper Shavers Fork. It may occur in other parts of the state, but has not been documented.

**Classification Comments:** Twenty plots (14 occurrences) represent this type (CEGL006568), which was classified as part of a 2006 classification of palustrine plots statewide. This type clusters and ordines in two broad groups. One type is dominated by *Solidago rugosa* (wrinkleleaf goldenrod) and is broadly distributed in the Allegheny Mountains region. The second type is dominated by *Euthamia graminifolia* (flat-top goldentop) and occurs in the Meadow River. The type has been adequately sampled within West Virginia.

**West Virginia Description Author:** E.A. Byers

**Plots:** DAWS.37, GRAN.5, KUMB.8, KUMB.9, MERI.119, MERI.127, MERI.154, MERI.161, MERI.34, MERI.41, MONF.71, MONF.96, MONF.141, MONF.211, MONF.219, MONF.223, USFS.263, USFS.264, USFS.265, USFS.274.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Low temperate or subpolar perennial forb vegetation (V.B.2.N.b.)
Alliance	Low Forbs Mixed Herbaceous Alliance (A.3537)
Alliance (English name)	Low Forbs Mixed Herbaceous Alliance
Association	<i>Solidago rugosa</i> - <i>Euthamia graminifolia</i> Herbaceous Vegetation
Association (English name)	Wrinkleleaf Goldenrod - Flat-top Goldentop Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609) High Allegheny Wetland (CES202.069)

### GLOBAL DESCRIPTION

**Concept Summary:** This herbaceous tall-herb type occurs on moist to temporarily flooded floodplains in the Allegheny Mountains region of West Virginia, at elevations between 370 and 1220 m. It is a small-patch type that occupies flat to gently sloping land (0- 3-degree slopes) adjacent to small streams. Occasional flooding keeps this community open and prevents buildup of organic material in the substrate. Flooding can occur at any time of year. This type is common in beaver-influenced wetlands and on disturbed ground. It is likely to be present on the landscape as long as natural (beaver and flooding) and man-made disturbance regimes persist. Its present distribution is probably larger than its presettlement distribution, when disturbances were less

widespread. Soil texture is variable and may include well-drained to poorly drained sandy loam, silt loam, or silty clay, with pH averaging 4.0, underlain by alluvial deposits including stratified sediments, cobbles, and woody debris. A few percent cover of trees and shrubs may be present, including *Acer rubrum* (red maple), *Cornus amomum* (silky dogwood), *Crataegus* (hawthorn) spp., *Hypericum densiflorum* (bushy St. Johnswort), *Ilex montana* (mountain holly), *Picea rubens* (red spruce), *Prunus serotina* var. *serotina* (black cherry), *Salix sericea* (silky willow), *Sambucus canadensis* (common elderberry), and *Spiraea alba* (white meadowsweet). The herbaceous layer has a number of species with fairly high constancy and cover, including *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Solidago rugosa* (wrinkleleaf goldenrod), *Juncus effusus* (common rush), *Dichanthelium clandestinum* (deertongue), *Thelypteris noveboracensis* (New York fern), *Polygonum sagittatum* (arrowleaf tearthumb), *Clematis virginiana* (virgin's bower), *Galium tinctorium* (stiff marsh bedstraw), *Doellingeria umbellata* var. *umbellata* (parasol whitetop), *Dennstaedtia punctilobula* (eastern hayscented fern), and *Carex scoparia* var. *scoparia* (broom sedge). Other frequent or locally abundant herbaceous species include *Symphotrichum lanceolatum* var. *lanceolatum* (white panicle aster), *Oxypolis rigidior* (stiff cowbane), *Scirpus cyperinus* (woolgrass), *Agrostis perennans* (upland bentgrass), *Impatiens capensis* (jewelweed), *Galium aparine* (stickywilly), *Eupatorium fistulosum* (trumpetweed), *Onoclea sensibilis* (sensitive fern), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Rubus hispidus* (bristly dewberry), *Poa pratensis* ssp. *pratensis* (Kentucky bluegrass), *Carex gynandra* (nodding sedge), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Hypericum mutilum* (dwarf St. Johnswort), *Eleocharis tenuis* (slender spikerush), *Carex atlantica* (prickly bog sedge), *Dichanthelium dichotomum* (cypress panicgrass), *Solidago canadensis* (Canada goldenrod), *Vernonia noveboracensis* (New York ironweed), *Verbesina alternifolia* (wingstem), *Symphotrichum praealtum* (willowleaf aster), *Aconitum uncinatum* (southern blue monkshood), *Stellaria longifolia* var. *longifolia* (longleaf starwort), *Carex squarrosa* (squarrose sedge), and *Carex annectens* (yellowfruit sedge). Cover by nonvascular plants is minimal. Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 28 taxa per 400 square meters for 20 plots in West Virginia.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia at elevations between 370 and 1220 m.

**States/Provinces:** WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### CONSERVATION STATUS

**Rank:** GNR (8-Jul-1999)

**Reasons:** Information not available.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:**

**Comments:** This association is composed primarily of tall herbs in a floodplain setting and does not fit well within Low Forbs Mixed Herbaceous Alliance (A.3537). Twenty plots (14

occurrences) represent this type in West Virginia, where it was classified as part of a 2006 classification of palustrine plots statewide.

**Similar Associations:** Information not available.

**Related Concepts:**

- *Carex - Scirpus - Solidago - Aster umbellatus* wet meadow (Fortney 1975) =
- Grass-leaved Goldenrod - Virgin's Bower Tall Herbaceous Community (Putnam 1995) F

**SOURCES**

**Description Author:** E.A. Byers

**References:** DeMeo et al. 1998, Eastern Ecology Working Group n.d., Fortney 1975, Putnam 1995

## V.B.2.N.f. Saturated temperate perennial forb vegetation

### Monongahela Barbara's-buttons Riverscour Prairie

**Scientific Name:** *Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava* var. *herbiola* Riverscour Prairie  
**Translated Name:** Smooth Azalea / Monongahela Barbara's-buttons - Sticky Bog-asphodel - Pale-green Orchid Riverscour Prairie  
**NVC Name:** CEG1006598: *Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava* var. *herbiola* Herbaceous Vegetation  
**Conservation Rank:** S1 / G1

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This herbaceous riverscour prairie occurs on temporarily flooded sand and cobbles in the Allegheny Mountains region of West Virginia, at elevations between 1060 and 1100 m. It is a small-patch type that occupies flat to gently sloping islands, cobble bars, and shorelines along high-gradient streams. Ice-scour and flood deposition/scour keep this community open and prevent accumulation of organic material in the substrate. Flooding can occur at any time of year. Shoreline locations probably receive seepage from the adjacent upland forest. Bedrock may be Mauch Chunk shale or Pottsville sandstone. The unvegetated surface averages 40% large rocks, 25% small rocks, 20% sand, and 15% bare soil, with a trace amount of litter and woody debris.

**Vegetation Description:** This herbaceous riverscour prairie occurs in the Allegheny Mountains region of West Virginia. The community is characterized by a remarkable profusion of showy, flowering forbs, which share a tolerance for high-energy flooding and ice-scour. The shrub layer, kept at low stature and cover by frequent ice-scour, averages 12% cover and includes *Rhododendron arborescens* (smooth azalea), *Hypericum densiflorum* (bushy St. Johnswort), and *Alnus incana* ssp. *rugosa* (speckled alder). The herbaceous layer, averaging 60% cover, includes a large number of species with high constancy, including *Marshallia grandiflora* (Monongahela Barbara's buttons), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Carex haydenii* (Hayden's sedge), *Eleocharis tenuis* (slender spikerush), *Sanguisorba canadensis* (Canadian

burnet), *Triantha glutinosa* (sticky bog-asphodel), *Hypericum ellipticum* (pale St. Johnswort), *Solidago rugosa* (wrinkleleaf goldenrod), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Juncus dudleyi* (Dudley's rush), *Potentilla simplex* (common cinquefoil), *Houstonia serpyllifolia* (thymeleaf bluet), *Phlox maculata* (wild sweetwilliam), *Deschampsia caespitosa* (tufted hairgrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Platanthera flava* var. *herbiola* (palegreen orchid). Exotic weeds washed in by the river typically include *Prunella vulgaris* (common selfheal), *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass), and *Daucus carota* (Queen Anne's lace). Cover by nonvascular plants is insignificant. This community provides habitat for species of conservation concern in West Virginia, including *Carex haydenii* (Hayden's sedge) (S1G5), *Marshallia grandiflora* (Monongahela Barbara's buttons) (S2G2), *Sanguisorba canadensis* (Canadian burnet) (S2S3G5), and *Triantha glutinosa* (sticky bog-asphodel) (S1G3G5). Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Marshallia grandiflora* (Monongahela Barbara's buttons), *Juncus dudleyi* (Dudley's rush), *Krigia biflora* var. *biflora* (twoflower dwarfdandelion), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Phlox maculata* (wild sweetwilliam), *Platanthera flava* var. *herbiola* (palegreen orchid), *Rhododendron arborescens* (smooth azalea), *Sanguisorba canadensis* (Canadian burnet), *Triantha glutinosa* (sticky bog-asphodel), and *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane). Mean species richness of vascular plants is 37 taxa per 400 square meters.

#### Other Noteworthy Species:

Species	GRank	Type	Note
<i>Carex haydenii</i>	-	plant	WV species of concern
<i>Marshallia grandiflora</i> (Monongahela Barbara's buttons)	G2	plant	WV species of concern
<i>Sanguisorba canadensis</i> (Canadian burnet)	-	plant	WV species of concern
<i>Triantha glutinosa</i> (sticky bog-asphodel)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia at elevations between 1060 and 1100 m. The single known occurrence is on the Upper Shavers Fork of the Cheat River. This type may possibly occur in a similar setting in the headwaters of the Gauley River.

**Classification Comments:** Five plots (1 occurrence) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters consistently and closely together. It ordinales closely in the riverscour portion of species space but does not overlap with the *Carex torta* (twisted sedge) riverscour type. It has slight overlap with the adjacent tall herb or *Carex trichocarpa* (hairyfruit sedge) floodplain prairie communities. The single known occurrence in West Virginia has been adequately sampled. *Marshallia grandiflora* (Monongahela Barbara's buttons) populations in a similar setting have been noted on the uppermost Gauley River above Cowan. If the community occurs there, it should be sampled. At lower elevations on the Gauley River and Tygart Valley River, *Marshallia grandiflora* (Monongahela Barbara's buttons) community type(s) with warm-season grasses occur. Warm-season grasses are not a component of this high-elevation type.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.45, MONF.46, MONF.47, MONF.54, MONF.340.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Saturated temperate perennial forb vegetation (V.B.2.N.f.)
Alliance	<i>Triantha glutinosa</i> - <i>Parnassia glauca</i> Saturated Herbaceous Alliance (A.1697)
Alliance (English name)	Sticky Bog-asphodel - Fen Grass-of-Parnassus Saturated Herbaceous Alliance
Association	<i>Rhododendron arborescens</i> / <i>Marshallia grandiflora</i> - <i>Triantha glutinosa</i> - <i>Platanthera flava</i> var. <i>herbiola</i> Herbaceous Vegetation
Association (English name)	Smooth Azalea / Monongahela Barbara's-buttons - Sticky Bog-asphodel - Pale-green Orchid Herbaceous Vegetation
Ecological System(s)	Central Appalachian Stream and Riparian (CES202.609)

### GLOBAL DESCRIPTION

**Concept Summary:** This herbaceous riverscour prairie occurs on temporarily flooded sand and cobbles in the Allegheny Mountains region of West Virginia, at elevations between 1060 and 1100 m. It is a small-patch type that occupies flat to gently sloping islands, cobble bars, and shorelines along high-gradient streams. Ice-scour and flood deposition/scour keep this community open and prevent accumulation of organic material in the substrate. Flooding can occur at any time of year. The community is characterized by a remarkable profusion of showy, flowering forbs, which share a tolerance for high-energy flooding and ice-scour. The shrub layer, kept at low stature and cover by frequent ice-scour, averages 12% cover and includes *Rhododendron arborescens* (smooth azalea), *Hypericum densiflorum* (bushy St. Johnswort), and *Alnus incana* ssp. *rugosa* (speckled alder). The herbaceous layer, averaging 60% cover, includes a large number of species with high constancy, including *Marshallia grandiflora* (Monongahela Barbara's buttons), *Euthamia graminifolia* var. *graminifolia* (flat-top goldentop), *Carex stricta* (tussock sedge), *Eleocharis tenuis* (slender spikerush), *Sanguisorba canadensis* (Canadian burnet), *Triantha glutinosa* (sticky bog-asphodel), *Hypericum ellipticum* (pale St. Johnswort), *Solidago rugosa* (wrinkleleaf goldenrod), *Calamagrostis canadensis* var. *canadensis* (bluejoint), *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane), *Juncus dudleyi* (Dudley's rush), *Potentilla simplex* (common cinquefoil), *Houstonia serpyllifolia* (thymeleaf bluet), *Phlox maculata* (wild sweetwilliam), *Deschampsia caespitosa* (tufted hairgrass), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), and *Platanthera flava* var. *herbiola* (palegreen orchid). Exotic weeds washed in by the river typically include *Prunella vulgaris* (common selfheal), *Anthoxanthum odoratum* ssp. *odoratum* (sweet vernalgrass), and *Daucus carota* (Queen Anne's lace). Cover by nonvascular plants is insignificant. Indicator species that help to distinguish this community from others within the herbaceous physiognomy for high-elevation wetlands of the Allegheny Mountains region include *Marshallia grandiflora* (Monongahela Barbara's buttons), *Juncus dudleyi* (Dudley's rush), *Krigia biflora* var. *biflora* (twoflower dwarfdandelion),

*Lysimachia quadrifolia* (whorled yellow loosestrife), *Phlox maculata* (wild sweetwilliam), *Platanthera flava* var. *herbiola* (palegreen orchid), *Rhododendron arborescens* (smooth azalea), *Sanguisorba canadensis* (Canadian burnet), *Triantha glutinosa* (sticky bog-asphodel), and *Trautvetteria caroliniensis* var. *caroliniensis* (Carolina bugbane). Mean species richness of vascular plants is 37 taxa per 400 square meters.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### Other Noteworthy Species:

<u>Species</u>	<u>G</u>	<u>Rank</u>	<u>Type</u>
<i>Marshallia grandiflora</i> (Monongahela Barbara's buttons)	G2		plant

#### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia at elevations between 1060 and 1100 m. The single known occurrence is on the Upper Shavers Fork of the Cheat River. This type may possibly occur in a similar setting in the headwaters of the Gauley River.

**States/Provinces:** WV:S1

**Federal Lands:** USFS (Monongahela)

#### CONSERVATION STATUS

**Rank:** G1 (3-Apr-2007)

**Reasons:** This community is restricted to very small patches on the Upper Shavers Fork of the Cheat River, at elevations between 1060 and 1100 m in the Allegheny Mountains region of West Virginia. It may occur on one other river in a similar setting in West Virginia; beyond this, additional occurrences are unlikely to be found. The type is characterized by a rare central Appalachian endemic *Marshallia grandiflora* (Monongahela Barbara's buttons) in co-occurrence with a northern species *Triantha glutinosa* (sticky bog-asphodel) at the southern edge of its range. It has a very narrow environmental specificity along high-elevation, high-gradient streams with intact ice-scour and flood hydrology.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Five plots (1 occurrence) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region.

**Similar Associations:** Information not available.

**Related Concepts:** Information not available.

#### SOURCES

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d.

## Golden Saxifrage Seep

**Scientific Name:** *Betula alleghaniensis* var. *alleghaniensis* / *Impatiens capensis* - *Chrysosplenium americanum* - (*Symplocarpus foetidus*) / *Rhizomnium appalachianum* Forest Seep  
**Translated Name:** Yellow Birch / Jewelweed – Golden Saxifrage – (Skunk Cabbage) / Largeleaf Mniium Forest Seep  
**NVC Name:** CEG006193: *Chrysosplenium americanum* Herbaceous Vegetation  
**Conservation Rank:** S3 / G3G5

### WEST VIRGINIA INFORMATION

**Environmental Description:** This forested seep occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 750 and 1280 m. It generally occupies gently sloping land (0.5-4 degrees), although one occurrence in an old-growth forest has a 13-degree slope. It occurs as concave linear seeps in upland forest, as toeslope seeps at the base of upland forest, and as a combination of toeslope seeps and overflow channels along meandering streams. The latter setting, where a toeslope seep is impounded by a natural stream levee, receives occasional medium-energy overflow during floods. This represents a natural hydrological setting that was probably common in presettlement time but is now rare due to the general channelization of West Virginia's streams by railroads, roads, and constructed levees. Microtopography is characterized by hummocks formed by tip-up mounds, nurse logs, roots, downed wood, tussocks, and woody stem clusters. Bedrock may be shale, sandstone, or occasionally limestone. Soils are poorly to moderately poorly drained with variable texture ranging from muck to silt loam to sandy loam. Hydric soil indicators include histosol, histic epipedon, black histic, 2 cm muck, sandy mucky mineral, dark surface, depleted matrix, redox depressions, and alluvial depleted matrix. Soil pH averages 4.4 (n=8). Pore water pH ranges from 4.5-6.2, with an average of 5.5 (n=8). Soil chemistry is characterized by high Mn, Na, P, S; moderate Ca, Mg, and exchangeable nitrogen; and low organic matter, Al, B, Cu, Fe, K, Zn, and total exchange capacity (n=8). Electrical conductivity averages 83 micromhos/cm. The unvegetated surface is predominantly litter, with an average of 5% downed wood and 4% standing water.

**Vegetation Description:** This forested seep occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch), with an abundant herbaceous layer dominated by *Impatiens capensis* (jewelweed) and with characteristic presence of *Chrysosplenium americanum* (American golden saxifrage) and *Rhizomnium appalachianum* (Appalachian rhizomnium moss). The canopy also includes lower cover of *Picea rubens* (red spruce) and *Acer rubrum* (red maple), and occasional presence of *Tsuga canadensis* (eastern hemlock), *Prunus serotina* var. *serotina* (black cherry), *Quercus rubra* (northern red oak), *Acer saccharum* var. *saccharum* (sugar maple), *Magnolia acuminata* (cucumber-tree), *Abies balsamea* (balsam fir), *Fraxinus nigra* (black ash), and *Crataegus* (hawthorn) spp. Mean canopy cover is 33%. Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. Trees that are rooted within the seep tend to grow on moss-covered hummocks with buttressed roots. The subcanopy averages 15% cover and has a similar composition to that of the canopy, with the occasional addition of *Fagus grandifolia* (American beech), *Acer spicatum* (mountain maple), *Sorbus americana* (American mountain ash), and *Amelanchier* (serviceberry) spp. The shrub strata are sparse and variable in

composition, with the tall-shrub layer averaging 10% cover and the short-shrub averaging only 2% cover. Many of the canopy species also occur in the shrub strata. Other shrub species may include *Rhododendron maximum* (great laurel), *Alnus incana* ssp. *rugosa* (speckled alder), *Kalmia latifolia* (mountain laurel), *Ilex montana* (mountain holly), *Sambucus canadensis* (common elderberry), *Vaccinium erythrocarpum* (southern mountain cranberry), *Viburnum recognitum* (southern arrowwood), *Viburnum nudum* var. *cassinoides* (northern wild raisin), and *Ilex verticillata* (common winterberry). The herbaceous layer averages 68% cover and is dominated by *Impatiens capensis* (jewelweed). Other herbaceous species with high constancy include *Dryopteris intermedia* (intermediate woodfern), *Glyceria striata* (fowl mannagrass), *Viola cucullata* (marsh blue violet), *Chelone glabra* (white turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Carex stipata* (owlfruit sedge), *Thelypteris noveboracensis* (New York fern), *Acer rubrum* (red maple), *Glyceria melicaria* (melic mannagrass), *Carex gynandra* (nodding sedge), *Agrostis perennans* (upland bentgrass), *Carex leptalea* ssp. *leptalea* (bristlystalked sedge), *Symphotrichum prenanthoides* (crookedstem aster), *Oxalis montana* (mountain woodsorrel), *Symplocarpus foetidus* (skunk cabbage), *Carex scabrata* (eastern rough sedge), *Lycopus uniflorus* var. *uniflorus* (northern bugleweed), *Juncus effusus* (common rush), and *Carex baileyi* (Bailey's sedge). Nonvascular plants average 25% cover and are dominated by *Rhizomnium appalachianum* and *Plagiomnium ciliare* with lesser amounts of *Thuidium delicatulum* and *Bazzania trilobata*. A variety of bryophyte species characterizes this community, and locally abundant species may include *Trichocolea tomentella*, *Sphagnum recurvum*, *Polytrichum pallidisetum*, *Atrichum undulatum*, *Sphagnum palustre*, and *Sphagnum affine*. The indicator species that help to distinguish this community from others within the forested seep physiognomy in West Virginia are *Chelone glabra* (white turtlehead), *Carex prasina* (drooping sedge), *Cinna latifolia*, *Dryopteris intermedia*, *Glyceria striata*, *Impatiens capensis*, *Rhizomnium appalachianum*, *Thuidium delicatulum*, and *Thelypteris noveboracensis*. This community provides habitat for species of conservation concern in West Virginia including *Abies balsamea* (S3G5), *Carex leptoneuria* (S2G4), *Cymophyllus fraserianus* (S3G4), *Geum rivale* (S1G5), and *Saxifraga pensylvanica* (swamp saxifrage) (S2G5). Mean species richness of all vascular plants, and any non-vascular plants with cover >1%, is 42 taxa per 400 square meters, with about 15% of the diversity in the bryophyte layer.

**Fauna observed:** Grass moths of the family Pyralidae were observed in this community. Spiders found within this community included *Araneus* sp. (angulate/roundshouldered orbweaver), *Frontinella pyramitela* (weaver spider), *Helophora insignis* (sheetweb/dwarf weaver), *Neriene radiata* (filmy dome spider), *Ceraticelus fissiceps* (dwarf/sheetweb weaver), *Glenognatha foxi* and *Tetragnatha* sp. (longjawed orbweavers), *Tetragnatha laboriosa* (silver longjawed orbweaver), *Theridion frondeum* and *Therx* sp. (cobweb weavers), *Theridiosoma gemmosum* (ray orbweaver), *Misumenops* sp. (flower crab spider), and *Leiobunum* sp. and *Palpx* sp. (harvestmen). Insects from nine orders were represented within this community type. The order Coleoptera (beetles) included *Cantharis* sp. (a ground beetle), *Capraita quercata*, *Lexiphanes saponatus*, *Plateumaris* sp., and *Scelolyperus meracus* (leaf beetles), and *Cylindrocopturus* sp. (a weevil), *Cyphon* sp. (a marsh beetle) and *Isomira* sp. (a comb-clawed beetle). The order Collembola (springtails) included an unidentified species from Entomobryidae (slender springtails). Representing the order Diptera (true flies) were species of Anthomyiidae (root-maggot flies), Chironomidae (midges), *Clusia lateralis* (a clusiid flies), Diastatidae (diastatid flies), Dolichopodidae (long-legged flies), Drosophilidae (vinegar and fruit

flies), *Suillia* sp. (a heleomyzid fly), *Minettia* sp. (a lauxaniid fly), *Lonchoptera* sp. (a spear-winged fly), *Cordilura* sp. (a dung fly), and *Sargus* sp. (a soldier fly). Insects in the order Hemiptera (true bugs) were collected including *Balclutha* sp. (a leafhopper), *Cixius* sp. and *Oliarus* sp. (cixiid planthoppers), *Delphacodes* sp. (a planthopper), and *Hoplistocelis sordidus* (a damselbug). Other collections include species of Acrididae (grasshoppers), Leuctridae (rolled-wing stoneflies), Psocoptera (barklice) and Trichoptera (caddisflies).

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Abies balsamea</i>	-	plant	WV species of concern
<i>Carex leptonevia</i>	-	plant	WV species of concern
<i>Cymophyllus fraserianus</i>	-	plant	WV species of concern
<i>Geum rivale</i>	-	plant	WV species of concern
<i>Saxifraga pensylvanica</i>	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 750 and 1280 m. Within this region, the community is known from Beaverdam Run, Blister Run Swamp, Cathedral State Park, Gaudineer Scenic Area, Rhine Creek, Tea Creek Mountain, Terra Alta Lake, and tributaries to the East Fork of the Greenbrier River.

**Classification Comments:** Eleven plots represent this type (CEGL006193), which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. It fits within the broadly defined NVC type; however, it should be noted that the West Virginia expression of this type is a shaded forested seep, with woodland physiognomy, rather than an herbaceous community. This is the most common high-elevation forested seep type in West Virginia. The other two high-elevation forested seeps differ from this type in floristic composition, and one of them also differs in its steeply sloping environmental setting.

**West Virginia Description Author:** E.A. Byers

**Plots:** CATH.3, CATH.4, CATH.5, MONF.56, MONF.140, MONF.142, MONF.170, MONF.184, MONF.185, MONF.220, PRES.3, PRES.4, USFS.287.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Saturated temperate perennial forb vegetation (V.B.2.N.f.)
Alliance	<i>Chrysosplenium americanum</i> Saturated Herbaceous Alliance (A.1685)
Alliance (English name)	American Golden-saxifrage Saturated Herbaceous Alliance
Association	<i>Chrysosplenium americanum</i> Herbaceous Vegetation

Association (English name) American Golden-saxifrage Herbaceous Vegetation  
Ecological System(s) Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)  
Central and Southern Appalachian Spruce-Fir Forest (CES202.028)

#### GLOBAL DESCRIPTION

**Concept Summary:** This type includes small herbaceous seepage areas with scattered cover of forbs. Herbs are strongly dominant and tend to be relatively diverse, especially where there is greater enrichment. Characteristic species can include *Chrysosplenium americanum* (American golden saxifrage), *Cardamine bulbosa* (bulbous bittercress), *Circaea alpina* (small enchanter's nightshade), *Viola cucullata* (marsh blue violet), *Chelone glabra* (white turtlehead), *Glyceria melicaria* (melic mannagrass), *Glyceria striata* (fowl mannagrass), *Cinna arundinacea* (sweet woodreed), *Impatiens capensis* (jewelweed), *Poa paludigena* (bog bluegrass), *Carex scabrata* (eastern rough sedge), *Mimulus ringens* (Allegheny monkeyflower), *Symplocarpus foetidus* (skunk cabbage), *Pilea pumila* (Canadian clearweed), *Galium triflorum* (fragrant bedstraw), *Saxifraga pensylvanica* (eastern swamp saxifrage), *Thelypteris noveboracensis* (New York fern), *Veratrum viride* (green false hellebore), *Hydrocotyle americana* (American marshpennywort), *Onoclea sensibilis* (sensitive fern), *Laportea canadensis* (Canadian woodnettle), *Arisaema triphyllum* (Jack in the pulpit), *Tiarella cordifolia* (heartleaf foamflower), *Carex gynandra* (nodding sedge), *Geum rivale* (purple avens), and the mosses *Rhizomnium punctatum*, *Rhizomnium appalachianum*, *Brachythecium rivulare*, *Thuidium delicatulum*, *Steerecleus serrulatus* and *Bryhnia novae-angliae*. Typically the community is over-topped by trees and shrubs from the surrounding forest, although large examples will be open.

**USFWS Wetland System:** Palustrine

#### DISTRIBUTION

**Range:** This association occurs throughout the eastern United States.

**States/Provinces:** CT, DE, MA, MD, NH, NY, PA, RI, VA, VT, WV:S3

**Federal Lands:** USFS (Monongahela)

#### CONSERVATION STATUS

**Rank:** G3G5 (1-Dec-1997)

**Reasons:** Information not available.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 3 - Weak

**Comments:** This association currently comprises all forested seeps, springs and intermittent streams; when further data are available regionally, more associations can be teased apart.

#### Similar Associations:

- *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation (CEGL006597)
- *Symplocarpus foetidus* - *Impatiens capensis* Herbaceous Vegetation [Provisional] (CEGL006567)

#### Related Concepts:

- Golden saxifrage forested seep (CAP pers. comm. 1998) ?
- Golden-Saxifrage Seep (Schafale 1998b) ?

## SOURCES

**Description Authors:** Eastern Ecology Group

**References:** Bowman 2000, CAP pers. comm. 1998, DeMeo et al. 1998, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Harrison 2004, Metzler and Barrett 2001, Schafale 1998b, Sperduto 2000a, Swain and Kearsley 2000, TDNH unpubl. data, Thompson and Sorenson 2000

## Rough Sedge Seep

**Scientific Name:** *Betula alleghaniensis* var. *alleghaniensis* / *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Sloping Forested Seep

**Translated Name:** Yellow Birch / Eastern Rough Sedge - Marsh Blue Violet / Wavy-leaf Moss Sloping Forested Seep

**NVC Name:** CEG006597: *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation

**Conservation Rank:** S3 / G3

### WEST VIRGINIA INFORMATION

**Environmental Description:** This linear, sloping forested seep occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 780 and 1300 m. It occupies gently to steeply sloping drainages (1.5-20 degrees) in upland forest, typically occurring as small, discontinuous patches that repeat across a mountainside. Microtopography is characterized by a complex of tip-up mounds, buttressed roots, and downed wood over large and small rocks. Bedrock is typically shale or sometimes sandstone. Soils are moderately to poorly drained and stony, with variable texture ranging from muck to silt loam to sandy loam. Hydric soil indicators include histic epipedon, 2 cm muck, sandy mucky mineral, loamy gleyed matrix, and depleted matrix. Soil pH averages 4.8, but pore water pH is significantly higher, ranging from 5.8-7.0, with an average of 6.6 (n=4). Electrical conductivity of the pore water is low, averaging 48 micromhos/cm (n=4). Soil chemistry is characterized by high B, Ca, Cu, Fe, Mg, Mn, Na, P, S, Zn; moderate K and exchangeable nitrogen; and low Al, organic matter, and total exchange capacity (n=4). The unvegetated surface is predominantly litter, with an average of 10% rocks, 6% downed wood and 5% standing or flowing water.

**Vegetation Description:** This linear forested seep occurs in the Allegheny Mountains region of West Virginia. It is characterized by an open canopy of *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) with an herbaceous layer dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), and the characteristic bryophyte *Plagiomnium ciliare*. The canopy often includes low cover by *Acer saccharum* var. *saccharum* (sugar maple), *Picea rubens* (red spruce), and *Fagus grandifolia* (American beech). Mean canopy cover is 40%. Most trees are not rooted in the seep, but rather overhang and shade the seep from the edges. Trees that are rooted within the seep tend to grow on moss-covered hummocks with buttressed roots. The subcanopy and shrub layers are sparse, totaling about 8% cover, and with a composition similar to that of the canopy. The herbaceous layer averages 60% cover and is dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), *Laportea canadensis* (Canadian woodnettle), *Tiarella cordifolia* (heartleaf foamflower), and *Glyceria melicaria* (melic

mannagrass). Other herbaceous species with high constancy include *Dryopteris intermedia* (intermediate woodfern), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), *Cardamine diphylla* (crinkleroot), *Chrysosplenium americanum* (American golden saxifrage), *Poa alsodes* (grove bluegrass), *Symphotrichum prenanthoides* (crookedstem aster), *Packera aurea* (golden ragwort), *Thelypteris noveboracensis* (New York fern), *Cardamine pensylvanica* (Pennsylvania bittercress), *Arisaema triphyllum* (Jack in the pulpit), *Monarda didyma* (scarlet beebalm), and *Oxalis montana* (mountain woodsorrel). Nonvascular plants average 25% cover and are dominated by *Plagiomnium ciliare* with lesser amounts of *Brachythecium rivulare*, *Thuidium delicatulum*, and *Rhizomnium appalachianum*. The indicator species that help to distinguish this community from others within the forested seep physiognomy in West Virginia are *Carex scabrata* (eastern rough sedge), *Laportea canadensis* (Canadian woodnettle), *Tiarella cordifolia* (heartleaf foamflower), *Acer saccharum* var. *saccharum* (sugar maple), *Brachythecium rivulare* (brachythecium moss), *Cardamine diphylla* (crinkleroot), *Carex leptonevia* (nerveless woodland sedge), and *Plagiomnium ciliare* (plagiomnium moss). This community provides habitat for species of conservation concern in West Virginia, including *Aconitum reclinatum* (white monkshood) (S3G3), *Carex bromoides* ssp. *bromoides* (bromelike sedge) (S3G5T5), and *Carex leptonevia* (nerveless woodland sedge) (S2G4). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 32 taxa per 400 square meters, with about 15% of the diversity in the bryophyte layer.

**Fauna observed:** Insects from seven orders and 23 families were collected in this community type. Specimens from the order Coleoptera (beetles) include *Cantharis* sp. (a soldier beetle), *Plateumaris* sp. and *Sumitrosis* sp. (leaf beetles), *Denticollis denticornis* (a click beetle), an unidentified species from Curculionidae (weevils), *Ptilodactyla* sp. (a toe-winged beetle), *Cyphon* sp. (a marsh beetle), and *Oxytelus* sp. (a rove beetle). Insects from the order Collembola (springtails) within the family Entomobryidae (slender springtails) were noted. Within Diptera (true flies), the following species were collected: Chironomidae (midges), *Chlorops* sp. (a frit fly), Dolichopodidae (long-legged flies), Heleomyzidae (heleomyzid flies), *Lonchoptera* sp. (a spear-winged fly), *Mycomya* sp. (a fungus gnat), and *Scathophaga* sp. (a dung fly). Collections from the order Hemiptera (true bugs) are *Balclutha* sp. (a leafhopper) and *Stenocranus dorsalis* (a planthopper). The order Hymenoptera (bees, wasps, and ants) included *Nomada* sp. (a honeybee), Braconidae (parasitoid wasps) and Tenthredinidae (common sawflies). The order Plecoptera (stoneflies) included species of Leuctridae (rolled-wing stoneflies) and Nemouridae (spring stoneflies). There were unidentified species found from the order Trichoptera (caddisflies).

**Other Noteworthy Species:**

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Aconitum reclinatum</i> (white monkshood)	G3	plant	WV species of concern
<i>Carex bromoides</i> ssp. <i>bromoides</i> (bromelike sedge)	-	plant	WV species of concern
<i>Carex leptonevia</i> (nerveless woodland sedge)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 780 and 1300 m. Within this region, the community is

known from Black Mountain, Cabin Mountain, Middle Mountain, Mount Porte Crayon, Pharis Knob, Shavers Mountain, Snowy Mountain, Stuart Knob, and Tingler Run.

**Classification Comments:** Seven plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia. This type differs from *Chrysosplenium americanum* (American golden saxifrage) Herbaceous Vegetation (CEGL006193) in its steeply sloping environmental setting and its floristic composition, which is dominated by *Carex scabrata* (eastern rough sedge) and *Plagiomnium ciliare* (plagiomnium moss), rather than by *Chrysosplenium americanum* (American golden saxifrage) and *Rhizomnium appalachianum* (Appalachian rhizomnium moss).

**West Virginia Description Author:** E.A. Byers

**Plots:** CVWR.47, MONF.175, MONF.177, MONF.182, MONF.222, MONF.270, RAND.6.

## GLOBAL INFORMATION

### NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Saturated temperate perennial forb vegetation (V.B.2.N.f.)
Alliance	<i>Chrysosplenium americanum</i> Saturated Herbaceous Alliance (A.1685)
Alliance (English name)	American Golden-saxifrage Saturated Herbaceous Alliance
Association	<i>Carex scabrata</i> - <i>Viola cucullata</i> / <i>Plagiomnium ciliare</i> Herbaceous Vegetation
Association (English name)	Eastern Rough Sedge - Marsh Blue Violet / Wavy-leaf Moss Herbaceous Vegetation
Ecological System(s)	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) Central and Southern Appalachian Spruce-Fir Forest (CES202.028)

### GLOBAL DESCRIPTION

**Concept Summary:** This linear, sloping forested seep occurs on saturated, temporarily flooded, and semi-permanently flooded soils in headwater basins of the Allegheny Mountains region of West Virginia, at elevations between 780 and 1300 m. It occupies gently to steeply sloping drainages (1.5-20 degrees) in upland forest, typically occurring as small, discontinuous patches that repeat across a mountainside. It is fed primarily by seepage and springs from the adjacent upland forest. Microtopography is characterized by a complex of tip-up mounds, buttressed roots, and downed wood over large and small rocks. Bedrock is typically shale or sometimes sandstone. Soils are moderately to poorly drained and stony, with variable texture ranging from muck to silt loam to sandy loam. The canopy is open and dominated by *Betula alleghaniensis* var. *alleghaniensis* (yellow birch) with an herbaceous layer dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), and the characteristic bryophyte *Plagiomnium ciliare*. The canopy often includes low cover by *Acer saccharum* var. *saccharum* (sugar maple), *Picea rubens* (red spruce), and *Fagus grandifolia* (American beech). Most trees

are not rooted in the seep, but rather overhang and shade the seep from the edges. The subcanopy and shrub layers are sparse. The herbaceous layer is dominated by *Carex scabrata* (eastern rough sedge), *Viola cucullata* (marsh blue violet), *Laportea canadensis* (Canadian woodnettle), *Tiarella cordifolia* (heartleaf foamflower), and *Glyceria melicaria* (melic mannagrass). Other herbaceous species with high constancy include *Dryopteris intermedia* (intermediate woodfern), *Saxifraga micranthidifolia* (lettuceleaf saxifrage), *Cardamine diphylla* (crinkleroot), *Chrysosplenium americanum* (American golden saxifrage), *Poa alsodes* (grove bluegrass), *Symphotrichum prenanthoides* (crookedstem aster), *Packera aurea* (golden ragwort), *Thelypteris noveboracensis* (New York fern), *Cardamine pensylvanica* (Pennsylvania bittercress), *Arisaema triphyllum* (Jack in the pulpit), *Monarda didyma* (scarlet beebalm), and *Oxalis montana* (mountain woodsorrel). Nonvascular plants are dominated by *Plagiomnium ciliare* with lesser amounts of *Brachythecium rivulare*, *Thuidium delicatulum*, and *Rhizomnium appalachianum*. The indicator species that help to distinguish this community from others within the forested seep physiognomy in West Virginia are *Carex scabrata* (eastern rough sedge), *Laportea canadensis* (Canadian woodnettle), *Tiarella cordifolia* (heartleaf foamflower), *Acer saccharum* var. *saccharum* (sugar maple), *Brachythecium rivulare* (brachythecium moss), *Cardamine diphylla* (crinkleroot), *Carex leptonevia* (nerveless woodland sedge), and *Plagiomnium ciliare* (plagiomnium moss). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 32 taxa per 400 square meters, with about 15% of the diversity in the bryophyte layer.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations between 780 and 1300 m.

**States/Provinces:** WV:S3

**Federal Lands:** USFS (Monongahela); USFWS (Canaan Valley)

#### CONSERVATION STATUS

**Rank:** G3 (3-Apr-2007)

**Reasons:** This community is restricted in known distribution to very small patches along steeply sloping drainage tracks within intact northern hardwoods or *Picea rubens* (red spruce) forest, above 780 m in the Allegheny Mountains region of West Virginia; however, it may occur in surrounding states. Only nine occurrences are known, but several dozen more probably exist in West Virginia.

#### CLASSIFICATION INFORMATION

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Seven plots represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. The type clusters and ordines well and has been sampled throughout its range in West Virginia.

#### Similar Associations:

- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193)

#### SOURCES

**Description Author:** E.A. Byers

**References:** Eastern Ecology Working Group n.d.

## VI. Bryophyte vegetation

### VI.A.1.N.c. Saturated bryophyte vegetation

#### Bog-rosemary Peatland

<b>Scientific Name:</b>	<i>(Andromeda polifolia</i> var. <i>glaucophylla)</i> / <i>Polytrichum strictum</i> - <i>Cladina</i> spp. - <i>Sphagnum</i> spp. Peatland
<b>Translated Name:</b>	(Bog-rosemary) / Haircap Moss- Reindeer Lichen - Peatmoss Peatland
<b>NVC Name:</b>	CEGL006589: <i>(Andromeda polifolia</i> var. <i>glaucophylla)</i> / <i>Polytrichum strictum</i> - <i>Cladina</i> spp. - <i>Sphagnum</i> spp. Nonvascular Vegetation
<b>Conservation Rank:</b>	S1 / G1

#### WEST VIRGINIA INFORMATION

**Environmental Description:** This ombrotrophic wetland occurs on slightly domed peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 960-1030 m. It is a small-patch type (0.05-10 ha) that occupies flat-lying headwater basins in the center of wetland mosaics, where it is isolated from seepage inputs. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 25-50 cm in height. Bedrock is Mississippian shale or Quaternary alluvium. The substrate is poorly drained peat, with depths ranging from 2 to 3.5 m. According to carbon dating of peat at Cranberry Glades, this community grows on a site that has been characterized by bog vegetation for about 9500 years. The water table may be several feet below the surface during dry periods throughout the year, and the community relies on rainfall to nourish the vegetation. Often a perched moisture layer is evident in the peat close to the ground surface. Hydric soil indicators include histisol, histic epipedon, and hydrogen sulphide. Mean soil pH is 3.7 (n=3), mean pore water pH is 3.9 (n=4), and electrical conductivity averages 50 micromhos/cm (n=4). Soil chemistry is characterized by high exchangeable nitrogen, total exchange capacity, and organic matter; moderate B, K, Na, P; and low Al, Ca, Cu, Fe, Mg, Mn, S, and Zn (n=3). The unvegetated surface is litter.

**Vegetation Description:** This ombrotrophic, late-successional peatland occurs in the Allegheny Mountains region of West Virginia. It is characterized by well-developed hummocks of mosses and lichens with occasional dominance by clonal patches of *Andromeda polifolia* var. *glaucophylla* (bog rosemary). The short-shrub stratum ranges from 0 to 60% cover and is almost exclusively composed of *Andromeda polifolia* var. *glaucophylla* (bog rosemary), with very low cover by *Photinia melanocarpa* (black chokeberry) or *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub layer is comprised of *Rubus hispidus* (bristly dewberry) and *Vaccinium oxycoccos* (small cranberry) with an average cover of 12%. The herbaceous layer, with mean 5% cover, is characterized by *Eriophorum virginicum* (tawny cottongrass), which grows on top of the hummocks. *Rhynchospora alba* (white beaksedge) may line the hollows, and very low cover of *Carex trisperma* var. *trisperma* (threeseeded sedge) or *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) may be present. Nonvascular plants average 95% cover, with

hummocks dominated by *Polytrichum strictum* and *Cladina* (reindeer lichen) spp. (*Cladina arbuscula*, *Cladina rangiferina*, *Cladina stygia*), and hollows lined with *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum flexuosum*, *Sphagnum magellanicum*). This community provides habitat for species of conservation concern in West Virginia, including *Andromeda polifolia* var. *glaucophylla* (bog rosemary) (S1G5T5) and *Vaccinium oxycoccos* (small cranberry) (S3G5). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 13 taxa per 400 square meters, with 40% of the diversity in the nonvascular stratum.

**Fauna observed:** Small mammals observed in this community include *Peromyscus* sp. (deer mouse or white-footed mouse), *Sorex cinereus* (masked shrew), *Microtus pensylvanicus* (meadow vole), *Sorex fumeus* (smoky shrew), and *Clethrionomys gapperi* (southern red-backed vole). Spiders collected include *Argiope trifasciata* (banded garden spider), *Neoscona arabesca* (thickjawed orbweaver), *Tetragnatha laboriosa* (silver longjawed orbweaver), and *Misumenoides formosipes* (whitebanded crab spider).

**Other Noteworthy Species:**

<u>Species</u>	<u>G</u> <u>R</u> <u>a</u> <u>n</u> <u>k</u>	<u>T</u> <u>y</u> <u>p</u> <u>e</u>	<u>N</u> <u>o</u> <u>t</u> <u>e</u>
<i>Andromeda polifolia</i> var. <i>glaucophylla</i> (bog rosemary)-		plant	WV species of concern
<i>Vaccinium oxycoccos</i> (small cranberry)	-	plant	WV species of concern

**West Virginia Range:** This community is known from the Cranberry Glades wetland complex (Pocahontas County) in the Allegheny Mountains region of West Virginia, at elevations of 1020-1022 m. It has been reported from Canaan Valley (L. Ceperley pers. comm. 2007) at an elevation of about 980 m but has not been sampled there.

**Classification Comments:** Four plots (several patches forming one occurrence) represent this type, which was classified as part of a 2004-2006 study of high-elevation wetlands in West Virginia's Allegheny Mountains region. This type clusters consistently together and ordinales in a close grouping in the ombrotrophic portion of species space. The single occurrence has been adequately sampled. It is possible that this type may exist at a second location (Canaan Valley), where it has not yet been sampled.

**West Virginia Description Author:** E.A. Byers

**Plots:** MONF.118, MONF.119, MONF.145, MONF.146.

**GLOBAL INFORMATION**

**NVC CLASSIFICATION**

Physiognomic Class	Nonvascular Vegetation (VI)
Physiognomic Subclass	Bryophyte vegetation (VI.A.)
Physiognomic Group	Temperate or subpolar bryophyte vegetation (VI.A.1.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar bryophyte vegetation (VI.A.1.N.)
Formation	Saturated bryophyte vegetation (VI.A.1.N.c.)
Alliance	<i>Sphagnum cuspidatum</i> - <i>Cladopodiella fluitans</i> Saturated Nonvascular Alliance (A.3006)

Alliance (English name)	Toothed Peatmoss - Cladopodiella Moss Saturated Nonvascular Alliance
Association	( <i>Andromeda polifolia</i> var. <i>glaucophylla</i> ) / <i>Polytrichum strictum</i> - <i>Cladina</i> spp. - <i>Sphagnum</i> spp. Nonvascular Vegetation
Association (English name)	(Bog-rosemary) / Bog Haircap Moss- Reindeer Lichen species - Peatmoss species Nonvascular Vegetation
Ecological System(s)	High Allegheny Wetland (CES202.069)

#### GLOBAL DESCRIPTION

**Concept Summary:** This ombrotrophic late-successional wetland occurs on slightly domed peat deposits in the Allegheny Mountains region of West Virginia, at elevations between 960 and 1030 m. It is characterized by well-developed hummocks of mosses and lichens with occasional dominance by clonal patches of *Andromeda polifolia* var. *glaucophylla* (bog rosemary). It is a small-patch type (0.05-10 hectares) that occupies flat-lying headwater basins in the center of wetland mosaics, where it is isolated from seepage inputs. Hummock-and-hollow microtopography is well-developed, with rounded peat hummocks ranging from 25-50 cm in height. The substrate is poorly drained peat, with depths ranging from 2 to 3.5 m. According to carbon dating of peat, this community grows on a site that has been characterized by bog vegetation for about 9500 years. The short-shrub stratum ranges from 0 to 60% cover and is almost exclusively composed of *Andromeda polifolia* var. *glaucophylla* (bog rosemary), with infrequent very low cover by *Photinia melanocarpa* (black chokeberry) or *Hypericum densiflorum* (bushy St. Johnswort). The dwarf-shrub layer is comprised of *Rubus hispidus* (bristly dewberry) and *Vaccinium oxycoccos* (small cranberry) with an average cover of 12%. The herbaceous layer, with mean 5% cover, is characterized by *Eriophorum virginicum* (tawny cottongrass), which grows on top of the hummocks. *Rhynchospora alba* (white beaksedge) may line the hollows, and very low cover of *Carex trisperma* var. *trisperma* (threeseeded sedge) or *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern) may be present. Nonvascular plants average 95% cover, with hummocks dominated by *Polytrichum strictum* and *Cladina* (reindeer lichen) spp. (*Cladina arbuscula*, *Cladina rangiferina*, *Cladina stygia*), and hollows lined with *Sphagnum* spp. (*Sphagnum rubellum*, *Sphagnum flexuosum*, *Sphagnum magellanicum*). Mean species richness of all vascular plants and any nonvascular plants with cover >1% is 13 taxa per 400 square meters, with 40% of the diversity in the nonvascular stratum.

**Environmental Description:** Same as West Virginia description.

**Vegetation Description:** Same as West Virginia description.

#### DISTRIBUTION

**Range:** This community is known from the Allegheny Mountains region of West Virginia, at elevations of 960-1030 m.

**States/Provinces:** WV:S1

**Federal Lands:** USFS (Monongahela)

#### CONSERVATION STATUS

**Rank:** G1 (3-Apr-2007)

**Reasons:** This is a small-patch type with a single protected, viable occurrence. It has been reported from a second location but has not been sampled there. It has very narrow environmental specificity and high intrinsic vulnerability.

#### **CLASSIFICATION INFORMATION**

**Status:** Standard

**Confidence:** 1 - Strong

**Comments:** Same as West Virginia classification comments.

**Similar Associations:** Information not available.

#### **Related Concepts:**

- *Andromeda glaucophylla* - *Vaccinium oxycoccos* open bog community (Edens 1973) =
- *Polytrichum* - *Cladonia* association (Darlington 1943) =

#### **SOURCES**

**Description Author:** E.A. Byers

**References:** Darlington 1943, Eastern Ecology Working Group n.d., Edens 1973

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Appendix I in Byers, E. A., J. P. Vanderhorst, and B. P. Streets. 2007.  
**Classification and Conservation Assessment of High Elevation Wetland  
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 Natural Heritage Program, WVDNR. Elkins, WV.