
**IDENTIFICATION AND PROTECTION OF REFERENCE
WETLAND NATURAL COMMUNITIES IN MARYLAND:
Northern Piedmont and Blue Ridge Circumneutral Seepage Swamps**

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INTRODUCTION

In recent years, the practice of natural resource conservation through the protection of rare, threatened, and endangered species has come under fire by both the general public and the scientific community (Wilcove et al., 1996). These species have served as regulatory endpoint umbrellas, used to protect the larger systems that they inhabit. These procedures have led to the focus of conservation efforts onto majestic species like the Bald Eagle and charming species like the Spotted Owl (Harwell et al., 1990). These species have acted as representatives for their natural systems, but rare species usually do not play a major ecological role within these systems. Actually, the endpoints of conservation efforts should be the natural systems themselves (Harwell et al., 1990). Originally, these representatives served their systems well; it is difficult to induce the public to feel strongly about the conservation of ecologically important endpoints such as predatory mites (Pimentel and Edwards, 1982) and other invertebrates (Wilson, 1987), arbuscular mycorrhizal fungi (Van der Heijden et al., 1998), or the nitrogen cycle (Barbour et al., 1987). But, land protection based on charismatic endangered animal species can create a great deal of public controversy (e.g. Spotted Owl conservation in the Pacific Northwest) and often leaves many questions unresolved (Williams, 1996). What happens to land that is currently protected, because of the presence of a species, once that species recovers and is de-listed? What happens to the same type of land if the species becomes extinct? Also, these conservation concepts can lead to the intentional degradation of private land in order to ensure that no endangered species move in and create a regulatory situation, such as in the case of the Red-cockaded Woodpecker in the Southeastern United States (Bean and Wilcove, 1997; Bonnie, 1997).

The complications associated with species level conservation have given rise to a relatively new method in the protection of natural resources. Natural communities have been identified as generally appropriate units of biodiversity conservation, they are hierarchically above individual species but more manageable than larger landscape units such as watersheds or physiographic provinces (Thompson, 1996). The definition of natural communities used in this report closely follows that of Mueller-Dombois and Ellenberg (1974): communities are physiognomically uniform assemblages of plants which are ecologically related to each other and their physical environment, and predictably found under similar habitat conditions. The abiotic environment is not a component of the definition of natural communities, it is assumed that these conditions determine the combination of species within the concept (Thompson, 1996). Often, the natural community descriptions are necessarily vague, recognizing that these associations intergrade at ecotones and that boundaries are artificial constructs necessary for conservation. Natural communities are merely empirical tools used for natural resource conservation, not an absolute representation of ecological truth (Thompson, 1996).

Historically, a debate has transpired as to whether vegetation actually consists of distinct

communities or a continuum of overlapping species ranges (Grossman et al., 1994). Much of this discussion centered around the “supra-organism” view of F. E. Clements (1936) versus the “individualistic” view of H. Gleason (1926). A full treatise of this debate can be found in Whittaker (1962) and Mueller-Dombois and Ellenberg (1974). More recently, Austin and Smith (1989) have reevaluated this debate and emphasized that there is not actually a polar dichotomy between these two concepts, rather the frames of reference of the observer are in conflict. Vegetation patterns are characterized by the link between individual species distribution patterns, their occurrence in landscape features, and the distribution of the landscape features (Grossman et al., 1994). Species can be individually distributed along gradients, uni-dimensional or complex, following any possible model (Austin, 1987; Austin and Smith, 1989). The pattern of distribution of the landscape features that control environmental factors constrains the pattern of species combinations, their distribution in the landscape, and their frequency (Grossman et al., 1994). Thus the views of community and continuum complement, rather than exclude each other (Westhoff and Van der Maarel, 1978; Austin, 1991).

Natural communities are a tractable level of hierarchy for establishing preservation benchmarks because their conservation allows the protection of the overall trophic structure, which is essentially biodiversity (Harwell et al., 1990). Also, there are some legal provisions for protecting natural communities: Section 403 © of the Federal Water Pollution Control Act specifically calls for consideration of changes in species diversity (Harwell, 1984b), and Section 301(h) of the Federal Water Pollution Control Act indirectly calls for maintenance of species diversity through its “balanced indigenous population” endpoint as interpreted by regulations and litigation (Harwell, 1984a). Generally, high priority natural communities are habitat to high priority plant and animal species, protection of the community will protect these species (Keddy and Wisheu, 1989; Noss, 1987). Conservation using this “coarse-filter” approach has been documented for some taxa (Panzer and Schwartz, 1998). Also, natural communities, with their associated biological, chemical, and physical processes, drive the biogeochemical processes of the earth (Naeem et al., 1994). Natural community based inventories give a better assessment of the status, distribution, and interrelatedness of vegetation types across the landscape as compared to the historically more prevalent methods of jurisdictionally based (ie. county or agency) inventory. Often, these types of inventory are limited to smaller geographic land units, lead to haphazard data collection, and conclude with improper understanding of community rarity.

Unlike species, natural communities are not always self-evident on the landscape. A series of floristic data, collected across both geographic and temporal gradients, is often necessary for naming and understanding natural community types. This information must be expressed within the organizational framework of a community classification for the best utilization of the biological data. This classification is a way of collecting uniform hierarchical data that facilitates effective resource stewardship by ensuring compatibility and widespread use of the

information by various individuals and agencies (Grossman et al., 1994). The National Vegetation Classification System (Grossman et al., 1998) is a current priority of The Nature Conservancy and the network of Natural Heritage Programs. This system is the product of a great body of earlier scientific work and over twenty years of data collection by these organizations. Classification is a critical ingredient in the recipe of conservation, it allows for the accurate identification and description of the full range of natural community types within the landscape. This along with information on rarity permits formation of proper protection priorities.

Within the framework of The National Vegetation Classification System (Grossman et al., 1998) are hierarchically more finely divided classifications at the regional and state levels. This project contributes to the development of the Maryland Vegetation Classification (Berdine, 1998) which is used for management within the state, comparison to other states, and fine tuning the Community Alliances and Elements of the Eastern Region - 2nd Draft (Sneddon et al., 1996) and The National Vegetation Classification System (Grossman et al., 1998). The Maryland Vegetation Classification (Berdine, 1998) facilitates complete inventory and mapping of the vegetation of Maryland in such formats as the Biological Conservation Database (BCD) and the Gap Analysis Program (Scott and Jennings, 1998). It is also critical for the Maryland Department of Natural Resources' ecosystem - based management approach (MD DNR, 1996). Development of the classification through a series of "special projects", intensely focusing on a small subset of community types, yields the required detailed description of community types as well as the identification and mapping of exemplary examples of these types as reference sites.

With the exception to portions of Garrett and Worcester Counties, the entire land surface area of Maryland lies within the Chesapeake Bay drainage basin. This is one of the largest and most productive estuaries in the United States (Lipson and Lipson, 1997). All of the wetlands within the Chesapeake drainage are integral to the healthy function of the Bay. The phrase "Chesapeake Bay Drainage" is painted on the storm drains in Baltimore City and "The Bay Starts Here" stickers adorn the sinks of many public bathrooms. These statements are also true of the wetlands scattered throughout the state. In order to truly protect the bay, the sources and buffers throughout its watershed must receive protection priority. In addition to their connection with the Chesapeake Bay, Maryland's wetlands are critical habitat for numerous rare, threatened, and endangered plant and animal species and serve valuable ecosystem functions such as flood control, water filtration, and nutrient recycling (Tiner, 1995). Within the diverse set of Maryland's wetlands, there are a very unique group of non-tidal palustrine wetlands called circumneutral seepage wetlands. Some regional names for these wetland types are: hillside seepage slopes, seepage toeslopes, stream headwaters, fens, and sedge meadows. The near neutral conditions of these wetlands are often controlled by geochemistry and they can be found on a variety of parent material including greenstone, limestone, schist, gneiss, and ultramafic bedrock (such as diabase and serpentinite). Prior to

this project, very little was known about the species composition, distribution, and abundance of the communities found in these Maryland wetlands. Circumneutral seepage wetlands serve valuable ecosystem functions, furnish habitat to numerous taxonomic groups, are generally rare, and are often habitat for numerous rare, threatened, and endangered plant and animal species. In general, circumneutral seepage wetlands are threatened by both traditional agricultural land use, as well as residential and commercial development. Also, areas with serpentine parent material are especially prone to anthropogenic degradation due to their "wasteland appearance". They have the stressful conditions of high levels of Mg and low Ca:Mg ratios, which has led to the development of unique assemblages of plants that can endure these conditions but are highly sensitive to disturbance (Rawinski, 1991).

Fragmentation and development pressures are degrading Maryland's wetland resources at an alarming rate. An estimated 1.2 million acres of wetlands occurred in Maryland before European settlement, but that number is now reduced to 600,000 acres (Tiner, 1995). Of these 600,000 acres of wetlands, approximately 51% (342,000 acres) are non-tidal palustrine wetlands (Tiner, 1995). The state has lost over 600 acres of these wetlands each year since 1955. The drastic loss has accelerated the need for more qualitative information on the character and significance of these wetland resources. This information is necessary for setting protection priorities and initiating existing protection mechanisms. This study was restricted to the Blue Ridge and Northern Piedmont physiographic provinces of central Maryland, where these communities are poorly understood and severely threatened. The pressure imposed by the sprawling development of Baltimore and Washington D.C. has heightened the need for study of relatively pristine examples of these community types. Also, some of the geologic conditions necessary for these wetlands, such as greenstone and ultramafic bedrock are restricted in Maryland to these provinces (Vokes and Edwards, 1957).

One impediment to wetland protection and restoration efforts is the lack of adequate benchmarks against which to assess ecological integrity. The health of an ecosystem is difficult, if not impossible to assess without explicit knowledge of the target community. Objective measures of the impacts of anthropogenic disturbance on the complex and vast ecosystems of Maryland's palustrine wetlands present a daunting challenge. The measurement of these stresses, documentation of changes, and estimation of geographic cover depends upon the identification of basic units of these wetlands, the component communities, which are some of the end products of this project.

PURPOSE

The purpose of this project was to develop a more complete understanding of the natural communities within the circumneutral seepage wetlands of central Maryland's Blue Ridge and Northern Piedmont physiographic provinces. This was accomplished by developing a natural community classification for these wetland types. This classification will be used to augment the ongoing Maryland Vegetation Classification (Berdine, 1998), the Community Alliances and Elements of the Eastern Region - 2nd Draft (Sneddon et al., 1996), and The National Vegetation Classification System (Grossman et al., 1998). With this classification, exemplary examples of each community type were identified and described as reference sites. The information gathered in this project will be used to complement other projects studying palustrine wetlands in the Northeastern United States.

The information generated by this project will simplify the regulatory review of these wetlands by providing the quantitative data necessary to objectively rank these communities as to their rarity and biological importance. The results of this study will be used to aid in the conservation of these rare communities, to assist in current regulation, to support mapping projects such as the Gap Analysis Program (Scott and Jennings, 1998), and to interpret regional data at higher hierarchical levels. They will also be used by the US EPA to determine baseline levels of parameters within reference wetlands for long term modeling and conservation.

The end products of this project are: a detailed natural community classification and description, a key to these community types, and reference site descriptions for long term monitoring. These products will be utilized by the United States Environmental Protection Agency, Maryland Department of the Environment: Non-tidal Wetlands and Waterways Division, Maryland Department of Natural Resources: Wildlife and Heritage Division, traditional users of the Natural Heritage's Biological Conservation Database, and the Gap Analysis Program.

METHODS

Landscape Analysis

In order to collect ecologically pertinent information, the intricate process of Landscape Analysis must supersede field surveys. The process starts with the development of a preliminary definition of the abiotic and biotic factors that contribute to the community structure of the system of study. Our definition of circumneutral seepage wetlands was based on previous field experience, consultation with regional ecologists, and literature surveys. The abiotic factors used in the definition were: water pH range of 5.5 - 7.5, size range 0.1 - 10 hectares, slope greater than one degree, obvious groundwater percolation with generally diffuse flow, presence of mineral soils, and low peat accumulation (less than 15 cm). The biotic factor used to define these wetlands was the presence of characteristic plant species such as: *Cardamine pensylvanica*, *Carex stricta*, *Chrysosplenium americanum*, *Deschampsia cespitosa*, *Euphorbia purpurea*, *Platanthera psycodes*, and *Sanguisorba canadensis*.

Once a clear search image was established, the process of assembling a portfolio of potential sites occurred using the standard methodologies employed by The Nature Conservancy and the network of state Natural Heritage Programs. Some of these wetlands were already known to the Maryland Wildlife and Heritage Division, and were used in determining the definition. Interviews of knowledgeable individuals, both professional and amateur, led to the discovery of many previously unknown sites. Searching thematic spatial data maps (e.g. soils, geology, topographic, etc.) for signatures associated with occurrences of these types of wetland also yielded the discovery of new sites. A very useful technique was searching the Biological Conservation Database for the locations of rare species that characteristically inhabit these wetlands. These species included: *Carex hystericina* (Porcupine Sedge), *Carex lanuginosa* (Woolly Sedge), *Clemmys muhlenbergii* (Bog Turtle), *Coeloglossum viride* (Long-bracted Orchid), *Deschampsia cespitosa* (Tufted Hairgrass), *Dirca palustris* (Leatherwood), *Gentiana andrewsii* (Fringed-tip Closed Gentian), *Gentianopsis crinita* (Fringed Gentian), *Juncus brevicaudatus* (Narrow-panicked Rush), *Juncus torreyi* (Torrey's Rush), *Platanthera ciliaris* (Yellow-fringed Orchid), *Platanthera flava* (Pale Green Orchid), *Platanthera peramoena* (Purple-fringless Orchid), *Platanthera psycodes* (Purple-fringed Orchid), *Pycnanthemum verticillatum* (Whorled Mountain-mint), *Sanguisorba canadensis* (Canada Burnet), and *Sphenopholis pensylvanica* (Swamp Oats). Attempts to utilize aerial photography and National Wetland Inventory maps were unsuccessful primarily because many of the previously unknown occurrences of these wetlands are too small to be easily detected with the photos and smaller than the minimum mapping unit of NWI maps. At the completion of the Landscape Analysis phase of the project, 212 potential sites were identified. Owners of private land and managers of public land were contacted and site visits were approved. Proper plant collection permits for public and private land were obtained.

Landscape analysis for this project occurred during the period from February 1997 to May 1997.

Spatial Distribution of Vegetation: Implications for Sampling Design

An effective and accurate vegetation classification requires sampling the full range of compositional heterogeneity, but the complex spatial nature of vegetation presents a number of problems when designing an optimal sampling scheme at the landscape scale (Grossman et al., 1994). Some characteristics of a good sampling approach are flexibility, replicability, and cost effectiveness; it attempts to characterize as many vegetation patterns possible with efficiency in mind (Grossman et al., 1994). Due to time, budgetary constraints, and large geographic area of Maryland's Blue Ridge and Northern Piedmont physiographic provinces, it was implausible to use the methods of multiple random plot samples of a single vegetation type at one site or repeated sampling of single plots over time to capture the overall composition. Also, randomization procedures may actually be counterproductive to the intent of ecological surveys, especially where the occurrence of natural patterns are known to be non-random (Gillison and Brewer, 1985). In general, plant communities do not occur randomly on the landscape, they occur where the abiotic factors constrain the individual species that constitute the community. Although sampling theory emphasizes randomization in order to provide a probability structure for statistical analysis or to give credibility to statistical models, the recovery of vegetation patterns are not necessarily accomplished by standard statistical sampling procedures (Gillison and Brewer, 1985).

To compensate for these restrictions, an inherently subjective method of selecting sample locations was employed to capture the full floristic range, both among and within vegetation types. While the number of samples within each vegetation type was proportional to its abundance across the entire landscape, types with greater within-type heterogeneity required more intensive sampling.

Field Surveys

Sampling was stratified such that vegetation types were sampled in approximate proportion to their representation on the landscape, and sampling occurred across the entire region of circumneutral seepage wetlands in central Maryland. Attempts were made to capture the full range of variation in local conditions, including hydrology, soil chemistry and texture, elevation, aspect, and geologic substrate. A random approach was used to the extent possible to aid in the selection of sites from the set of potential sites, but several factors contributed to the need for a primarily subjective and non-random approach to the actual location and configuration of sample plots. These include the need to place plots in homogeneous vegetation, the necessity to capture as much of the floral heterogeneity of a site as possible,

the desire to ease future relocation, and the existence of restrictions on site access. Although the identification of populations of rare species was a secondary goal of this study, plot placement often was guided by the occurrence of rare taxa because they can be indicative of high quality examples of certain community types.

The field work for this project followed standard methodologies utilized by The Nature Conservancy and the network of state Natural Heritage Programs (Sneddon, 1993) and occurred during the 1997 and 1998 field seasons. The sites identified in landscape analysis were visited and given an initial qualitative rank, which is a relative scale where "A" is excellent, "B" is good, "C" is marginal or fair, and "D" is poor. The ranking was based on four factors: Quality, Condition, Viability, and Defensibility. Only those sites receiving ranks A - C qualified for quantitative survey. Knowledge of the history of land management was also important for the initial ranking (Grossman et al., 1994). These surveys avoided ecotones and significant unusual disturbance events.

Site selection and plot layout placed plots in fairly homogeneous vegetation and avoided sites recently disturbed by human activities or natural events that may have resulted in atypical composition or structure. Plots were small enough to encompass homogeneous vegetation and uniform local conditions and large enough to capture the full range of within-community variation in species composition and vegetation structure.

Vegetation Sampling

At each survey site, project ecologists became familiar with the vegetation and potential natural communities. Then, one temporary survey plot was established in the most representative location for each potential community type at each site. The Natural Heritage Methodology utilizes 10 m X 10 m (100 m²) for herbaceous vegetation, 15 m X 15 m (225 m²) for shrubland vegetation, and 20 m X 20 m (400 m²) for forest vegetation, as recommended by Mueller-Dombois and Ellenberg (1974). These standard sizes for plots were used unless the community occupied a smaller area, and then the vegetation of the entire occurrence was recorded. Plant taxonomy and nomenclature followed that of Gleason and Cronquist (1991).

Each plot was surveyed for presence of all vascular plant species rooted in the plot and the percent ground cover was recorded for each species. Cover was estimated by a summation of vertical projections of the canopies of each individual of each species and recorded as a percentage, with a maximum value of 100. All species within the plot that had less than one percent cover received the default value of 0.5%. Any species not rooted within the survey plot, but included in the community were recorded and assigned a cover of zero. The total percent cover for each physiognomic strata was estimated and the dominants of each strata were recorded.

Appendix 1 (Form 3, page 2) contains a sample field form for recording vegetation data and Sneddon (1993) contains detailed instructions for filling out these community field forms.

Environmental Parameters

The location of each community plot was measured in the field using *CMT - March II* global positioning system (GPS) units or subsequently determined from topographic maps. Elevation (within 20 feet) and topographic position were determined using USGS 7.5 minute quadrangle maps. Percent slope was measured with a clinometer and aspect was measured to the nearest 5° using a compass. Geologic substrate was determined from field samples or available geologic topographic maps produced by the Maryland Geological Survey. Soil profiles were recorded from samples extracted with a soil auger. Soil moisture regime, soil stoniness, soil drainage, and average soil texture and color were measured from the soil cores. Also, assignment of hydrologic regime and determination of inundation were based on site position relative to water sources, examination of soil surveys and National Wetlands Inventory maps, and on-site assessment. Surface substrate cover was estimated visually; precision varies such that all values sum to 100 %.

Appendix 1 (Form 3, page 1) contains a sample field form for recording Environmental Parameters and Sneddon (1993) contains detailed instructions for filling out these community field forms.

Site Descriptors

Brief descriptions of each community including characteristic species and community processes, as well as its landscape context were recorded. An elevation range and community size were determined from USGS 7.5 minute quadrangle maps. Comments on management needs, protection, and ownership were recorded. The landform, geology, soil, hydrology, system, and physiognomic characteristics were described. The vegetation structure was summarized by recording the dominant vascular plant species, height, and estimate of the total percent cover for each physiognomic strata. Then each community occurrence surveyed was ranked again, in comparison to other examples that were surveyed for quantitative data within the scope of the project.

Appendix 1 (Form 2) contains a sample field form for recording Site Descriptors and Sneddon (1993) contains detailed instructions for filling out these community field forms.

Metadata

Each sample plot was assigned a unique numeric or alphanumeric identifier. Dates of sampling, participants, county, physiographic region, and USGS 1:24,000 topographic map quadrangle were recorded. The size and configuration of each plot were noted and photo documentation typically consisted of at least one wide angle photograph of the entire plot. A

sketch map accompanied each plot cover sheet, indicating orientation of the plot, locations of soil samples and soil depth measurements, location of photo point(s), and distances and directions to any landmarks.

Field surveys occurred in the time period from June 1997 to September 1997 and from May 1998 to August 1998.

Data Compilation and Analysis

After the completion of field surveys, a complete species list for the project was determined and transcribed to a QuatroPro spreadsheet. Then, the percent cover for each species was entered for each community plot. Error checking procedures included manual inspection for transcription errors, invalid formats, values, and species codes. After error checking was completed, archival data files and data forms were prepared. As necessary, environmental variables and site descriptors were calculated or derived (e.g. determining elevation from topographic maps) and numerical indices derived from descriptive scalars (e.g. site moisture regime). The QuatroPro spreadsheet files were then converted to PC-ORD format (McCune and Mefford, 1995).

Data analysis involved both classification and ordination techniques on the full data set and a series of reduced data sets. The various reduced data sets contained information from both physiographic provinces or each province separately. The provinces were separated because an actual combination of natural landscape features can occur in two different regions but a change in the overall climate may change the suitability of the habitat for particular species (Grossman et al., 1994). Then various further reductions were derived by separately removing weedy species, poor quality sites, and trees. These reductions resulted in nine versions of the vegetation information and analyses were performed on all versions. TWINSpan (Hill, 1979b) and Cluster Analysis within PC-ORD (McCune and Mefford, 1995) were used as tools for developing a classification of vegetation types. Both of these analyses were used because Two Way Indicator Species Analysis is a polythetic divisive classification model while Cluster Analysis is a polythetic agglomerative classification model. They determine classifications using different assumptions and mathematical algorithms (Gauch, 1982; Jongman et al., 1995). Vegetation types were recognized using these classification statistics and refined through subsequent interpretation and comparison with other data. Then, summary statistics for each type (including mean cover, relative cover, constancy, fidelity, and indicator value for each species) were calculated using Indication Species Analysis. These statistics were used to guide the selection of nominal species for each type, with reference, where possible, to existing natural community types. This resulted in a meaningful classification of associations, which was cross-walked with existing natural community types using the Maryland Vegetation Classification (Berdine, 1998), the Community Alliances and Elements of the Eastern Region - 2nd Draft (Sneddon et

al., 1996), and The National Classification System (Grossman et al., 1998). Ordination techniques were used to identify the relationships of recognized vegetation types to one another and the environmental gradients along which they are distributed (Gauch, 1982; Jongman et al., 1995). These techniques were also used to validate the vegetation types determined with the classification models. Ordination was performed using Detrended Correspondence Analysis (Hill, 1989a), as implemented in PC-ORD (McCune and Mefford, 1995).

The objective algorithms of the analysis techniques within PC-ORD were the primary tool used to determine the vegetation classification (McCune and Mefford, 1995). But, these analysis techniques often do not recognize compositional subtleties of similar communities. They often focus on presence or absence of certain species, which can be due to seasonal and conditional biases rather than true community shift. Also, common non-native species tend to combine community types. Therefore, a certain degree of subjective determination by highly trained project ecologists, with the consultation of regional ecologists, was utilized to fine-tune the classification. This classification was field check during the 1998 field season.

Detailed descriptions of each natural community type were prepared. They contain descriptions of physiognomy and composition, the range of habitat conditions across which a type occurs, and spatial distribution. They also include the features that distinguish a type from similar types, nomenclatural synonymy, global and state conservation rank, lists of rare species, a discussion of characteristic species, disturbance history, successional status, and conservation and management concerns. A dichotomous key to circumneutral seepage wetlands was developed for the community classification. Also, a list of high quality reference sites was created. These include detailed site descriptions and accurate digital maps created with ArcView using field collected GPS plot data and *SureRaster* digital topographic maps.

Data compilation and analysis occurred during the time period from October 1997 to July 1998.

RESULTS

Of the 212 sites initially identified as potential circumneutral seepage wetlands, 148 were visited and quantitative data was collected from 79 plots.

Through discretion of project ecologists, consultation with regional ecologists, and comparison with the classifications of neighboring states with similar natural community types, the final interpretation was based on the analyses of the data split by physiographic province, with the removal of the most common non-native species. The regional species that are characteristic of the two provinces were not distinct enough for a community split in TWINSPAN (Hill, 1989b) and the presence of common non-native species caused agglomerations based on these species rather than on community composition.

Community Descriptions

The interpretation of ecological statistics was used as a tool to clarify relationships of field observations. All things considered, the classification of circumneutral seepage wetland vegetation ascertained seven community types in central Maryland's Blue Ridge and Northern Piedmont physiographic provinces. These types are:

The *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest, found in the Blue Ridge province.

The *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest, found in the Northern Piedmont province.

The *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland, found in the Northern Piedmont province.

The *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation, found in the Northern Piedmont province.

The *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation, found in the Northern Piedmont province.

The *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation found in the Northern Piedmont province.

The *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation, found in the Blue Ridge province.

The complete descriptions of these natural communities, as well as a key for their identification, can be found in the Community Description section of this report.

Reference Sites

One site containing an exemplary example of each of the seven circumneutral seepage wetland community types was identified, mapped, and described. The order of these sites in this report correspond to the order in which its natural community is described. These sites are: Hunting Creek Hollow, Gunpowder Falls - Hereford, Wildcat Branch, Rockdale Meadows, Alesia Swamp, Soldier's Delight, and Owen's Creek Headwaters. The full descriptions of these sites can be found in the Reference Site Description section of this report.

DISCUSSION

Site Visits

During the landscape analysis for this project, 212 sites that were potential habitat for circumneutral seepage wetland communities were identified. The most productive method used to determine these sites was interviews with knowledgeable individuals. Discussions with both amateur and professional ecologists led to the discovery of over 50% of the potential sites. The second most productive method for site identification was searching the Natural Heritage's Biological Conservation Database (BCD) for the locations of rare species that characteristically occurred in these wetland types. De novo searches led to a small additional group of sites. These searches were primarily based upon hydrologic interpretation of topographic maps with some additional information gleaned from geology and soils map. These data sources were generally used only for the identification of potential sites with specialized geologic characteristic, such as the serpentine influenced wetland type. Aerial photos and NWI maps were used sparingly; generally only as a tertiary source of information once perspective sites were identified.

During the field surveys for this project, 148 of the 212 potential sites were visited for preliminary assessment. The remaining 64 sites were not visited due to several factors. Denial of site visit by landowners was the cause of most of the unvisited sites. The second leading cause of unvisited sites was the acquisition of new site information after the completion of landscape analysis. Many sites were lost to development in Baltimore and Carroll Counties, but were not recorded as such. Also, after a preliminary understanding of these community types was established, the need to collect additional data tapered and sites were not visited.

Of the 148 sites that were visited, 79 community plots were surveyed. The diversity of natural community types within the circumneutral seepage wetlands was lower than expected. After the preliminary classification was developed, sites were visited to check this classification and data was collected only in suspected new community types. As a rule of thumb, between 5 and 10 plots for each community type are best for an accurate classification. Since this classification has 7 community types, the 79 plots are ample for their description. Other reasons that visited sites were not surveyed are that there were no circumneutral seepage wetlands present or that the wetlands contained D quality community occurrences.

Classification

This project yielded seven natural community types found within the circumneutral seepage wetlands of central Maryland's Blue Ridge and Northern Piedmont physiographic provinces.

This classification is a product of untangling statistical analyses and interpreting the landscape. These community types were determined by balancing the results of various classification and ordination techniques on several versions of collected data with the opinions of project ecologists, regional ecologists, and previous classifications of these community types. One cannot solely utilize multivariate statistical methods and expect to determine an ecologically meaningful classification. These statistics are merely a tool, albeit an extremely powerful one, to assist in the understanding of ecological information. Often times, these tools cannot accurately examine subtle relationships between generally similar vegetation types and create groups based on the presence or absence of less ecologically meaningful species.

Some of the natural community types determined in the analysis seem to be linked to abiotic factors. The dominant factor that determined the classification of these vegetation types is geographic position. The vegetation types split by physiographic province due to distribution of montane and lowland species. Another abiotic factor that drives the relationship of vegetation types is disturbance. The level of disturbance and time since disturbance events seems to control the relationships between three community types in the Northern Piedmont and two types in the Blue Ridge. Ordination techniques have led to the belief that these community types are successional related. Geology correlated with the classification for only one type in the Northern Piedmont, which is dependent on serpentine bedrock. Surprisingly, pH was not a controlling factor in determining the classification. Although all of the samples were collected in areas with pH in the 5.5-7.5 range, each vegetation type had examples throughout this range. This was also true for these natural community types in Pennsylvania (WPC, 1998).

Wetland Conditions

Although high quality examples of each of these seven community types exist within Maryland's Blue Ridge and Northern Piedmont physiographic provinces, most of these wetlands suffer from significant abiotic and biotic threats. There are heavy impacts on these wetlands from traditional land use practices. Many examples of the forested wetland types have been logged, either historically or within the last 80 years and herbaceous wetlands have been altered creating farm ponds or upland agriculture. It has been estimated that 10,000 acres of palustrine wetlands were lost to agricultural practices between 1955 and 1978 and 2062 acres were lost due to agricultural practices between 1982 and 1989 (Tiner, 1995). Where wetlands have not been completely destroyed, soil compaction and decimation of native plants have resulted from intensive livestock grazing. Feeding, trampling, and seed dispersal by animals at a high density can destroy the pristine areas as thoroughly as can a chainsaw (Janzen, 1986). Also, nutrient and soil run off have led to sedimentation and other alterations of these wetlands. The impacts of traditional land use are accompanied by the pressures from land development. The conversion of land from natural and agricultural to

commercial and residential poses one of the single largest threats to small palustrine wetlands in Maryland. This alteration of the landscape often leads to filling, lowering watertables from well drilling, trenching in attempts to drain, removing forest buffers, polluting with chemical lawn fertilizers and pesticides and road runoff, polluting with excessive noise (especially for birds), and reducing habitat for pollinators and seed dispersal vectors.

The landscape of central Maryland is highly fragmented. Now, natural communities generally exist as isolated patches often within a matrix of agricultural land, urban development, pastures, and clearcuts (Burgess, 1988). This is especially true of the circumneutral seepage wetlands of central Maryland. These wetlands are small biologically rich islands surrounded by relatively depauperate upland forest or sterile cultural habitats. They may be linked genetically via gene flow by pollen and seed dispersal vectors. But, the habitat between fragments can be a formidable barrier to colonization (Wilcove et al., 1986), pollination (Aizen and Feinsinger, 1994), and dispersal (Matlack, 1994). Much of the surrounding upland forest has been removed, cutting off natural corridors. This forest fragmentation can cause changes in the remnant patch's internal community structure, composition, biomass, and microclimate (Laurance et al., 1998). The fragmentation also causes a loss of habitat heterogeneity, which leads to local extinctions (Wilcove et al., 1986).

Diversity within a community is a balance of regional speciation and dispersal with predation, competitive exclusion, adaptation, and stochastic variation. Local diversity is dependent on regional diversity and regional and historical processes profoundly influence local community structure (Ricklefs, 1987). We must consider the matrix of processes on large spatial and temporal scales effecting natural communities. Protecting the land that contains the wetland natural communities alone may not be enough to protect the communities themselves.

Habitat fragmentation has led to the development of habitats for ruderal and non-native species which then can directly threaten native interior species (Wilcove et al., 1986). Other alterations to wetland habitats have also resulted in the introduction of non-native species into these communities. The largest nuisance species in these wetlands is *Microstegium vimineum*. There are very few examples of these wetlands in which this species is absent. If the pattern of this species is similar in these palustrine wetlands as it is in the floodplains and uplands of Maryland, then this species could soon become the dominant in most occurrences.

Other non-native species that are problems in these wetlands are: *Rosa multiflora*, *Lonicera japonica*, *Polygonum perfoliatum*, and *Lysamachia nummularia*. Efforts should be made to reduce these species through manual removal.

Conservation Implications

Current conservation norms determine protection priorities based on species level information. Although the conservation of rare, threatened, and endangered species is a

reasonable endpoint, often these species occur in highly fragmented and human dominated landscapes. These habitat conditions may not allow the persistence of these species. This type of conservation is substantively attempting to maintain biodiversity through protecting these occurrences as umbrella endpoints. However, the conservation of biodiversity may be better served through the protection of rare and / or exemplary common examples of natural communities. Natural communities can play a much broader role by linking habitat and process information to specific species requirements (WPC, 1998). Potentially, the protection of natural communities will protect the full range of heterogeneity on the landscape, and thus biodiversity. Communities can have longer term viability than rare, threatened, and endangered species. Generally, a large scale stochastic event must occur to alter the structure and composition of natural communities at a site, while smaller scale events could eliminate a species from that same site.

Proper documentation and understanding of the biotic and abiotic factors that contribute to natural communities can lead to predictive ability of where these communities occur on the landscape, what species can be found within them, and what rarity and condition qualities exist. By creating a classification of circumneutral seepage wetlands of central Maryland's Blue Ridge and Northern Piedmont physiographic provinces, this project has assisted in these factors.

The information obtained from this project will be used in planning and regulation by state agencies, federal agencies, municipalities, land trusts, and conservation groups concerned with protection of ecological values in the following ways:

- 1) Inventory information is used directly within the state's regulatory framework. The Wildlife and Heritage Division, Maryland Department of Natural Resources, serves as a clearing house of information on the status, location, and distribution of rare plant and animal species and exemplary natural communities in the state. The Wildlife and Heritage Division administers the state's Threatened and Endangered Species Act, which requires the compliance of state agencies and private land developers in the protection of threatened and endangered species with the state via permitting for proposed activities affecting said species.

The Wildlife and Heritage Division has long reviewed proposed activities of many state agencies, and is collaborating with the state's Water Resources Administration to review wetlands permit applications. Water Resources' Water and Wetlands Program has adopted rules which require that impacts on state-listed plant and animal species and exemplary natural communities tracked in the Biological Conservation Database (BCD) must be considered for all major and minor projects.

- 2) Protection results through the dissemination of Natural Heritage information to

traditional users of this data, including federal agencies, developers, consultants, private landowners, municipalities, and conservation groups. These groups request natural resource information in the early planning stages of local projects, and for longer term municipal zoning, development planning, and conservation priority setting. In addition to these traditional uses exists the following results:

a) Maps of high protection priorities and biologically important examples of natural communities discovered will soon be available in a digital form through the Wildlife and Heritage Division's Information Technology GIS system (although not within the scope of this project). This will provide the Maryland Department of Natural Resources with a consistent and compatible data layer for its use in review and the planning process. Updated and specific information resulted from this project is an important aspect for Natural Heritage data use by others, since much of our historic natural community data is vaguely located and causes misinterpretation by users not familiar with the specific site of species.

b) The data is made available to local and international land trusts and conservation organizations. Because of the potential rarity of these natural communities, the protection of exemplary occurrences automatically becomes a priority for The Nature Conservancy field offices.

3) This inventory also complements Section 104 (b) (3) projects undertaken by the Nontidal Wetlands and Wetlands and Waterways Division in several ways. The Water Resources Division is currently developing a computerized database for accessing permitting information more efficiently. Natural Heritage information on unique wetland resources could be represented as a GIS data layer in this database. This would help create a better permit review context for applications received by the Division. Although this option is available, Wildlife and Heritage Division staff currently review wetlands permits and other applications and provide comments on the potential project impacts directly to the Nontidal Wetlands and Waterways Division. This data will also aid in the development of watershed management plans. Inventory must be completed as one of the first steps in plan development.

4) The results from this project will be shared with the governments and conservation organizations of neighboring states with similar community types. This data will also be shared with the Eastern Regional Office of The Nature Conservancy. The data will be compiled with the data from other states (eleven states within the Eastern Region) and analyzed with a regional perspective. This will increase the ability to recognize meaningful patterns and make classification decisions, which will in turn result in an improved context for making conservation and management decisions over a large

and comprehensive landscape on the scale of natural community and species ranges (WPC, 1998).

5) The results of this project provide the necessary baseline data for long term monitoring for assessing the function of similar wetlands by the United States Environmental Protection Agency. Reference wetlands are recommended as the best examples of each community type defined for continued research by EPA cooperators. This information will also be used to provide a critical reference by which to measure the success of mitigation efforts.

Additional Research Needs

This survey of the natural communities of the circumneutral seepage wetlands of Maryland's Blue Ridge and Northern Piedmont physiographic provinces should not stand alone. A better understanding of these dynamic and diverse systems would be acquired with additional research. There appears to be a multitude of amphibians, birds, reptiles, odinates, lepidoptera, and other insects that utilize these wetlands as habitat and may play a vital role in their function. Intensive study of these taxa should be conducted, but with sensitivity to wetland impacts due to site visitation. Also, research on the soil chemistry, hydrogeomorphology, and nutrient cycles in these wetlands would aid in the understanding of the functions of these wetlands.

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APPENDIX 1

The following pages are sample field forms used by The Nature Conservancy and the network of Natural Heritage Programs for collecting quantitative data on the survey of natural communities.

APPENDIX 2

The following are definitions of the state and global rankings of rare species utilized in this report. Originally developed and instituted by The Nature Conservancy, an international conservation organization, the global and state ranking system is used by all 50 state Natural Heritage Programs and numerous Conservation Data Centers in other countries in this hemisphere. Because they are assigned based upon standard criteria, the ranks can be used to assess the range-wide status of a species as well as the status within portions of the species' range. The primary criterion used to define these ranks are the number of known distinct occurrences with consideration given to the total number of individuals at each locality. Additional factors considered include the current level of protection, the types and degree of threats, ecological vulnerability, and population trends. Global and state ranks are used in combination to set inventory, protection, and management priorities for species both at the state as well as regional level.

GLOBAL RANK

- G1 Highly globally rare. Critically imperiled globally because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 Globally rare. Imperiled globally because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 Either very rare and local throughout its range or distributed locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; typically with 21 to 100 estimated occurrences.
- G4 Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G5 Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- GH No known extant occurrences (i.e., formerly part of the established biota, with the expectation that it may be rediscovered).
- GU Possibly in peril range-wide, but its status is uncertain; more information is needed.

- GX Believed to be extinct throughout its range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G? The species has not yet been ranked.
- _Q Species containing a "Q" in the rank indicates that the taxon is of questionable or uncertain taxonomic standing (i.e., some taxonomists regard it as a full species, while others treat it at an infraspecific level).
- _T Ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

STATE RANK

- S1 Highly State rare. Critically imperiled in Maryland because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres in the State) or because of some factor(s) making it especially vulnerable to extirpation. Species with this rank are actively tracked by the Natural Heritage Program.
- S2 State rare. Imperiled in Maryland because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the Natural Heritage Program.
- S3 Watch List. Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Species with this rank are not actively tracked by the Natural Heritage Program.
- S3.1 A "Watch List" species that is actively tracked by the Natural Heritage Program because of the global significance of Maryland occurrences. For instance, a G3 S3 species is globally rare to uncommon, and although it may not be currently threatened with extirpation in Maryland, its occurrences in Maryland may be critical to the long term security of the species. Therefore, its status in the State is being monitored.
- S4 Apparently secure in Maryland with typically more than 100 occurrences in the State or may have fewer occurrences if they contain large numbers of individuals. It is apparently secure under present conditions, although it may be restricted to only a

portion of the State.

- S5 Demonstrably secure in Maryland under present conditions.
- SA Accidental or a vagrant in Maryland.
- SE Established, but not native to Maryland; it may be native elsewhere in North America.
- SH Historically known from Maryland, but not verified for an extended period (usually 20 or more years), with the expectation that it may be rediscovered.
- SP Potentially occurring in Maryland or likely to have occurred in Maryland (but without persuasive documentation).
- SR Reported from Maryland, but without persuasive documentation that would provide a basis for either accepting or rejecting the report (e.g., no voucher specimen exists).
- SRF Reported falsely (in error) from Maryland, and the error may persist in the literature.
- SU Possibly rare in Maryland, but of uncertain status for reasons including lack of historical records, low search effort, cryptic nature of the species, or concerns that the species may not be native to the State. Uncertainty spans a range of 4 or 5 ranks as defined above.
- SX Believed to be extirpated in Maryland with virtually no chance of rediscovery.
- S? The species has not yet been ranked.
- _B This species is a migrant and the rank refers only to the breeding status of the species. Such a migrant may have a different rarity rank for non-breeding populations.

FEDERAL STATUS

This is the status of a species as determined by the U.S. Fish and Wildlife Service's Office of Endangered Species, in accordance with the Endangered Species Act. Definitions for the following categories have been modified from 50 CRF 17.

- LE Taxa listed as endangered; in danger of extinction throughout all or a significant portion of their range.

- LT Taxa listed as threatened; likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
- PE Taxa proposed to be listed as endangered.
- PT Taxa proposed to be listed as threatened.

- C Candidate taxa for listing for which the Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.

STATE STATUS

This is the status of a species as determined by the Maryland Department of Natural Resources, in accordance with the Nongame and Endangered Species Conservation Act. Definitions for the following categories have been taken from Code of Maryland Regulations (COMAR) 08.03.08.

- E Endangered; a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.
- I In Need of Conservation; an animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.
- T Threatened; a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.
- X Endangered Extirpated; a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.

- * A qualifier denoting the species is listed in a limited geographic area only.

APPENDIX 3

The following are definitions of official wetland designations used in this report.

Non-tidal Wetlands of Special State Concern

Nontidal wetlands of special state concern (NTWSSC) are defined in the Code of Maryland Regulations (26.23.06) as wetlands that meet the following criteria:

- a) Provide habitat of ecologically important buffers for the habitat of plant or animal species that are:
 - i) Listed as endangered or threatened by the U. S. Fish and Wildlife Service,
 - ii) Listed as endangered or threatened, or species listed as in need of conservation by the Maryland Department of Natural Resources or,
 - iii) Considered to be a candidate for listing by the U. S. Fish and Wildlife Service, or considered to be locally unusual or rare by the Maryland Department of Natural Resources or,
- b) Are unique natural areas or contain ecologically unusual natural communities.

Wetlands that are defined as nontidal wetlands of special state concern have restrictions placed on the wetlands and an expanded 100 foot buffer for the following activities: excavating, dredging, changing drainage patterns, disturbing water level or water table, filling, grading, and removing vegetation. This regulation exempts agriculture and forestry but requires the use of “best management practices”.

Geographic Areas of Particular Concern

The Federal Coastal Zone Management Act requires the designation of Geographic Areas of Particular Concern. Coastal states are required to inventory and develop management measures to protect the integrity of “areas of unique, scarce, fragile, or vulnerable natural habitats” and “areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and endangered species, and the various trophic levels in the food web critical to their well being”. Although this does not provide any regulatory protection mechanisms, it is a directive to the state to protect these areas under existing regulations.

**Dichotomous Key to
Circumneutral Seepage Wetland
Community Types**

and

Community Descriptions

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

Dichotomous key to Circumneutral Seepage Wetland Community Types within the Blue Ridge and Northern Piedmont Physiographic Provinces of Central Maryland.

These community types can be found in locations that have abiotic factors that match those used in this report's definition of circumneutral seepage wetlands.

- 1a. Vegetation Predominantly Herbaceous (Woody Vegetation Cover < 25%) 2
 - 2a. Vegetation dominated by tussock sedges such as *Carex stricta* (> 25%) and ferns such as *Onoclea sensibilis* and *Thelypteris palustris* (> 15%). High diversity of forbs.....***Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation (S2)**
 - 2b. Vegetation not dominated by tussock sedges and ferns. Low diversity of forbs 3
 - 3a. Vegetation dominated by grasses such as *Agrostis* spp., *Cinna arundinacea*, and *Glyceria melicaria*. Found in the Blue Ridge province associated with disturbance ***Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation (S5)**
 - 3b. Vegetation not dominated by species listed above. Grasses such as *Andropogon gerardii*, *Schizachyrium scoparium*, and *Sorghastrum nutans* present. Found in the Piedmont 4
 - 4a. Vegetation dominated by *Deschampsia cespitosa* with low forb diversity. Found in association with serpentine bedrock ***Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation (S1)**
 - 4b. Vegetation dominated by *Panicum dichotomum* with high forb diversity. Not found in association with serpentine bedrock ***Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation (S1)**
- 1b. Vegetation Not Predominantly Herbaceous (Woody Vegetation Cover > 25%) 5
 - 5a. Vegetation predominantly a Shrubland (Tree Cover < 25%). Presence of shrub species such as *Alnus serrulata*, *Cephalanthus occidentalis*, and *Viburnum dentatum* and herb species such as *Carex stricta*, *Thelypteris palustris*, and *Onoclea sensibilis* ***Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland (S3)**
 - 5b. Vegetation predominantly a Forest (tree cover > 60%) and lacking species mentioned above..... 6
 - 6a. Tree canopy dominated by *Acer rubrum*, *Fraxinus pennsylvanica*, and *Betula lenta*, but also contains montane components such as *Betula alleghaniensis*, *Fraxinus nigra*, and *Tsuga canadensis*. Found in the mountains of the Blue Ridge province ***Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest (S2S3)**
 - 6b. Tree canopy dominated by *Acer rubrum*, *Fraxinus pennsylvanica*, and *Betula lenta*, but does not contain *Betula alleghaniensis* and *Fraxinus nigra* and rarely contains *Tsuga canadensis*. Found in the lowlands of the Northern Piedmont province ***Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (S3)**

***Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest**

COMMON NAME	Red maple - Green ash - Birch (Yellow, Black) / Winterberry / Skunk cabbage Forest
ELEMENT CODE	MD6800
NATURAL COMMUNITY	Blue Ridge Seepage Forest
NATIONAL SYNONYM	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> High Allegheny Plateau, Central Appalachian Forest [6132 in part] <i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Seasonally Flooded Forest [7380 in part]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Saturated Cold-deciduous Forest
ALLIANCE	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> Saturated Forest Alliance

ENVIRONMENTAL DESCRIPTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest is a component of the diverse group of central Maryland circumneutral (ph 5.5 - 7.5) seepage wetlands. This wetland type was once found throughout Maryland's Blue Ridge physiographic province, but now is less prevalent due to anthropogenic impacts. This wetland type is directly threatened by logging, draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff. These wetlands are often small, ranging in size from one-tenth to ten hectares. Generally, these wetlands are found at stream headwaters, on hillside seepage slopes and on shallow toeslopes where groundwater percolation occurs throughout the year. The water table is usually at or near the soil surface (within 30 cm) throughout the growing season. These wetlands typically have organic soils in the first 5 - 20 cm of the profile and sandy loam or sandy clay to 60 cm. The soils of these wetlands are often interspersed with greenstone cobble or fine gravel. Greenstone refers to a type of granitic gneiss metabasalt that is part of the Catoctin metavolcanic series. It is a dense hard green rock in which most of the original minerals have been altered and often generates circumneutral conditions.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tree Canopy	<i>Acer rubrum</i> , <i>Betula alleghaniensis</i> , <i>Betula lenta</i> , <i>Fraxinus nigra</i> , <i>Fraxinus pennsylvanica</i> , <i>Liriodendron tulipifera</i> , <i>Nyssa sylvatica</i> , <i>Quercus prinus</i> , <i>Tsuga canadensis</i>
Tall Shrub	<i>Ilex verticillata</i> , <i>Lindera benzoin</i> , <i>Rhododendron periclymenoides</i> , <i>Vaccinium corymbosum</i> , <i>Viburnum dentatum</i>
Herbaceous	<i>Athyrium filix-femina</i> , <i>Impatiens capensis</i> , <i>Symplocarpus foetidus</i> , <i>Osmunda cinnamomea</i> , <i>Osmunda regalis</i> , <i>Polygonum cespitosum</i> , <i>Veratrum viride</i>
Non-vascular	<i>Sphagnum</i> spp., <i>Mnium punctatum</i> var. <i>appalachianum</i>

ADDITIONAL CHARACTERISTIC SPECIES

Arisaema triphyllum, *Aster divaricatus*, *Brachyelytrum erectum*, *Caltha palustris*, *Cardamine pensylvanica*, *Carex debilis*, *Carex intumescens*, *Carex leptalea*, *Chionanthus virginicus*, *Chrysosplenium americanum*, *Circaea lutetina*, *Dryopteris intermedia*, *Eupatorium purpureum*, *Galium* spp., *Glyceria melicaria*, *Glyceria striata*, *Hamamelis virginiana*, *Lycopus americanus*, *Lycopus uniflorus*, *Maianthemum canadense*, *Onoclea sensibilis*, *Parthenocissus quinquefolia*, *Rudbeckia laciniata*, *Rubus hispidus*, *Thalictrum pubescens*, *Viola* spp.

VEGETATION DESCRIPTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest is typical of many Maryland's Blue Ridge seepage wetlands. The tree canopy is often dominated by a diverse combination of *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Fraxinus nigra*, *Fraxinus pennsylvanica*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Quercus prinus*, and *Tsuga canadensis*. Since this community can be as small as one-tenth of a hectare in size, the tree canopy is occasionally composed of facultative or upland species that are not rooted within the wetland but have branches that hang over it. These species can include *Carya ovata*, *Fagus grandifolia*, *Prunus serotina*, *Quercus alba*, *Quercus coccinea*, and *Quercus rubra*. This community can also have a tree subcanopy (5 - 15 m) composed of *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Carpinus caroliniana*, *Chionanthus virginicus*, *Fraxinus pennsylvanica*, *Hamamelis virginiana*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Tsuga canadensis*, and *Ulmus rubra*. These trees may be sparsely scattered throughout and rarely comprise over 30 percent cover. The shrub layer of this forested community is quite variable, both in total cover and species composition. This layer can vary from five percent to 75 percent cover, and appears to be greatly affected by deer browse. The dominants of the shrub layer can include *Ilex verticillata*, *Lindera benzoin*, *Rhododendron periclymenoides*, *Vaccinium corymbosum*, and *Viburnum dentatum*. Other species that may inhabit this community, but contribute less to the total shrub cover, are *Alnus incana*, *Alnus serrulata*, *Castanea pumila*, *Kalmia latifolia*, *Sambucus canadensis*, *Vaccinium angustifolium*, and *Viburnum prunifolium*. The herb layer is characteristically dominated by *Symplocarpus foetidus* and *Osmunda cinnamomea*. These two species are often accompanied by *Athyrium filix-femina*, *Impatiens capensis*, *Osmunda regalis*, *Polygonum cespitosum*, and *Veratrum viride* which can contribute a significant portion to the total herb cover of the community. Also present, but with lower abundance, can be *Amphicarpa brachteata*, *Arisaema triphyllum*, *Aster divaricatus*, *Brachyelytrum erectum*, *Caltha palustris*, *Cardamine pensylvanica*, *Carex debilis*, *Carex intumescens*, *Carex leptalea*, *Chelone glabra*, *Chrysosplenium americanum*, *Cinna arundinacea*, *Circaea lutetina*, *Dryopteris intermedia*, *Eupatorium purpureum*, *Galium* spp., *Glyceria melicaria*, *Glyceria striata*, *Lycopus americanus*, *Lycopus uniflorus*, *Maianthemum canadense*, *Onoclea sensibilis*, *Parthenocissus quinquefolia*, *Rudbeckia laciniata*, *Rubus hispidus*, *Thalictrum pubescens*, and several *Viola* spp.

A variation of this community type occurs in which the tree canopy is dominated by *Tsuga canadensis*, with nearly 100 percent cover. The structure of the other strata remains consistent with this community description. Other variations occur in which the tree canopy is similar to that described here, but either or both of the characteristic herbaceous dominants *Symplocarpus foetidus* and *Osmunda cinnamomea* are absent.

A similar community type, the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (newly proposed), occurs in the Northern Piedmont physiographic province of central Maryland and contains more lowland plant species.

This community type can be a floristically diverse island in the mosaic of upland forests of the Blue Ridge physiographic province. Since it is a small patch community, it is usually found embedded within upland forests with communities that most closely resemble the *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (7221) and the *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (7268).

This wetland forest community suffers significant threats by invasive non-native species such as *Alliaria petiolata*, *Agrostis tenuis*, *Agrostis stolonifera*, *Berberis thunbergii*, *Glechoma hederacea*, *Lysimachia nummularia*, *Microstegium vimineum*, *Polygonum perfoliatum*, *Rosa multiflora* and *Rubus phoenicolasius*.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

OTHER NOTEWORTHY SPECIES

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest is habitat for state highly rare (S1), rare (S2), watch list (S3) and possibly rare (SU) plants that may include *Cirsium muticum* (S3), *Coeloglossum viridis* (S1), *Dirca palustris* (S2), *Dryopteris clintoniana* (S3), *Equisetum silvaticum* (S1), *Euphorbia purpurea* (S1/G3), *Fraxinus nigra* (S3), *Gentiana andrewsii* (S2), *Juglans cinerea* (S2S3 / G3), *Isoetes engelmannii* (S3), *Melanthemum virginiana* (S3), *Platanthera flava* (S1), *Platanthera grandifolia* (S2) *Solidago uliginosa* (S3), *Stenanthium gramineum* (S1), *Trillium cernuum* (S3), and *Vernonia gigantea* (SU). This community is also habitat for *Geum rivale* and *Saxifraga pensylvanica*, species being considered for state listing.

More inventory data are needed to assess this community's habitat value, but this *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera, and other insects.

RANGE

Since this is a newly proposed community association, national distribution requires further determination. According to the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996), the *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance occurs in Maine, New Hampshire, Vermont, Connecticut, Massachusetts, New York, Pennsylvania, Delaware and Maryland. The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) states that it occurs in Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia.

MARYLAND DISTRIBUTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest community was once widely distributed throughout the Blue Ridge physiographic province of Maryland's Frederick and Washington Counties. Due to anthropogenic disturbance, the abundance of this community type is reduced within its historical range.

A similar community type, the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (newly proposed), occurs in the Northern Piedmont physiographic province of central Maryland and contains more lowland plant species. A similar community type, the *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (6132) occurs in western Maryland. Other similar community types may occur in the Upper and Lower Coastal Plain physiographic provinces on Maryland's eastern and western shores. More inventory data are needed to determine the relationship between these forest communities and this *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest.

CONSERVATION RANK

S2/S3

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for limited distribution and limited occurrences known in Maryland. Due to the generally small size and suspected dependence on long periods without disturbance, this community type is uncommon in Maryland. It is believed that there are less than 100 occurrences of this community type in the state. Of these occurrences, only some of them are of high quality. This community is habitat to a large number of rare, threatened and endangered plants in Maryland. The scenic quality and proximity to major metropolitan centers make this community type more susceptible to development pressures. Many occurrences of this community type inhabit wetlands that are smaller than the minimum mapping unit of the National Wetland Inventory maps. This community is directly threatened by logging, draining and filling, pond creation through wetland excavation, soil compaction from livestock grazing and invasion by non-native plants. This community may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Hunting Creek Hollow, Frederick County (39° 67' 18.86" N, 77° 27' 51.54" W)

COMMENTS

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest appears to be an end point of the successional trajectory within Blue Ridge seepage wetland habitats. It seems that this community type is dependent on long periods of time without human disturbance, and those that have had fairly recent disturbance show signs of invasion by non-native plants and altered hydrologic function. Those sites that are most recently disturbed are inhabited by the *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation.

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AUTHOR

Andrew M. A. Gould, 1998.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

***Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest**

COMMON NAME	Red maple - Green ash - Blackgum / Spicebush / Skunk cabbage Forest
ELEMENT CODE	6801
NATURAL COMMUNITY	Costal Plain / Northern Piedmont Seepage Forest
NATIONAL SYNONYM	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> High Allegheny Plateau, Central Appalachian Forest [6132 in part] <i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Seasonally Flooded Forest [7380 in part]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Saturated Cold-deciduous Forest
ALLIANCE	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> Saturated Forest Alliance

ENVIRONMENTAL DESCRIPTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest is a component of the diverse group of central Maryland circumneutral (ph 5.5 - 7.5) seepage wetlands. This wetland type was once found throughout Maryland's Northern Piedmont physiographic province, but now is less prevalent due to anthropogenic impacts. This wetland type is directly threatened by logging, draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff. This community type appears to be dependent on long periods without these disturbances. These wetlands are often small, ranging in size from one-tenth to ten hectares. Generally, these wetlands are found at stream headwaters, hillside seepage slopes and on shallow toeslopes of rolling hills where groundwater percolation occurs throughout the year. The water table is usually at or near the soil surface (within 30 cm) throughout the growing season. These wetlands typically have organic soils in the first 5 - 20 cm of the profile and sandy loam or sandy clay to 60 cm.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tree Canopy	<i>Acer rubrum</i> , <i>Betula lenta</i> , <i>Fraxinus pennsylvanica</i> , <i>Liriodendron tulipifera</i> , <i>Nyssa sylvatica</i>
Tall Shrub	<i>Cornus racemosa</i> , <i>Ilex verticillata</i> , <i>Lindera benzoin</i> , <i>Viburnum dentatum</i>
Herbaceous	<i>Arisaema triphyllum</i> , <i>Impatiens capensis</i> , <i>Symplocarpus foetidus</i> , <i>Osmunda cinnamomea</i> , <i>Pilea pumila</i> , <i>Polygonum cespitosum</i> , <i>Veratrum viride</i>
Non-vascular	<i>Sphagnum</i> spp.

ADDITIONAL CHARACTERISTIC SPECIES

Aster divaricatus, *Athyrium felix-femina* var. *asplenoides*, *Bohemeria cylindrica*, *Carex debilis*, *Carex lurida*, *Carpinus caroliniana*, *Chelone glabra*, *Chrysosplenium americanum*, *Cinna arundinacea*, *Circaea lutetina*, *Galium* spp., *Hamamelis virginiana*, *Laportea canadensis*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Tsuga canadensis*, *Toxicodendron radicans*, *Vaccinium corymbosum*, *Viburnum prunifolium*, *Viola* spp.

VEGETATION DESCRIPTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest is typical of many Maryland Northern Piedmont seepage wetlands. The tree canopy is often dominated by *Acer rubrum*, *Betula lenta*, *Fraxinus pennsylvanica*, *Liriodendron tulipifera*, and *Nyssa sylvatica*. Since this community can be as small as one-tenth of a hectare in size, the tree canopy is occasionally composed of facultative or upland species that are not rooted within the wetland but have branches that hang over it. These species can include *Fagus grandifolia*, *Prunus serotina*, *Quercus alba*, *Quercus coccinea*, and *Quercus rubra*. This community can also have a tree subcanopy (5 - 15 m) composed of *Acer rubrum*, *Betula lenta*, *Carpinus caroliniana*, *Fraxinus pennsylvanica*, *Hamamelis virginiana*, *Juglans nigra*, *Liriodendron tulipifera*, *Nyssa sylvatica*, and *Ulmus rubra*. These trees may be sparsely scattered throughout and rarely comprise over 30 percent cover. The shrub layer of this forested community is quite variable, both in total cover and species composition. This layer can vary from 10 percent to 75 percent in cover, and appears to be greatly affected by deer browse. The dominants of the shrub layer can include *Cornus racemosa*, *Ilex verticillata*, *Lindera benzoin*, and *Viburnum dentatum*. Other species such as *Cornus florida*, *Cornus sericea*, *Hamamelis virginiana*, *Kalmia latifolia*, *Rhododendron periclymenoides*, *Vaccinium corymbosum*, *Viburnum acerifolium*, and *Viburnum prunifolium* can occur in this forested community type, but contribute less to the total shrub cover. The herb layer is characteristically dominated by *Arisaema triphyllum*, *Impatiens capensis*, *Symplocarpus foetidus*, *Osmunda cinnamomea*, *Pilea pumila*, *Polygonum cespitosum*, and *Veratrum viride*. *Chrysosplenium americanum*, *Onoclea sensibilis*, and *Athyrium felix-femina* var. *asplenoides* can comprise a significant amount of the herbaceous cover. Some of the species frequently present in this community, but with less cover, are *Aster divaricatus*, *Bohemeria cylindrica*, *Carex debilis*, *Carex lurida*, *Chelone glabra*, *Cinna arundinacea*, *Circaea lutetina*, *Galium* spp., *Laportea canadensis*, *Parthenocissus quinquefolia*, and *Toxicodendron radicans*.

This community type has a rare variant in which the tree canopy is dominated by *Tsuga canadensis*, with nearly one hundred percent cover. The structure of the other strata is consistent with those described above.

A similar forest community type, the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest (newly proposed), occurs in the Blue Ridge physiographic province of western Maryland and includes more montane plant species.

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest appears to be the end point of the Northern Piedmont circumneutral (ph 5.5 - 7.5) seepage wetland successional trajectory, and thus has had the longest period of recovery from disturbance. Often, more recently disturbed wetlands are inhabited by the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation (newly proposed), which can succeed into the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland (newly proposed). Typically, this forest community can occur adjacent to either of the earlier successional community types. All three of these community types can inhabit swales and floodplain toeslopes but, unlike the two earlier successional community types, this forested wetland can also occur at stream headwaters and steep seepage slopes. This forested wetland is often found adjacent to upland forests that most closely resemble the *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (7221), the *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (2067), and the *Quercus alba* - *Quercus rubra* - *Quercus vellutina* / *Cornus florida* - *Viburnum acerifolium* Forest (6336).

This forest community type suffers significant threats from invasive non-native species such as *Microstegium vimineum*, *Polygonum perfoliatum*, *Rosa multiflora*, *Berberis thunbergii*, *Alliaria petiolata*, *Glechoma hederacea*, *Agrostis tenuis*, and *Agrostis stolonifera*.

OTHER NOTEWORTHY SPECIES

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest is habitat for state highly rare (S1), rare (S2), watch list (S3), and possibly rare (SU) plants that may include *Dryopteris celsa* (S3), *Euphorbia purpurea* (S1/G3), *Gentiana andrewsii* (S2), *Juglans cinerea* (S2S3/G3), *Magnolia tripetala* (SU), *Rhododendron arborescens* (S3), *Sagittaria longirostra* (SU), and *Saxifraga micranthidifolia* (S3). This community is also habitat for *Geum rivale*, a species being considered for state listing.

More inventory data are needed to assess this community's habitat value, but this *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera and other insects.

RANGE

Since this is a newly proposed community association, national distribution requires further determination. According to the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996), the *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance occurs in Maine, New Hampshire, Vermont, Connecticut, Massachusetts, New York, Pennsylvania, Delaware, and Maryland. The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) states that it occurs in Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia.

MARYLAND DISTRIBUTION

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest was once widely distributed throughout the Northern Piedmont physiographic province of central Maryland, including Cecil, Harford, Baltimore, Carroll, Frederick, Howard, and Montgomery Counties. Due to anthropogenic disturbance, the abundance of this community type is well reduced within its historical range.

A similar forest community type, the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest (newly proposed), occurs in the Blue Ridge physiographic province of western Maryland and includes more montane plant species. A similar community type, the *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (6132) occurs in western Maryland. Other similar community types may occur in the Upper and Lower Coastal Plain physiographic provinces on Maryland's eastern and western shores. More inventory data are needed to determine the relationship between these forest communities and this *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest.

CONSERVATION RANK

S3

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for limited distribution and limited occurrences known in Maryland. It is believed that there are less than 100 occurrences of this community type in the state. Of these occurrences, few of them are of high quality. Due to the generally small size and suspected dependence on long periods without disturbance, this community type is uncommon in Maryland. Many of the occurrences of this community type inhabit wetlands that are smaller than the minimum mapping unit of the National Wetland Inventory maps. This community type is directly threatened by logging, draining and filling, pond creation through wetland excavation, soil compaction from livestock grazing and invasion by non-native plants. This community type may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Gunpowder Falls -Hereford, Baltimore County (39° 36' 32.85" N, 76° 39' 4.14" W)

COMMENTS

This *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest appears to be an end point of the Northern Piedmont circumneutral (ph 5.5 - 7.5) seepage wetland successional trajectory, and thus has had the longest period of recovery from disturbance. Often, more recently disturbed wetlands are inhabited by the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation, which can succeed into the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland. Unlike the two earlier successional community types, this forested wetland can also occur among the mosaic of upland forest interior and along fairly steep slopes. Often, this forest community occurs adjacent to either of the earlier successional community types.

REFERENCES

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AUTHOR

Andrew M. A. Gould, 1998.

***Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland**

COMMON NAME	Smooth alder - Arrow-wood / Tussock sedge - Skunk cabbage Shrubland
ELEMENT CODE	6802
NATURAL COMMUNITY	Costal Plain / Northern Piedmont Seepage Shrubland
NATIONAL SYNONYM	<i>Alnus incana</i> Swamp Shrubland [Provisional] [2381 in part] <i>Alnus serrulata</i> Eastern Shrubland [5082 in part] <i>Alnus (serrulata, incana) - Osmunda cinnamomea - Sphagnum</i> spp. Shrubland [6164 in part] <i>Alnus serrulata / Sanguisorba canadensis - Calamagrostis canadensis</i> Shrubland [4252 in part] <i>Alnus serrulata</i> Saturated Shrubland [Provisional] [3912 in part]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Deciduous Shrubland
PHYSIOGNOMIC GROUP	Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Saturated Cold-deciduous Shrubland
ALLIANCE	<i>Alnus serrulata</i> Saturated Shrubland Alliance

ENVIRONMENTAL DESCRIPTION

This *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland is a component of the diverse group of central Maryland circumneutral (ph 5.5 - 7.5) seepage wetlands. This wetland type was once found throughout Maryland's Northern Piedmont physiographic province, but now is less prevalent due to anthropogenic impacts. This wetland type is directly threatened by draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff. These wetlands are often small, ranging in size from one-tenth to ten hectares. Generally, these wetlands are found on shallow toeslopes of rolling hills where groundwater percolation occurs throughout the year. The water table is usually at or near the soil surface (within 30 cm) throughout the growing season. These wetlands typically have organic soils in the first 5 - 20 cm of the profile and sandy loam to 60 cm.

Vegetation and community structure in these Northern Piedmont seepage wetlands seems to be related to natural disturbance history. Wetlands that have received relatively recent natural disturbance are characteristically inhabited by the *Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation. Those that have had a longer period of recovery are often inhabited by this *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland. Often, this shrubland community occurs on the dryer edges and hummocks of wetlands in which the herbaceous community dominates the wetter regions.

MOST ABUNDANT SPECIES

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

<u>Strata</u>	<u>Species</u>
Tall Shrub	<i>Acer rubrum</i> , <i>Alnus serrulata</i> , <i>Cephalanthus occidentalis</i> , <i>Ilex verticillata</i> , <i>Lindera benzoin</i> , <i>Vaccinium corymbosum</i> , <i>Viburnum dentatum</i>
Herbaceous	<i>Carex stricta</i> , <i>Chrysosplenium americanum</i> , <i>Impatiens capensis</i> , <i>Onoclea sensibilis</i> , <i>Symplocarpus foetidus</i> , <i>Polygonum sagittatum</i> , <i>Thelypteris palustris</i>

ADDITIONAL CHARACTERISTIC SPECIES

Amphicarpa bracteata, *Boehmeria cylindrica*, *Carex gynandra*, *Carex lurida*, *Cornus racemosa*, *Galium* spp., *Juncus effusus*, *Lyonia ligustrina*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Pilea pumila*, *Polygonum arifolium*, *Rosa palustris*, *Salix nigra*, *Sambucus canadensis*, *Scirpus expansus*, *Scirpus validus*, *Solidago canadensis*, *Solidago patula*, *Spirea alba*, *Stellaria pubera*, *Toxicodendron vernix*

VEGETATION DESCRIPTION

This *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland is typical of many Maryland Northern Piedmont seepage wetlands. The shrub layer is often dominated by *Acer rubrum* saplings, *Alnus serrulata*, and *Viburnum dentatum*. Other woody species can comprise significant cover such as *Cephalanthus occidentalis*, *Ilex verticillata*, *Lindera benzoin*, and *Vaccinium corymbosum*. Also present, but usually with less cover, may be *Cornus racemosa*, *Lyonia ligustrina*, *Rosa palustris*, *Salix nigra*, *Sambucus canadensis*, *Spirea alba*, and *Toxicodendron vernix*. The herb layer is characteristically dominated by *Carex stricta*, *Impatiens capensis*, *Symplocarpus foetidus*, and *Polygonum sagittatum*. *Chrysosplenium americana*, *Onoclea sensibilis*, and *Thelypteris palustris* can comprise a significant amount of the herbaceous cover, as well. Some of the species found frequently in this community, but with less cover, are *Amphicarpa bracteata*, *Boehmeria cylindrica*, *Carex gynandra*, *Carex lurida*, *Galium* spp., *Juncus effusus*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Pilea pumila*, *Polygonum arifolium*, *Scirpus expansus*, *Scirpus validus*, *Solidago canadensis*, *Solidago patula*, and *Stellaria pubera*. Although this community is physiognomically a shrubland, subcanopy trees of *Acer rubrum*, *Fraxinus pennsylvanica*, *Nyssa sylvatica*, and *Liriodendron tulipifera* may be sparsely scattered throughout or in small dense patches on dryer hummocks. This tree subcanopy is rarely over 25 percent cover and seldom dominated by one species.

Variants of this community exist that more closely resemble the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest, but without a tree canopy. These examples are dominated by *Lindera benzoin* in the shrub layer and *Symplocarpus foetidus* in the herb layer. They lack the diversity usually found in this shrubland association.

This *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland often occurs on the dryer edges and on the mosaic of dryer hummocks in wetlands that *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation dominates the wetter regions. This shrubland appears to be the next stage in the successional trajectory that begins with the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation. It appears that this shrubland can succeed into the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest, and is typically found adjacent to this wetland type. This shrubland is also found adjacent to upland forests that resemble the *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (7221), the *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (2067), and the *Quercus alba* - *Quercus rubra* - *Quercus vellutina* / *Cornus florida* - *Viburnum acerifolium* Forest (6336).

This *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland suffers significant invasion by non-native species such as *Microstegium vimineum*, *Polygonum perfoliatum*, *Rosa multiflora*, *Rosa rugosa*, *Berberis thunbergii*, *Alliaria petiolata*, *Glechoma hederacea*, *Agrostis tenuis*, and *A. stolonifera*.

OTHER NOTEWORTHY SPECIES

This *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland is habitat for state rare (S2), watch list (S3), and possibly rare (SU) plants that may include *Circium muticum* (SU), *Sanguisorba canadensis* (S2), and *Solidago patula* (S3). This community is also habitat for *Geum rivale* a species being considered for state listing.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

This community type is also habitat for the state rare (S2/G3) Bog Turtle (*Clemmys muhlenbergii*).

More inventory data are needed to assess this community's habitat value, but this *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera, and other insects.

RANGE

Since this is a newly proposed community association, national distribution requires further determination. According to the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996), the *Alnus incana* Saturated Shrubland Alliance occurs in Maine, New Hampshire, Vermont, Connecticut, Rhode Island, Massachusetts, New York and Pennsylvania. Also, the *Alnus (incana, serrulata)* - *Cornus amomum* Shrubland Alliance occurs in Delaware and Maryland. The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) states that the *Alnus serrulata* Saturated Shrubland Alliance occurs in Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia and West Virginia.

MARYLAND DISTRIBUTION

This community type was once widely distributed throughout the Northern Piedmont physiographic province of central Maryland, including Cecil, Harford, Baltimore, Carroll, Frederick, Howard, and Montgomery Counties. Due to anthropogenic disturbance, this community type is now suspected to be restricted to the more rural sections of Carroll, Baltimore, and Harford Counties.

Similar variations of this community type may occur in the wet riversides of Maryland's eastern shore Lower Coastal Plain physiographic province as well as adjacent to the wet meadows of western Maryland's Allegheny Plateau physiographic province. More inventory data are needed to determine the relationship between the montane shrubland community, the coastal shrubland community, and this *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland.

CONSERVATION RANK

S3

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for limited distribution and limited occurrences known in Maryland. It is believed that there are less than 100 occurrences of this community type in the state. Of these occurrences, few of them are of high quality. Due to the generally small size and suspected dependence on infrequent low levels of natural disturbance, this community type is uncommon in Maryland. Many of the occurrences of this community type inhabit wetlands that are smaller than the minimum mapping unit of the National Wetland Inventory maps. This community is directly threatened by draining and filling, pond creation through wetland excavation, soil compaction from livestock grazing and invasion by non-native plants and indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Wildcat Branch Powerline, Harford County (39° 28' 8.66" N, 76° 23' 56.53" W)

COMMENTS

In the Northern Piedmont physiographic province, this *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland appears to be the next stage in the successional trajectory that begins with the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation.

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AUTHOR

Andrew M. A. Gould, 1998.

***Panicum dichotomum - Andropogon gerardii - Schizachyrium scoparium - Sorghastrum nutans - Polygonum sagittatum* Herbaceous Vegetation**

COMMON NAME	Delicate panic grass - Big blue stem - Little blue stem - Yellow indian grass - Arrow-leaved tearthumb Herbaceous Vegetation
ELEMENT CODE	6803
NATURAL COMMUNITY	Northern Piedmont Wet Prairie
NATIONAL SYNONYM	<i>Andropogon gerardii - Baptisia australis - Chasmanthium latifolium</i> Herbaceous Vegetation [6283 in part]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Temporarily Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Andropogon gerardii - (Sorghastrum nutans)</i> Temporarily Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This *Panicum dichotomum - Andropogon gerardii - Schizachyrium scoparium - Sorghastrum nutans - Polygonum sagittatum* Herbaceous Vegetation is a component of the diverse group of central Maryland's Northern Piedmont circumneutral (pH 5.5 - 7.5) wetlands. Generally, this community type is found in swales and on shallow toeslopes of rolling hills. This community type is typically influenced by overland flow of surface water during storm events and spring thaw. Also, this community is influenced by groundwater percolation early in the growing season. The water table is often well below the surface (below 30 cm) throughout the growing season. This community characteristically has poor development of organic soils (0.5 - 3 cm) and sandy loam mineral soil to 60 cm.

Vegetation and community structure of this Northern Piedmont temporarily flooded prairie seems to be related to disturbance history. This community type has a history of periodic grazing and mowing, maintaining the herbaceous successional stage.

MOST ABUNDANT SPECIES

<u>Strata</u> Herbaceous	<u>Species</u> <i>Agrostis perennans, Andropogon gerardii, Panicum dichotomum, Polygonum sagittatum, Pycnanthemum flexuosum, Schizachyrium scoparium, Sorghastrum nutans</i>
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ADDITIONAL CHARACTERISTIC SPECIES

Asclepias incarnata, Aster puniceus, Aster vimineus, Bidens frondosa, Carex lurida, Carex stricta, Cyperus strigosus, Dioscorea quarternata, Eleocharis tenuis, Eupatorium perfoliatum, Eupatorium purpureum, Hypericum muticum, Impatiens capensis, Juncus canadensis, Juncus effusus, Lobelia siphilitica, Oxipolis rigidior, Panicum clandestinum, Potentilla simplex, Solidago canadensis, Solidago patula, Spirea alba Thelypteris palustris, Vernonia noveboracensis

VEGETATION DESCRIPTION

This *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation is a rare type of Maryland Northern Piedmont temporarily flooded wetland. The herbaceous layer is often dominated by *Agrostis perennans*, *Andropogon gerardii*, *Panicum dichotomum*, *Polygonum sagittatum*, *Pycnanthemum flexuosum*, *Schizachyrium scoparium*, and *Sorghastrum nutans*. Other herbaceous species can comprise significant cover such as *Aster vimineus*, *Dioscorea quaternata*, *Eleocharis tenuis*, *Impatiens capensis*, *Juncus canadensis*, *Juncus effusus*, *Panicum clandestinum*, *Potentilla simplex*, *Solidago canadensis*, *Solidago patula*, and *Thelypteris palustris*. Also present, but usually with less cover, may be *Asclepias incarnata*, *Aster puniceus*, *Bidens frondosa*, *Carex lurida*, *Carex stricta*, *Cyperus strigosus*, *Eupatorium perfoliatum*, *Eupatorium purpureum*, *Hypericum muticum*, *Lobelia siphilitica*, *Oxipolis rigidior*, and *Vernonia noveboracensis*. Although this community is physiognomically herbaceous, individuals of *Acer rubrum*, *Alnus serrulata*, *Ilex verticillata*, *Lyonia ligustrina*, *Spirea alba*, and *Viburnum dentatum* can form a sparse tall-shrub layer scattered throughout or in small dense patches on dryer hummocks. This shrub layer is rarely over 10 percent cover, and seldom dominated by one species.

Variations of this community exist, but do not have the species diversity and presence of rare species. These differences may be due to hydrologic, geologic, and historical land use factors.

This *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation usually occurs topographically upslope of the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation.

This *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation suffers significant threats from invasive non-native species such as *Achillea milifolia*, *Agrostis tenuis*, *Agrostis stolonifera*, *Alliaria petiolata*, *Allium vineale*, *Berberis thunbergii*, *Chrysanthemum leucanthemum*, *Daucus carota*, *Glechoma hederacea*, *Mentha spicata*, *Microstegium vimineum*, *Phleum pratense*, *Prunella vulgaris*, and *Rosa multiflora*.

OTHER NOTEWORTHY SPECIES

This *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation is habitat for highly state rare (S1), state rare (S2), watch list (S3), and possibly rare (SU) plants that may include *Arnica acaulus* (S1), *Carex brunnescens* (S3), *Cirsium horridulum* (SU), *Cirsium muticum* (SU), *Platanthera ciliaris* (S2), *Platanthera flava* (S1), *Pycnanthemum torrei* (S1/G2), *Scleria triglomerata* (S2), *Solidago patula* (S3), and *Sphenopholis pensylvanica* (S1S2).

More inventory data are needed to assess this community's habitat value, but this *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera and other insects.

RANGE

Since this is a newly proposed community association, national distribution requires further determination. According to the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996), the *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance occurs in Maine, New Hampshire, Pennsylvania, Ohio, Maryland, Virginia, Kentucky, and Tennessee. The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) states that it occurs in Kentucky, Tennessee, Virginia, and West Virginia. More research is needed to determine where this association occurs.

MARYLAND DISTRIBUTION

This community type may have been distributed throughout the Northern Piedmont physiographic province of central Maryland, including Cecil, Harford, Baltimore, Carroll, Frederick, Howard, and Montgomery Counties. Due to anthropogenic disturbance, this community type is now suspected to be restricted to the more rural sections Baltimore County.

Similar variations of this community type may occur in the wet riversides throughout Maryland. Similar

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

communities have been described as associated with dry cobble riverbanks and lakeshores in other sections of the eastern United States. More inventory data are needed to determine the relationship between the riverine and lacustrine types and this *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation.

CONSERVATION RANK

S1

RANK CONFIDENCE

High

RANK JUSTIFICATION

Only one occurrence of this community has been found in Maryland's Northern Piedmont physiographic province. Due to the small size and suspected dependence on infrequent low levels of natural disturbance, this community type is extremely rare in Maryland. This community type may be directly threatened by development and invasion by non-native plants and indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Rockdale Meadows, Baltimore County (39° 41' 0.00" N, 76° 45' 59.41" W)

COMMENTS

In the Northern Piedmont physiographic province, possible variants of this community may be more common but lack the rare species due to hydrology, geology and disturbance history.

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AUTHOR

Andrew M. A. Gould, 1998.

***Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation**

COMMON NAME	Tussock sedge - Jewelweed - Sensitive fern Herbaceous Vegetation
ELEMENT CODE	6804
NATURAL COMMUNITY	Costal Plain / Northern Piedmont Seepage Meadow
NATIONAL SYNONYM	<i>Carex stricta</i> Semipermanently Flooded Herbaceous Vegetation [6100 in part]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Semipermanently Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Carex stricta</i> Semipermanently Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This *Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation is a component of the diverse group of central Maryland circumneutral (ph 5.5 - 7.5) seepage wetlands. This wetland type was once found throughout Maryland's Northern Piedmont physiographic province, but now is less prevalent due to anthropogenic impacts. This wetland type is directly threatened by draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff. These wetlands are often small, ranging in size from one-tenth to one hectare. Generally, these wetlands are found on shallow toeslopes of rolling hills where groundwater percolation occurs throughout the year. The water table is usually at or near the soil surface (within 30 cm) throughout the growing season. These wetlands typically have organic soils in the first 5 - 20 cm of the profile and sandy loam to 60 cm.

Vegetation and community structure in these Northern Piedmont seepage wetlands seems to be related to natural disturbance history. Wetlands that have received relatively recent natural disturbance are inhabited by this *Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation, while those that have had a longer period of recovery are inhabited by the *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland. Often, this shrubland community occurs on the dryer edges of wetlands in which this herbaceous community dominates the wetter regions.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Herbaceous	<i>Carex stricta, Impatiens capensis, Leersia oryzoides, Onoclea sensibilis, Polygonum sagittatum, Polygonum arifolium</i>

ADDITIONAL CHARACTERISTIC SPECIES

Acer rubrum, *Agrostis* spp., *Alnus serrulata*, *Asclepias incarnata*, *Aster puniceus*, *Carex gynandra*, *Carex lanuginosa*, *Carex lurida*, *Cirsium muticum*, *Ciscuta maculata*, *Cuscuta* spp., *Cyperus strigosus*, *Eupatorium perfoliatum*, *Eupatorium purpurea*, *Hypericum punctatum*, *Ilex verticillata*, *Juncus canadensis*, *Juncus effusus*, *Lycopus americanus*, *Mikania scandens*, *Mimulus ringens*, *Osmunda cinnamomea*, *Oxypolis rigidor*, *Panicum clandestinum*, *Sagittaria latifolia* var. *pubescens*, *Sanguisorba canadensis*, *Scirpus expansus*, *Scirpus validus*, *Solidago canadensis*, *Solidago patula*, *Solidago rugosa*, *Thelypteris palustris*, *Typha angustifolia*, *Typha latifolia*, *Vernonia noveboracensis*

VEGETATION DESCRIPTION

This *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation is typical of many Maryland Northern Piedmont seepage wetlands. The most apparent dominant is *Carex stricta*, which usually comprises 25 - 60 percent of the total cover. *Impatiens capensis*, *Polygonum sagittatum*, and *Polygonum arifolium* can be dense throughout this community, as well. *Onoclea sensibilis* is found irregularly throughout this community and occurs in dense patches on slightly drier hummocks. *Sagittaria latifolia* var. *pubescens* can be quite thick in the wettest portions of this community. Occasionally, this community type can have dense patches of *Leersia oryzoides*. Other herbaceous species comprising significant cover are *Carex lurida*, *Carex gynandra*, *Agrostis* spp., *Panicum clandestinum*, *Panicum dichotomum*, *Thelypteris palustris*, and *Osmunda cinnamomea*. Also present, but usually with less cover, may be *Cyperus strigosus*, *Scirpus expansus*, *Scirpus validus*, *Juncus canadensis*, *Juncus effusus*, *Eupatorium perfoliatum*, *Eupatorium purpurea*, *Vernonia noveboracensis*, *Solidago patula*, *Solidago canadensis*, *Solidago rugosa*, *Cirsium muticum*, *Aster puniceus*, *Sanguisorba canadensis*, *Oxypolis rigidor*, and *Ciscuta maculata*. Although this community is physiognomically herbaceous, shrubs and small saplings of *Alnus serrulata*, *Ilex verticillata*, *Viburnum dentatum*, and *Acer rubrum* may be sparsely scattered throughout or in small dense patches. The shrub canopy is seldom over 25 percent cover, and rarely dominated by one species.

A similar variation of this community type may occur in the wet meadows of western Maryland's Allegheny Plateau province. More inventory and data are needed to determine the relationship between the montane wet meadow community and this *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation.

The *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland often occurs on the dryer edges and on the mosaic of dryer hummocks of wetlands where this herbaceous community dominates the wetter regions. This *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation could succeed into the shrubland community. This herbaceous community is often found as a small wetland island, surrounded by agricultural lands.

This *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation suffers significant threats from invasion by non-native species such as *Microstegium vimineum*, *Polygonum perfoliatum*, *Rosa multiflora*, *Agrostis tenuis*, and *Agrostis stolonifera*.

OTHER NOTEWORTHY SPECIES

This *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation is habitat for highly state rare (S1), state rare (S2), watch list (S3), and possibly rare (SU) plants that may include: *Carex brunnescens* (S3), *Carex buxbaumii* (S2), *Carex lanuginosa* (S2), *Castilleja coccinea* (S1), *Cirsium horridulum* (SU), *Cirsium muticum* (SU), *Epilobium ciliatum* (S1), *Leersia lenticularis* (S1?), *Platanthera ciliaris* (S2), *Platanthera flava* (S1), *Pycnanthemum verticillatum* (S1), *Sanguisorba canadensis* (S2), *Scirpus verecundus* (S2), *Solidago patula* (S3), *Sphenopholis pensylvanica* (S1S2), and *Zizia aurea* (S3).

This community type is also habitat for the state rare (S2/G3) Bog Turtle (*Clemmys muhlenbergii*).

More inventory data are needed to assess this community's habitat value, but this *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation appears to be utilized by a diverse group of mammals, herptiles, avifauna, odonates, lepidoptera and other insects.

RANGE

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

Since this is a newly proposed community association, national distribution requires further determination. According to the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996), the *Carex stricta* Herbaceous Alliance occurs in Maine, New Hampshire, Vermont, Connecticut, Rhode Island, Massachusetts, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, and West Virginia. The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) states that the *Carex stricta* Seasonally Flooded Herbaceous Alliance occurs in Virginia and North Carolina.

MARYLAND DISTRIBUTION

This community type was once widely distributed throughout the Northern Piedmont physiographic province of central Maryland, including Cecil, Harford, Baltimore, Carroll, Frederick, Howard, and Montgomery Counties. Due to anthropogenic disturbance, this community type is now suspected to be restricted to the more rural sections of Carroll, Baltimore, and Harford Counties.

A similar variation of this community type may occur in the wet meadows of western Maryland's Allegheny Plateau province. More inventory and data are needed to determine the relationship between the montane wet meadow community and this *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation.

CONSERVATION RANK

S2

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for limited distribution and limited viable occurrences known in Maryland. Although there may be more than twenty occurrences of this community type in the state, very few of them are of high quality. Due to the generally small size and suspected dependence on periodic low levels of natural disturbance, this community type is threatened in Maryland. Many of the occurrences of this community type inhabit wetlands that are smaller than the minimum mapping unit of the National Wetland Inventory maps. This community is directly threatened by draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Alesia Swamp, Carroll County (39° 41' 38.89" N 76° 49' 29.38" W)

COMMENTS

In the Northern Piedmont physiographic province this herbaceous community may be the first stage in a successional trajectory that succeeds into the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland and then into the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest.

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- The Western Pennsylvania Conservancy. 1995. A Study of Calcareous Fen Communities in Pennsylvania.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

Report to The Department of Conservation and Natural Resources, Bureau of Forestry, Forest Advisory Services, Harrisburg, PA.

The Western Pennsylvania Conservancy and The Nature Conservancy. 1998. A Study of Seepage Wetlands in Pennsylvania. Report to The United States Environmental Protection Agency and The Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Forest Advisory Services, Harrisburg, PA.

AUTHOR

Andrew M. A. Gould, 1998.

***Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous
 Vegetation**

COMMON NAME	Tufted hairgrass - Slender spikerush - Deer-tongue grass Herbaceous Vegetation
ELEMENT CODE	6805
NATURAL COMMUNITY	Costal Plain / Piedmont Wet Prairie
NATIONAL SYNONYM	[none]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Semipermanently Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Deschampsia cespitosa</i> Semipermanently Flooded Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation is a component of the diverse group of central Maryland's Northern Piedmont circumneutral (pH 5.5 - 7.5) wetlands. Generally, this community type is found in swales and on shallow toeslopes of rolling hills with serpentine bedrock influence. Serpentine refers to a type of bedrock that is high in Iron, Magnesium, Nickel, and Chromium. These heavy metals in the bedrock create harsh growing conditions for plants and creates habitat for rare serpentine tolerant species. This community is influenced by perennial groundwater percolation throughout the growing season. The water table is often near or at the surface (5 - 15 cm) throughout the growing season. This community characteristically has moderate organic soils (5 - 15 cm) and sandy loam serpentine mineral soil to 60 cm.

Vegetation and community structure of this Northern Piedmont temporarily flooded herbaceous vegetation seems to be related to disturbance history. This community type may have received a history of grazing and burning to maintain the herbaceous successional stage.

MOST ABUNDANT SPECIES

<u>Strata</u> Herbaceous	<u>Species</u> <i>Deschampsia cespitosa</i> , <i>Eleocharis tenuis</i> , <i>Leersia oryzoides</i> , <i>Panicum clandestinum</i> , <i>Polygonum sagittatum</i> , <i>Sorghastrum nutans</i> , <i>Vernonia noveboracensis</i>
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ADDITIONAL CHARACTERISTIC SPECIES

Andropogon gerardii, *Carex lurida*, *Cyperus strigosus*, *Eupatorium perfoliatum*, *Eupatorium purpureum*, *Juncus canadensis*, *Juncus effusus*, *Schizachyrium scoparium*

VEGETATION DESCRIPTION

This *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation is a rare type of Maryland Northern Piedmont seepage wetland. The herbaceous layer is often dominated by *Deschampsia cespitosa*, *Eleocharis tenuis*, *Leersia oryzoides*, *Panicum clandestinum*, *Polygonum sagittatum*, *Sorghastrum nutans*, and *Vernonia noveboracensis*. Other herbaceous species can comprise significant cover such as *Andropogon gerardii*, *Carex lurida*, *Cyperus strigosus*, *Eupatorium perfoliatum*, *Eupatorium purpureum*, *Juncus canadensis*, *Juncus effusus*, and *Schizachyrium scoparium*. Also present, but usually with less cover, may be *Carex hystrixina*, *Carex lanuginosa*, *Cirsium muticum*, *Gentiana andrewsii*, *Gentianopsis crinita*, *Juncus torreyi*, *Rhynchospora alba*, *Sangiusorba canadensis*, and *Scleria reticularis*.

Examples of this community type occur that are dominated by *Panicum clandestinum* and *Microstegium viminium*. These examples lack the rare species usually found in this community type. These examples appear to have a recent history of severe anthropogenic disturbance.

This *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation is usually found topographically down slope from serpentine barrens with communities that resemble the *Schizachyrium scoparium* - *Sporobolus (compositus, heterolepis)* Herbaceous Vegetation (4077) or serpentine forests with communities that resemble *Quercus stellata* - *Quercus marilandica* Woodland (newly proposed) or *Pinus virginiana* - *Quercus marilandica* Forest (6266).

This *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation suffers significant threats from invasion of nuisance non-native species such as *Achellia milifolia*, *Alliaria petiolata*, *Allium vineale*, *Berberis thunbergii*, *Chrysanthemum leucanthemum*, *Dacus carrota*, *Glechoma hederacea*, *Mentha spicata*, *Microstegium vimineum*, *Phleum pratense*, *Prunella vulgaris*, and *Rosa multiflora*.

OTHER NOTEWORTHY SPECIES

This *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation is habitat for highly state rare (S1), state rare (S2), watch list (S3), and possibly rare (SU) plants and may include: *Carex hystrixina* (S1), *Carex lanuginosa* (S2), *Cirsium muticum* (SU), *Deschampsia cespitosa* (S1), *Gentiana andrewsii* (S2), *Gentianopsis crinita* (S1), *Juncus torreyi* (S1), *Rhynchospora alba* (S3), *Sangiusorba canadensis* (S2), and *Scleria reticularis* (S2).

More surveys and data are needed to assess this community's habitat value, but this *Deschampsia cespitosa* - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation community appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepedoptera, and other insects.

RANGE

Distribution is uncertain, but this herbaceous vegetation most likely occurs in association with serpentine barrens dominated by *Schizachyrium scoparium* - *Sporobolus (compositus, heterolepis)* Herbaceous Vegetation (4077), serpentine forest dominated *Quercus stellata* - *Quercus marilandica* Woodland (newly proposed), and serpentine forest dominated by *Pinus virginiana* - *Quercus marilandica* Forest (6266) throughout their ranges. The Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996) and The Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) list these ranges to include the states Alabama, Georgia, Kentucky, Tennessee, South Carolina, North Carolina, Virginia, West Virginia, Pennsylvania, Maryland, Delaware, and New York. More research is needed to determine the range of this association.

MARYLAND DISTRIBUTION

This community type may have been distributed throughout the serpentine outcrops of the Northern Piedmont physiographic province of central Maryland, including Cecil, Harford, Baltimore, Carroll, Howard, and Montgomery Counties. Due to anthropogenic disturbance, this community type is now suspected to be restricted to serpentine preserves in Cecil, Harford, and Baltimore Counties.

CONSERVATION RANK

S1

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

RANK CONFIDENCE

High

RANK JUSTIFICATION

Only 4 occurrences of this community has been found in Maryland's Northern Piedmont physiographic province. Due to the generally small size and association with serpentine bedrock, this community type is rare in Maryland. This community type may be directly threatened by development and invasion by non-native plants and indirectly threatened by lowering of the water table by residential wells and chemical pollution from agricultural and residential runoff.

REFERENCE SITES

Soldier's Delight, Baltimore County (39° 24' 30.80"N, 76° 51' 10.38" W)

COMMENTS

In the Northern Piedmont physiographic province, possible variants of this community may be more common but lack rare species and are invaded by trees due to hydrology, geology, and disturbance history.

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AUTHOR

Andrew M. A. Gould, 1998.

Cinna arundinacea - Glyceria melicaria - Impatiens capensis - Microstegium vimineum
Herbaceous Vegetation

COMMON NAME	Wood reed - Northeastern managrass - Jewelweed - Browntop Herbaceous Vegetation
ELEMENT CODE	6806
NATURAL COMMUNITY	Blue Ridge Seepage Herbaceous Vegetation
NATIONAL SYNONYM	[none]
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural / Semi-natural
FORMATION	Saturated Temperate or Subpolar Grassland
ALLIANCE	<i>Cinna arundinacea - Glyceria melicaria</i> Saturated Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This *Cinna arundinacea - Glyceria melicaria - Impatiens capensis - Microstegium vimineum* Herbaceous Vegetation is a component of the diverse group of central Maryland circumneutral (ph 5.5 - 7.5) seepage wetlands. Pristine examples of this wetland type were once found throughout Maryland's Blue Ridge physiographic province, but now are less prevalent due to anthropogenic impacts. This wetland type is directly threatened by logging, draining and filling, pond creation through wetland excavation, and soil compaction from livestock grazing and may be indirectly threatened by lowering of water table by residential wells and chemical pollution from agricultural and residential runoff. These wetlands are often small, ranging in size from one-tenth to one hectare. Generally, these wetlands are found at stream headwaters, on hillside seepage slopes, and on shallow toeslopes where groundwater percolation occurs throughout the year. The water table is usually at or near the soil surface (within 30 cm) throughout the growing season. These wetlands typically have organic soils in the first 5 - 20 cm of the profile and sandy loam or sandy clay to 60 cm. The soils of these wetlands are often interspersed with greenstone cobble or fine gravel. Greenstone refers to a type of granitic gneiss metabasalt that is part of the Catoclin metovolcanic series. It is a dense hard green rock in which most of the original minerals have been altered and often generates circumneutral conditions.

MOST ABUNDANT SPECIES

<u>Strata</u> Herbaceous	<u>Species</u> <i>Agrostis stolonifera, Alliaria petiolata, Carex gynandra, Cinna arundinacea, Glyceria melicaria, Impatiens capensis, Microstegium vimineum, Polygonum arifolium, Polygonum sagittatum, Symplocarpus foetidus</i>
Non-vascular	<i>Sphagnum</i> spp.

ADDITIONAL CHARACTERISTIC SPECIES

Aster divaricatus, Brachyelytrum erectum, Carex leptalea, Carex lurida, Carex trisperma, Chelone glabra, Eupatorium perfoliatum, Galium spp., *Glyceria striata, Lycopus americanus, Lycopus uniflorus, Maianthemum canadense, Mimulus ringens, Onoclea sensibilis, Panicum clandestinum, Panicum dichotomum, Ranunculus recurvatus, Rudbeckia laciniata, Rubus hispidus, Scirpus validus, Thalictrum pubescens, Viola* spp.

VEGETATION DESCRIPTION

This *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation is typical of many Maryland's Blue Ridge seepage wetlands that have received recent disturbance. This disturbance may be natural in origin, such as canopy opening from blow downs, ice storms, or natural tree mortality. Most often this disturbance results from anthropogenic sources, such as logging, wetland alteration, and gypsy moth originated tree mortality. This community type may be a starting point on the successional trajectory that leads to the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest community.

The herb layer is characteristically dominated by a diverse combination of *Carex gynandra*, *Cinna arundinacea*, *Glyceria melicaria*, *Impatiens capensis*, *Polygonum arifolium*, *Polygonum sagittatum*, and *Symplocarpus foetidus*. Also present, but with lower abundance, can be *Aster divaricatus*, *Brachyelytrum erectum*, *Carex leptalea*, *Carex lurida*, *Carex trisperma*, *Chelone glabra*, *Eupatorium perfoliatum*, *Galium* spp., *Glyceria striata*, *Lycopus americanus*, *Lycopus uniflorus*, *Maianthemum canadense*, *Mimulus ringens*, *Onoclea sensibilis*, *Panicum clandestinum*, *Panicum dichotomum*, *Ranunculus recurvatus*, *Rudbeckia laciniata*, *Rubus hispidus*, *Scirpus validus*, *Thalictrum pubescens*, and *Viola* spp.. Although this community type is physiognomically herbaceous, often there are shrubs and subcanopy trees (5 - 15 m tall) scattered throughout the community. The shrub layer may include species such as *Acer rubrum*, *Alnus incana*, *Ilex verticillata*, *Lindera benzoin*, *Rhododendron periclymenoides*, *Sambucus canadensis*, *Vaccinium corymbosum*, *Viburnum dentatum*, and *Viburnum prunifolium*. This shrub stratum is rarely over 25 percent cover or dominated by one species. The tree subcanopy may include species such as *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Fraxinus nigra*, *Fraxinus pennsylvanica*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Salix nigra*, and *Ulmus rubra*. This tree stratum is rarely over 40 percent cover or dominated by one species.

This successional community type is very diverse, and variants occur that are dominated by *Carex gynandra* and *Symplocarpus foetidus*, where *Cinna arundinacea* and *Glyceria melicaria* are absent. This variant is otherwise similar in community structure and disturbance history. There are also examples of this community type in which either (or both) *Cinna arundinacea* or *Impatiens capensis* are minor components of the community structure. Unfortunately the disturbance history that opens the tree canopy can often lead to invasion by non-native species such as *Agrostis stolonifera*, *Alliaria petiolata*, and *Microstegium vimineum*. These three species can often comprise over 50 percent of the herbaceous cover, reducing native species abundance through competition. Historically, these non-natives would not have been a major component of an otherwise, presumably, similar herbaceous community.

Since this is a small patch disturbance community, it is often bordered by the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest and the tree subcanopy can be composed of trees hanging over from adjacent uplands with communities that most closely resemble the *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (7221) and the *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (7268).

This forest community suffers significant invasion by non-native species such as *Alliaria petiolata*, *Agrostis tenuis*, *Agrostis stolonifera*, *Berberis thunbergii*, *Glechoma hederacea*, *Lysimachia nummularia*, *Microstegium vimineum*, *Polygonum perfoliatum*, *Rosa multiflora*, and *Rubus phoenicolasius*.

OTHER NOTEWORTHY SPECIES

This *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation is habitat for rare (S2) and watch list (S3) plants that may include *Fraxinus nigra* (S3), *Juglans cinerea* (S2S3/G3), and *Trillium cernuum* (S3). It is also habitat for *Saxifraga pensylvanica*, a species being considered for state listing.

More inventory data are needed to assess this community's habitat value, but this *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera, and other insects.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

RANGE

This newly proposed alliance was not previously described in the Community Alliances and Elements of the Eastern Region (Sneddon et al., 1996) or the Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998), but may occur in Maine, New Hampshire, Vermont, Connecticut, Massachusetts, New York, Pennsylvania, Delaware, Maryland, Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia and West Virginia. More research is necessary to determine the genuine range of this alliance.

MARYLAND DISTRIBUTION

This *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation is becoming more prevalent throughout the Blue Ridge Physiographic Province of Maryland's Frederick and Washington Counties due to anthropogenic disturbances. This community is replacing the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest due to current land use practices.

CONSERVATION RANK

S5

RANK CONFIDENCE

High

RANK JUSTIFICATION

This successional community is very common and is favored by current land use practices in its range.

REFERENCE SITES

Owen's Creek Headwaters, Frederick County (39° 38' 45.05" N, 77° 29' 33.37" W)

COMMENTS

This *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation appears to be a starting point of the successional trajectory within these Blue Ridge wetland habitats. This community type occurs after recent disturbance and eventually succeeds to the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest. This early successional community is often associated with severe invasion by non-native plants and altered hydrologic function.

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Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Community Descriptions

The Western Pennsylvania Conservancy and The Nature Conservancy. 1998. A Study of Seepage Wetlands in Pennsylvania. Report to The United States Environmental Protection Agency and The Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Forest Advisory Services, Harrisburg, PA.

AUTHOR

Andrew M. A. Gould, 1998.

Reference Site Descriptions

Hunting Creek Hollow

COUNTY

Frederick County, Maryland

USGS QUAD

Catoctin Furnace, MD

PRIMARY REASON FOR SELECTION

Hunting Creek Hollow contains a high quality occurrence and one of Maryland's best examples of *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high, and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

Hunting Creek Hollow is found within Cunningham Falls State Park. It contains a large (10 acres) a circumneutral seepage wetland, a ground water influenced wetland with a pH range from 5.5 to 7.5, approximately seven acres in size. This site occurs in the Blue Ridge physiographic province, along a toeslope within Hunting Creek valley. This forested wetland has perennial diffuse groundwater seepage from several sources and forms a braided stream that flows down a shallow gradient slope. The soil is primarily hydric muck that overlies greenstone cobble. Greenstone refers to a type of granitic gneiss metabasalt that is part of the Catoctin metavolcanic series. It is a dense hard green rock in which most of the original minerals have been altered and often generates circumneutral conditions. This wetland is surrounded by mixed upland forest, of at least 25 acres in size, dominated by *Quercus rubra*, *Quercus alba*, *Liriodendron tulipifera* and *Fagus grandifolia*.

The *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest occurs in the more pristine sections of the site while the *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation occurs in the more disturbed section of the site.

This site suffers potential threats from non-native plant invasion and excessive deer browse. Although there are no buildings near the wetland, a paved park road runs beyond the eastern margin of the site. A reservoir was created by flooding the Hunting Creek valley; this wetland is beyond the high flood stage of this reservoir and drains into it.

At least four plant species considered rare, threatened or endangered in Maryland are known to occur at Hunting Creek Hollow.

COMMUNITY DESCRIPTION

Hunting Creek Hollow was chosen as a reference site primarily because it is habitat to one of the best examples of *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest known in Maryland. This wetland community type is rare in Maryland and ranked S2, a designation meaning that between 5 and 20 occurrences are known in the state. This site is a type location for this community; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is very typical of that defined in the Vegetation Description but differs slightly in that there are more upland hummocks, forming a mosaic of facultative and upland species within the wetland. The shrub layer has less cover than expected, which is most likely due to high levels of deer browse. Also there is a lower prevalence of *Fraxinus pennsylvanica* than in a typical example of this community type. See Vegetation Description section of this report for a precise definition of this community type.

Maryland Circumneutral Seepage Wetlands

Vegetation Classification / Description and Reference Sites

Reference Sites

MANAGEMENT COMMENTS / MONITORING NEEDS

The *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest supports at least 20 state rare, threatened, or endangered plant species and this site is known to contain four of these species. More inventory data are needed to assess this community's habitat value, but it appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera and other insects.

The populations of rare species should be monitored annually. Access in the form of new trail construction at this site should be limited or well planned because this wetland type could be severely impacted by trampling and soil compaction by visitors. Due to neighboring land development, the water table of this site may be lowering over time. Efforts should be made to annually monitor the hydrologic changes at this site.

PROTECTION COMMENTS

Hunting Creek Hollow is owned and managed by the State of Maryland, thus receiving some conservation attention. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Visitation and further research at this site should be restricted and require a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

This site is designated a Nontidal Wetland of Special State Concern by the Maryland Department of Natural Resources (See Appendix 3 for definitions of designations).

OCCURRENCE RANK

The *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest at Hunting Creek Hollow is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Hunting Creek Hollow is owned by the State of Maryland and is managed by Cunningham Falls State Park.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Park managed by Ms. Cindy Eckard, Park Manager, Cunningham Falls State Park.

BOUNDARY JUSTIFICATION

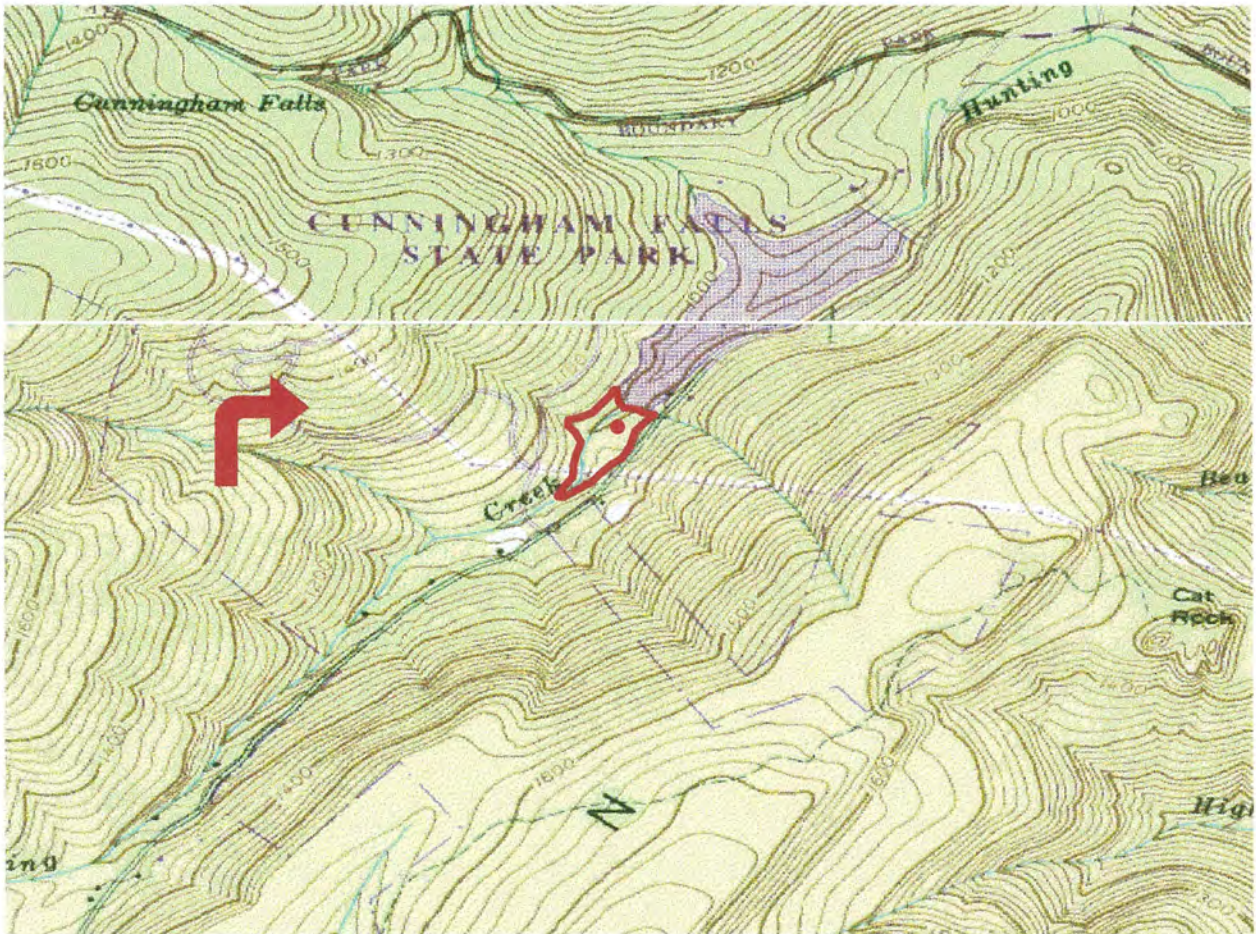
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 67' 18.86" N, 77° 27' 51.54" W

Acer rubrum - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest

Hunting Creek Hollow, Fredrerick County, Maryland USGS Quadrangle: Catoctin Furnace



Acer rubrum - *Fraxinus pennsylvanica* - *Betula* (*alleghaniensis*, *lenta*) /
Ilex verticillata / *Symplocarpus foetidus* Forest

39° 67' 18.82" N, 77° 27' 51.54" W

Gunpowder Falls - Hereford

COUNTY

Baltimore County, Maryland

USGS QUAD

Hereford, MD

PRIMARY REASON FOR SELECTION

Gunpowder Falls - Hereford contains a high quality occurrence and one of Maryland's best examples of *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high, and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

This site is found within Gunpowder Falls State Park. Gunpowder Falls - Hereford is a circumneutral seepage wetland complex, a ground water influenced wetland with a pH range from 5.5 to 7.5, approximately 30 acres in size. This site occurs along steep seepage slopes and along a shallow toeslope adjacent to the Gunpowder Falls River in the Northern Piedmont. This wetland complex has perennial groundwater seepage from several sources that form seepage slopes and a basin swamp. The soils are primarily hydric sandy loam. This wetland complex is surrounded by mixed upland forest dominated by *Quercus rubra*, *Quercus alba*, *Liriodendron tulipifera* and *Fagus grandifolia*. Floodplain forest dominated by *Fraxinus pennsylvanica*, *Plantanus occidentalis*, and *Acer rubrum* inhabits the eastern edge of the wetland complex, adjacent to the river.

Two distinct seepage wetland communities can be found at Gunpowder Falls - Hereford. The seepage slopes are inhabited by the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest and the basin swamp is inhabited by the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Impatiens capensis* Shrubland. These communities are found neighboring each other at this site, and their boundaries are obscurely defined.

This site suffers potential threats from non-native species invasion and trampling by park users. There is an old homestead within 100 meters to the east of the site and two park trails cross through the wetland complex.

At least two plant species considered rare, threatened or endangered in Maryland are known to occur at Gunpowder Falls - Hereford.

This site is designated a Geographic Area of Particular Concern by the Coastal Zone Management Act (See Appendix 3 for definitions of designations).

COMMUNITY DESCRIPTION

Gunpowder Falls - Hereford was chosen as a reference site primarily because it is habitat to one of the best examples of *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest known in Maryland. This wetland community type is rare in Maryland and ranked S3, a designation meaning that between 20 and 100 occurrences are known in the state. This site is a type location; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is very typical of that defined in the Vegetation Description for *Acer rubrum - Fraxinus pennsylvanica - Nyssa sylvatica / Lindera benzoin / Symplocarpus foetidus* Forest. See Vegetation Description section of this report for a precise definition of this community type. This occurrence differs from the typical example in that it has a lower prevalence of *Symplocarpus foetidus*.

MANAGEMENT COMMENTS / MONITORING NEEDS

The *Acer rubrum - Fraxinus pennsylvanica - Nyssa sylvatica / Lindera benzoin / Symplocarpus foetidus* Forest is habitat for at least eight state rare, threatened, or endangered plant species and this site is known to contain at least two of these. More inventory data are needed to assess this community's habitat value, but it appears to be utilized by a diverse group of mammals, herptiles, avifauna, odonates, lepidoptera, and other insects.

The populations of the rare species at this site should be monitored annually. Access in the form of new trail construction at this site should be limited or well planned because this wetland type could be severely impacted by trampling and soil compaction by visitors. Due to neighboring land development, the water table of this site may be lowering over time. Efforts should be made to annually monitor the hydrologic changes at this site.

PROTECTION COMMENTS

Gunpowder Falls - Hereford is owned and managed by the State of Maryland, thus receiving some conservation attention. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Visitation and further research at this site should be restricted and require a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

OCCURRENCE RANK

The *Acer rubrum - Fraxinus pennsylvanica - Nyssa sylvatica / Lindera benzoin / Symplocarpus foetidus* Forest at Gunpowder Falls - Hereford is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Gunpowder Falls - Hereford is owned by the State of Maryland and is managed by Gunpowder Falls State Park.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Park is managed by Mr. Mike Browning, Park Manager, Gunpowder Falls State Park.

BOUNDARY JUSTIFICATION

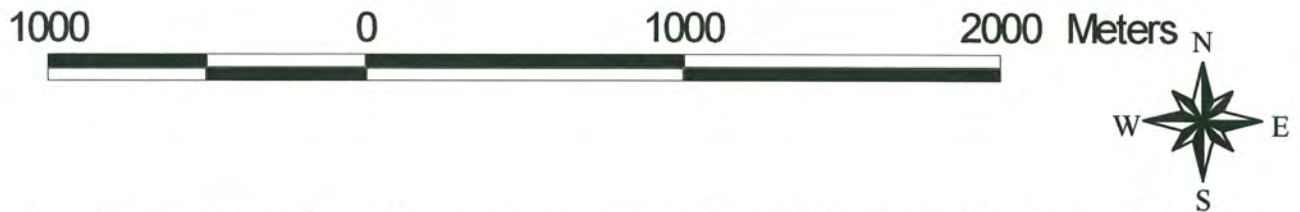
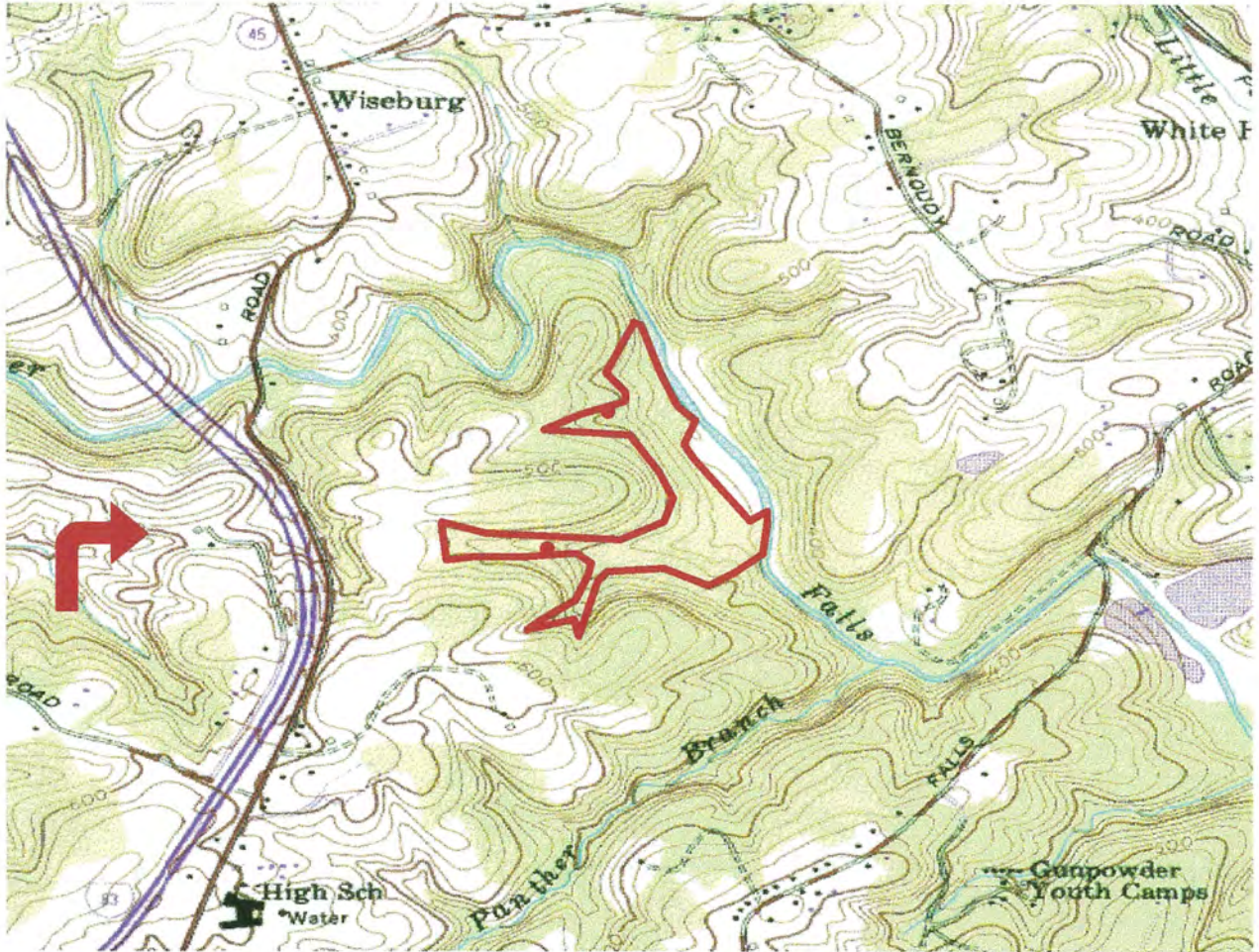
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 36' 32.85" N, 76° 39' 4.14" W

Acer rubrum - Fraxinus pennsylvanica - Nyssa sylvatica / Lindera benzoin / Symplocarpus foetidus Forest

Gunpowder Falls; Baltimore County, Maryland USGS Quadrangle: Hereford



Acer rubrum - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest

39° 36' 32.85" N, 76° 39' 4.14" W

Wildcat Branch

COUNTY

Harford County, Maryland

USGS QUAD

White Marsh, MD

PRIMARY REASON FOR SELECTION

Wildcat Branch contains a high quality occurrence and one of Maryland's best examples of the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high, and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

This site is also known as Little Gunpowder Falls, within the Biological Conservation Database and is found within Gunpowder Falls State Park. Wildcat Branch contains a circumneutral seepage wetland complex, a ground water influenced wetland with a pH range from 5.5 to 7.5, approximately 13 acres in size. This site occurs along a steep seepage slope and along shallow toeslopes adjacent to the Gunpowder Falls River in the Northern Piedmont. This wetland complex has perennial groundwater seepage from several sources that form seepage slopes and a basin swamp. The soils are primarily hydric sandy loam. This wetland complex is surrounded by mixed upland forest dominated by *Quercus rubra*, *Quercus alba*, *Liriodendron tulipifera* and *Fagus grandifolia*. Floodplain forest dominated by *Fraxinus pennsylvanica*, *Plantanus occidentalis*, and *Acer rubrum* inhabits the southern edge of the wetland complex, adjacent to the river.

The herbaceous seepage swamp is inhabited by *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation and may persist due to powerline management practices. Adjacent to this open canopy community, both to the east and west, occurs examples of the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland. Beyond this shrubland community, along toeslopes and steep seepage slopes, the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest occurs.

This site suffers potential threats by invasion of non-native plants, trampling by park patrons, and excessive browsing by deer. The herbaceous wetland community occurs beneath a high tension powerline, which is frequently mowed, and a park trail crosses through the southern portion of the wetland complex.

At least seven plant species considered rare, threatened or endangered in Maryland are known to occur at Wildcat Branch.

This site is designated a Geographic Area of Particular Concern by the Coastal Zone Management Act (See Appendix 3 for definitions of designations).

COMMUNITY DESCRIPTION

Wildcat Branch was chosen as a reference site primarily because it is habitat to one of the best examples of *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland known in Maryland. This wetland community type is rare in Maryland and ranked S3, a designation meaning that between 20 and 100 occurrences are known in the state. This site is a type location, it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is very typical of that defined in the Vegetation Description for *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland. See Vegetation Description section of this report for a precise definition of this community type. This occurrence differs from the typical example in that it has high prevalence of *Cephalanthus occidentalis* and *Vaccinium corymbosum* and lower prevalence of *Symplocarpus foetidus* and *Thelypteris palustris* than expected.

MANAGEMENT COMMENTS / MONITORING NEEDS

The *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland at Wildcat Branch is known to be habitat for at least four rare, threatened, or endangered plant species and the other wetland community types at this site are known to contain at least three other rare, threatened, or endangered plant species. More inventory data are needed to assess this community's habitat value, but the *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland appears to be utilized by a diverse group of mammals, herptiles, avifauna, odonates, lepidoptera and other insects.

The populations of the rare species at this site should be monitored annually. Access in the form of new trail construction at this site should be limited or well planned because this wetland type could be severely impacted by trampling and soil compaction by visitors. Woody plant succession may be occurring at this site and may change the community composition and structure through time.

Efforts should be made to monitor these processes. Due to neighboring land development, the water table of this site may be lowering over time. Efforts should be made to annually monitor the hydrologic changes of this site.

PROTECTION COMMENTS

Wildcat Branch is owned and managed by the State of Maryland, thus receiving some conservation attention. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Visitation and further research at this site should be restricted and require a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

This site is designated a Nontidal Wetland of Special State Concern by the Maryland Department of Natural Resources (See Appendix 3 for definitions of designations).

OCCURRENCE RANK

The *Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus* Shrubland at Wildcat Branch is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Wildcat Branch is owned by the State of Maryland and is managed by Gunpowder Falls State Park.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Park managed by Mr. Mike Browning, Park Manager, Gunpowder Falls State Park.

BOUNDARY JUSTIFICATION

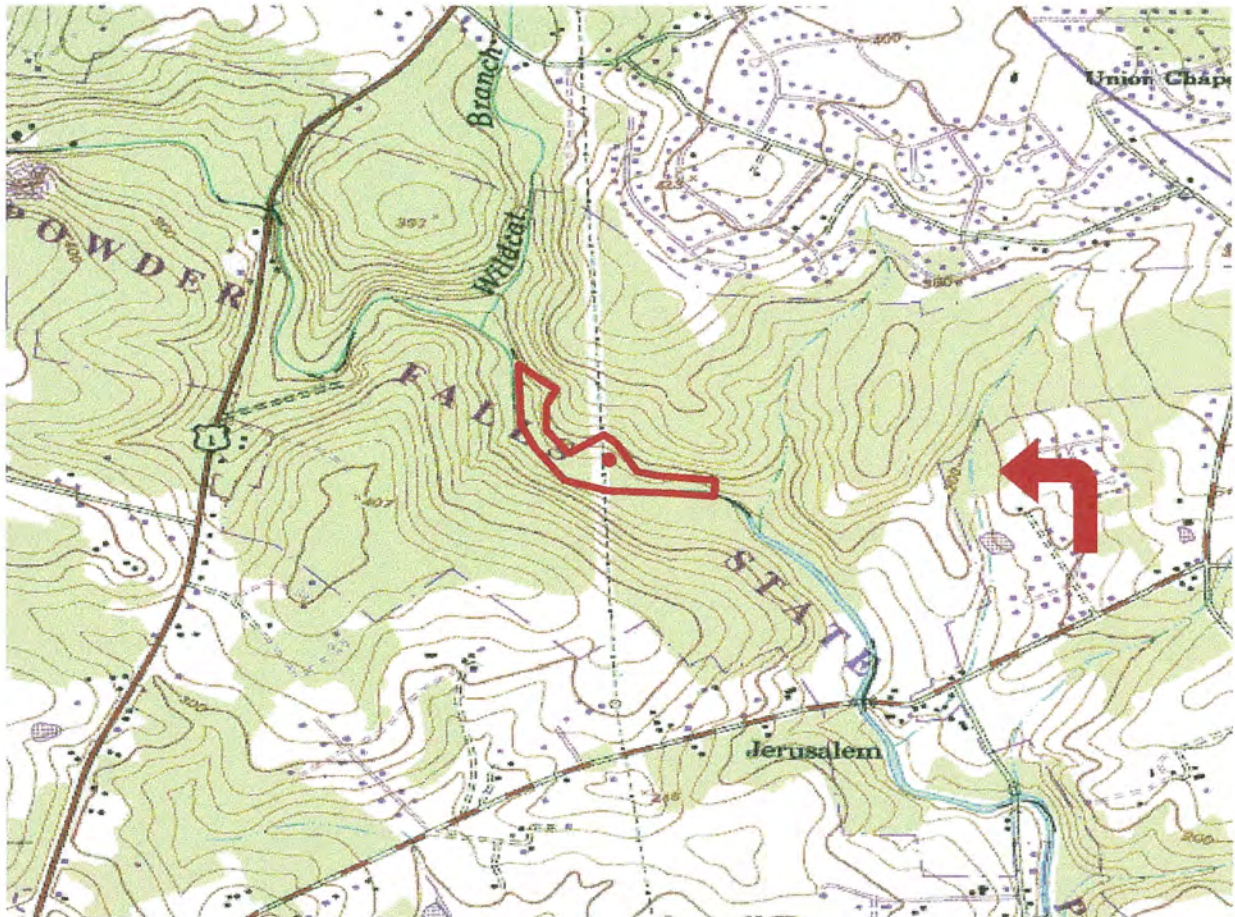
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 28' 8.66" N, 76° 23' 56.53" W

Alnus serrulata - Viburnum dentatum / Carex stricta - Symplocarpus foetidus Shrubland

Wildcat Branch; Harford County, Maryland USGS Quadrangle: White Marsh



Alnus serrulata - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland

39° 28' 8.66" N, 76° 23' 56.53" W

Rockdale Meadows

COUNTY

Baltimore County, Maryland

USGS QUAD

Lineboro, MD

PRIMARY REASON FOR SELECTION

Rockdale Meadows contains a high quality occurrences and one of Maryland's best examples of the *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

Rockdale Meadows is a privately owned site. It contains a circumneutral seepage wetland, a ground water influenced wetland with a pH range from 5.5 to 7.5, complex that is approximately six acres in size. This site occurs in a shallow swale between two rolling hills of the Northern Piedmont. The hydrologic source of this wetland complex is multifarious and originates from at least two spring heads as well as several points of diffuse groundwater seepage. The soils at this site range from hydric muck in the wettest sections to thin sandy gravel in the driest. The wetlands are surrounded by pasture and mixed deciduous upland forest.

Four distinct wetland community types form an aggregate mosaic at this site. The wettest toe slopes that border a small intermittent stream (two acres) are habitat to an occurrence of the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation. Topographically upslope and to the east of this community occurs an example of the *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation (the primary reason for site selection). These dryer edges and midslopes occupy one acre of land. In wetter years, these two community types blend together along a soil moisture gradient but in the driest years, the *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation can be devoid of subsurface water and wetland vegetation.

Upstream from the open canopy wetland mosaic is an example of the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland that occupies approximately one acre of land. It is adjacent to the north edge of the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation. These two communities blend together and their boundaries are not clearly defined.

Upstream from the wet shrubland community is an example of the *Acer rubrum* - *Fraxinus pennsylvanica* - *Nyssa sylvatica* / *Lindera benzoin* / *Symplocarpus foetidus* Forest which occupies approximately one acre of land. This forested community surrounds the shrubland blending together with obscurely defined boundaries.

This site suffers potential threats from non-native plant invasion and excessive deer browse. An unimproved private lane runs through the upland pasture along the east edge of the wetland complex, but turns west and bisect the herbaceous wetland community. Three small farm buildings are present at this site and all occur within 100 meters of the wetlands.

At least 10 plant species and one animal considered rare, threatened, or endangered in Maryland are known to occur at Rockdale Meadows.

This site is designated a Geographic Area of Particular Concern by the Coastal Zone Management Act (See Appendix 3 for definitions of designations).

COMMUNITY DESCRIPTION

Rockdale Meadows was chosen as a reference site primarily because it is habitat to the best example of *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation. This wetland community type is rare in Maryland and ranked as S1, a designation meaning that between 1 and 5 occurrences are known in the state. This site is a type location for this community; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification. It is also very typical of that defined in the Vegetation Description for *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation. See Vegetation Description section of this report for a precise definition of this community type.

MANAGEMENT COMMENTS / MONITORING NEEDS

All of the wetland community types at Rockdale Meadows, including the *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation, are inhabited by interesting flora and fauna. This site is known to support 10 state rare, threatened, or endangered plants species and one state endangered animal. More inventory data are needed to assess this site's habitat value, but it appears to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera and other insects.

The populations of rare species should be monitored annually. Active stewardship should be conducted to avoid woody plant succession and maintain herbaceous conditions at this site. Mowing every 3-5 years or pulling of tree seedlings should be conducted. These activities should be conducted at a time of year that would be least detrimental to rare species at this site (i.e. late autumn - early winter). Due to neighboring land development, the water table may be lowering over time. Efforts should be made to annually monitor the hydrologic changes at this site.

PROTECTION COMMENTS

Rockdale Meadows is privately owned, but is voluntarily protected. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Efforts should be made for formal protection through conservation easements.

OCCURRENCE RANK

The *Panicum dichotomum* - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation at Rockdale Meadows is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Rockdale Meadows is owned privately, but wetland values are voluntarily protected with the Maryland / D.C. Chapter of The Nature Conservancy's registry program.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Land is privately owned and managed.

BOUNDARY JUSTIFICATION

Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 41 0.00 N, 76° 45' 59.41" W

Panicum dichotomum - *Andropogon gerardii* - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Polygonum sagittatum* Herbaceous Vegetation

Rockdale Meadows; Baltimore County, Maryland USGS Quadrangle: Lineboro



1000 0 1000 2000 Meters



Panicum dichotomum - *Andropogon gerardii* - *Schizachyrium scoparium* -
Sorghastrum nutans - *Polygonum sagittatum* Herbaceous Vegetation

39° 41' 0.00" N, 76° 45' 59.41" W

Alesia Swamp

COUNTY

Carroll County, Maryland

USGS QUAD

Lineboro, MD

PRIMARY REASON FOR SELECTION

Alesia Swamp contains a high quality occurrence and one of Maryland's best examples of the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high, and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

Alesia Swamp is a privately owned site. It contains a circumneutral seepage wetland complex, a ground water influenced wetland with a pH range from 5.5 to 7.5, approximately seven acres in size. This site occurs in a very shallow swale among rolling hills in the Northern Piedmont. The hydrologic source of this wetland complex is multifarious and originates from many points of diffuse groundwater seepage. The soils at this site are primarily hydric muck in the herbaceous wetlands and hydric sandy loam in the shrublands. Topographically up slope, both to the east and west, lies a mosaic of pasture, cropland, and farm buildings.

Two distinct wetland community types occur adjacent to each other at this site. The wettest depressions of this site (approximately five acres) are habitat to the *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation and the dryer toeslopes and hummocks (approximately two acre) are inhabited by the *Alnus serrulata* - *Viburnum dentatum* / *Carex stricta* - *Symplocarpus foetidus* Shrubland.

This site suffers potential threats from non-native plant invasion and deer browse. No structures are within 100 meters of the wetlands. The shallow swale valley in which this site occurs continues for many acres, but is developed as cropland, pasture, and farm ponds. A gravel road bisects the wetland to the south and has fragmented it from what was once an extensive (over 50 acres) wetland complex.

At least eight plant species and one animal considered rare, threatened, or endangered in Maryland are known to occur at Alesia Swamp.

COMMUNITY DESCRIPTION

Alesia Swamp was chosen as a reference site primarily because it is habitat to one of the best examples of *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation known in Maryland. This wetland community type is rare in Maryland and preliminarily ranked as S2, a designation meaning that between 5 and 20 occurrences are known in the state. This is a type location for this community; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is very typical of that defined in the Vegetation Description for *Carex stricta* - *Impatiens capensis* - *Onoclea sensibilis* Herbaceous Vegetation. See Vegetation Description section of this report for a precise definition of this community type. It differs from the typical example of this community type in that it has a greater dominance of *Thelypteris palustris* and *Onoclea sensibilis* throughout the wetland. Also, the vegetation is 1.5 - 2 meters in height, rather than the typical 1 - 1.5 meters.

MANAGEMENT COMMENTS / MONITORING NEEDS

The *Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation can support at least 16 state rare, threatened, or endangered species, and this site is known to contain eight of these. This community type is also habitat for a state rare animal. More inventory data are needed to assess this community's habitat value, but these communities appear to be utilized by a diverse group of mammals, herptiles, avefauna, odonates, lepidoptera, and other insects.

The populations of the rare species at this site should be monitored annually. Active stewardship should be conducted to avoid woody plant succession and maintain the herbaceous conditions at this site. Mowing every 3-5 years or pulling of tree seedlings should be conducted. These activities should be conducted at a time of year that would be least detrimental to rare species at this site (i.e. late autumn - early winter). Due to neighboring land development, the water table may be lowering over time. Efforts should be made to annually monitor the hydrology of this site.

PROTECTION COMMENTS

Alesia Swamp is privately owned. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Efforts should be made for formal protection through conservation easements or informing landowner of significant qualities at this site.

This site is designated a Nontidal Wetland of Special State Concern by the Maryland Department of Natural Resources (See Appendix 3 for definitions of designations).

OCCURRENCE RANK

The *Carex stricta - Impatiens capensis - Onoclea sensibilis* Herbaceous Vegetation at Alesia Swamp is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Alesia Swamp is owned privately, but registered with the Maryland / D.C. Chapter of The Nature Conservancy.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Land is privately owned and managed.

BOUNDARY JUSTIFICATION

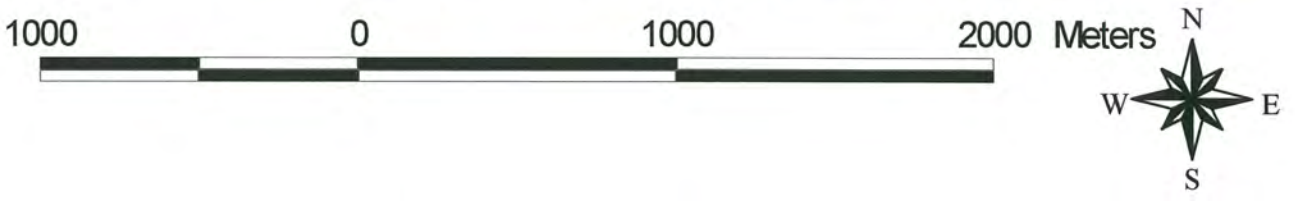
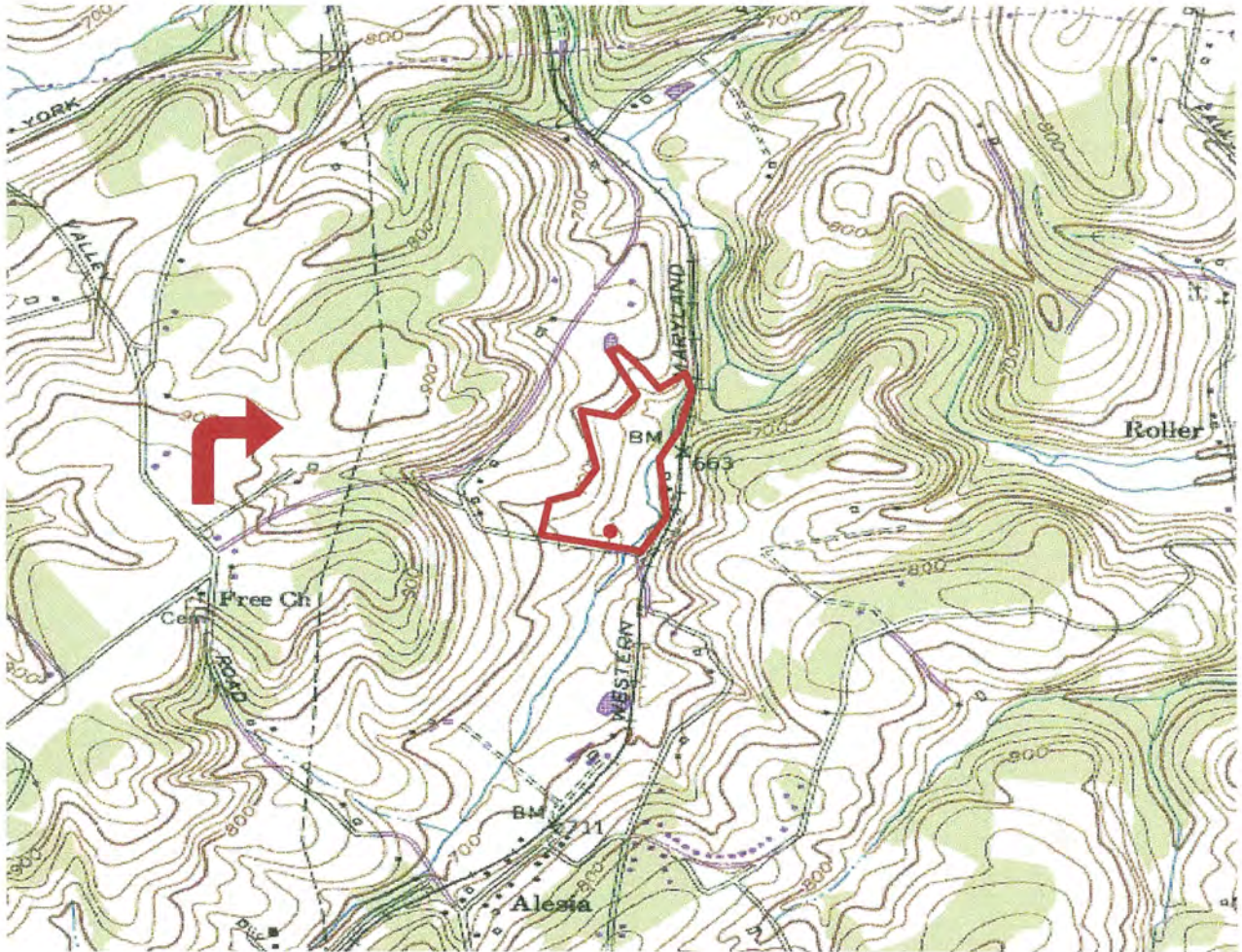
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 41' 38.89" N, 76° 49' 29.38" W

Carex stricta - Impatiens capensis - Onoclea sensibilis Herbaceous Vegetation

Alesia Swamp; Carroll County, Maryland USGS Quadrangle: Lineboro



Carex stricta - *Impatiens capensis* - *Onoclea sensibilis*
Herbaceous Vegetation

39° 41' 38.89" N, 76° 49' 29.38" W
65

Soldier's Delight

COUNTY

Baltimore County, Maryland

USGS QUAD

Reisterstown, MD

PRIMARY REASON FOR SELECTION

Soldier's Delight contains a high quality occurrence and one of Maryland's best examples of the *Deschampsia cespitosa - Eieocharis tenuis - Panicum clandestinum* Herbaceous Vegetation.

The term high quality occurrence is defined by of four factors: 1) the site includes a very representative example of the vegetation type as defined in the Maryland Vegetation Classification, 2) the occurrence is in good to excellent condition – the habitat supporting this community type is less degraded than other known occurrences, 3) the occurrence has a good to excellent viability – long term prospects for the continued existence of this occurrence are high, and 4) the occurrence has good to excellent defensibility – this occurrence can be protected from extrinsic human factors.

SITE DESCRIPTION

Soldier's Delight is found within the state owned Soldier's Delight Natural Environmental Area. It contains three occurrences of circumneutral seepage wetlands, each approximately three acres in size. These are ground water influenced wetlands with a pH range from 5.5 to 7.5. This site is a 2000 acre serpentine barren complex in the Northern Piedmont, with three intermitant streams occuring in shallow valleys. Serpentine refers to a type of bedrock that is high in Iron, Magnesium, Nickle, and Chromium. The heavy metals in this bedrock create harsh growing conditions for plants, and habitat for rare serpentine tolerant species. These wetlands occur along Chimney Branch and Red Run, on the shallow toeslopes of their valleys. These wetlands have perennial groundwater seepage from several sources that form shallow streamside seepage slopes. The soils are primarily hydric sandy loam.

The *Deschampsia cespitosa - Eieocharis tenuis - Panicum clandestinum* Herbaceous Vegetation at this site occurs topographically downslope from serpentine barrens dominated by *Schiachyrium scoparium - Sporobolis (compositus, heterolepis)* Herbaceous Vegetation or serpentine forest dominated by either *Quercus stellata - Quercus marilandica* Forest or *Pinus virginiana - Quercus marilandica* Forest.

This site suffers potential threats from non-native plant invasion and trampling by park users. The history of this site includes mining, grazing, and driving of off road vehicles. There are remnant ATV tracks in the wetlands as well as evidence of past mining.

At least 10 plant species considered rare, threatened or endangered in Maryland are known to occur within these wetlands at Soldier's Delight.

The wetlands at this site are designated Nontidal Wetlands of Special State Concern by the Maryland Department of Natural Resources (See Appendix 3 for definitions of designations).

COMMUNITY DESCRIPTION

Soldier's Delight was chosen as a reference site primarily because it is habitat to one of the best examples of *Deschampsia cespitosa - Eleocharis tenuis - Panicum clandestinum* Herbaceous Vegetation. This wetland community type is rare in Maryland and ranked S1, a designation meaning that between 1 and 5 occurrences are known in the state. This site is a type location; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is very typical of that defined in the Vegetation Description for *Deschampsia cespitosa - Elyocharis tenuis - Panicum clandestinum* Herbaceous Vegetation. See Vegetation Description section of this report for a precise definition of this community type. This occurrence differs from the typical example in that it has higher prevalence of *Sorghastrum nutans* and lower prevalence of *Polygonum sagittatum* than expected.

MANAGEMENT COMMENTS / MONITORING NEEDS

The *Deschampsia cespitosa - Elyocharis tenuis - Panicum clandestinum* Herbaceous Vegetation at Soldier's Delight is known to be habitat for at least 10 rare, threatened, or endangered plant species. More inventory data are needed to assess this community's habitat value, but the *Deschampsia cespitosa - Elyocharis tenuis - Panicum clandestinum* Herbaceous Vegetation appears to be utilized by a diverse group of mammals, herptiles, avifauna, odonates, lepidoptera and other insects.

The populations of the rare species at this site should be monitored annually. Access in the form of new trail construction at this site should be limited or well planned because this wetland type could be severely impacted by trampling and soil compaction by visitors. Woody plant succession may be occurring at this site and may change the community composition and structure through time. Efforts should be made to monitor these processes. Due to neighboring land development, the water table of this site may be lowering over time. Efforts should be made to annually monitor the hydrologic changes of this site.

PROTECTION COMMENTS

Soldier's Delight is owned and managed by the State of Maryland, thus receiving some conservation attention. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Visitation and further research at this site should be restricted and require a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

The wetlands at this site are designated Geographic Areas of Particular Concern by the Coastal Zone Management Act (See Appendix 3 for definitions of designations).

OCCURRENCE RANK

The *Deschampsia cespitosa - Elyocharis tenuis - Panicum clandestinum* Herbaceous Vegetation at Soldier's Delight is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Soldier's Delight is owned by the State of Maryland and is managed by Soldier's Delight Natural Environmental Area.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural resources for initial communication.

LAND MANAGER

Park managed by Jennifer Cline, Park Naturalist, Soldier's Delight Natural Environmental Area.

BOUNDARY JUSTIFICATION

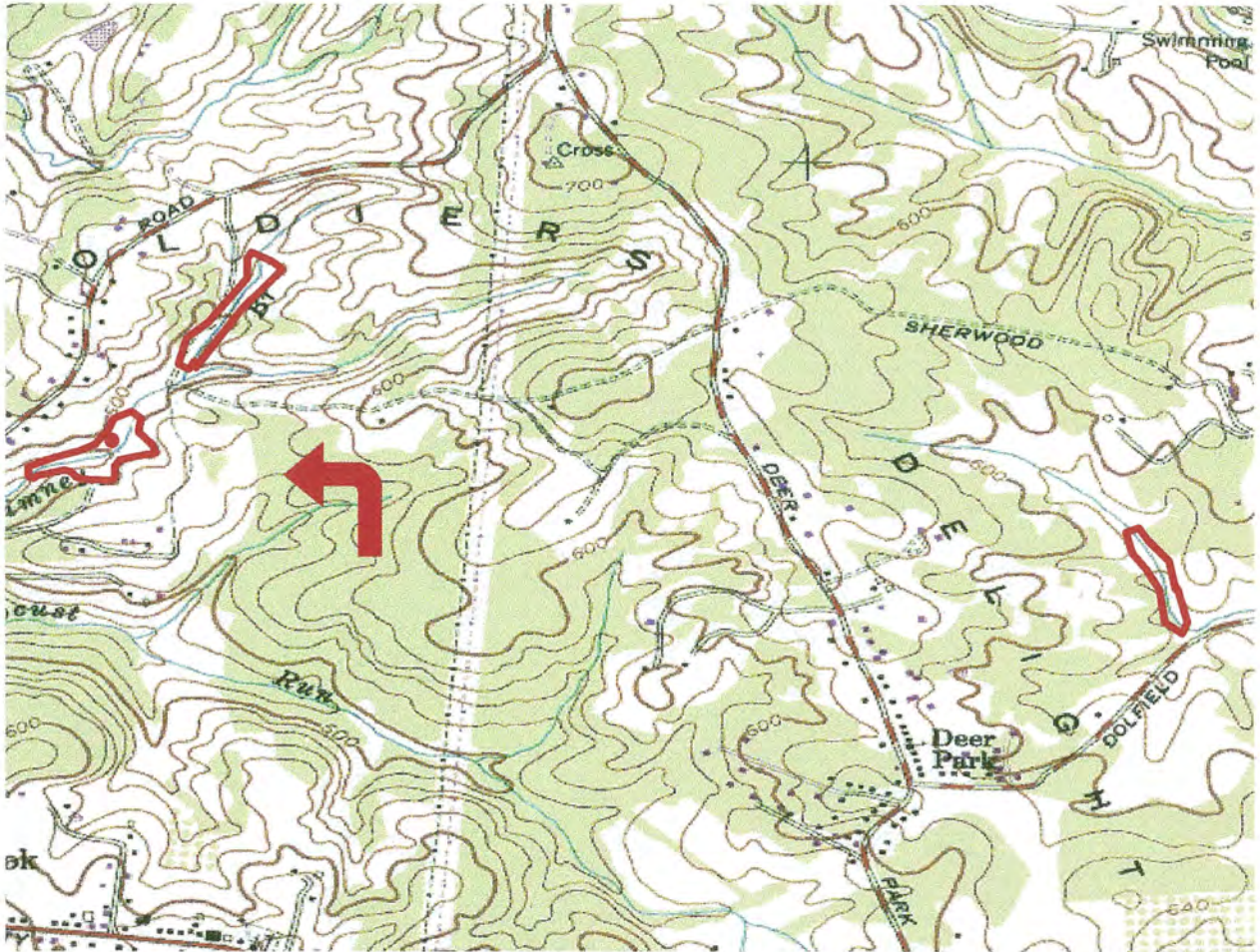
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 24' 30.80" N, 76° 51' 10.38" W

Deschampsia cespitosa - Elyocharis tenuis - Panicum clandestinum Herbaceous Vegetation

Soldier's Delight Wetlands; Baltimore County, Maryland USGS Quadrangle: Reisterstown



Deschampsia cespitosa - *Eleocharis tenuis* - *Panicum clandestinum* Herbaceous Vegetation

39° 24' 30.80" N, 76° 51' 10.38" W

Owen's Creek Headwaters

COUNTY

Frederick County, Maryland

USGS QUAD

Blue Ridge Summit, MD

PRIMARY REASON FOR SELECTION

Owen's Creek Headwaters contains a very representative example of the *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation.

SITE DESCRIPTION

This site is adjacent to the site Owen's Creek Swamp, found within the Biological Conservation Database, and is found within Catoctin Mountain National Park. Owen's Creek Headwaters is a very large circumneutral seepage wetland complex, a ground water influenced wetland with a pH range from 5.5 to 7.5, approximately 50 acres in size. This site occurs in the Blue Ridge physiographic province, at the headwaters and along toeslopes adjacent to Owen's Creek. This wetland complex has perennial diffuse groundwater seepage from many sources and forms braided streams that flows down a shallow gradient slope. The soil is primarily hydric muck and hydric sandy loam that overlies greenstone cobble. Greenstone refers to a type of granitic gneiss metabasalt that is part of the Catoctin metavolcanic series. It is a dense hard green rock in which most of the original minerals have been altered and often generates circumneutral conditions. The large wetland complex is surrounded by mixed upland forest dominated by *Quercus rubra*, *Quercus alba*, *Liriodendron tulipifera* and *Fagus grandifolia*.

This site is dominated by forested seepage wetlands that contain examples of the *Acer rubrum* - *Fraxinus pennsylvanica* - *Betula (alleghaniensis, lenta)* / *Ilex verticillata* / *Symplocarpus foetidus* Forest. Large forest canopy gaps, both natural and anthropogenic in origin, occur in a mosaic throughout the wetlands and contain examples of the *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation.

This site suffers from potential threats from invasion of non-native plants, excessive deer browse, and trampling from park patrons. Hiking trails and historic farm building foundations are within 100 meters of the northern section of the wetland. A paved park road runs along the entire western edge of the wetland complex. Another paved park road bisects the wetland and fragments the upper headwaters from the remainder of the wetland.

At least five plant species considered rare, threatened or endangered in Maryland are known to occur at Owen's Creek Headwaters.

COMMUNITY DESCRIPTION

Owen's Creek Headwaters was chosen as a reference site primarily because it is habitat to one of the best examples of *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation known in Maryland. This wetland community type is ranked S5 because it is a successional community that is favored by current land use practices in its range and has well over 100 suspected occurrences in the state. This site is a type location for this community; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification.

This occurrence is typical of that defined in the Vegetation Description for *Carex gynandra* - *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* Herbaceous Vegetation. This example differs from the average occurrence in that it contains far fewer non-native invasive plants and resembles what may be a natural early stage in the Blue Ridge circumneutral seepage wetland successional trajectory. See Vegetation Description section of this report for a precise definition of this community type.

MANAGEMENT COMMENTS / MONITORING NEEDS

This site is known to support at least five state rare, threatened, or endangered plant species. More inventory data are needed to assess this community's habitat value, but the *Carex gynandra* - *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* Herbaceous Vegetation appears to be utilized by a diverse group of mammals, herptiles, avifauna, odonates, lepidoptera, and other insects.

The populations of rare species should be annually monitored at this site. Access in the form of new trail construction at this site should be limited or well planned because this wetland type could be severely impacted by trampling and soil compaction by visitors. Due to neighboring land development, the water table of this site may be lowering over time. Efforts should be made to annually monitor the hydrologic changes of this site.

PROTECTION COMMENTS

Owen's Creek Headwaters is owned and managed by the National Park Service, thus receiving some conservation attention. The Maryland Department of Natural Resources is aware of the rare species and significant plant communities at this site. Visitation and further research at this site should be restricted and require a detailed proposal and approval by the Resource Manager of the Catoctin Mountain National Park.

The adjacent Owen's Creek Swamp is designated a Nontidal Wetland of Special State Concern by the Maryland Department of Natural Resources (See Appendix 3 for definitions of designations).

OCCURRENCE RANK

The *Cinna arundinacea* - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation at Owen's Creek Headwaters is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this successional / disturbance community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Owen's Creek Headwaters is owned by the National Park Service and is managed by Catoctin Mountain National Park.

BEST INFORMATION SOURCE

Contact Community Ecologists at the Wildlife and Heritage Division, Maryland Department of Natural Resources for initial communication.

LAND MANAGER

Park managed by Mr. James Voigt, Resource Manager, Catoctin Mountain National Park.

BOUNDARY JUSTIFICATION

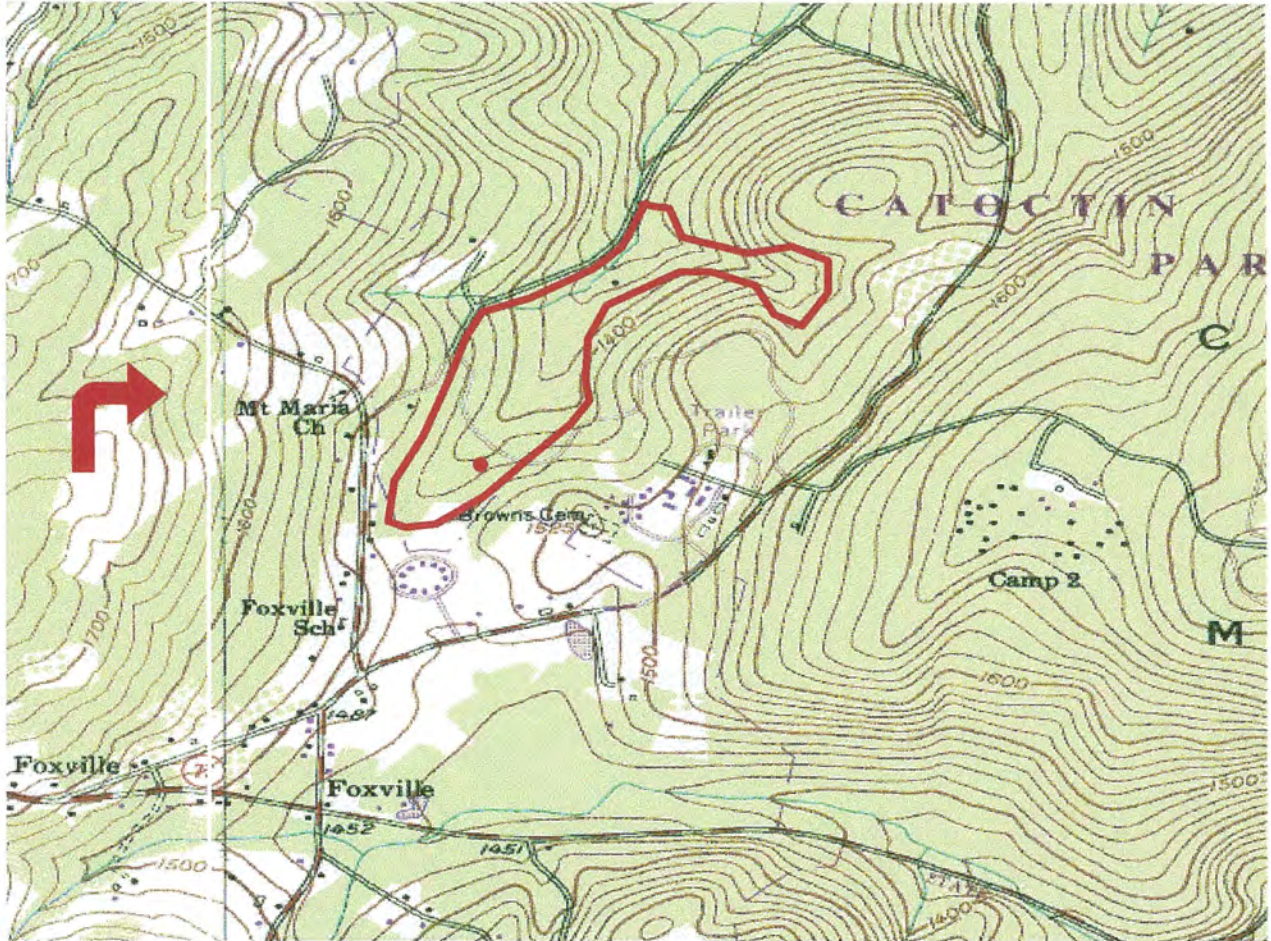
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE COORDINATES

39° 38' 45.05" N, 77° 29' 33.37" W

Cinna arundinacea - *Glyceria melicaria* - *Impatiens capensis* - *Microstegium vimineum* Herbaceous Vegetation

Owen's Creek Headwaters; Frederick County, Maryland USGS Quadrangle: Blue Ridge Summit



Cinna arundinacea - *Glyceria melicaria* *Impatiens capensis* -
Microstegium vimineum Herbaceous Vegetation

39° 38' 45.05" N, 77° 29' 33.37" W

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APPENDIX 1

The following pages are sample field forms used by The Nature Conservancy and the network of Natural Heritage Programs for collecting quantitative data on the survey of natural communities.

PROTECTION URGENCY: (circle one)

U1 immediately threatened
 U2 threat expected within 5 yrs.
 U3 threatened, but not in next 5 yrs.
 U4 no threats imminent
 U5 land protection complete

MANAGEMENT URGENCY: (circle one)

M1 management needed this year
 M2 management needed within 5 yrs. to prevent loss of EOs
 M3 management needed within 5 yrs. to maintain current EO quality
 M4 management may be needed in future
 M5 no management needed

Protection Urgency Comments (& date):

Management Urgency Comments (& date):

TOPOGRAPHIC BASE MAP:

Attach a photocopy of the topographic map and/or aerial photograph showing the site. Complete steps 1 to 3 below.

Completed?

- yes no 1. Indicate precise element locations and/or boundaries (use solid lines). Identify each element with the codes you used on page 1.
- yes no 2. If knowledge of the site permits, draw primary (+ + +) and secondary (|| || ||) ecological site boundaries. Within the primary site boundary include all known element occurrences and lands necessary for the immediate protection of the EOs. The secondary boundary (or buffer) includes lands intended to mitigate future unforeseen negative impacts to the EOs (e.g. to control erosion, trespass related damage, natural succession, exotic species, urban sprawl). Use (+ || + ||) where primary and secondary boundaries coincide. Below, provide a brief written justification of the boundary locations.

Boundary Justification:

- yes no 3. If known, indicate tract ownership boundaries, using dashed lines (- - - -).

Tract Ownership or Managed Area Name (names, addresses, phone #):

Land Use Comments:

Describe current and past land use, improvements, and structures, and possible stewardship implications.

Potential Hazards:

Describe any potential hazards, both natural (e.g. cliffs, caves, venomous snakes, etc.), and of human origin (e.g. mine shafts, old wells, dangerous structures). Prescribe appropriate precautions.

Exotic Flora/Fauna Comments:

List problem exotic species, describe their effects on the EOs, and, if possible, prescribe control methods.

Off-site Considerations:

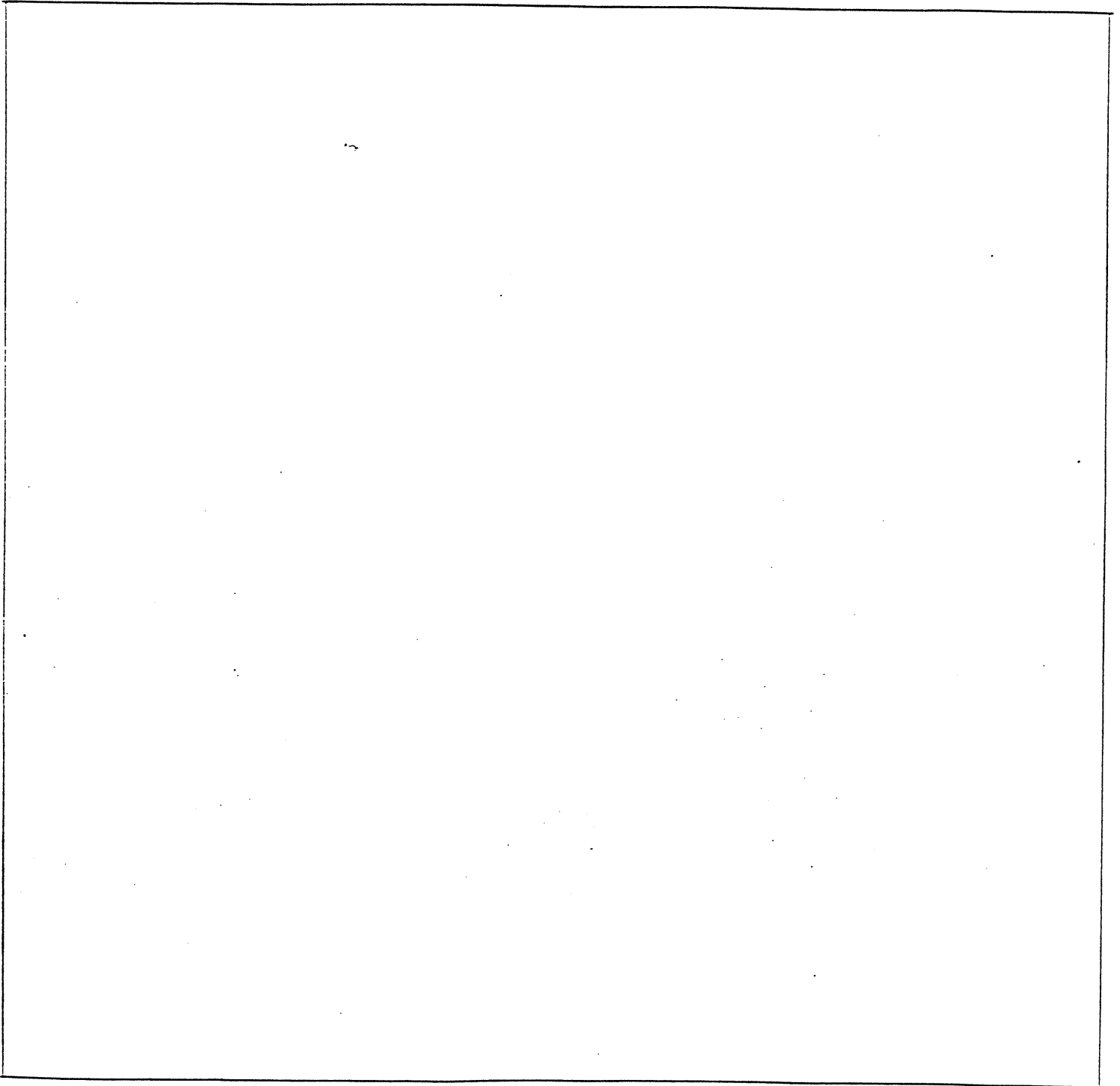
Describe off-site land uses (e.g. farming, grazing, mining, urban development, stream perturbations) and how these uses might affect the EOs on the site and their future management.

Site and Element Management Needs:

Summarize the expected management needs for the site and its EOs.

DETAILED SKETCH MAP:

The purpose of this map is to show fine details of the site which are not shown on the topographic base map. This map can be used to show: (1) EO locations, (2) study plots or marked individuals, (3) natural landmarks, and (4) disturbance features, such as structures, dumps, trails, etc. Include scale and indicate north.



Identifiers

STATE: SPRING, 1993

1. Site name: _____

2. Survey site name: _____

3. Quad name(s): _____

4. Quad code(s): _____

5. County name(s): _____

6. County code(s): _____

7. Town (LOCAL JURIS): _____

8. Directions: _____

9. Source code: _____

10. Survey date: _____ . _____ . _____

11. State: _____

12. Surveyors: _____

Topography

13. Transect _____

4. Reconnaissance diagram: _____ Scale: _____

Vegetation / Habitat

5. Observation point 1 _____	Observation point 2 _____	Observation point 3 _____
6. Community name: _____	Community name: _____	Community name: _____
7. Additional data: form 2 _____ form 3 _____	Additional data: form 2 _____ form 3 _____	Additional data: form 2 _____ form 3 _____
8. General description (physiognomy, har./dom. spp. of tree, shrub, herb, cyophyte layers)	General description:	General description:

Reconnaissance Diagram: Scale:

Observation Point 4	Observation Point 5	Observation Point 6	Observation Point 7
Community name: _____ Additional data: form 2 ___ form 3 ___ General Description:	Community name: _____ Additional data: form 2 ___ form 3 ___ General Description:	Community name: _____ Additional data: form 2 ___ form 3 ___ General Description:	Community name: _____ Additional data: form 2 ___ form 3 ___ General Description:

31. Survey type: Qualitative Quantitative

32. Landform: _____

33. Geology comments: _____

34. Soil type: _____

35. Hydrological influence: _____

36. System: Terrestrial Palustrine Estuarine 37. Physiognomic type: _____

38. Strata/life form: height % cover most abundant / characteristic species

Emergent tree			
Tree canopy			
Tree sub-canopy			
Tall shrub			
Short shrub			
Herbaceous			
Non-vascular			
Epiphyte / liana			

Element occurrence ranking information

39. Size, relative to other occurrences (state whether full extent of occurrence is known): _____

40. Age, successional stage: _____

41. Quality Rank: _____

42. Known land use history: _____

43. Inferred land use history: _____

44. Other anthropogenic or unnatural disturbance: _____

45. Pesticides (known or suspected): _____

46. Condition rank: _____

47. Presence of invasives: _____

48. Alterations in natural processes: _____

49. Integrity / fragmentation of community: _____

50. Viability Rank: _____

51. Threats (on-site): _____

52. Threats (off-site): _____

53. Defensibility rank: _____

54. EO Rank comments: _____

55. (Overall) Element Occurrence Rank: _____

APPENDIX 2

The following are definitions of the state and global rankings of rare species utilized in this report. Originally developed and instituted by The Nature Conservancy, an international conservation organization, the global and state ranking system is used by all 50 state Natural Heritage Programs and numerous Conservation Data Centers in other countries in this hemisphere. Because they are assigned based upon standard criteria, the ranks can be used to assess the range-wide status of a species as well as the status within portions of the species' range. The primary criterion used to define these ranks are the number of known distinct occurrences with consideration given to the total number of individuals at each locality. Additional factors considered include the current level of protection, the types and degree of threats, ecological vulnerability, and population trends. Global and state ranks are used in combination to set inventory, protection, and management priorities for species both at the state as well as regional level.

GLOBAL RANK

- G1 Highly globally rare. Critically imperiled globally because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 Globally rare. Imperiled globally because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 Either very rare and local throughout its range or distributed locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; typically with 21 to 100 estimated occurrences.
- G4 Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G5 Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- GH No known extant occurrences (i.e., formerly part of the established biota, with the expectation that it may be rediscovered).
- GU Possibly in peril range-wide, but its status is uncertain; more information is needed.

- GX** Believed to be extinct throughout its range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G?** The species has not yet been ranked.
- _Q** Species containing a "Q" in the rank indicates that the taxon is of questionable or uncertain taxonomic standing (i.e., some taxonomists regard it as a full species, while others treat it at an infraspecific level).
- _T** Ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

STATE RANK

- S1** Highly State rare. Critically imperiled in Maryland because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres in the State) or because of some factor(s) making it especially vulnerable to extirpation. Species with this rank are actively tracked by the Natural Heritage Program.
- S2** State rare. Imperiled in Maryland because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the Natural Heritage Program.
- S3** Watch List. Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Species with this rank are not actively tracked by the Natural Heritage Program.
- S3.1** A "Watch List" species that is actively tracked by the Natural Heritage Program because of the global significance of Maryland occurrences. For instance, a G3 S3 species is globally rare to uncommon, and although it may not be currently threatened with extirpation in Maryland, its occurrences in Maryland may be critical to the long term security of the species. Therefore, its status in the State is being monitored.
- S4** Apparently secure in Maryland with typically more than 100 occurrences in the State or may have fewer occurrences if they contain large numbers of individuals. It is apparently secure under present conditions, although it may be restricted to only a portion of the State.

- S5 Demonstrably secure in Maryland under present conditions.
- SA Accidental or a vagrant in Maryland.
- SE Established, but not native to Maryland; it may be native elsewhere in North America.
- SH Historically known from Maryland, but not verified for an extended period (usually 20 or more years), with the expectation that it may be rediscovered.
- SP Potentially occurring in Maryland or likely to have occurred in Maryland (but without persuasive documentation).
- SR Reported from Maryland, but without persuasive documentation that would provide a basis for either accepting or rejecting the report (e.g., no voucher specimen exists).
- SRF Reported falsely (in error) from Maryland, and the error may persist in the literature.
- SU Possibly rare in Maryland, but of uncertain status for reasons including lack of historical records, low search effort, cryptic nature of the species, or concerns that the species may not be native to the State. Uncertainty spans a range of 4 or 5 ranks as defined above.
- SX Believed to be extirpated in Maryland with virtually no chance of rediscovery.
- S? The species has not yet been ranked.
- _B This species is a migrant and the rank refers only to the breeding status of the species. Such a migrant may have a different rarity rank for non-breeding populations.

FEDERAL STATUS

This is the status of a species as determined by the U.S. Fish and Wildlife Service's Office of Endangered Species, in accordance with the Endangered Species Act. Definitions for the following categories have been modified from 50 CRF 17.

- LE Taxa listed as endangered; in danger of extinction throughout all or a significant portion of their range.
- LT Taxa listed as threatened; likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
- PE Taxa proposed to be listed as endangered.

- PT Taxa proposed to be listed as threatened.
- C Candidate taxa for listing for which the Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.

STATE STATUS

This is the status of a species as determined by the Maryland Department of Natural Resources, in accordance with the Nongame and Endangered Species Conservation Act. Definitions for the following categories have been taken from Code of Maryland Regulations (COMAR) 08.03.08.

- E Endangered; a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.
- I In Need of Conservation; an animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.
- T Threatened; a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.
- X Endangered Extirpated; a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.
- * A qualifier denoting the species is listed in a limited geographic area only.

APPENDIX 3

The following are definitions of official wetland designations used in this report.

Non-tidal Wetlands of Special State Concern

Nontidal wetlands of special state concern (NTWSSC) are defined in the Code of Maryland Regulations (26.23.06) as wetlands that meet the following criteria:

- a) Provide habitat of ecologically important buffers for the habitat of plant or animal species that are:
 - I) Listed as endangered or threatened by the U. S. Fish and Wildlife Service,
 - ii) Listed as endangered or threatened, or species listed as in need of conservation by the Maryland Department of Natural Resources or,
 - iii) Considered to be a candidate for listing by the U. S. Fish and Wildlife Service, or considered to be locally unusual or rare by the Maryland Department of Natural Resources or,
- b) Are unique natural areas or contain ecologically unusual natural communities.

Wetlands that are defined as nontidal wetlands of special state concern have restrictions placed on the wetlands and an expanded 100 foot buffer for the following activities: excavating, dredging, changing drainage patterns, disturbing water level or water table, filling, grading, and removing vegetation. This regulation exempts agriculture and forestry but requires the use of “best management practices”.

Geographic Areas of Particular Concern

The Federal Coastal Zone Management Act requires the designation of Geographic Areas of Particular Concern. Coastal states are required to inventory and develop management measures to protect the integrity of “areas of unique, scarce, fragile, or vulnerable natural habitats” and “areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and endangered species, and the various trophic levels in the food web critical to their well being”. Although this does not provide any regulatory protection mechanisms, it is a directive to the state to protect these areas under existing regulations.