
**IDENTIFICATION AND PROTECTION OF REFERENCE
WETLAND NATURAL COMMUNITIES IN MARYLAND:
Delmarva Bay Wetlands**

Report Submitted To:

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Report Submitted By:

M. Ashton Berdine

and

Andrew M.A. Gould

for

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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. Vegetation 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 vegetation 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 vegetation communities, it is assumed that these conditions determine the combination of species within the concept (Thompson, 1996). Often, the vegetation community descriptions are necessarily vague, recognizing that these associations intergrade at ecotones and that boundaries are artificial constructs necessary for conservation. Vegetation 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).

Vegetation 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 vegetation 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 vegetation 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, vegetation communities, with their associated biological, chemical, and physical processes, drive the biogeochemical processes of the earth (Naeem et al., 1994). Vegetation 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, vegetation 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 vegetation 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 vegetation 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 Delmarva Bays. Prior to this project, very little was known about the species composition, distribution, and abundance of the communities found in these Maryland Delmarva Bays. Delmarva Bays serve valuable ecosystem functions, furnish habitat to numerous taxonomic groups, are increasingly threatened, and are often habitat for numerous rare, threatened, and endangered plant and animal species. In general, Delmarva Bays are threatened by both traditional agricultural land use, as well as residential and commercial development.

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 all Delmarva Bays, where these communities are poorly understood and severely threatened. The pressure imposed by the sprawling development has heightened the need for study of relatively pristine examples of these community types.

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 vegetation communities within Maryland's Delmarva Bays. This was accomplished by developing a vegetation 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 coastal plain depressional wetlands in the Northeastern United States.

The information generated by this project will simplify the regulatory review of these depressional 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 cooperators to determine baseline levels of parameters within reference wetlands for long term modeling and conservation.

The end products of this project are: a detailed vegetation community classification and description and reference site descriptions for long term monitoring. These products will be utilized by the 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 a Delmarva Bay was based on previous field experience, consultation with regional ecologists, and literature surveys. For the purposes of this study, a Delmarva Bay is defined as a coastal plain depressional wetland occurring on Maryland's Delmarva peninsula.

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. All of these Delmarva Bays were already known to the Maryland Wildlife and Heritage Division, and were used in determining the definition. Searching thematic spatial data maps (e.g. soils, geology, topographic, etc.) for signatures associated with occurrences of these types of wetlands 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 depressional wetlands. At the completion of the Landscape Analysis phase of the project, over 35 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 1995 to May 1995.

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 the Maryland's Delmarva Peninsula, 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 the Delmarva Peninsula in 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.

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 1995 field season. 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 vegetation 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 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 July 1995 to October 1995.

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. Then various further reductions were derived by separately removing weedy species, poor quality sites, and herbs. 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 vegetation community types. This resulted in a meaningful classification of associations, which was cross-walked with existing vegetation 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.

Detailed descriptions of each vegetation 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. 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 1995 to July 1996.

RESULTS

Of the over 35 sites initially identified as potential Delmarva Bays to visit, 23 were visited and quantitative data was collected from 95 plots.

Through discretion of project ecologists, consultation with regional ecologists, and comparison with the classifications of neighboring states with similar vegetation community types, the final interpretation was based on the analyses of the data primarily split by dominant species.

Community Descriptions

The interpretation of ecological statistics was used as a tool to clarify relationships of field observations. All things considered, the classification of depressional wetland vegetation ascertained eight community types on the Delmarva Peninsula in Maryland. These types are:

Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis
Herbaceous Vegetation (6825)

Panicum hemitomon / Cephalanthus occidentalis Herbaceous Vegetation (6826)

Carex striata / Cephalanthus occidentalis Herbaceous Vegetation (6827)

Panicum longifolium - Oldenlandia uniflora - Polygonum (amphibium, hydropiperoides) / Sphagnum sp. / Cephalanthus occidentalis Herbaceous Vegetation (6828)

Erianthus giganteus - Panicum (spretum, verrucosum) Herbaceous Vegetation (6829)

Leersia hexandra Herbaceous Vegetation (6830)

Woodwardia virginica Herbaceous Vegetation (6831)

Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia Forest (6832)

The complete descriptions of these vegetation communities can be found in the Community Description section of this report.

Reference Sites

One site containing an exemplary example of each of the eight Delmarva Bay community types was identified, mapped, and described. The order of these sites in this report correspond to the order in which its vegetation community is described. These sites are: Dorchester Pond, Pristine Pines Preserve, Baltimore Corner Preserve, Golt's Pond, Brookview Ponds, Dividing Creek Pond, and Jackson Lane Preserve. 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, over 35 sites that were potential habitat for Delmarva Bay communities were identified. The most productive method used to determine these sites was interviews with knowledgeable individuals. Aerial photos and NWI maps were used sparingly; generally only as a secondary source of information once perspective sites were identified.

During the field surveys for this project, 23 of the over 35 potential sites were visited for preliminary assessment. The remaining sites were not visited due to several factors. The leading cause of most of the unvisited sites was the denial of site visit by landowners. 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 23 sites that were visited, 95 community plots were surveyed. The diversity of vegetation community types within the Delmarva Bays was as 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 10 and 15 plots for each community type are best for an accurate classification. Since this classification has eight community types, the 95 plots were ample for their description.

Classification

This project yielded eight community types found within the depressional wetlands of the Delmarva Peninsula in Maryland. 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 factors that determined the classification of these vegetation types are underlying soil texture (sand vs clay) and length of inundation during the growing season (ie. flooding regime / soil moisture).

Wetland Conditions

Although high quality examples of each of these eight community types exist on Maryland's Delmarva Peninsula, most of these bays suffer from significant abiotic and biotic threats. There are heavy impacts on these Delmarva Bays from suspected lowering ground water, causing an increase in woody plant invasion and succession of historically herbaceous types to shrub and forested types. Many examples of the forested wetland types have been logged, either historically or within the last 80 years. 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). 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 palustrine wetlands in Maryland.

The landscape of 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 Delmarva Bays in Maryland. These wetlands are often 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 vegetation communities alone may not be enough to protect the communities themselves.

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 vegetation communities. Vegetation

communities can play a much broader role by linking habitat and process information to specific species requirements (WPC, 1998). Potentially, the protection of vegetation 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 vegetation 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 vegetation 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 Delmarva Bay wetland communities, 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 wetland 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 vegetation 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 vegetation 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 Nature Conservancy. The data will be compiled with the data from other states 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 depressional wetlands by other wetland researchers. 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 Delmarva Bay wetlands of Maryland 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 depressional 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, hydrogeo-morphology, and nutrient cycles in these bays would aid in the understanding of the functions of these wetlands.

Community Descriptions

***Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis /
Cephalanthus occidentalis* Herbaceous Vegetation**

COMMON NAME	Panic grass - Meadow-beauty - Fimbristylis / Buttonbush Herbaceous Vegetation
ELEMENT CODE	6825
NATURAL COMMUNITY	Delmarva Bay Low Grassland / Sparse Shrubland
NATIONAL SYNONYM	<ul style="list-style-type: none"> ● <i>Cephalanthus occidentalis</i> / <i>Panicum verrucosum</i> Shrubland (6242 in part) <i>Rhexia virginica</i> - <i>Panicum verrucosum</i> Herbaceous Vegetation (6264 in part) ● <i>Cephalanthus occidentalis</i> / <i>Glyceria</i> spp. - <i>Polygonum amphibium</i> Shrubland (6015 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	Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Panicum verrucosum</i> - <i>Rhexia virginica</i> / <i>Cephalanthus occidentalis</i> Seasonally Flooded Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation is most often positioned at or near the lowest elevation zone within the pond and is generally widespread across the interior of the pond or may occupy only a small “drawdown pocket.” This refers to a distinct low point in the pond, that is the last to desiccate during the summer season. Most often, this *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation resides at the center of a circular pond and will form an abrupt transition to other herbaceous or shrub community zones occupying a slightly higher elevation or may grade directly into surrounding forest (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is absent but inundation of up to 20 cm may occur during the growing season. Seasonal inundation and frequent flooding prevents woody species from establishing, except for the flood tolerant *Cephalanthus occidentalis*, which can have a wide range of prominence in this community.

Surface water is typically absent during the growing season, but the water table is very close to the surface (within 30 cm). Hydric soils are obvious with vegetation achieving almost total ground cover. Generally a thin organic horizon (0 to 5 cm) of dry muck or muck exists – but this layer does not contain coarse organic matter such as peat. Soils of the A horizon are very poorly drained black sandy loam, clay loam, or sandy clay loam and may contain mottling. Therefore, free water remains at or near the surface, even during dry seasons or dry years.

MOST ABUNDANT SPECIES

Strata

Tall shrub
Herbaceous

Species

Cephalanthus occidentalis
Panicum verrucosum, *Panicum spretum*, *Fimbristylis autumnalis*, *Rhexia virginica*,
Dulichium arundinaceum, *Scleria reticularis*, *Juncus repens*

ADDITIONAL CHARACTERISTIC SPECIES

Bidens discoidea, *Bidens frondosa*, *Oldenlandia uniflora*, *Ludwigia sphaerocarpa*, *Leersia oryzoides*, *Proserpinaca pectinata*, *Rhynchospora macrostachya*, *Eleocharis microcarpa*, *Scirpus cyperinus*

VEGETATION DESCRIPTION

This *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation is typical of many Delmarva Bays (see Environmental Description above) in Maryland, characterized by a dominance of low graminoids. Most obvious is the dominance of either *Panicum verrucosum* or *Panicum spretum* or a codominance of both. These graminoids typically comprise 50 to 100 percent of the total ground cover. Other herbaceous species may make up significant cover including *Fimbristylis autumnalis*, *Rhexia virginica*, *Dulichium arundinaceum*, *Scleria reticularis*, and *Juncus repens*. Also present, but usually with less prevalence, may be *Bidens discoidea*, *Bidens frondosa*, *Oldenlandia uniflora*, *Ludwigia sphaerocarpa*, *Leersia oryzoides*, *Proserpinaca pectinata*, *Rhynchospora macrostachya*, *Eleocharis microcarpa*, and *Scirpus cyperinus*.

Although this community is physiognomically herbaceous, shrubs of *Cephalanthus occidentalis* may be scattered throughout or form small patchy clumps. Canopy of *Cephalanthus occidentalis* in this community is usually less than 10 percent total cover, but may reach as high as 50 percent cover in some cases.

Slight variations of this community may include very dense cover of *Scleria reticularis*, *Juncus repens*, *Fimbristylis autumnalis*, or *Dulichium arundinaceum*. In these cases, though, *Panicum verrucosum* or *P. spretum* is also present at a much lower percent cover. During years with greater precipitation, this same community may be dominated by different species than observed during dryer years. For instance, at one known occurrence, late season with standing water has resulted in this same community being dominated by *Nymphaea odorata*, *Xyris smalliana*, and *Utricularia purpurea* with a preponderance of open water. Species variability is often subject to yearly precipitation.

This *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation often occurs in close association with other Delmarva Bay communities. This community may grade into the *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation. In ponds where community zonation occurs as concentric rings related to depth levels within the pond, this community may abruptly grade into the *Carex striata / Cephalanthus occidentalis* Herbaceous Vegetation or the *Panicum hemitomon / Cephalanthus occidentalis* Herbaceous Vegetation, both occupying a higher (drier) level within the pond. This community may also form an abrupt transition into a *Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest, the common forest type surrounding Delmarva Bays.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Lachnanthes caroliana*, *Paspalum dissectum*, *Fimbristylis purpusilla*, *Carex jorii*, *Scleria reticularis*, *Rhynchospora scirpoides*, *Eleocharis microcarpa*, *Eleocharis*

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

robbinsii, *Rhynchospora inundata*, *Utricularia purpurea*, *Xyris smalliana*, *Lobelia canbyi*, *Bidens discoidea*, *Hypericum adpressum*, *Oldenlandia uniflora* and *Cladium mariscoides*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination. According to the International Classification of Ecological Communities: Terrestrial Vegetation of United States (Anderson et al., 1998) a very similar community, the *Rhexia virginica* - *Panicum verrucosum* Herbaceous Vegetation, is known to occur in DE, MA, NH?, NJ, NY and RI? and the similar *Cephalanthus occidentalis* / *Panicum verrucosum* Shrubland is known to occur in DE, MA?, MD, RI?, and VA?

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S2

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for the limited number of known occurrences, regional threats from surrounding agricultural use and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Dorchester Pond, Dorchester County (38 33 24.32 N, 75 52 35.06 W) – precise coordinates for community occurrence at this site
- Bridgetown Pond, Caroline County (39 01 12.20 N, 75 52 2.97 W) – precise coordinates for site only and not necessarily for the community occurrence
- Jones Road Pond, Caroline County (39 03 14.24 N, 75 50 7.95 W) – precise coordinates for site only and not necessarily for the community occurrence
- Wade's Savanna, Dorchester County (38 33 10.87 N, 75 45 22.77 W) – precise coordinates for community occurrence at this site

COMMENTS

Occupying a similar low elevation, "niche" in the center of a pond may also be the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum sp.* / *Cephalanthus occidentalis* Herbaceous Vegetation. Spatially, though, this other herbaceous vegetation generally occupies a much smaller area (one to ten square meters) as compared to the *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation.

REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II. The National Vegetation Classification System: list of types. The Nature Conservancy, Arlington, Virginia, USA.
- McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.
- McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation**

COMMON NAME	Maiden-cane / Buttonbush Herbaceous Vegetation
ELEMENT CODE	6826
SYNONYM	Delmarva Bay Tall Grassland / Sparse Shrubland
NATIONAL SYNONYM	<i>Panicum hemitomon</i> - <i>Eleocharis equisetoides</i> - <i>Rhynchospora inundata</i> Herbaceous Vegetation (4127 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	Natural/Semi-natural Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Panicum hemitomon</i> Seasonally Flooded Temperate Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation is most often positioned at the outer zone or the higher elevations within the pond. If this herbaceous vegetation does not occur as a ring or concentric zone, it may occur as a larger, more widespread patch across the interior of the pond or as a small patch on the outer edges of the pond. Most often, this *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation occupies the earliest water recession zone; a vegetated zone of higher elevation within a pond where, consequently, surface water draws down (drys up) first. This community will form an abrupt transition to other herbaceous or shrub community zones occupying a slightly lower elevation or may grade directly into surrounding forest (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by very shallow water. Seasonal inundation and frequent flooding prevents woody species from establishing, except for the flood tolerant *Cephalanthus occidentalis*, which has a very low prominence in this community.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

Surface water is typically absent during the growing season, but the water table is very close to the surface (within 1 meter). Hydric soils are obvious with vegetation achieving almost total ground cover. Generally a thin organic horizon (0 to 5 cm) of dry muck or muck exists. Soils of the A horizon are moderately well drained to somewhat poorly drained loamy sand.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tall shrub	<i>Cephalanthus occidentalis</i>
Herbaceous	<i>Panicum hemitomon</i>
Non-vascular	<i>Sphagnum</i> sp.

ADDITIONAL CHARACTERISTIC SPECIES

Liquidambar styraciflua, *Acer rubrum*, and *Diospyros virginiana*

VEGETATION DESCRIPTION

This *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation is typical of many Delmarva Bays (see Environmental Description above) in Maryland, characterized by a dominance of tall graminoids. The community is often monotypic, dominated by 100 percent cover of *Panicum hemitomon*. Very few herbaceous species can compete, although individuals of *Cladium mariscoides*, *Dulichium arundinaceum*, *Panicum verrucosum*, *Panicum spretum*, *Carex striata*, *Juncus repens*, *Eleocharis quadrangulata*, *Echinochloa crus-galli*, and *Erechtites hieracifolia* may be interspersed. These additional herbs typically make up less than 2 percent total ground cover. Individual shrubs of *Cephalanthus occidentalis* may or may not be scattered throughout, comprising less than 5 percent total cover. This community may also have high ground cover (up to 90 percent) of *Sphagnum* sp. beneath the *Panicum hemitomon* canopy.

Although this community is physiognomically herbaceous, saplings of *Acer rubrum*, *Liquidambar styraciflua*, and *Diospyros virginiana*, may be frequent, but making up less than 25 percent total cover. These saplings usually occur in situations where this *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation is succeeding to a forest community type – probably due to dryer soils resulting from recent hydrological changes.

One variation to the typical structure (described above) has been observed where large trees of *Liquidambar styraciflua* are sparsely scattered throughout the community but comprising less than 10 percent total cover.

This *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation often occurs in close association with other Delmarva Bay communities. Most often this community occurs alongside *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation. The difference being that the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation generally occupies a dryer hydrologic regime and a higher elevation zone. This community is prone to woody succession, often with many tree saplings scattered throughout. Thus, the ecotone between this *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation and the surrounding upland *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest can be abrupt or include a broad successional zone of mixed tree saplings and *Panicum hemitomon*.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Panicum hemitomon*, *Lachnanthes caroliana*, *Scleria reticularis*, *Bidens discoidea*, and *Cladium mariscoides*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination. According to the International Classification of Ecological Communities: Terrestrial Vegetation of United States (Anderson et al., 1998) a very similar community, the *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation, occurs in FL?, GA?, NC, SC, and VA?

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

CONSERVATION RANK

S2

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for limited number of known occurrences, regional threats from surrounding agricultural use and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Dorchester Pond, Dorchester County (38 33 24.32 N, 75 52 35.06 W) – precise coordinates for site only and not necessarily for the community occurrence
- Pristine Pines, Queen Anne’s County (39 08 59.11 N, 75 48 45.28 W) – precise coordinates for site only and not necessarily for the community occurrence
- Kane Crossroads Pond, Queen Anne’s County (39 07 25.89 N, 75 49 8.32 W) – precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II. The National Vegetation Classification System: list of types. The Nature Conservancy, Arlington, Virginia, USA.
- McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.
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- Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.
- Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation**

COMMON NAME	Walter's Sedge / Buttonbush Herbaceous Vegetation
ELEMENT CODE	6827
SYNONYM	Delmarva Bay Tall Sedge Meadow / Sparse Shrubland
NATIONAL SYNONYM	<ul style="list-style-type: none"> ● <i>Carex striata</i> var. <i>striata</i> Herbaceous Vegetation [Provisional] (4120 in part) ● <i>Cephalanthus occidentalis</i> / <i>Carex striata</i> Shrubland (6221 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	Natural/Semi-natural Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Carex striata</i> Seasonally Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation is most prevalent at the outer zone or the higher elevations within the pond. If this herbaceous vegetation does not occur as a ring or concentric zone, it may occur as a larger, more widespread patch across the interior of the pond – this is the most common expression of this community. This community will most often form an abrupt transition into other herbaceous or shrub community zones occupying a slightly lower elevation or may grade directly into surrounding forest (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by shallow water. Seasonal inundation and frequent flooding prevents woody species from establishing, except for the flood tolerant *Cephalanthus occidentalis*, which has a wide range of prominence in this community.

Surface water is typically absent during the growing season but can be present; the water table is very close to the surface (usually within 1 meter). Hydric soils are obvious with vegetation achieving almost total ground cover. Generally an

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

organic horizon (up to 25 cm) of partially decomposed sedge leaves exists. In few cases the organic layer is just a thin layer (0 to 5 cm) of dry muck. Soils of the A horizon are somewhat poorly to poorly drained silty clay loam or clay loam up to 70 cm deep but more typically 20 to 40 cm deep. Expansive, monotypic communities of *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation generally overlie a B horizon of clay or sandy clay loam. This clay based B horizon is often rust mottled. When this community lacks a clay based B horizon, woody species of shrubs and tree saplings are better established and more prevalent – probably due to better drainage and dryer soils, overall.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tree canopy	<i>Acer rubrum</i> (saplings/small trees)
Tall shrub	<i>Cephalanthus occidentalis</i>
Herbaceous	<i>Carex striata</i>
Non-vascular	<i>Sphagnum</i> sp.

ADDITIONAL CHARACTERISTIC SPECIES

Cladium mariscoides, *Juncus canadensis*, *Woodwardia virginica*, and *Liquidambar styraciflua*

VEGETATION DESCRIPTION

This *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation is typical of many Delmarva Bays (see Environmental Description above) in Maryland, characterized by a dominance of tall graminoids. The community is often monotypic, dominated by 100 percent cover of *Carex striata*. Very few herbaceous species can compete, although individuals of *Cladium mariscoides*, *Juncus canadensis*, *Panicum verrucosum*, *Panicum longifolium*, *Proserpinaca pectinata*, *Dulichium arundinaceum*, *Bidens frondosa*, *Bidens discoidea*, *Panicum hemitomon*, *Woodwardia virginica*, and *Scirpus cyperinus* may be interspersed. These additional herbs typically make up less than 2 percent total ground cover. Individual shrubs of *Cephalanthus occidentalis* are almost always scattered throughout, comprising varied cover – generally less than 10 percent total cover (up to 60 percent cover in a few cases). A few other individual shrubs of *Clethra alnifolia*, *Vaccinium corymbosum*, *Decodon verticillatus*, *Leucothoe racemosa*, *Rhododendron viscosum*, *Itea virginica*, or *Litsea aestivalis* may also be present, but they generally make up very low total ground cover. This community may also have high ground cover (up to 90 percent) of *Sphagnum* sp. beneath the *Carex striata* canopy.

Although this community is physiognomically herbaceous, saplings or small trees of *Acer rubrum*, *Liquidambar styraciflua*, and *Diospyros virginiana*, may be frequent and even prevalent. In such cases where they are prevalent, these tree species can make up as much as 50 percent total cover – *Carex striata* is always the prevalent ground cover, though. *Acer rubrum* is usually the most common tree species found in this variation of the typical monotypic *Carex striata* community. These saplings or small trees usually occur in situations where this *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation is succeeding to a forest community type – probably due to dryer soils resulting from recent hydrological changes.

This *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation often occurs in close association with other Delmarva Bay communities. Most often this community occurs alongside *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation. The difference being that the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation generally occupies a dryer hydrologic regime and a higher elevation zone. This *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation is also closely associated with the less common *Woodwardia virginica* Herbaceous Vegetation. *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation is prone to woody succession, often with many tree saplings scattered throughout. Thus, the ecotone between this *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation and the surrounding upland *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest can be abrupt or include a broad successional zone of mixed tree saplings and *Carex striata*. If lower levels (drawdowns) or vegetation zones occur in a pond this *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation usually encircles them. These low level communities form an abrupt ecotone and could include the *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation or the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Panicum hemitomon*, *Litsea aestivalis*, *Scleria reticularis*, *Bidens discoidea*, and *Cladium mariscoides*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination. According to the International Classification of Ecological Communities: Terrestrial Vegetation of United States (Anderson et al., 1998) a very similar community, the *Carex striata* var. *striata* Herbaceous Vegetation [Provisional] occurs in DE, MD, NC, NJ, NY, SC, and VA. Another very similar community, the *Cephalanthus occidentalis* / *Carex striata* Shrubland occurs in DE, MD, and VA.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S2/S3

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for limited number of known occurrences, regional threats from surrounding agricultural use and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Baltimore Corner (Pond #3/Pond A), Caroline County (39 03 56.99 N, 75 49 12.93 W) – precise coordinates for community occurrence at this site
- Jackson Lane Preserve, Caroline County (39 03 21.32 N, 75 45 21.34 W) – precise coordinates for site only and not necessarily for the community occurrence
- Cherry Pond (South Melville Crossroads/Persimmon Preserve), Caroline County (39 04 14.26 N, 75 47 20.37 W) – precise coordinates for community occurrence at this site

COMMENTS

[none]

REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II. The National Vegetation Classification System: list of types. The Nature Conservancy, Arlington, Virginia, USA.
- McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.
- McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.
- Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* /
Sphagnum sp. / *Cephalanthus occidentalis* Herbaceous Vegetation**

COMMON NAME	Long-leaf panic grass - Clustered bluets - (Water smartweed, False water-pepper) / Sphagnum moss / Buttonbush Herbaceous Vegetation
ELEMENT CODE	6828
SYNONYM	Delmarva Bay Low Grassland / Sparse Shrubland
NATIONAL SYNONYM	<ul style="list-style-type: none"> ● <i>Cephalanthus occidentalis</i> / <i>Glyceria</i> spp. - <i>Polygonum amphibium</i> Shrubland (6015 in part) ● <i>Eragrostis hypnoides</i> - <i>Juncus repens</i> - <i>Lipocarpa micrantha</i> Herbaceous Vegetation (4341 in part) ● <i>Cephalanthus occidentalis</i> / <i>Carex striata</i> Shrubland (6221 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	Natural/Semi-natural Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Panicum longifolium</i> Seasonally Flooded Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation is most often positioned at or near the lowest elevation zone within the pond and is generally widespread across the interior of the pond or may occupy only a small “drawdown pocket.” This refers to a distinct low point in the pond, being the last to dry up during the summer season. Most often, this *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation resides at the center of a circular pond and will form an abrupt transition to other

herbaceous or shrub community zones occupying a slightly higher elevation or may grade directly into surrounding forest (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by 0 to 20 cm of water. Seasonal inundation and frequent flooding prevents woody species from establishing, except for the flood tolerant *Cephalanthus occidentalis*, which can have a low prominence in this community.

Surface water is typically absent during the growing season, but the water table is very close to the surface (within 30 cm). Hydric soils are obvious with vegetation (including Sphagnum moss) comprising almost total ground cover in some cases. In other cases, where Sphagnum moss is not present, vegetation cover is much lower and a higher percentage of bare soil including muck or dry muck are present. In either case, a thin organic horizon (0 to 5 cm) of dry muck exists – but this layer does not contain coarse organic matter such as peat. Soils of the A horizon are very poorly drained black clay loam overlying a B horizon of gray clay or sandy clay often containing rust mottles. Therefore, free water remains at or near the surface, even during dry seasons or dry years.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tall shrub	<i>Cephalanthus occidentalis</i>
Herbaceous	<i>Polygonum amphibium</i> , <i>Polygonum hydropiperoides</i> , <i>Panicum longifolium</i> , <i>Scirpus cyperinus</i> , <i>Ludwigia sphaerocarpa</i> , <i>Eragrostis hypnoides</i> , <i>Cyperus strigosus</i> , <i>Oldenlandia uniflora</i>
Non-vascular	<i>Sphagnum</i> sp.

ADDITIONAL CHARACTERISTIC SPECIES

Carex gigantea, *Eragrostis hypnoides*, *Proserpinaca pectinata*, and *Hottonia inflata*

VEGETATION DESCRIPTION

This *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation is typical of many Delmarva Bays (see Environmental Description above) in Maryland, characterized by a higher diversity of low forbs and graminoids sometimes scattered in among a dense carpet of Sphagnum moss. Most obvious is a higher prevalence of forbs instead of graminoids.

In some examples, but not all, *Sphagnum* sp. can comprise 50 to 100 percent of the total ground cover; forbs typically comprise 10 to 20 percent cover in such cases. When Sphagnum moss is not present, forbs and graminoids are diverse and cover is highly variable. In non-Sphagnum dominated cases, if vegetation cover is low, the unvegetated surface is usually a muck or dry muck substrate. *Panicum longifolium* is generally always present, usually comprising less than 20 percent total cover, but in rare cases up to 80 percent cover. *Panicum longifolium* cover is higher in non-Sphagnum dominated examples.

Other herbaceous species make up low cover (0 to 20 percent) including *Polygonum amphibium*, *Polygonum hydropiperoides*, *Panicum longifolium*, *Scirpus cyperinus*, *Ludwigia sphaerocarpa*, *Carex gigantea*, *Eragrostis hypnoides*, *Cyperus strigosus*, and *Oldenlandia uniflora*. Shrubs of *Cephalanthus occidentalis* are usually present at low cover (10 to 30 percent) or may be totally absent. Also present, often only as scattered individuals (usually less than 2 percent total cover), may be *Bidens discoidea*, *Bidens frondosa*, *Carex striata*, *Oldenlandia uniflora*, *Thelypteris palustris*, *Fimbristylis autumnalis*, *Fimbristylis purpusilla*, *Juncus pelocarpus*, *Polygonum punctatum*, *Rhexia virginica*, *Echinochloa crus-galli*, *Proserpinaca pectinata*, *Dulichium arundinaceum*, *Rhynchospora corniculata*, *Hottonia inflata*, *Glyceria acutiflora*, *Carex gigantea*, *Panicum verrucosum*, *Panicum spretum*, and *Carex striata*.

Scattered saplings of *Acer rubrum* and *Diospyros virginiana* may be present or overshadow the edges of this herbaceous opening. These tree species comprise negligible cover.

Variations of this community may include examples with very dense *Sphagnum* sp. cover or examples with no Sphagnum cover at all. Variants void of Sphagnum moss are much more likely to be habitat to the S1 to S3 rare species (see Other Noteworthy Species below).

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

One other variation of this community exhibits a very high dominance of *Eragrostis hypnoides* and/or *Cyperus strigosus* (50 to 80 percent total cover). In such cases, *Panicum longifolium* is usually present at very low cover. Given further state and regional inventory, this variation may merit recognition as a solid association.

This *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum sp.* / *Cephalanthus occidentalis* Herbaceous Vegetation often occurs in close association with other Delmarva Bay communities. In ponds where community zonation occurs as concentric rings related to depth levels within the pond, this community may abruptly grade into the *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation or the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation, both occupying a higher (drier) level within the pond. This community typically does not grade directly into a forested community. The fore-mentioned herbaceous communities separate this *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum sp.* / *Cephalanthus occidentalis* Herbaceous Vegetation from surrounding forested communities.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Fimbristylis purpusilla*, *Eleocharis microcarpa*, *Bidens discoidea*, *Glyceria acutiflora*, *Rhynchospora corniculata*, *Hottonia inflata*, *Oldenlandia uniflora* and *Carex gigantea*. This is the most common community type to find *Fimbristylis purpusilla*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S2

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for limited number of known occurrences, regional threats from surrounding agricultural use and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Jackson Lane (TNC) Preserve, Caroline County (39 03 21.32 N, 75 45 21.34 W) – precise coordinates for site only and not necessarily for the community occurrence
- Golt's Pond, Kent County (39 20 0.58 N, 75 46 35.55 W) – precise coordinates for site only and not necessarily for the community occurrence
- Black Bottom Ponds, Kent County (39 18 47.60 N, 75 47 38.94 W) – close (but not exact) coordinates for site only and not necessarily for the community occurrence

COMMENTS

Occupying a similar low elevation, “niche” in the center of a pond may also be the *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation. Spatially, though, this other herbaceous vegetation generally occupies a much larger area (greater than ten square meters) as compared to the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum sp.* / *Cephalanthus occidentalis* Herbaceous Vegetation.

REFERENCES

McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.

Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation**

COMMON NAME	Sugar-cane plumegrass - Panic grass Herbaceous Vegetation
ELEMENT CODE	6829
SYNONYM	Delmarva Bay Tall Grassland
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	Natural/Semi-natural Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Erianthus giganteus</i> Seasonally Flooded Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation is most often positioned at the outer zone or the higher elevations within the pond. If this herbaceous vegetation does not occur as a ring or concentric zone, it may occur as a larger, more widespread patch across the interior of the pond or as a small patch on the outer edges of the pond. Most often, this *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation occupies the earliest water recession zone; a vegetated zone of higher elevation within a pond where, consequently, surface water draws down (drys up) first. This community will form an abrupt transition to other herbaceous or shrub community zones occupying a slightly lower elevation or may grade directly into surrounding forest (see Vegetation Description below).

Any unvegetated surface is generally covered with a thin layer of undecomposed organic material – primarily old leaf material from dead *Erianthus giganteus* and other graminoids.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by 0 to 20 cm of water. Seasonal inundation and frequent flooding helps maintain this open community as herbaceous, somewhat preventing woody species from overtaking or dominating the community.

Surface water is typically absent during the growing season, but the water table is within 50 to 100 cm of the surface. A thin organic horizon (0 to 5 cm) of coarse organic matter (old graminoid leaf material) overlies a deep A horizon of sandy loam. This A horizon is generally moist to wet and averages 80 to 100 cm deep. The B horizon is pure sand 10 to 20 cm deep before becoming saturated with water.

MOST ABUNDANT SPECIES

Strata

Tree canopy
Tall shrub
Herbaceous

Species

Liquidambar styraciflua (saplings/small trees), *Acer rubrum* (saplings/small trees)
Vaccinium corymbosum
Erianthus giganteus, *Panicum verrucosum*, *Panicum spretum*, *Fimbristylis autumnalis*,
Rhexia virginica, *Erechtites hieracifolia*, *Carex striata*,

ADDITIONAL CHARACTERISTIC SPECIES

Clethra alnifolia and *Vaccinium corymbosum*

VEGETATION DESCRIPTION

This *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation is typical of many Delmarva Bays (see Environmental Description above) in Maryland, characterized by a dominance of tall graminoids. Most obvious and characteristic is the presence of *Erianthus giganteus*.

In some examples, *Sphagnum* sp. can comprise up to 10 percent of the total ground cover. *Erianthus giganteus* typically dominates with 30 to 90 percent of total vegetative cover.

Except for other grasses, herbaceous species generally occur only as scattered individuals and make up very low cover (0 to 5 percent). These species include *Polygonum hydropiperoides*, *Panicum longifolium*, *Scirpus cyperinus*, *Proserpinaca pectinata*, *Rhynchospora corniculata*, *Erechtites hieracifolia*, *Fimbristylis autumnalis*, *Juncus repens*, *Rhexia virginica*, *Panicum verrucosum*, *Scleria reticularis*, *Panicum spretum*, *Carex striata*, *Woodwardia virginica*, *Triadenum virginicum*, and *Oldenlandia uniflora*.

Shrubs are usually present at low cover (10 to 30 percent) or may be totally absent. These include *Cephalanthus occidentalis*, *Leucothoe racemosa*, *Clethra alnifolia*, and *Vaccinium corymbosum*. Also present as scattered individuals may be *Acer rubrum*, *Liquidambar styraciflua*, *Diospyros virginiana*, *Nyssa sylvatica*, and/or *Pinus taeda*. These tree species are usually present only as saplings and small trees or simply overshadow the edges of this herbaceous community. These tree species comprise negligible cover (usually less than 2 percent).

This *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation may occur in close association with other Delmarva Bay communities. The ecotone between this *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation and the surrounding upland *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest can be abrupt or include a broad successional zone of mixed tree saplings and *Erianthus giganteus*. If lower levels (drawdowns) or vegetation zones occur in a pond this *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation usually encircles them. These low level communities form an abrupt ecotone and could include the *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation or the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Rhynchospora corniculata*, *Xyris smalliana*, *Oldenlandia uniflora* and *Scleria reticularis*.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

RANGE

This is a newly proposed community association, therefore national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S1

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for limited number of known occurrences, regional threats from surrounding forest management and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Brookview Pond C, Dorchester County (38 33 42.51 N, 75 48 45.51 W) – precise coordinates for site only and not necessarily for the community occurrence
- Brookview Pond D, Dorchester County (38 33 28.86 N, 75 48 42.05 W) – precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

Ecologically, it appears possible that *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation is replacing *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation as a later successional stage. Both communities are situated at similar levels within ponds and both share *Carex striata*.

REFERENCES

- Major, S. January 1995. Survey, Classification, and Conservation Assessment of Natural Communities in the Nanticoke Watershed. Unpublished report submitted to Coastal Zone Management Program, Maryland Department of Natural Resources by the Maryland Natural Heritage Program.
- McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.
- McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.
- Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.
- Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

Leersia hexandra Herbaceous Vegetation

COMMON NAME	Club-headed Cutgrass Herbaceous Vegetation
ELEMENT CODE	6830
SYNONYM	Low Wet Grassland
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	Natural/Semi-natural Seasonally Flooded Temperate or Subpolar Grassland
ALLIANCE	<i>Leersia hexandra</i> Seasonally Flooded Herbaceous Alliance [proposed]

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds) or low wet areas. In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

This *Leersia hexandra* Herbaceous Vegetation may occur as a widespread patch across the interior of the pond or wet depression. This community will form an abrupt transition into other herbaceous, shrub, or forest vegetation occupying a slightly higher elevation (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by shallow water. Seasonal inundation and frequent flooding prevents woody species from establishing. Surface water is typically absent during the growing season but can be present; the water table is very close to the surface (usually within 1 meter). Hydric soils are obvious with vegetation comprising almost total ground cover. Generally a shallow organic horizon (1 cm) of muck or dry muck exists. Soils of the A horizon are very poorly drained to poorly drained sandy clay loam up to 40 cm deep. The B horizon changes to a mottled sandy clay and is generally 50 cm deep. Below this is pure sand.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Herbaceous	<i>Leersia hexandra</i> , <i>Juncus repens</i>

ADDITIONAL CHARACTERISTIC SPECIES

Rhynchospora macrostachya, *Scleria reticularis*, *Fimbristylis autumnalis*, *Panicum spretum*

VEGETATION DESCRIPTION

This *Leersia hexandra* Herbaceous Vegetation is very rare in Maryland, characterized by a dominance of low graminoids. The community is monotypic, dominated by almost 100 percent cover of *Leersia hexandra*. Very few herbaceous species can compete, although individuals of *Rhynchospora macrostachya* may be present.

Slight variations of this community may include very dense cover of *Juncus repens* with *Fimbristylis autumnalis* and *Panicum spretum* scattered within. This variation generally occurs during years with greater precipitation. Species variability is often subject to yearly precipitation. Due to this variability, future consideration should be given to lumping this community with the *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation.

This *Leersia hexandra* Herbaceous Vegetation occurs in close association with other depressional wetland communities. This community is known to form an abrupt transition into *Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest and *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Leersia hexandra*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S1

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for only one occurrence known in Maryland, regional threats from surrounding silvicultural practices and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

Dividing Creek Pond, Worcester County (38 09 16.04 N, 75 32 56.02 W) – precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

REFERENCES

McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.

McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.

Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Woodwardia virginica* Herbaceous Vegetation**

COMMON NAME	Virginia Chain Fern Herbaceous Vegetation
ELEMENT CODE	6831
NATURAL COMMUNITY	Fern Swale
NATIONAL SYNONYM	<i>Woodwardia virginica</i> / <i>Sphagnum cuspidatum</i> Herbaceous Vegetation (4475 in part)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Forb Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Perennial Forb Vegetation
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Seasonally Flooded Temperate Perennial Forb Vegetation
ALLIANCE	<i>Woodwardia virginica</i> Seasonally Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This herbaceous community is included among those characteristic of Delmarva Bays (also known as seasonal ponds). In Maryland, Delmarva Bays are depressional wetlands of the Lower Coastal Plain and these depressions can vary from less than one-tenth hectare to four hectares in size and are generally one-half meter to one meter deeper than the surrounding landscape. In some cases Delmarva Bays may be bordered by a subtle sand rim. Seasonal fluctuations in groundwater recharge and precipitation cause these wetlands to be irregularly flooded or seasonally inundated – often void of surface water during very dry seasons or with standing water much reduced to a smaller area at the deepest point within the bay.

Vegetation and community structure in a Delmarva Bay is closely linked to its hydrologic regime. Fluctuations in water levels may vary based on precipitation, evapotranspiration from bay vegetation, and groundwater pumping or depletion (for nearby agricultural purposes). Depth and duration of flooding is also important in influencing the vegetation of a particular community type. Based on water levels during the growing season, changes in vegetation or community structure are often exhibited as concentric rings around the pond perimeter – with community changes progressing to the center or lowest point within the interior of the pond.

If community zonation does occur as concentric rings from the outer edge into the center (or lowest point) of the bay, this *Woodwardia virginica* Herbaceous Vegetation is most often positioned at the outer zone or the higher elevations within the pond. This *Woodwardia virginica* Herbaceous Vegetation typically occurs as a large localized patch on the outer edge of a pond. Most often, this community occupies the earliest water recession zone; a vegetated zone of higher elevation within a pond where, consequently, surface water draws down (drys up) first. This community will form an abrupt transition to other herbaceous or shrub community zones occupying a slightly lower elevation or may grade directly into surrounding forest (see Vegetation Description below).

Typically, this community establishes during dry years when surface water is gone but it may be inundated during the growing season by very shallow water. Seasonal inundation, frequent flooding, and very dense herbaceous cover prevents woody species from establishing.

Surface water is typically absent during the growing season, but the water table is very close to the surface (within 1 meter). Hydric soils are obvious with vegetation comprising almost total ground cover. Generally a thin organic horizon (0 to 5 cm)

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

of dry muck or muck exists. Soils of the A horizon are moderately well drained to somewhat poorly drained black loamy sand.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Herbaceous	<i>Woodwardia virginica</i>
Non-vascular	<i>Sphagnum</i> sp.

ADDITIONAL CHARACTERISTIC SPECIES *Carex striata*

VEGETATION DESCRIPTION

This *Woodwardia virginica* Herbaceous Vegetation is associated with Delmarva Bays in Maryland which are dominated by a tall graminoids. The community is often monotypic (possibly clonal), dominated by 100 percent cover of *Woodwardia virginica*. Very few herbaceous species can compete, although individuals of *Carex striata* may be interspersed, comprising less than 5 percent total cover. This community may also have high ground cover (up to 100 percent) of *Sphagnum* sp. beneath the *Woodwardia virginica* canopy.

This *Woodwardia virginica* Herbaceous Vegetation often occurs in close association with other Delmarva Bay communities. This community is known to always occurs alongside *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation.

OTHER NOTEWORTHY SPECIES

RANGE

This is a newly proposed community association, therefore national distribution requires further determination. According to the International Classification of Ecological Communities: Terrestrial Vegetation of United States (Anderson et al., 1998) a very similar community, the *Woodwardia virginica* / *Sphagnum cuspidatum* Herbaceous Vegetation is known to occur in MD and NC.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S1

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for limited number of known occurrences, regional threats from surrounding agricultural use and subsequent hydrological changes (lowering of water table) causing successional conversion, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Baltimore Corner (Pond #3/Pond A), Caroline County (39 03 55.50 N, 75 49 14.84 W) – precise coordinates for community occurrence at this site
- Wetipquin Pond, Wicomico County (38 20 35.26 N, 75 49 36.70 W) — precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

REFERENCES

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

McAvoy, W., K. Clancy. 1994. Community Classification and Mapping Criteria for Category I Interdunal Swales and Coastal Plain Pond Wetlands in Delaware. Unpublished report submitted to Division of Water Resources, Delaware Department of Natural Resources and Environmental Control by the Delaware Natural Heritage Inventory.

McCarthy, K.A., J. Modlin. 1992. An Assessment of the Encroachment of Woody Vegetation into Five Unforested Delmarva Bays and Five Coastal Plain Bogs by Analysis of Aerial Photography. Unpublished report submitted to Coastal Resources Division, Maryland Tidewater Administration by the Maryland Natural Heritage Program.

Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

***Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest**

COMMON NAME	Sweet gum - Red maple - Black gum / Sweet pepper-bush Forest
ELEMENT CODE	6832
SYNONYM	Seasonally Flooded Gum / Maple Forest
NATIONAL SYNONYMS	<i>Acer rubrum - Nyssa sylvatica - Magnolia virginiana</i> Forest (6238 in part) <i>Liquidambar styraciflua - Acer rubrum - Quercus phellos / Leucothoe racemosa</i> Forest (6110 in part)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Natural/Semi-natural Seasonally Flooded Cold-deciduous Forest
ALLIANCE	<i>Liquidambar styraciflua - (Acer rubrum)</i> Seasonally Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This predominantly deciduous forest is characterized by seasonal flooding rather than a saturated hydrologic regime. This forest type generally occurs on the margins of seasonal ponds (Delmarva Bays), along streams, or in flats characterized by a high water table.

Typically this vegetation develops on moderately well-drained to poorly drained soils that are temporarily flooded during the growing season or, less commonly, permanently saturated. A thin organic horizon (0 to 5 cm) of coarse organic matter and humus (decomposed leaf material) overlies a deep A horizon of sandy loam. This A horizon is generally somewhat moist to somewhat wet and averages 40 cm deep. The B horizon is most often sand, but occasionally a sandy-clay-loam mix, and very deep.

MOST ABUNDANT SPECIES

<u>Strata</u>	<u>Species</u>
Tree canopy	<i>Acer rubrum, Liquidambar styraciflua, Nyssa sylvatica, Magnolia virginiana</i>
Tall shrub	<i>Clethra alnifolia, Vaccinium corymbosum, Leucothoe racemosa, Rhododendron viscosum</i>
Vine/liana	<i>Smilax rotundifolia</i>
Herbaceous	<i>Mitchella repens, Triadenum virginicum</i>
Non-vascular	<i>Sphagnum</i> sp.

ADDITIONAL CHARACTERISTIC SPECIES

Chimaphila maculata, Panicum spretum, Panicum virgatum, Carex striata, Fraxinus pennsylvanica, Quercus falcata, Quercus alba, Quercus palustris, Ilex opaca, Symplocarpus foetidus, Sassafras albidum, and Pinus taeda

VEGETATION DESCRIPTION

This *Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest is typical of many Coastal Plain seasonally flooded forested wetlands (see Environmental Description above) in Maryland. The forest canopy is

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

characteristically dominated by *Acer rubrum*, *Liquidambar styraciflua*, and *Nyssa sylvatica* but typically a number of other tree species including *Pinus taeda*, *Fraxinus pennsylvanica*, *Quercus falcata*, *Quercus phellos*, *Quercus alba*, *Quercus palustris*, *Ilex opaca*, and *Magnolia virginiana* are present and may be locally dominant. There is generally a well developed shrub layer consisting of *Clethra alnifolia*, *Leucothoe racemosa*, *Vaccinium corymbosum*, and *Rhododendron viscosum*. *Sassafras albidum* is usually confined to hummocks or areas of slightly higher elevation, and *Smilax rotundifolia* is often present and abundant. The often sparse herbaceous layer may contain *Mitchella repens* and *Triadenum virginicum*, and *Symplocarpus foetidus* often occurs along streams. Total herbaceous cover is typically less than 5 percent. Occasionally, in the more permanently saturated areas, a canopy of *Acer rubrum* and *Liquidambar styraciflua* may develop over a *Sphagnum* dominated understory.

In cases where this *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest borders seasonal ponds (Delmarva Bays), it will usually form an abrupt transition into a herbaceous or shrub community occupying a slightly lower elevation within the pond. In other cases, this forest may grade into less mesic adjacent forests of the *Fagus grandifolia* - *Quercus alba* Forest Alliance or the *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species known to occur within this community include *Scleria reticularis*.

RANGE

This is a newly proposed community association, therefore national distribution requires further determination. According to the International Classification of Ecological Communities: Terrestrial Vegetation of United States (Anderson et al., 1998) a very similar community, the *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest is known to occur in DE, MD, NJ, PA?, and VA and the *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* Forest is known to occur in VA, DE, MD, NJ, and PA.

MARYLAND DISTRIBUTION

In Maryland, this community is widespread across Upper and Lower Coastal Plain Physiographic Provinces occurring on the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4/S5

RANK CONFIDENCE

Moderate

RANK JUSTIFICATION

Rank accounts for this being a large patch community, the large number of suspected occurrences and the wide distribution of this community across the Upper and Lower Coastal Plains of Maryland.

REFERENCE SITES

- Bridgetown Ponds, Caroline County (39 01 12.20 N, 75 52 2.97 W) – precise coordinates for site only and not necessarily for the community occurrence
- Jackson Lane Preserve, Caroline County (39 03 21.32 N, 75 45 21.34 W) – precise coordinates for site only and not necessarily for the community occurrence
- Andover Flatwoods, Queen Annes County (39 10 17.06 N, 75 46 54.57 W) – precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

REFERENCES

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

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

COMMUNITY DESCRIPTIONS

Major, S. January 1995. Survey, Classification, and Conservation Assessment of Natural Communities in the Nanticoke Watershed. Unpublished report submitted to Coastal Zone Management Program, Maryland Department of Natural Resources by the Maryland Natural Heritage Program.

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Rittenhouse, W.H. 1991. A land Use History of Five Delmarva Preserves. Unpublished report submitted to The Nature Conservancy, Maryland Field Office, Chevy Chase, MD.

Tyndall, R.W., K.A. McCarthy, J.C. Ludwig, and A. Rome. 1990. Vegetation of six Carolina Bays in Maryland. *Castanea* 55: 1-21.

AUTHOR

M. Ashton Berdine, 1998

Reference Sites

Dorchester Pond

COUNTY Dorchester County, Maryland

USGS QUAD East New Market, MD and Rhodesdale, MD

PRIMARY REASON FOR SELECTION

Dorchester Pond contains a high quality occurrence and one of Maryland's best examples of *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation (6825).

High quality occurrence refers to a combination 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 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

Dorchester Pond is a Delmarva Bay, a natural seasonally flooded pond, about eight acres in size. The pond is bordered by *Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest, *Pinus taeda* Forest and agricultural fields beyond the forest buffer. An unimproved farm lane runs near the northern edge of the pond and an unimproved County road borders near the western edge.

Three distinct wetland community types occur in the pond as concentric zones from the outer edge into the center (or lowest point) of the pond. These communities include *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation occurring at the lowest central zone, *Panicum hemitomon / Cephalanthus occidentalis* Herbaceous Vegetation occurring as a narrow zone near the outer edge, and an early successional stage of the *Liquidambar styraciflua - Acer rubrum - Nyssa sylvatica / Clethra alnifolia* Forest (mostly saplings and shrubs) occurring on the highest elevations within the pond on the outermost edges.

During the growing season in dry years, Dorchester Pond may be totally void of surface water and covered by a dense mat of herbaceous vegetation. The majority of the vegetation covering the pond interior (approximately five acres) is the *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation. During very wet seasons, the pond may contain as much as three feet of water and densely vegetated with emergent vegetation.

Species considered rare, threatened, or endangered in Maryland known to occur at Dorchester Pond include eight plant species, one bird species, and one amphibian species.

This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Dorchester Pond was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* 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 within the State. This particular occurrence is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis Herbaceous Vegetation occupies the majority of the pond area, approximately five acres in the lower central portion. There are portions of this community on the pond edge that have advanced shrub and sapling succession. These changes may be natural and cyclic or do to more permanent hydrologic changes across the landscape.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

This occurrence is very typical of that defined in the Vegetation Description for *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation (Unit 1 of this report), although slight variations at the Dorchester Pond occurrence include a presence of the State Endangered *Lachnanthes caroliana* and a greater periodic cover of *Rhexia virginica*. *Panicum verrucosum* and *P. spretum* codominate this herbaceous community at Dorchester Pond.

See Vegetation Description (Unit 1 of this report) for a precise definition of this community type, *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

An increase in woody succession has been observed at Dorchester Pond over the past fifteen years (Maryland Wildlife and Heritage staff, personal communication) especially on the higher elevated edges of the pond. Hydrological changes are suspected, possibly due to lowering of the water table by groundwater pumping or other depletion (for nearby agricultural purposes). Woody plant succession, community changes, and rare species should be monitored. A thorough determination of hydrological changes and their causes should be undertaken and correlations to vegetation changes substantiated, if they exist.

Access to site should remain limited due to trampling and compaction of vegetation by visitors. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Dorchester Pond has excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Dorchester Pond is a Nature Conservancy Preserve, thus receiving some conservation attention. The Nature Conservancy is aware of the rare species and significant plant communities at this site. Visitation and further research at this site is restricted and requires a detailed proposal and approval by the Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy.

OCCURRENCE RANK

This Dorchester Pond occurrence of *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation ranks as an "A" or excellent example when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Dorchester Pond owned by The Nature Conservancy

BEST SOURCE / LAND MANAGER

Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy

BOUNDARY JUSTIFICATION

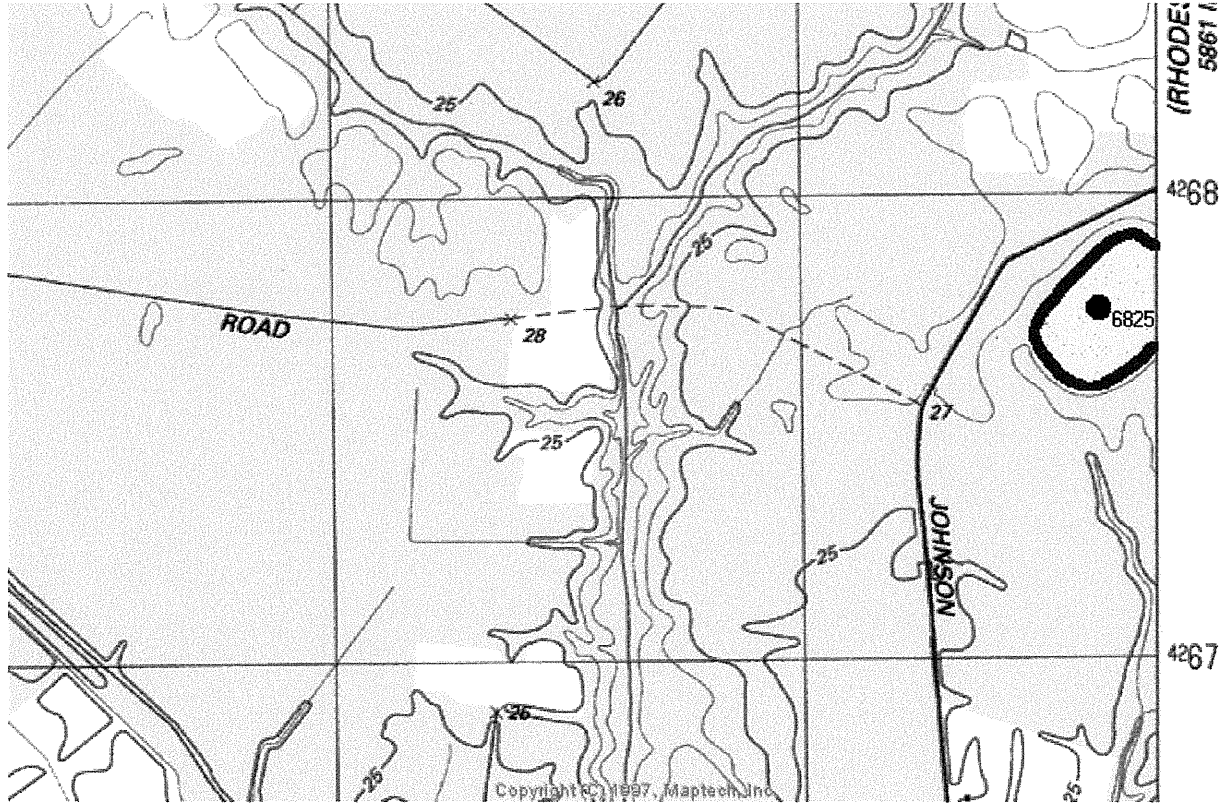
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

38 33 24.32 N, 75 52 35.06 W -- precise coordinates for *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation (6825) at this site

Dorchester Pond

Dorchester County, Maryland



USGS QUAD East New Market, MD and Rhodesdale, MD

38 33 24.32 N, 75 52 35.06 W -- precise coordinates for *Panicum (verrucosum, spretum) - Rhexia virginica - Fimbristylis autumnalis / Cephalanthus occidentalis* Herbaceous Vegetation (6825) at this site

Pristine Pines Preserve

COUNTY Queen Anne's County, Maryland

USGS QUAD Sudlersville, MD

PRIMARY REASON FOR SELECTION

Pristine Pines Preserve contains a high quality occurrence and one of Maryland's best examples of *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation (6826).

High quality occurrence refers to a combination 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 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

Pristine Pines Preserve contains a Delmarva Bay, a natural seasonally flooded pond, about three acres in size. The pond is bordered by *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest.

Three distinct wetland vegetation types occur in the pond, not as concentric zones but as indiscriminate patches. These communities include the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation covering the western half of the pond, *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation occurring at the "drawdown" or lowest point in the pond, and *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation occurring throughout the eastern half of the pond.

During the growing season in dry years, ponds at Pristine Pines Preserve may be totally void of surface water and covered by a dense mat of herbaceous vegetation. The majority of the vegetation covering the pond interior is evenly split between *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation and *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation. During very wet seasons, the pond may contain as much as two feet of water and densely vegetated with emergent vegetation.

Species considered rare, threatened, or endangered in Maryland known to occur at Pristine Pines Preserve include eight plant species and one amphibian species.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Pristine Pines Preserve was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Panicum hemitomon* / *Cephalanthus occidentalis* 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 within the State. This particular occurrence is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation (Unit 1 of this report), although slight variations at the Pristine Pines occurrence include the presence of scattered *Liquidambar styraciflua* trees. *Panicum hemitomon* dominates and tree cover makes up less than ten percent total cover in this occurrence.

See Vegetation Description (Unit 1 of this report) for a precise definition of this community type, *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. Woody succession should be monitored to determine changes in community structure. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Pristine Pines Preserve has excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Pristine Pines Preserve is a Nature Conservancy Preserve, thus receiving some conservation attention. The Nature Conservancy is aware of the rare species and significant plant communities at this site. Visitation and further research at this site is restricted and requires a detailed proposal and approval by the Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy.

OCCURRENCE RANK

This occurrence of *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation at Pristine Pines Preserve ranks as an "A" or excellent example when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Pristine Pines Preserve is owned by The Nature Conservancy

BEST SOURCE / LAND MANAGER

Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy

BOUNDARY JUSTIFICATION

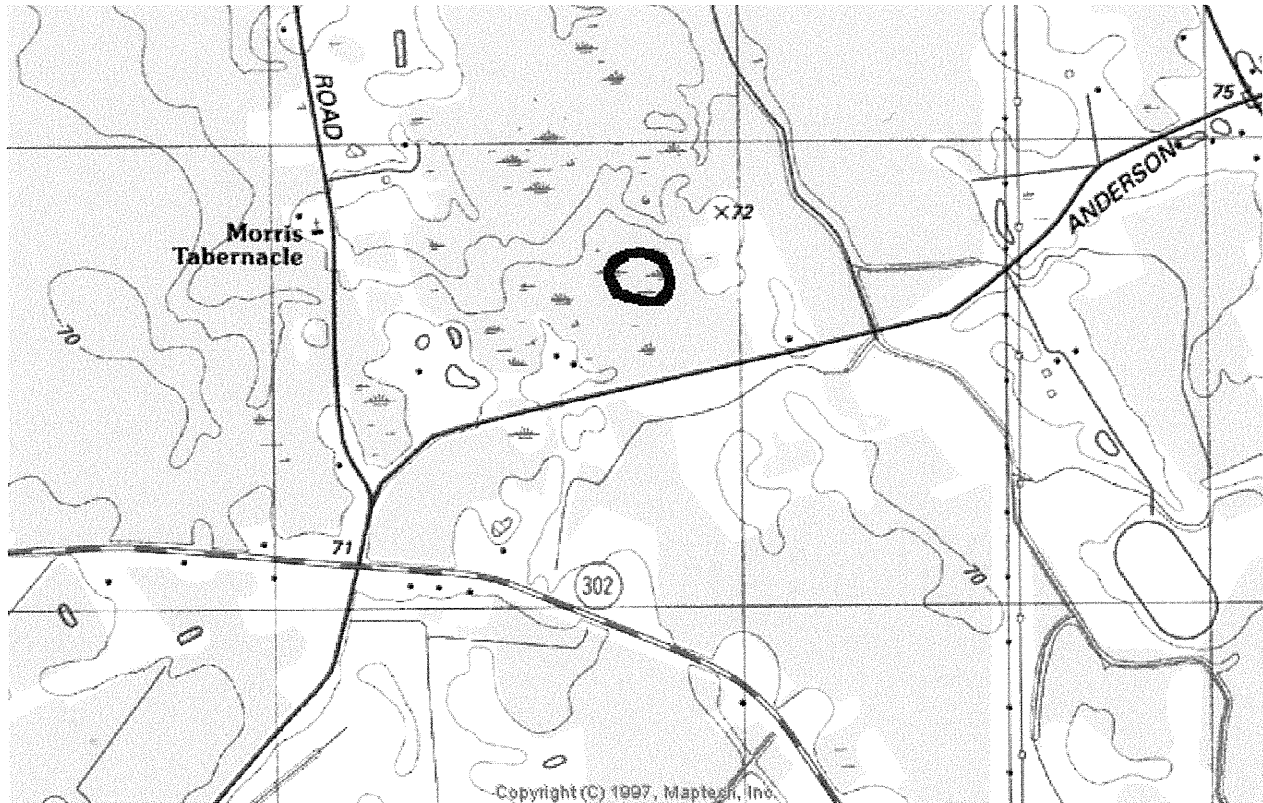
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

39 08 59.11 N, 75 48 45.28 W -- precise coordinates for site only and not necessarily for the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation (6826) occurrence at this site

Pristine Pines Preserve

Queen Anne's County, Maryland



USGS QUAD Sudlersville, MD

39 08 59.11 N, 75 48 45.28 W -- precise coordinates for site only and not necessarily for the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation (6826) occurrence at this site

Baltimore Corner Preserve

COUNTY Caroline County, Maryland

USGS QUAD Goldsboro, MD

PRIMARY REASON FOR SELECTION

Baltimore Corner Preserve contains high quality occurrences and Maryland's best examples of two wetland community types, the *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation (6827) and *Woodwardia virginica* Herbaceous Vegetation (6831).

High quality occurrence refers to a combination 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 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

Baltimore Corner Preserve contains various Delmarva Bays, natural seasonally flooded ponds, each vary from a half to three acres in size. The ponds are bordered by *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest.

Four distinct wetland vegetation types occur throughout the ponds, as concentric zones and as indiscriminate patches. These communities include the *Panicum hemitomon* / *Cephalanthus occidentalis* Herbaceous Vegetation on the outermost edge of one pond, *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation occurring as a large central patch at the lowest point within two ponds, *Woodwardia virginica* Herbaceous Vegetation occurring as a patch at the edge of the largest pond, and *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation dominating cover at the largest pond.

During the growing season in dry years, ponds at Baltimore Corner Preserve may be totally void of surface water and covered by a dense mat of herbaceous vegetation. The largest pond at this site is habitat to excellent examples of two vegetation types, highlighting the site as a reference wetland. The interior of this pond is dominated by approximately three acres of *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation. The southern edge of this pond also has a patch of the *Woodwardia virginica* Herbaceous Vegetation, the largest known example of this community in Maryland. During very wet seasons, the pond may contain as much as two feet of water and densely vegetated with emergent vegetation.

Species considered rare, threatened, or endangered in Maryland known to occur at Baltimore Corner Preserve include eight plant species and one amphibian species.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Baltimore Corner Preserve was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation and *Woodwardia virginica* Herbaceous Vegetation known in Maryland. These wetland community types are rare in Maryland and preliminarily ranked as S2 and S1 respectively. S2 designation means that between 5 and 20 occurrences are known within the State and S1 designation means that between 1 and 5 occurrences are known within the State. These particular occurrences are two of a set of similar communities used to define and classify these community types for the Maryland Vegetation Classification, thus type localities.

These occurrences are very typical of those defined in the Vegetation Description for both *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation and *Woodwardia virginica* Herbaceous Vegetation (Unit 1 of this report). See

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

Vegetation Description (Unit 1 of this report) for a precise definition of each community type, *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation and *Woodwardia virginica* Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. Woody succession should be monitored to determine changes in community structure. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Baltimore Corner Preserve has excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Baltimore Corner Preserve is a Nature Conservancy Preserve, thus receiving some conservation attention. The Nature Conservancy is aware of the rare species and significant plant communities at this site. Visitation and further research at this site is restricted and requires a detailed proposal and approval by the Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy.

OCCURRENCE RANK

These occurrences of *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation and *Woodwardia virginica* Herbaceous Vegetation at Baltimore Corner Preserve both rank as an "A" or excellent example when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Baltimore Corner Preserve is owned by The Nature Conservancy

BEST SOURCE / LAND MANAGER

Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy

BOUNDARY JUSTIFICATION

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

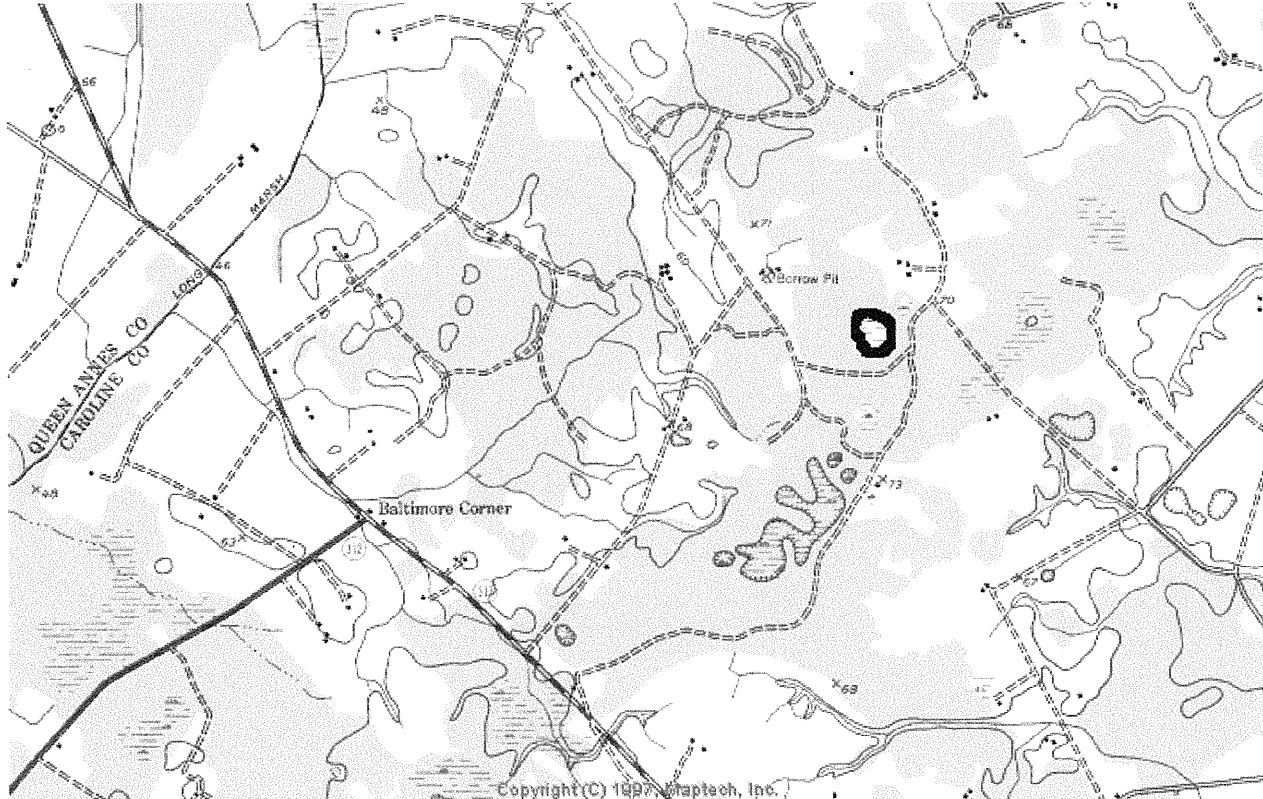
LATITUDE / LONGITUDE

39 03 56.99 N, 75 49 12.93 W – precise coordinates for *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation (6827) occurrence at this site

39 03 55.50 N, 75 49 14.84 W – precise coordinates for the *Woodwardia virginica* Herbaceous Vegetation (6831) occurrence at this site

Baltimore Corner Preserve

Caroline County, Maryland



USGS QUAD Goldsboro, MD

39 03 56.99 N, 75 49 12.93 W -- precise coordinates for *Carex striata* /
Cephalanthus occidentalis Herbaceous Vegetation (6827) occurrence at this site

39 03 55.50 N, 75 49 14.84 W -- precise coordinates for *Woodwardia virginica*
Herbaceous Vegetation (6831) occurrence at this site

Golt's Pond

COUNTY Caroline County, Maryland

USGS QUAD Goldsboro, MD

PRIMARY REASON FOR SELECTION

Golt's Pond contains a high quality occurrence and one of Maryland's best examples of *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation (6828).

High quality occurrence refers to a combination 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 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

Golt's Pond contains a Delmarva Bay, a natural seasonally flooded pond, about two acres in size. The pond is bordered by *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest.

Typical *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation dominates the pond cover, although noticeable variations of this community occur within the pond. At the north end of Golt's Pond woody succession changes community composition as indicated by greater presence of *Diospyros virginiana* saplings. At a south-central point within the pond, the typical *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation varies by having a greater dominance of *Eragrostis hypnoides*. This variation occurs within a small "drawdown" or the lowest point within the pond.

During the growing season in dry years, Golt's Pond may be totally void of surface water and covered by a dense mat of herbaceous vegetation and *Sphagnum* moss. During very wet seasons, the pond may contain as much as two feet of water and densely vegetated with emergent vegetation.

Species considered rare, threatened, or endangered in Maryland known to occur at Golt's Pond include five plant species and one amphibian species.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Golt's Pond was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* 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 within the State. This particular occurrence is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation (Unit 1 of this report), although slight variations at the Golt's Pond occurrence include localized woody succession and a drawdown dominated by *Eragrostis hypnoides*.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

See Vegetation Description (Unit 1 of this report) for a precise definition of this community type, *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. Woody succession should be monitored to determine changes in community structure. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Golt's Pond has excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Golt's Pond 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 requires a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

OCCURRENCE RANK

This occurrence of *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation at Golt's Pond ranks as an "A" or excellent example when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Golt's Pond is owned by the State of Maryland and is managed by the Millington Wildlife Management Area.

BEST SOURCE / LAND MANAGER

Wildlife and Heritage Division, Maryland Department of Natural Resources and is managed by the Land Manager, Millington Wildlife Management Area

BOUNDARY JUSTIFICATION

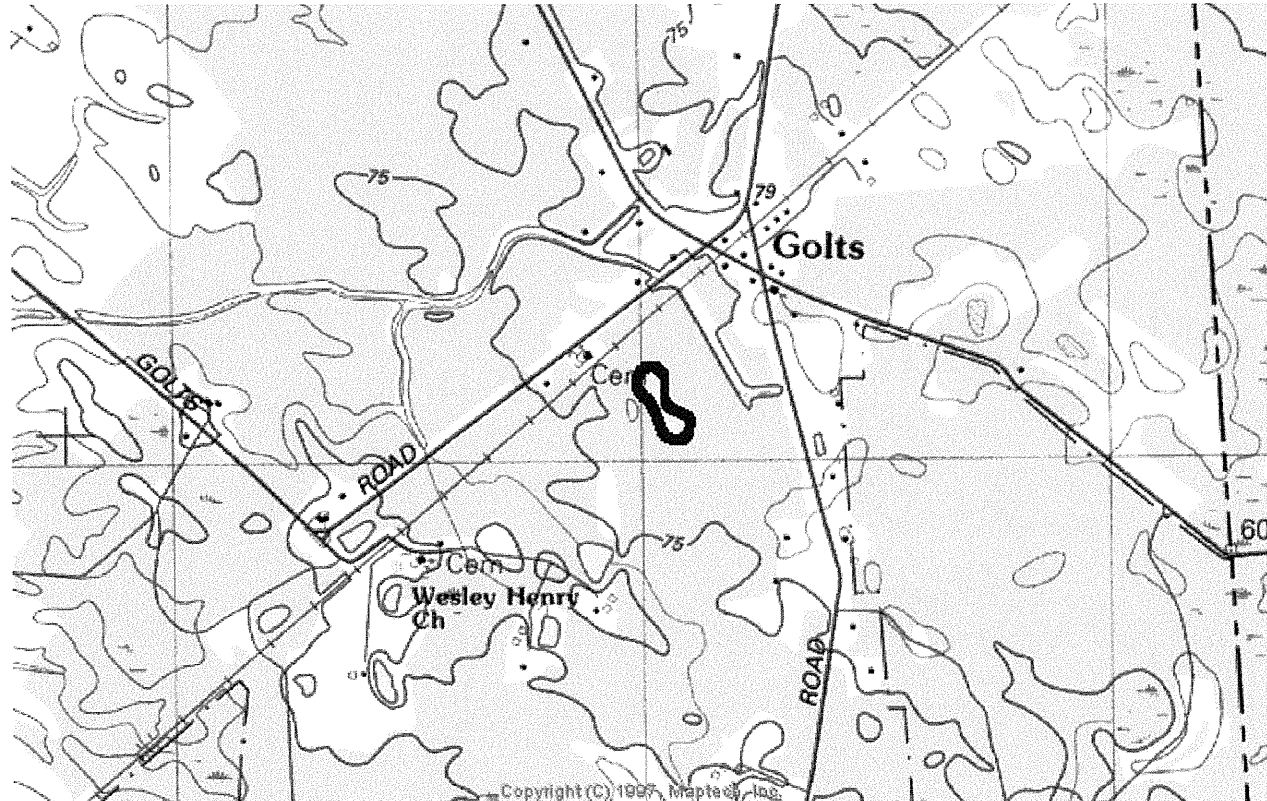
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

39 20 0.58 N, 75 46 35.55 W -- precise coordinates for site only and not necessarily for the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation (6828) occurrence at this site

Golt's Pond

Caroline County, Maryland



USGS QUAD Goldsboro, MD

39 20 0.58 N, 75 46 35.55 W -- precise coordinates for site only and not necessarily for the *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation (6828) occurrence at this site

Brookview Ponds

COUNTY Dorchester County, Maryland

USGS QUAD Rhodesdale, MD

PRIMARY REASON FOR SELECTION

Brookview Ponds contain a high quality occurrence and one of Maryland's best examples of *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation (6829).

High quality occurrence refers to a combination 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 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

Brookview Ponds contain two Delmarva Bays, natural seasonally flooded ponds, each about one acre in size. The ponds are bordered by *Pinus taeda* Planted Forest.

Typical *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation dominates ground cover at each pond, although other wetland vegetation also occurs at each pond. Brookview Pond "C" contains an inclusion of *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest. Brookview Pond "D" is bordered by this same wetland forest and also contains a small drawdown inclusion of *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation.

Four plant species considered rare, threatened, or endangered in Maryland are known to occur at Brookview Ponds.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Brookview Ponds was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation known in Maryland. This wetland community type is rare in Maryland and preliminarily ranked as S1, a designation meaning that between 1 and 5 occurrences are known within the State. This particular occurrence is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Erianthus giganteus* - *Panicum (spretum, verrucosum)* Herbaceous Vegetation. See Vegetation Description (Unit 1 of this report) for a precise definition of this community type.

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. Woody succession should be monitored to determine changes in community structure. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Brookview Ponds have excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Brookview Ponds are owned and managed by the Chesapeake Corp. of Virginia, thus receiving no designated conservation attention. Permission to access the site and inventory for rare species and communities was granted by Chesapeake Corp. to the Maryland Department of Natural Resources, who is aware of the rare species and significant plant communities at this site. Brookview Ponds would be an excellent site to pursue additional conservation attention with the landowner.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

OCCURRENCE RANK

This occurrence of *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation at Brookview Ponds ranks as an "A" or excellent example and are currently the only examples of this community type known in Maryland.

MANAGED AREA NAME / TRACT OWNERSHIP

Brookview Ponds are owned and managed by Chesapeake Corp. of Virginia, a private timber management company.

BEST SOURCE / LAND MANAGER

Wildlife and Heritage Division, Maryland Department of Natural Resources and is managed by the Land Manager, Chesapeake Corp. of Virginia

BOUNDARY JUSTIFICATION

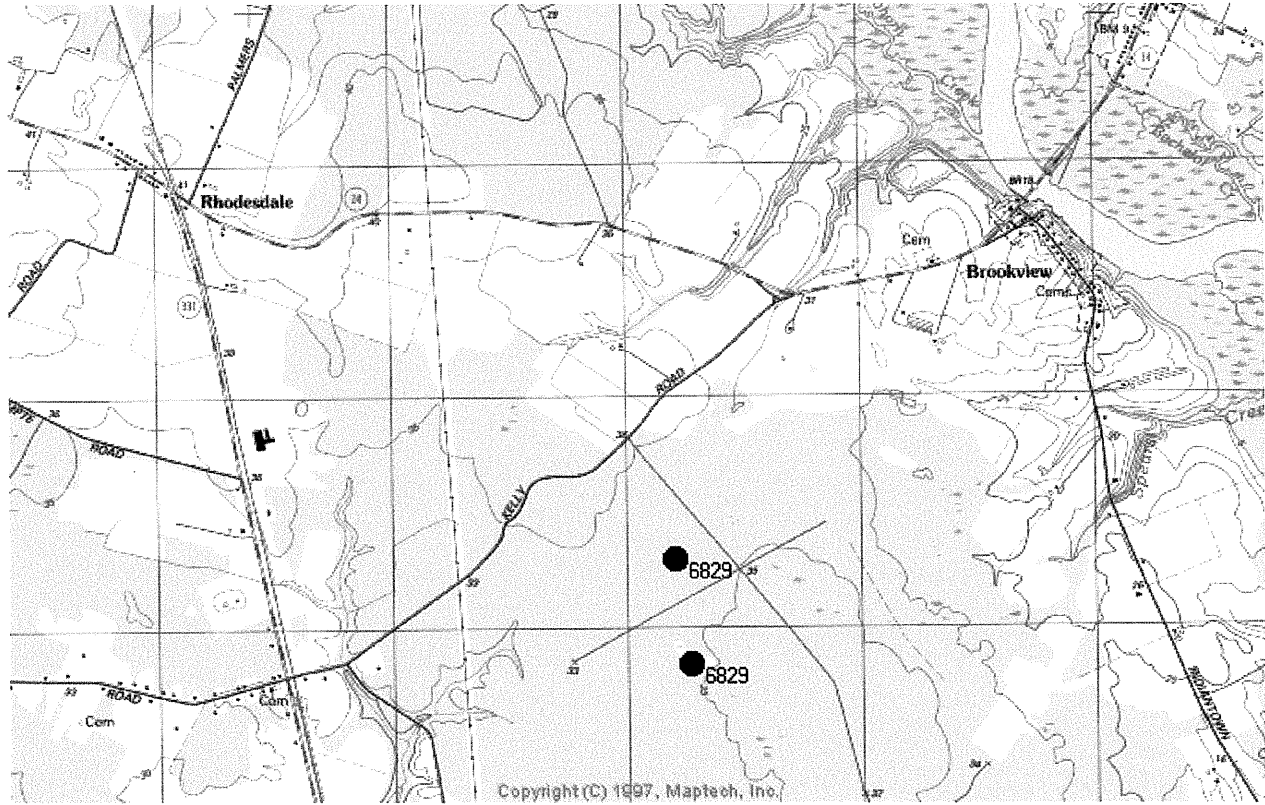
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

38 33 28.86 N, 75 48 42.36 W and 38 33 43.51 N, 75 48 45.19 W -- precise coordinates for site only and not necessarily for the *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation (6829) occurrence at this site

Brookview Ponds

Dorchester County, Maryland



USGS QUAD Rhodesdale, MD

38 33 28.86 N, 75 48 42.36 W and 38 33 43.51 N, 75 48 45.19 W -- precise coordinates for site only and not necessarily for the *Erianthus giganteus - Panicum (spretum, verrucosum)* Herbaceous Vegetation (6829) occurrence at this site

Dividing Creek Pond

COUNTY Worcester County, Maryland

USGS QUAD Dividing Creek, MD

PRIMARY REASON FOR SELECTION

Dividing Creek Pond contains a high quality occurrence and one of Maryland's best examples of *Leersia hexandra* Herbaceous Vegetation (6830).

High quality occurrence refers to a combination 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 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

Dividing Creek Pond contains a Delmarva Bay, a natural seasonally flooded pond, about one acre in size. The pond is bordered by *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest and *Pinus taeda* Forest.

Typical *Leersia hexandra* Herbaceous Vegetation dominates the eastern half of the non-forested portion of Dividing Creek Pond. The western half of the non-forested portion is vegetated by a slight variation of the typical *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation; exhibiting a greater dominance of *Juncus repens* than typically defined. The northern portion of this pond is forested by *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest.

The only indication of recent anthropogenic disturbance at this site is a small two square meter depression dug in the middle of the *Panicum (verrucosum, spretum)* - *Rhexia virginica* - *Fimbristylis autumnalis* / *Cephalanthus occidentalis* Herbaceous Vegetation, presumably as a wildlife enhancement.

Species considered rare, threatened, or endangered in Maryland known to occur at Dividing Creek Pond include six plant species.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Dividing Creek Pond was chosen as a “reference site” or “reference wetland” primarily because it is habitat to one of the best examples of *Leersia hexandra* Herbaceous Vegetation known in Maryland. This wetland community type is rare in Maryland and preliminarily ranked as S1, a designation meaning that between 1 and 5 occurrences are known within the State. This particular occurrence was used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Leersia hexandra* Herbaceous Vegetation. See Vegetation Description (Unit 1 of this report) for a precise definition of this community type.

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. Woody succession should be monitored to determine changes in community structure. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes.

PROTECTION COMMENTS

Dividing Creek Pond 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.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

Visitation and further research at this site should be restricted and requires a detailed proposal and approval by the Director of Wildlife and Heritage Division of the Maryland Department of Natural Resources.

OCCURRENCE RANK

This occurrence of *Leersia hexandra* Herbaceous Vegetation at Dividing Creek Pond ranks as an “A” or excellent example. This is the only known site for this vegetation type in Maryland.

MANAGED AREA NAME / TRACT OWNERSHIP

Dividing Creek Pond is owned by the State of Maryland and is managed by the Pocomoke State Forest.

BEST SOURCE / LAND MANAGER

Wildlife and Heritage Division, Maryland Department of Natural Resources and is managed by the State Forest Manager, Pocomoke State Forest

BOUNDARY JUSTIFICATION

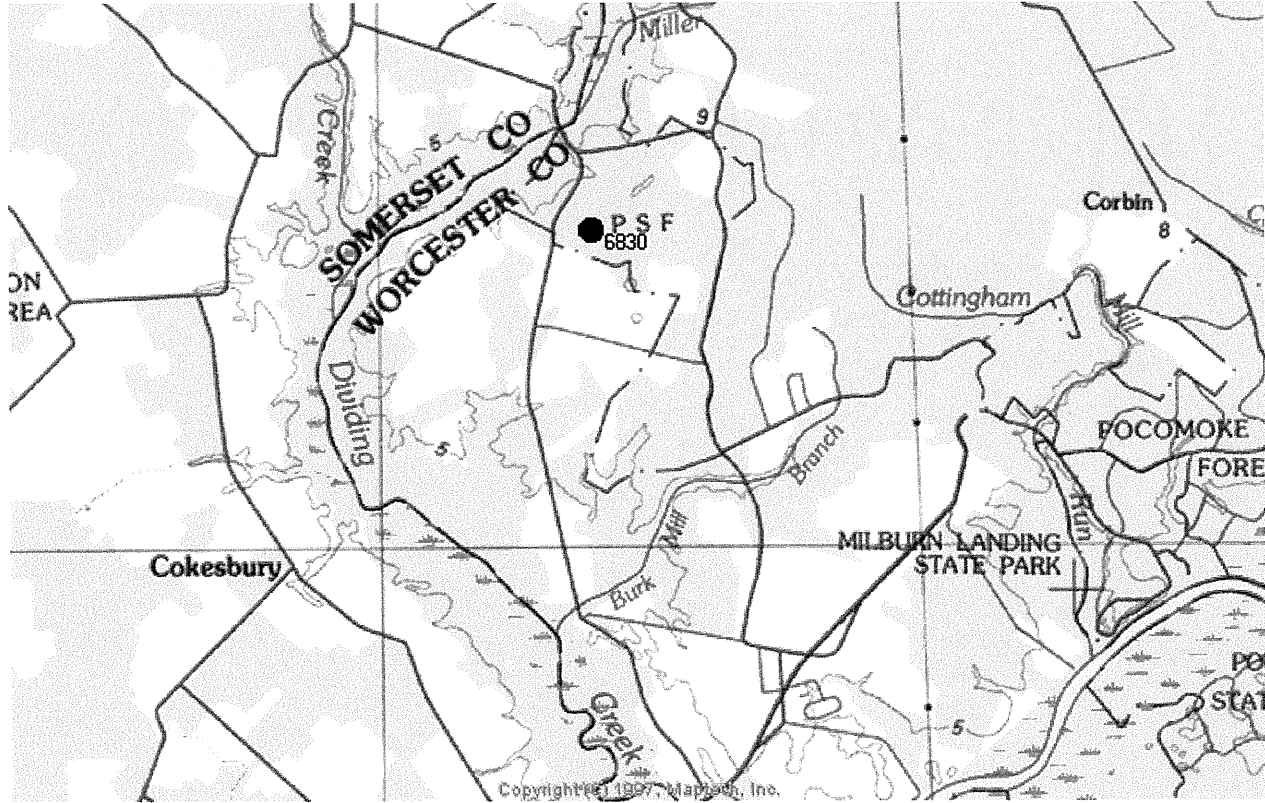
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

38 09 16.04 N, 75 32 56.02 W – precise coordinates for site only and not necessarily for the *Leersia hexandra* Herbaceous Vegetation (6830) occurrence at this site

Dividing Creek Pond

Worcester County, Maryland



USGS QUAD Dividing Creek, MD

38 09 16.04 N, 75 32 56.02 W -- precise coordinates for site only and not necessarily for the *Leersia hexandra* Herbaceous Vegetation (6830) occurrence at this site

Jackson Lane Preserve

COUNTY Caroline County, Maryland

USGS QUAD Goldsboro, MD

PRIMARY REASON FOR SELECTION

Jackson Lane Preserve contains a high quality occurrence and one of Maryland's best examples of *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest (6832).

High quality occurrence refers to a combination 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 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

Jackson Lane Preserve contains various Delmarva Bays, natural seasonally flooded ponds, of varying size. Most of the ponds are bordered by, or contain, some successional stage of the *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest. These ponds are spread out over a broad area and this wetland forest dominates the area in between these ponds. Uplands surrounding these ponds also contain *Pinus taeda* Forest.

Typical *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest dominates the forested wetlands at Jackson Lane Preserve. Herbaceous vegetation types also found within the ponds, themselves, include the typical *Panicum longifolium* - *Oldenlandia uniflora* - *Polygonum (amphibium, hydropiperoides)* / *Sphagnum* sp. / *Cephalanthus occidentalis* Herbaceous Vegetation, *Carex striata* / *Cephalanthus occidentalis* Herbaceous Vegetation, and *Woodwardia virginica* Herbaceous Vegetation.

There is a high degree of woody succession occurring within and around the edges of existing ponds at Jackson Lane Preserve. This succession appears to be an early stage of the *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest.

Species considered rare, threatened, or endangered in Maryland known to occur at Jackson Lane Preserve include four plant species and one amphibian species.

* This site is designated as a Maryland Non-tidal Wetland of Special State Concern.

COMMUNITY DESCRIPTION

Jackson Lane Preserve was chosen as a "reference site" or "reference wetland" primarily because it is habitat to one of the best examples of *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest in Maryland. This wet forest vegetation may become more prominent at Jackson Lane Preserve due to succession of open herbaceous wetland vegetation types. More data supporting this observation and a determination of the causes and implications is needed and recommended for this site.

This wetland community type is common on the Coastal Plain of Maryland and preliminarily ranked as S4/S5, a designation meaning the community is apparently secure and that greater than 100 occurrences are suspected within the State. This particular occurrence was used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest. See Vegetation Description (Unit 1 of this report) for a precise definition of this community type.

Maryland Delmarva Bay Wetlands

Vegetation Classification / Description and Reference Sites

REFERENCE SITES

MANAGEMENT COMMENTS / MONITORING NEEDS

Access to site should remain limited due to trampling and compaction of vegetation by visitors. An increase in woody succession has been observed at Jackson Lane Preserve especially on the higher elevated edges of the pond. Hydrological changes are suspected, possibly due to lowering of the water table by groundwater pumping or other depletion (for nearby agricultural purposes). Woody plant succession, community changes, and rare species should be monitored. A thorough determination of hydrological changes and their causes should be undertaken and correlations to vegetation changes substantiated, if they exist. This would be an excellent wetland to monitor hydrological changes over long periods of time to determine causes and impacts, if any, resulting from such changes. Jackson Lane Preserve has excellent potential for interesting invertebrates, and should be inventoried for significant species.

PROTECTION COMMENTS

Jackson Lane Preserve is a Nature Conservancy Preserve, thus receiving some conservation attention. The Nature Conservancy is aware of the rare species and significant plant communities at this site. Visitation and further research at this site is restricted and requires a detailed proposal and approval by the Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy.

OCCURRENCE RANK

This occurrence of *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest at Jackson Lane Preserve ranks as an "A" or excellent example when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Jackson Lane Preserve is owned by The Nature Conservancy

BEST SOURCE / LAND MANAGER

Director of Science and Stewardship, Maryland/DC Field Office of The Nature Conservancy

BOUNDARY JUSTIFICATION

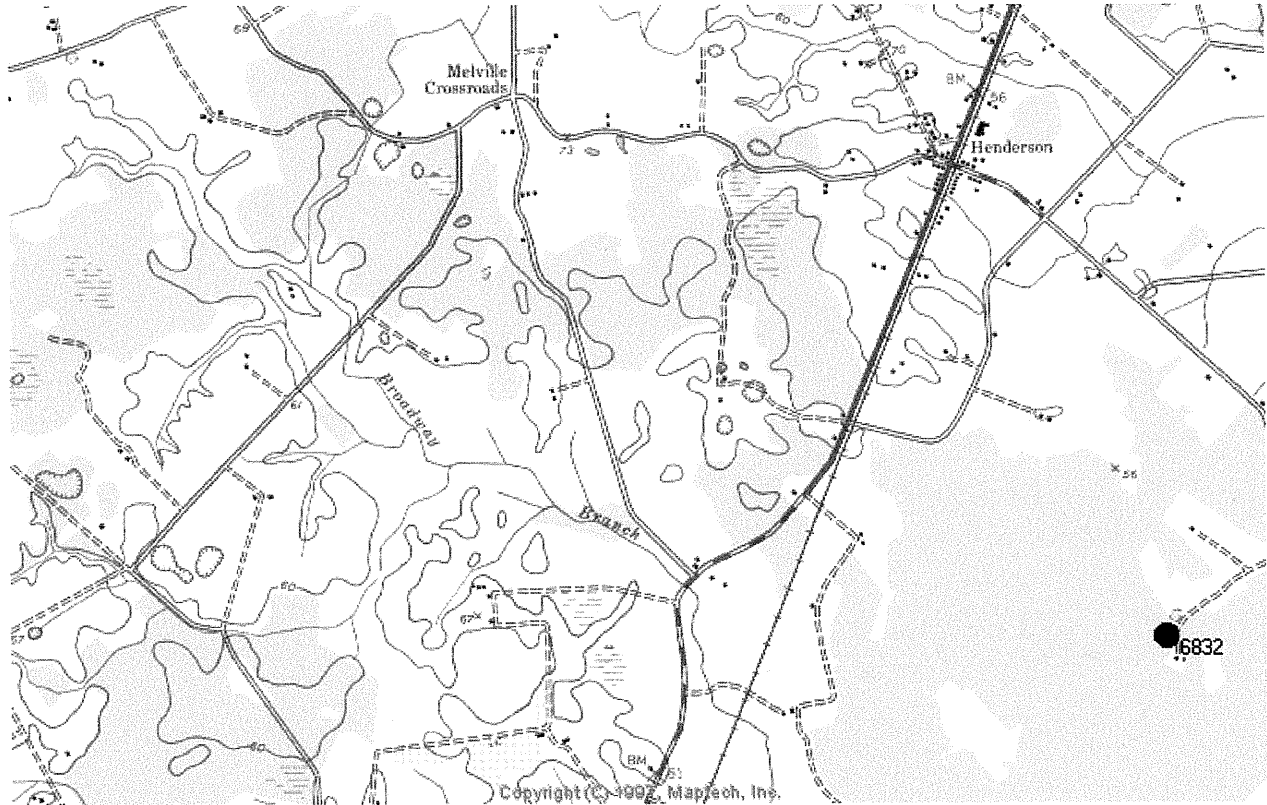
Boundary shown on map only as a general reference to site location.

LATITUDE / LONGITUDE

39 03 21.32 N, 75 45 21.34 W – precise coordinates for site only and not necessarily for the *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest (6832) occurrence at this site

Jackson Lane Preserve

Caroline County, Maryland



USGS QUAD Goldsboro, MD

39 03 21.32 N, 75 45 21.34 W -- precise coordinates for site only and not necessarily for the *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa sylvatica* / *Clethra alnifolia* Forest (6832) occurrence at this site

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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:

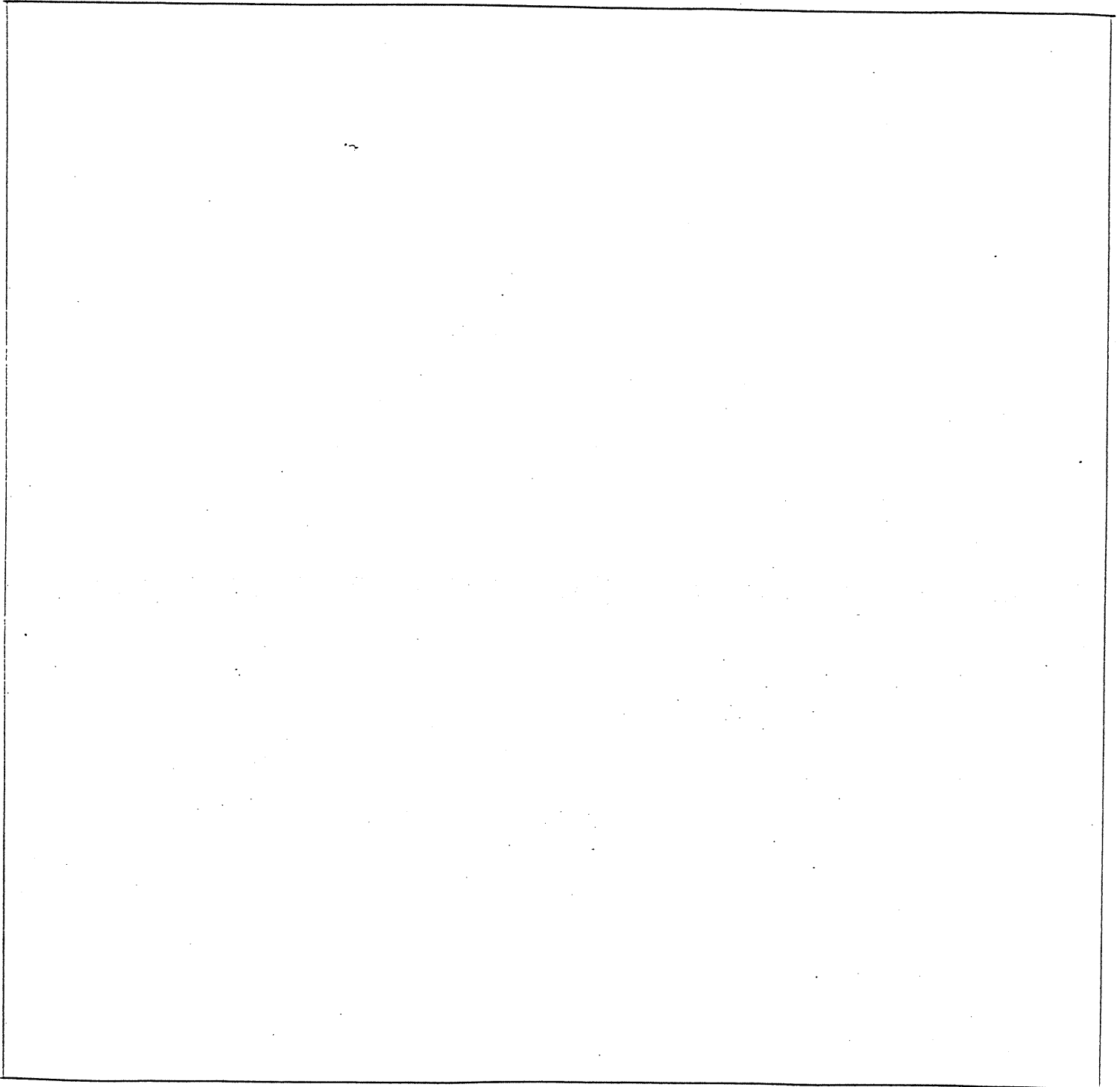
Describe off-site land uses (e.g. farming, grazing, mining, urban development, stream perturbations) and how these uses might affect the EOs on the site and their future management.

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

Site name: _____
 Survey site name: _____
 Quad name(s): _____ 4. Quad code(s): _____
 County name(s): _____ 6. County code(s): _____
 Town (LOCAL JURIS): _____
 Directions: _____

 Source code: _____ 10. Survey date: _____ . _____ . _____ 11. State: _____
 Surveyors: _____

Topography

13. Transect _____

Reconnaissance diagram: _____ Scale: _____

Vegetation / Habitat

Observation point 1 _____	Observation point 2 _____	Observation point 3 _____
Community name: _____	Community name: _____	Community name: _____
Additional data: form 2 _____ form 3 _____	Additional data: form 2 _____ form 3 _____	Additional data: form 2 _____ form 3 _____
General description (physiognomy, ar./dom. spp. of tree, shrub, herb, vophyte layers)	General description:	General description:

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

Identifiers (general EOR information)

1. SNAME _____ 2. GNAME: _____
 Site name: _____
 Survey site name: _____
 Quad name(s): _____ 6. Quad code(s): _____
 County name(s): _____ 8. County code(s): _____
 Town (LOCALJURIS): _____
 Directions: _____

 Sourcecode: _____ 12. Survey date: _____ . _____ . _____
 Last obs: _____ . _____ . _____ 14. First obs: _____ . _____ . _____ 15. State: _____
 Surveyors: _____

General Community Description (General EOR information)

Transect: _____ 18. Observation point number: _____
 Community Description (EODATA): (brief word picture of community; include characteristic spp., inclusion of other communities. If community occurs as mosaic, depict spatial distribution and associated community types) _____

 Fauna (EODATA): _____
 Evidence of community processes (EODATA): _____

 Minimum elevation: _____ ft. 23. Maximum elevation: _____ ft. 24. Size: _____ acres (0=unknown)
 General description (Describe landscape context of EO (GEN DESC): _____

 Management comments and monitoring needs (threats are described in #51) (MGMTCOM): _____

 Protection comments (PROTCOM): _____

 Owners: _____
 Owner comments (OWNERCOM): _____

 Comments: _____

Survey type: Qualitative Quantitative

Landform: _____

Geology comments: _____

Soil type: _____

Hydrological influence: _____

System: Terrestrial Palustrine Estuarine 37. Physiognomic type: _____

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

	height	% cover	most abundant / characteristic species
emergent tree			
tree canopy			
tree sub-canopy			
small shrub			
short shrub			
herbaceous			
non-vascular			
epiphyte / liana			

Element occurrence ranking information

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

Age, successional stage: _____

Known land use history: _____ **41. Quality Rank:** _____

Inferred land use history: _____

Other anthropogenic or unnatural disturbance: _____

Pesticides (known or suspected): _____

Presence of invasives: _____ **46. Condition rank:** _____

Alterations in natural processes: _____

Integrity / fragmentation of community: _____

Threats (on-site): _____ **50. Viability Rank:** _____

Threats (off-site): _____

53. Defensibility rank: _____

EO Rank comments: _____

(Overall) Element Occurrence Rank: _____

Identifiers (general EOR information)

1. name: 1.SNAME: _____ 2.GNAME: _____
 Site name: _____
 Survey site name: _____
 Quad name(s): _____ 6.Quad code(s): _____
 County name(s): _____ 8.County code(s): _____
 Town (LOCALJURIS): _____
 10.Lat: _____ N 11.Long: 0 _____ W 12.Directions: _____
 13.Sourcecode: _____ 14.Survey date: _____
 15.Last obs: _____ 16.First obs: _____ 17.State: _____
 18.Surveyors: _____

Environmental Description

<p>19. Transect / Observation point #</p> <p>20. Topographic position: Interfluve <input type="checkbox"/> Backslope High slope <input type="checkbox"/> Step in slope High level <input type="checkbox"/> Lowslope Midslope <input type="checkbox"/> Toeslope Low level <input type="checkbox"/> Channel wall Channel bed <input type="checkbox"/> Basin floor Other _____</p>	<p>20. Image annotation #</p> <p>23. Topographic sketch:</p>	<p>21. Elevation:</p> <p>24. Slope degrees: _____</p> <p>25. Slope aspect: _____</p> <p>26. Parent material:</p>
<p>27. Soil profile description: note depth, texture, and color of each horizon. Note significant changes such as depth to sttling, depth to water table, root penetration depth (SOILCOM)</p> <p>28. Organic horizon depth: _____</p>	<p>31. Soil moisture regime: <input type="checkbox"/> Extremely dry <input type="checkbox"/> Somewhat wet <input type="checkbox"/> Very dry <input type="checkbox"/> Wet <input type="checkbox"/> Dry <input type="checkbox"/> Very wet <input type="checkbox"/> Somewhat moist <input type="checkbox"/> Permanently inundated <input type="checkbox"/> Moist <input type="checkbox"/> Periodically inundated</p>	<p>32. Stoniness: <input type="checkbox"/> Stone free <0.1% <input type="checkbox"/> Moderately stony 0.1-1% <input type="checkbox"/> Stony 3-15% <input type="checkbox"/> Very stony 15-50% <input type="checkbox"/> Exceedingly stony 50-90% <input type="checkbox"/> Stone piles >90%</p>
<p>29. Organic horizon type: _____</p> <p>30. Average pH of mineral soil: _____</p>	<p>33. Soil drainage: <input type="checkbox"/> Rapidly drained <input type="checkbox"/> Somewhat poorly drained <input type="checkbox"/> Well drained <input type="checkbox"/> Poorly drained <input type="checkbox"/> Moderately well drained <input type="checkbox"/> Very poorly drained</p>	<p>34. Average texture: <input type="checkbox"/> sand <input type="checkbox"/> clay loam <input type="checkbox"/> sandy loam <input type="checkbox"/> clay <input type="checkbox"/> loam <input type="checkbox"/> peat <input type="checkbox"/> silt loam <input type="checkbox"/> muck <input type="checkbox"/> other _____</p>
<p>35. Unvegetated surface: <input type="checkbox"/> % Bedrock <input type="checkbox"/> % Litter, duff <input type="checkbox"/> % Large rocks (cobbles, boulders > 10 cm) <input type="checkbox"/> % Wood (> 1 cm) <input type="checkbox"/> % Small rocks (gravel, 0.2-10 cm) <input type="checkbox"/> % Water <input type="checkbox"/> % Sand (0.1-2 mm) <input type="checkbox"/> % Other: _____ <input type="checkbox"/> % Bare soil</p>		
<p>36. Environmental Comments: Note homogeneity of vegetation, erosion / sedimentation, inundation, etc.</p> <p>37. Plot representativeness:</p>		

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.