HERBACEOUS TIDAL WETLAND COMMUNITIES OF MARYLAND'S EASTERN SHORE

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HERBACEOUS TIDAL WETLAND COMMUNITIES OF MARYLAND'S EASTERN SHORE:

Identification, Assessment and Monitoring

Report Submitted To:

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for

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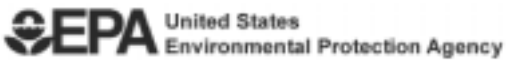

[U.S. EPA Reference Wetland Natural Communities of Maryland's Herbaceous Tidal Wetlands Grant # CD993724]

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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 mycorhizal 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 (Maryland Department of Natural Resources 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 and Burke 1995).

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 and Burke 1995). Of these 600,000 acres of wetlands, approximately 57 percent are represented by palustrine wetlands and 42 percent are represented by estuarine wetlands (Tiner and Burke 1995). According to the Tiner and Finn (1986) study, a significant decline in palustrine (6 %) and estuarine (8%) emergent wetland acreage occurred from 1955 to 1978. Conversion of tidal marshes to deepwater habitat, creation of saltwater and freshwater impoundments, ditching, and the overall lack of Federal and State wetland regulations during this period facilitated much of the acreage loss. This drastic loss has also 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 herbaceous tidal wetlands on Maryland's Eastern Shore, where these communities are poorly understood and severely threatened.

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 herbaceous tidal 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 Herbaceous Tidal Wetlands. 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 tidal wetlands in the eastern United States.

The information generated by this project will simplify the regulatory review of these tidal 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 herbaceous tidal wetlands was primarily based on that defined within the literature. For the purposes of this study, herbaceous tidal wetlands are broadly defined as emergent palustrine or estuarine wetlands that are subject to regular or irregular diurnal flooding and dominated by persistent or nonpersistent herbaceous vegetation.

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. The primary method of selecting sample sites was facilitated through the use of aerial photographs coupled with National Wetland Inventory maps. At the completion of the Landscape Analysis phase of the project, over 200 potential sites were identified. If required, 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 1999 to May 1999.

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 occurrences 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 m^2) for herbaceous vegetation, 15 m X 15 m (225 m^2) for shrubland vegetation, and 20 m X 20 m (400 m^2) 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. Salinity measurements were obtained from refractometer readings taken periodically during site assessment. 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 May 1999 to September 1999.

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 February 2001 to June 2001.

RESULTS

Of the over 200 sites initially identified as potential herbaceous tidal wetlands to visit, 26 were visited and quantitative data was collected from 70 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 herbaceous tidal wetland vegetation ascertained fourteen community types on the Delmarva Peninsula in Maryland. These types are:

1. *Acorus calamus* Tidal Herbaceous Vegetation
2. *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation
3. *Zizania aquatica* Tidal Herbaceous Vegetation
4. *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation
5. *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation
6. *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation
7. *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation
8. *Spartina cynosuroides* Herbaceous Vegetation
9. *Panicum virgatum* Tidal Herbaceous Vegetation
10. *Spartina alterniflora* Tidal Herbaceous Vegetation
11. *Juncus roemerianus* Tidal Herbaceous Vegetation
12. *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation
13. *Spartina patens - Distichlis spicata* Herbaceous Vegetation
14. *Phragmites australis* Tidal Herbaceous Vegetation

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 fourteen herbaceous tidal wetland 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: Lower Marshyhope Creek, Marshyhope Creek - Skinners Run, Watts Creek, Morgan Creek, King's Creek Preserve, Cypress Swamp, Nanticoke Central, Grays Island Marsh, Dames Quarter Marsh, and Thorofare Marsh. 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 200 potential sites were identified for assessment. The most productive method used to determine these sites was analyzing recent aerial photography in conjunction with National Wetlands Inventory maps. During the field surveys for this project, 26 of the over 200 potential sites were visited for preliminary assessment. The remaining sites were not visited due to time constraints. 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 26 sites that were visited, 70 community plots were surveyed. The diversity of vegetation community types within Maryland's herbaceous tidal wetlands 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.

Classification

This project yielded fourteen community types found embedded within the herbaceous tidal wetlands of Maryland's Eastern Shore. 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.

All 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 salinity, frequency of tidal flooding, and duration of tidal flooding.

Wetland Conditions

Although high quality examples of each of these fourteen community types exist on Maryland's Delmarva Peninsula, many of these wetland types suffer from significant abiotic and biotic threats. Many of these threats have led to qualitative changes in wetland function, structure, and composition. Agricultural runoff, coastal erosion, upland development, and invasive species (e.g., *Phragmites australis,* Nutria) continue to place pressure on natural wetland communities. Recently, there has been a sharp reduction in overall wetland acreage loss due to strong regulation of coastal wetland alterations through Maryland's Tidal Wetlands Act and through Federal regulations (e.g., *Section 404 program, Section 10 program)* pursuant to the Federal Clean Water Act (Tiner and Burke, 1995). Prior to these regulatory measures, most wetland loss was attributed to activities such as ditching, dredging, and impoundment construction.

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). Herbaceous tidal wetlands are often linear biologically rich islands bordered by open water, tidal swamp forests, depauperate upland forests, or sterile cultural habitats. They [herbaceous tidal wetlands] 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. Habitat fragmentation can cause changes in the remnant patch's internal community structure, composition, biomass, and microclimate (Laurance et al. 1998). This 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 Maryland's herbaceous tidal 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 tidal 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 herbaceous tidal wetlands of Maryland's Eastern Shore should not stand alone. A better understanding of these dynamic and diverse systems would be acquired with additional research on both the Eastern and Western shores of the Chesapeake Bay. Intensive study of other taxa that utilize these wetlands would also prove beneficial in understanding the complexity of these highly diverse systems.

Community Descriptions

Acorus calamus Tidal Herbaceous Vegetation

COMMON NAME	Sweetflag Tidal Herbaceous Vegetation
ELEMENT CODE	6833
NATURAL COMMUNITY	Tidal Freshwater Marsh
NATIONAL SYNONYM	*Acorus calamus* Tidal Herbaceous Vegetation (CEGL006833) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Vegetation
ALLIANCE	*Acorus calamus* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This tidal herbaceous community is among those characteristic of a diverse group of freshwater marshes subject to regular diurnal flooding bordering the upper reaches of Maryland's Coastal Plain rivers and tributaries. Salinity typically ranges from 0-0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources. Periodically, spring high tides or low river discharge may result in pulses of higher salinity. Occurring in the uppermost portion of the estuarine zone these freshwater marshes typically have a higher floristic diversity than adjacent brackish (mesohaline, 5.0-18.0 ppt) marshes. Vegetation composition and structure are closely linked to the frequency and duration of tidal flooding with species diversity typically increasing with elevation.

Acorus calamus Tidal Herbaceous Vegetation occurs primarily as narrow bands within higher portions of the intertidal zone of slow moving tidal rivers and tributaries on Maryland's Coastal Plain. Typically, this community forms dense monospecific stands in early spring and summer. As the growing season progresses, the leaves of *Acorus calamus* elongate becoming heavier and may lodge forming mats. Rain, wind, and high tides may also accelerate lodging. Matted down, this community gives way to seasonal changes as species such as *Impatiens capensis* and *Polygonum* spp. begin to emerge. Seasonal vegetation variations in freshwater marshes is a function of the species' various growth rates and their flowering sequence (Sipple 1990). Soils are highly variable and are composed of varying amounts of silts, silty mucks, peats, and sands.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Acorus calamus*

ADDITIONAL CHARACTERISTIC SPECIES

Peltandra virginica, Nuphar lutea ssp. *advena, Impatiens capensis, Polygonum arifolium, Polygoum sagittatum*

VEGETATION DESCRIPTION

Acorus calamus Tidal Herbaceous Vegetation is associated with diurnally flooded freshwater marshes of Maryland's Coastal Plain rivers and tributaries. This community is often monotypic, occupying 50 percent or more of the total vegetated cover. *Acorus calamus* Tidal Herbaceous Vegetation frequently borders shrub swamp communities and

herbaceous communities such as the *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472) and *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (4706). Areas less dense with *Acorus calamus* are often intermixed with substantial amounts of *Peltandra virginica.* This typically occurs on the perimeter of *Acorus calamus* beds and in areas with a softer, silt laiden bottom. If lodging occurs, other species may emerge as the growing season progresses. Most notably are *Impatiens capensis, Polygonum sagittatum,* and *Polygonum arifolium.*

OTHER NOTEWORTHY SPECIES

State rare (S1 to S3) plant species that may occur within this community include *Schoenoplectus cylindricus, Eriocaulon parkeri,* and *Aeschynomene virginica.*

RANGE

Acorus calamus Tidal Herbaceous Vegetation is a newly proposed community association, therefore national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to tidal freshwater marshes bordering tidal rivers and tributaries in the Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4?

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for the known and probable distribution of *Acorus calamus* Tidal Herbaceous Vegetation in Maryland. Additional inventory data are needed to finalize the conservation rank.

REFERENCE SITE

- Lower Marshyhope Creek, Dorchester County (38 33 52.32 N, 75 46 35.00 W) - precise coordinates for site only and not necessarily for the community occurrence
- Denton Marsh, Caroline County (38 53 8.66 N, 75 50 20.92 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Nuphar lutea ssp. *advena* Tidal Herbaceous Vegetation

COMMON NAME	Broadleaf Pondlily Tidal Herbaceous Vegetation
ELEMENT CODE	4472
NATURAL COMMUNITY	Tidal freshwater marsh
NATIONAL SYNONYM	Equivalent to *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (CEGL004472) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Hydromorphic Rooted Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Hydromorphic Rooted Vegetation
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Permanently Flooded Temperate or Subpolar Hydromorphic Rooted Vegetation
ALLIANCE	*Nuphar lutea* Permanently Flooded Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This tidal herbaceous community is among those characteristic of a diverse group of freshwater marshes subject to regular diurnal flooding bordering the upper reaches of Maryland's Coastal Plain rivers and tributaries. Salinity typically ranges from 0-0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources. Periodically, spring high tides or low river discharge may result in pulses of higher salinity. Occurring in the uppermost portion of the estuarine zone these freshwater marshes typically have a higher floristic diversity than adjacent brackish (mesohaline, 5.0-18.0 ppt) marshes. In these systems, the vegetation composition and structure are closely linked to the frequency and duration of tidal flooding with species diversity typically increasing with elevation.

The *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation alliance typically occurs in areas with the longest hydroperiod and where water depth is approximately 2-3 meters or less. Monospecific stands of *Nuphar lutea* ssp. *advena* typically occur below mean low water on unconsolidated tidal mudflats and submerged point bars of large coastal river meanders. Adjacent to open water, stands of *Nuphar lutea* ssp. *advena* are regularly submerged during high tides.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Nuphar lutea* ssp. *advena*

ADDITIONAL CHARACTERISTIC SPECIES

Peltandra virginica, Pontederia cordata, Acorus calamus, Zizania aquatica

VEGETATION DESCRIPTION

This *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation is associated with diurnally flooded freshwater marshes of Maryland's Coastal Plain rivers and tributaries. This community is often monotypic, dominated by 30 percent or more cover of *Nuphar lutea* ssp. *advena*. Large, dense clonal colonies (often circular) merge together to form expansive beds of *Nuphar lutea* ssp. *advena*. Few herbaceous species can compete due to a thick rhizomatous growth habit which spreads rapidly shading out many associative species. Scattered individuals of *Peltandra virginica*, *Pontederia*

cordata, *Zizania aquatica*, and other more cryptic submerged aquatic species may co-occur in transitional areas where the elevation is slightly higher and frequency of inundation is less.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

According to the International Classification of Ecological Communities: Terrestrial Vegetation of the United States (Anderson et al. 1998), *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation is distributed from Maine south to North Carolina.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to rivers and tributaries in the Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for the limited number of large known occurrences, regional threats from surrounding development activities, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Lower Marshyhope Creek, Dorchester County (38 34 22.72 N, 75 47 14.03 W) - precise coordinates for community occurrence at this site
- Watts Creek, Caroline County (38 51 8.3 N, 75 49 11.9 W) - precise coordinates for community occurrence at this site
- Snows Flats, Caroline County (38 52 6.41 N, 75 56 20.68 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Zizania aquatica Tidal Herbaceous Vegetation

COMMON NAME	Wild Rice Tidal Herbaceous Vegetation
ELEMENT CODE	4202
NATURAL COMMUNITY	Tidal Freshwater Marsh
NATIONAL SYNONYM	Equivalent to *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	Zizania aquatica Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This *Zizania aquatica* Tidal Herbaceous Vegetation association is among those characteristic of a diverse group of freshwater marshes subject to regular diurnal flooding bordering the upper reaches of Maryland's Coastal Plain rivers and tributaries. Salinity typically ranges from 0-0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources. Periodically, spring high tides or low river discharge may result in pulses of higher salinity. Occurring in the uppermost portion of the estuarine zone these freshwater marshes typically have a higher floristic diversity than adjacent brackish (mesohaline, 5.0-18.0 ppt) marshes. Vegetation composition and structure are closely linked to the frequency and duration of tidal flooding with species diversity increasing with elevation.

Zizania aquatica Tidal Herbaceous Vegetation occurs primarily as fringe marshes within the mid-tidal zone of slow moving tidal rivers and tributaries on Maryland's Coastal Plain (e.g., Choptank River, Nanticoke River, Wicomico River, Tuckahoe Creek, Marshyhope Creek). Typically, these communities are composed of tall graminoids and a variety of forbs with *Zizania aquatica* dominant or codominant. Soils are highly variable and are composed of varying amounts of silts, silty mucks, peats, and sands.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Zizania aquatica*

ADDITIONAL CHARACTERISTIC SPECIES

Peltandra virginica, Pontederia cordata, Nuphar lutea ssp. *advena, Acorus calamus, Leersia oryzoides, Impatiens capensis, Typha* spp., *Polygonum* spp.

VEGETATION DESCRIPTION

This *Zizania aquatica* Tidal Herbaceous Vegetation is associated with diurnally flooded freshwater marshes of Maryland's Coastal Plain rivers and tributaries. The distribution of *Zizania aquatica* Tidal Herbaceous Vegetation is highly dependant on salinity and the frequency and duration of tidal flooding. This community typically borders the open waters of tidal rivers and tributaries or merges with emergent herbaceous communities such as *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472). *Zizania aquatica* Tidal Herbaceous Vegetation is more prevalent in

regularly inundated areas where the salinity is between 0 and 0.5 ppt Schofield (1905) reported 0.37 ppt as the maximum salt tolerance of *Zizania aquatica* at White Landing on the Patuxent River. Colonies of *Zizania aquatica* are highly variable in size and shape, ranging from less than 0.5 hectares to more than 150 hectares, and varying from linear to circular.

Zizania aquatica stands often reach heights in excess of 3 meters and frequently include a mixture of graminoids and forbs. Scattered plants of *Peltandra virginica, Nuphar lutea* ssp. *advena,* and *Pontederia cordata,* singly or in various combinations may form a discontinuous undergrowth in stands of *Zizania aquatica* (McCormick and Somes 1982). Among the graminoids found intermixed with the *Zizania aquatica* Tidal Herbaceous Vegetation are *Typha latifolia, Typha angustifolia, Leersia oryzoides, Spartina cynosuroides, Schoenoplectus pungens,* and *Schoenoplectus fluviatilis*. Associated forbs typically include *Peltandra virginica, Pontederia cordata, Nuphar lutea* ssp. *advena, Sagittaria latifolia, Impatiens capensis,* and *Acorus calamus.*

Invasive species such as *Phragmites australis* have been known to displace *Zizania aquatica* in areas of increased disturbance. Baxter (1973) and Sipple (1990) reported the advancement of *Phragmites australis* in *Zizania aquatica* marshes along the Patuxent River due to an increase in sedimentation from eroded uplands. By examining aerial photographs taken between 1938 and 1970, Baxter determined that circular colonies of *Phragmites australis* were spreading radially at a rate of approximately 13 meters per year into adjacent stands of *Zizania aquatica*.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Schoenoplectus cylindricus, Eriocaulon parkeri,* and *Aeschynomene virginica.*

RANGE

According to the International Classification of Ecological Communities: Terrestrial Vegetation of the United States (Anderson et al. 1998), *Zizania aquatica* Tidal Herbaceous Vegetation is distributed from Maine south to North Carolina and west to Louisiana.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to tidal freshwater marshes bordering rivers and tributaries in the Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S3

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for the limited number of large known occurrences, high level of threat from invasive species, regional threats from development activities, and a statewide distribution limited to one physiographic province in Maryland.

REFERENCE SITES

- Marshyhope Creek-Skinners Run, Dorchester County (38 39 27.84 N, 75 47 56.87 W) - precise coordinates for site only and not necessarily for the community occurrence
- Lower Marshyhope Creek, Dorchester County (38 33 7.02 N, 75 46 24.15 W) - precise coordinates for site only and not necessarily for the community occurrence
- Upper Choptank River-Greensboro, Caroline County (38 57 6.78 N, 75 49 17.83 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Peltandra virginica - Pontederia cordata Tidal Herbaceous Vegetation

COMMON NAME	Arrow-arum - Pickerelweed Tidal Herbaceous Vegetation
ELEMENT CODE	4706
NATURAL COMMUNITY	Tidal Freshwater Marsh, Oligohaline Marsh
NATIONAL SYNONYM	Equivalent to *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (CEGL004706) of the National Vegetation Classification System (TNC 1998)
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	Tidally flooded Temperate Perennial Forb Vegetation
ALLIANCE	*Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation Alliance

ENVIRONMENTAL DESCRIPTION

Peltandra virginica - Pontederia cordata Tidal Herbaceous Vegetation is a component of a diverse group of freshwater and slightly brackish (oligohaline, 0.5-5.0 ppt) marshes bordering the upper reaches of Maryland's Coastal Plain tidal rivers and tributaries. These systems are subject to irregular and regular diurnal flooding Salinity typically ranges from 0-5.0 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources. Periodically, spring high tides or low river discharge may result in pulses of higher salinity. Occurring in the uppermost portion of the estuarine zone these freshwater marshes typically have a higher floristic diversity than adjacent brackish (mesohaline, 5.0-18.0 ppt) marshes. Vegetation composition and structure are closely linked to the frequency and duration of tidal flooding with species diversity increasing with elevation.

Generally, the *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation community association is found in lower portions of the marsh often bordering the open water of small tidal creeks and sloughs. Stands of *Peltandra virginica,* in which *Pontederia cordata* may be a common associate, occur in many wetland areas as fringes of varying width along the banks of tidewater creeks and guts (McCormick and Somes 1982). Substrates are typically muck of variable depths.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Peltandra virginica, Pontederia cordata*

ADDITIONAL CHARACTERISTIC SPECIES

Zizania aquatica, Polygonum arifolium, Polygonum hydropiperoides, Polygonum sagittatum, Bidens spp.*, Sagittaria latifolia*

VEGETATION DESCRIPTION

This community association is characterized by a dominance of either *Peltandra virginica* or *Pontederia cordata* or variable mixtures of both. Often this community forms loose colonies along margins tidal streams, guts, and sloughs. Few associates may occur and typically include species such as *Acorus calamus, Zizania aquatica, Sagittaria latifolia, Impatiens capensis, Typha* spp.*, Polygonum hydropiperoides*. The *Peltandra virginica - Pontederia cordata* Tidal

Herbaceous Vegetation often occurs in close association with other tidal freshwater marsh communities such as *Acorus calamus* Tidal Herbaceous Vegetation (6833), *Zizania aquatica* Tidal Herbaceous Vegetation (4202), and *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation (6834).

OTHER NOTEWORTHY SPECIES

State rare (S1 to S3) plant species that may occur within this community include *Carex lacustris, Carex hyalinolepis, Aeschynomene virginica,* and *Schoenoplectus cylindricus.*

RANGE

According to the Terrestrial Vegetation of the Southeastern United States (Weakley et al. 1998), associations within the *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation Alliance occur from New Jersey south to Virginia.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to rivers and tributaries in the Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4?

RANK CONFIDENCE

Low

RANK JUSTIFICATION

Rank accounts for the known and probable distribution of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation in Maryland.

REFERENCE SITES

- Watts Creek, Caroline County (38 51 6.6 N, 75 49 11.4 W) - precise coordinates for site only and not necessarily for the community occurrence
- Lower Marshyhope Creek (38 33 29.2 N, 75 46 8.25 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Peltandra virginica - Impatiens capensis - Typha angustifolia Tidal Herbaceous Vegetation

COMMON NAME	Arrow-arum - Jewelweed - Narrowleaf Cattail Tidal Herbaceous Vegetation
ELEMENT CODE	6834
NATURAL COMMUNITY	Tidal Freshwater Marsh, Oligohaline Marsh
NATIONAL SYNONYM	*Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation [4706 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	Tidally flooded Temperate Perennial Forb Vegetation
ALLIANCE	*Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation Alliance

ENVIRONMENTAL DESCRIPTION

This *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation is a component of a diverse group of freshwater and slightly brackish (oligohaline, 0.5-5.0 ppt) marshes bordering the upper reaches of Maryland's Coastal Plain tidal rivers and tributaries. These systems are subject to irregular and regular diurnal flooding. Salinity typically ranges from 0-5.0 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources. Periodically, spring high tides or low river discharge may result in pulses of higher salinity. Occurring in the uppermost portion of the estuarine zone these freshwater marshes typically have a higher floristic diversity than adjacent brackish (mesohaline, 5.0-18.0 ppt) marshes. Within these systems, the vegetation composition and structure are closely linked to the frequency and duration of tidal flooding with species diversity typically increasing with elevation.

Generally, the *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation community occurs in the upper low marsh and high marsh zones. Typically, this area is subject to regular diurnal flooding. Soils of this association are highly variable and composed of varying amounts of silts, silty mucks, peats, and sands

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Peltandra virginica, Impatiens capensis, Typha angustifolia*

ADDITIONAL CHARACTERISTIC SPECIES

Pontederia cordata, Zizania aquatica, Hibiscus moscheutos, Leersia spp.*, Polygonum arifolium, Polygonum hydropiperoides, Polygonum sagittatum, Bidens* spp.*, Sagittaria latifolia*

VEGETATION DESCRIPTION

The *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation is typical of many tidal freshwater oligohaline marshes in Maryland. This herbaceous community is highly diverse, however best characterized by a dominance of *Peltandra virginica, Impatiens capensis,* and *Typha angustifolia*. Variable amounts of these species may occur in irregular patterns often merging with other community associations such as *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (4706) and *Zizania aquatica* Tidal Herbaceous Vegetation (4202). Other species that may occur in lesser cover values include *Hibiscus moscheutos, Leersia oryzoides,* and several species of *Polygonum* spp.

OTHER NOTEWORTHY SPECIES

State rare (S1 to S3) plant species that may occur within this community include *Schoenoplectus cylindricus.*

RANGE

Peltandra virginica - Impatiens capensis - Typha angustifolia Tidal Herbaceous Vegetation is a newly proposed community association; therefore national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to rivers and tributaries in the Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4?

RANK CONFIDENCE

Low

RANK JUSTIFICATION

Rank accounts for the known and probable distribution of *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation in Maryland. Additional inventory data are needed to finalize the conservation rank.

REFERENCE SITES

- Morgan Creek, Kent County (39 14 35.4 N, 76 02 32.2 W) - precise coordinates for community occurrence at this site

COMMENTS

[none]

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AUTHOR

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Typha (angustifolia, latifolia) - Hibiscus moscheutos Herbaceous Vegetation

COMMON NAME	Cattail - Rose Mallow Herbaceous Vegetation
ELEMENT CODE	4201
NATURAL COMMUNITY	Oligohaline Marsh, Brackish Marsh
NATIONAL SYNONYM	Equivalent to *Typha angustifolia - Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

The *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation community association is among those characteristic of diurnally flooded slightly brackish (oligohaline, 0.5-5.0 ppt) and brackish (mesohaline, 5.0-18.0 ppt) marshes bordering tidal rivers, tributaries, and shores of the Chesapeake Bay. Mesohaline or brackish systems are the predominant estuarine wetland type in Maryland (Tiner and Burke 1995). In Maryland, most brackish marshes border large tidal rivers and shores of the Chesapeake Bay, however, smaller marshes of this alliance also occur at the upper limits of larger tidal creeks. Although characterized by low species diversity, brackish marshes still exhibit a much higher floristic diversity than salt marshes (polyhaline, 18.0-30.0 ppt). Within brackish marshes there is a wide zone of transition from the more seaward brackish marshes with many representatives of salt marsh species to the more inland marshes with considerable representation by typical freshwater species (Tiner and Burke 1995).

Slightly brackish or oligohaline marshes typically occupy the uppermost zone of the estuarine marshes and occur in a freshwater zone subject to periodic saltwater intrusion. Pulses of higher salinity (greater than 5.0 ppt) may occur during spring high tides or periods of low river discharge. Within this transitional zone, species diversity is very high as representatives of both freshwater and brackish marshes co-exist. Although mostly dominated by facultative halophytic graminoids, oligohaline marshes may contain a wide variety of forb associates more characteristic of freshwater marshes. The vegetation and community structure in oligohaline and mesohaline systems are closely linked to the frequency and duration of tidal flooding, with species diversity typically increasing with elevation. At Assateague Island NS, the soils of this community are comprised of a shallow organic layer (5-20 cm peaty muck) overlying sand.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Typha angustifolia, Typha latifolia, Peltandra virginica, Pontederia cordata, Hibiscus moschuetos, Schoenoplectus pungens*

ADDITIONAL CHARACTERISTIC SPECIES

Spartina cynosuroides, Spartina patens, Hydrocotyle umbellata, Amaranthus cannabinus, Impatiens capensis, Mikania scandens, Bidens spp.*, Leersia oryzoides*

VEGETATION DESCRIPTION

The species composition of this community is a mixture of salt marsh and freshwater tidal marsh species. Most obvious is the dominance of either *Typha angustifolia* or *Typha latifolia* or a codominance of both. These graminoids typically comprise 50 to 100 percent of the total ground cover. *Hibiscus moscheutos* is commonly a codominant species within this community. The vegetation is dense and may include species such as *Peltandra virginica, Spartina cynosuroides, Schoenoplectus americanus, Pontederia cordata, Lilaeopsis chinensis, Hibiscus palustris,* and *Pluchea odorata*. At Assateague Island NS, this herbaceous vegetation typically occurs on the edge of non-tidal intermittently flooded wetlands and irregularly flooded tidal wetlands, or where the two meet. Therefore, a brackish influence is often present in the water feeding these poorly drained wetlands. *Typha angustifolia* characteristically dominates the vegetation cover (30 to 90 percent cover). Otherwise, the soil substrate is either bare muck or peat, standing water, or an accumulation of dead *Typha* litter. Other herbaceous species are present but sparsely distributed and with low cover values; characteristic species include: *Hibiscus moscheutos, Spartina patens, Distichlis spicata, Schoenoplectus pungens, Lycopus americanus, Eleocharis palustris, Hydrocotyle umbellata, Eupatorium capillifolium, Ptilimnium capillaceum, Bidens* spp., and *Spartina alterniflora*. This vegetation is not widespread on Assateague, and is largely confined to the head of tidal creeks on the bay side.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

The range of this community is not known; the alliance occurs in coastal areas from Maine through South Carolina. Further research is necessary to determine the classification, and thus the range, with confidence.

MARYLAND DISTRIBUTION

In Maryland, *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation is common to brackish marshes in the Lower Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for probable distribution of *Typha angustifolia - Hibiscus moscheutos* Herbaceous Vegetation in Maryland.

REFERENCE SITES

- Adkins Marsh, Talbot County (38 46 19.86 N, 75 58 35.25 W)
- Assateague Island National Seashore, Worcester County (general reference site- no coordinates given)

COMMENTS

Classification of this community and associated brackish tidal marshes is complex and awaits the collection and analysis of further data. The transitional fresh marsh (Hill 1986) described from Assateague Island is partially contained in this community. Higgins et al. (1971) did not describe this vegetation. The following vegetation descriptions are contained partially or entirely within the *Typha angustifolia - Hibiscus* spp. Alliance: *Typha angustifolia - Hibiscus palustris* community (Metzler and Barrett 1992, Connecticut); Brackish tidal marsh (Reschke 1990, New York); Brackish tidal marsh complex (Breden 1989, New Jersey); Brackish tidal marsh community (Maine Natural Heritage Program 1991, Maine); Brackish marsh (Sperduto 1994, New Hampshire); *Hibiscus* marsh (Cahoon and Stevenson 1986, Maryland); narrowleaf cattail type (McCormick and Ashbaugh 1972, New Jersey); *Typha*

angustifolia community (Good and Good 1975, New Jersey); *Typha angustifolia* type (Ferren et al 1981, New Jersey); fresh-brackish marsh (Klotz 1986, Virginia). The *Typha* association described from Maryland by Shreve et al. (1910) is likely synonymous with this community.

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Eleocharis (fallax, rostellata) Tidal Herbaceous Vegetation

COMMON NAME	Creeping Spikerush Tidal Herbaceous Vegetation
ELEMENT CODE	6837
NATURAL COMMUNITY	Oligohaline Marsh
NATIONAL SYNONYM	*Eleocharis rostellata - (Centella erecta, Eriocaulon decangulare)* Herbaceous Vegetation [4183 in part] *Eleocharis fallax - Eleocharis rostellata - Schoenoplectus americanus - Sagittaria lancifolia* Herbaceous Vegetation [4628 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	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Eleocharis fallax - Eleocharis rostellata* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

In Maryland, *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation is among those characteristic of diurnally flooded slightly brackish (oligohaline, 0.5-5.0 ppt) marshes bordering tidal rivers and tributaries of the Chesapeake Bay. These slightly brackish or transitional marshes typically occupy the uppermost zone of the estuarine marshes and occur in a freshwater zone subject to periodic saltwater intrusion. Pulses of higher salinity (greater than 5.0 ppt) may occur during spring high tides or periods of low river discharge. Within this transitional zone, species diversity is very high as representatives of both freshwater and brackish marshes co-exist. Although mostly dominated by facultative halophytic graminoids, oligohaline marshes may contain a wide variety of forb associates more characteristic of freshwater marshes. *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation typically occurs in the irregularly flooded high marsh zone slightly distanced from tidal creeks and guts. Substrates consist of muck and peat of variable depths.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Eleocharis fallax, Eleocharis rostellata*

ADDITIONAL CHARACTERISTIC SPECIES

Carex hormathodes, Hibiscus moscheutos, Cyperus haspan, Centella erecta, Cladium mariscoides, Typha angustifolia, Mikania scandens, Decodon verticillatus, Osmunda regalis, Distichlis spicata, Thelypteris palustris, Hydrocotyle umbellata, Sium suave

VEGETATION DESCRIPTION

This community is found in association with oligohaline marshes dominated by either *Eleocharis fallax* or *Eleocharis rostellata* or a codominance of both. Often these species occupy 75 to 100 percent of the total vegetated cover forming dense colonies termed “spikerush lawns”. This *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation is often found embedded amongst a matrix of other oligohaline marsh community types. Associates that may occur bordering

or intermixed with *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation include *Decodon verticillatus, Peltandra virginica, Thelypteris palustris, Carex hormathodes, Carex hyalinolepis, Cyperus haspan, Cladium mariscoides, Typha angustifolia,* and *Hydrocotyle umbellata*.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

Since this is a newly proposed community association, national distribution requires further determination. According to the Terrestrial Vegetation of the Southeastern United States (Weakley et al. 1998), similar community associations within the *Eleocharis fallax- Eleocharis rostellata* Tidal Herbaceous Vegetation Alliance are known from Delaware, Virginia, and North Carolina.

MARYLAND DISTRIBUTION

In Maryland, this community is restricted to tidal marshes in the Lower Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

SR

RANK CONFIDENCE

N/A

RANK JUSTIFICATION

More inventory data are needed to finalize a conservation rank for Maryland.

REFERENCE SITES

- Cypress Swamp, Worcester County (38 02 39.0 N, 75 39 31.5 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Spartina cynosuroides Herbaceous Vegetation

COMMON NAME	Giant Cordgrass Herbaceous Vegetation
ELEMENT CODE	4195
NATURAL COMMUNITY	Oligohaline Marsh, Brackish Marsh
NATIONAL SYNONYM	Equivalent to *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Spartina cynosuroides* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

Spartina cynosuroides Herbaceous Vegetation is among those characteristic of diurnally flooded oligohaline (0.5-5.0 ppt) and mesohaline (5.0-18.0 ppt) marshes bordering the tidal rivers, tributaries, and shores of the Chesapeake Bay. Mesohaline or brackish systems are the predominant estuarine wetland type in Maryland (Tiner and Burke 1995). In Maryland, most brackish marshes border the shores of the Chesapeake Bay. Although characterized by low species diversity (compared to oligohaline and freshwater marshes), brackish marshes still exhibit a much higher floristic diversity than salt marshes (polyhaline, 18.0-30.0 ppt). Within brackish marshes there is a wide zone of transition from the more seaward brackish marshes with many representatives of salt marsh species to the more inland marshes with considerable representation by typical freshwater species (Tiner and Burke 1995). The slightly brackish or oligohaline marshes typically occupy the uppermost zone of the estuarine marshes and occur in a freshwater zone subject to periodic saltwater intrusion. Pulses of higher salinity (greater than 5.0 ppt) may occur during spring high tides or periods of low river discharge. Within this transitional zone, species diversity is very high as representatives of both freshwater and brackish marshes co-exist. Although mostly dominated by facultative halophytic graminoids, oligohaline marshes may contain a wide variety of forb associates more characteristic of freshwater marshes. The vegetation and community structure in oligohaline and mesohaline systems are closely linked to the frequency and duration of tidal flooding, with species diversity typically increasing with elevation.

In Maryland, the *Spartina cynosuroides* Herbaceous Vegetation typically occurs in linear stands along tidal creeks, guts, and levees of oligohaline and mesohaline marshes. *Spartina cynosuroides* Herbaceous Vegetation is known to occur in both low marsh and high marsh zones, however, is more frequent to the irregularly flooded high marsh zone. Substrates are peat of variable depths overlying sand.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Spartina cynosuroides*

ADDITIONAL CHARACTERISTIC SPECIES

Hibiscus moscheutos, Typha angustifolia, Peltandra virginica, Pontederia cordata, Spartina patens, Spartina alterniflora, Iva frutescens

VEGETATION DESCRIPTION

This *Spartina cynosuroides* Herbaceous Vegetation is associated with oligohaline and mesohaline marshes dominated by mixed or monospecific stands of *Spartina cynosuroides*. This community often forms linear stands in excess of 3 meters tall along the margins of tidal creeks, guts, and levees. *Spartina cynosuroides* Herbaceous Vegetation communities are variable in vegetation structure and composition, as some may contain species more characteristic of freshwater marshes such as *Peltandra virginica* and *Typha angustifolia,* while others may contain species typical of more saline environments such as *Spartina alterniflora* and *Iva frutescens.* Other common associates include *Pontederia cordata, Schoenoplectus pungens, Schoenoplectus validus, Schoenoplectus americanus, Kosteletzkya virginica, Amaranthus cannabinus, Polygonum punctatum, Polygonum hydopiperoides,* and *Impatiens capensis.*

Invasive species such as *Phragmites australis* haven been known to displace *Spartina cynosuroides* in areas of increased disturbance.

OTHER NOTEWORTHY SPECIES

S1 to S3 plant species that may occur within this community include *Schoenoplectus cylindricus, Carex hyalinolepis,* and *Aeschynomene virginica.*

RANGE

According to the International Classification of Ecological Communities: Terrestrial Vegetation of the United States (Anderson et al. 1998), *Spartina cynosuroides* Herbaceous Vegetation is distributed from New York south to Georgia. Communities in the *Spartina cynosuroides* Tidal Herbaceous Alliance occur mainly in the mid-Atlantic states with the northern extent of distribution being southern New England.

MARYLAND DISTRIBUTION

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

CONSERVATION RANK

S4?

RANK CONFIDENCE

Low

RANK JUSTIFICATION

Rank accounts for the known and probable distribution of *Spartina cynosuroides* Herbaceous Vegetation in Maryland. Additional inventory data are needed to finalize the conservation rank.

REFERENCE SITES

- Nanticoke Central, Wicomico County (38 23 30.61 N, 75 49 28.08 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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Panicum virgatum Tidal Herbaceous Vegetation

COMMON NAME	Switchgrass Tidal Herbaceous Vegetation
ELEMENT CODE	6150
NATURAL COMMUNITY	Oligohaline Marsh, Brackish Marsh
NATIONAL SYNONYM	Equivalent to *Panicum virgatum* Tidal Herbaceous Vegetation (CEGL006150) of the National Vegetation Classification System (TNC 1998)
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Panicum virgatum* Tidal Herbaceous Vegetation Alliance

ENVIRONMENTAL DESCRIPTION

Panicum virgatum Tidal Herbaceous Vegetation is among those characteristic of diurnally flooded slightly brackish (oligohaline, 0.5-5.0 ppt) and brackish (mesohaline, 5.0-18.0 ppt) marshes bordering the tidal rivers, tributaries, and shores of the Chesapeake Bay. Mesohaline or brackish marshes are the predominant estuarine wetland type in Maryland (Tiner and Burke 1995). In Maryland, most brackish marshes border the shores of the Chesapeake Bay. Although characterized by low species diversity (compared to tidal freshwater marshes), brackish marshes still exhibit a much higher floristic diversity than salt marshes (polyhaline, 18.0-30.0 ppt). Within brackish marshes there is a wide zone of transition from the more seaward brackish marshes with many representatives of salt marsh species to the more inland marshes with considerable representation by typical freshwater species (Tiner and Burke 1995).

Slightly brackish or oligohaline marshes typically occupy the uppermost zone of the estuarine marshes and occur in a freshwater zone subject to periodic saltwater intrusion. Pulses of higher salinity may occur during spring high tides or periods of low river discharge. Within this transitional zone, species diversity is very high as representatives of both freshwater and brackish marshes co-exist. Although mostly dominated by facultative halophytic graminoids, oligohaline marshes may contain a wide variety of forb associates more characteristic of freshwater marshes. The vegetation and community structure in these tidal systems are closely linked to the frequency and duration of tidal flooding, with species diversity typically increasing with elevation.

In Maryland, *Panicum virgatum* Tidal Herbaceous Vegetation occurs as linear stands in transitional areas between uplands and wetlands. This interface is irregularly flooded due to being slightly higher in elevation. This community typically merges with the *Baccharis halimifolia - Iva frutescens* Tidal Shrubland Alliance. The substrate within this high marsh zone is commonly shallow peat overlying sand of variable depths.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Panicum virgatum*

ADDITIONAL CHARACTERISTIC SPECIES

Amaranthus cannabinus, Baccharis halimifolia, Juncus roemerianus, Carex spp.*, Hibiscus moscheutos, Solidago sempervirens, Schoenoplectus americanus, Spartina patens, Distichlis spicata, Typha angustifolius, Typha latifolia*

VEGETATION DESCRIPTION

This community is associated with tidal marshes dominated by monospecific stands of *Panicum virgatum*. This community often forms linear stands in excess of 2 meters tall at the upland/wetland interface. Common associates include *Iva frutescens, Baccharis halimifolia, Distichlis spicata, Schoenoplectus pungens, Schoenoplectus validus, Schoenoplectus americanus, Kosteletzkya virginica, Hibiscus moscheutos, Amaranthus cannabinus, Spartina patens, Typha latifolia,* and *Typha angustifolius.*

OTHER NOTEWORTHY SPECIES

[none]

RANGE

According to the Terrestrial Vegetation of the Southeastern United States (Weakley et al. 1998), the *Panicum virgatum* Tidal Herbaceous Vegetation Alliance occurs in coastal areas from Massachusetts south to Virginia.

MARYLAND DISTRIBUTION

In Maryland, *Panicum virgatum* Tidal Herbaceous Vegetation is restricted oligohaline and mesohaline marshes bordering tidal rivers and creeks in the Coastal Plain Physiographic Province. This community association occurs on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4

RANK CONFIDENCE

Medium

RANK JUSTIFICATION

Rank accounts for the known and probable distribution of *Panicum virgatum* Tidal Herbaceous Vegetation in Maryland.

REFERENCE SITES

- Adkins Marsh, Talbot County (38 46 16.27 N, 75 58 38.56 W) - precise coordinates for community occurrence at this site
- Hunting Creek, Caroline County (38 40 44.0 N, 75 55 23.6 W) - precise coordinates for community occurrence at this site

COMMENTS

[none]

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AUTHOR

Jason W. Harrison, 2001

Spartina alterniflora Tidal Herbaceous Vegetation

COMMON NAME	Smooth cordgrass Tidal Herbaceous Vegetation
ELEMENT CODE	4192
NATURAL COMMUNITY	Low Brackish Marsh, Low Salt Marsh
NATIONAL SYNONYM	*Spartina alterniflora / (Ascophyllum nodosum)* Acadian / Virginian Zone Herbaceous Vegetation
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Spartina alterniflora* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

In Maryland, *Spartina alterniflora* Tidal Herbaceous Vegetation occurs in mesohaline (5-18 ppt) and polyhaline (18-30 ppt) marshes bordering tidal rivers and shores of the Chesapeake Bay. This tall grassland community typically occurs in the regularly flooded zone between mean sea level and the mean high water level. *Spartina alterniflora* is limited to this low marsh zone by moderate salinity; it can withstand a longer submergence than other salt marsh grasses but still requires periodic exposure of the substrate. Variable depths of peat and high levels of iron (7-15 ppm) constitute the substrate requirements for this community.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Spartina alterniflora*

ADDITIONAL CHARACTERISTIC SPECIES

Agalinis maritima, Juncus roemerianus, Limonium carolinianum, Pluchea odorata, Spartina patens, Spartina cynosuroides, Salicornia bigelovii, Salicornia virginica

VEGETATION DESCRIPTION

This community occurs in association with low salt and brackish marshes, and is characterized by pure stands of *Spartina alterniflora* with relatively few associates. There is little variation in vascular plant species composition across the range. Associates that may occur at low cover include *Schoenoplectus americanus, Schoenoplectus pungens, Distichlis spicata, Pluchea odorata, Limonium carolinianum, Agalinis maritima, Spartina patens,* and *Salicornia* spp. Algal mats may also be present. Occasionally, low-growing species such as *Spergularia marina*, *Salicornia* spp., *Suaeda maritima* and seaweeds such as *Ulva lactuca* and other algae such as *Fucus vesiculosus* and *Ascophyllum nodosum*, which grow at the bases of the *Spartina* plants (Moul 1973). *Spartina alterniflora* Tidal Herbaceous Vegetation often borders or intermixes with the *Juncus roemerianus* Tidal Herbaceous Vegetation and *Spartina patens - Distichlis spicata* Herbaceous Vegetation associations.

At Assateague Island NS, this community typically exhibits two different expressions. Both form the low marshes of the island's bay side or fringes along gut channels into the island's interior. *Spartina alterniflora* growing in monotypic stands is the characteristic community closest to the tidal influence (along the water's edge). These pure stands of *Spartina alterniflora* generally cover 50 to 80 percent of the ground, leaving the remainder as exposed peat, mucky sand or algal mats. Herbs of *Salicornia virginica* and *S. bigelovii* can be quite common mixed in with the *Spartina*, often becoming more apparent later in the growing season. *Limonium carolinianum* is another characteristic herb, but only as scattered individuals. *Ascophyllum nodosum* was not observed during 1995 sampling, but may occur sparingly.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

According to the Terrestrial Vegetation of the Southeastern United States (Weakley et al. 1998), the *Spartina alterniflora* Tidal Herbaceous Vegetation Alliance is distributed from Maine south to Florida and west to Texas.

MARYLAND DISTRIBUTION

In Maryland, *Spartina alterniflora* Tidal Herbaceous Vegetation is common to brackish and salt marshes in the Lower Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S5

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for the known distribution of *Spartina alterniflora* Tidal Herbaceous Vegetation in Maryland.

REFERENCE SITES

- Grays Island Marsh, Dorchester County (38 19 17.99 N, 75 57 40.50 W) - precise coordinates for site only and not necessarily for the community occurrence
- Richardson Marsh, Somerset County (37 59 26.3 N, 75 43 43.2 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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AUTHOR

Lesley Sneddon and M. Ashton Berdine, 1995
Jason W. Harrison, 2001

Juncus roemerianus Tidal Herbaceous Vegetation

COMMON NAME	Black Needlerush Herbaceous Vegetation
ELEMENT CODE	6330 [*Juncus roemerianus* Chesapeake Bay Herbaceous Vegetation]
NATURAL COMMUNITY	Low Brackish Marsh, Low Salt Marsh
NATIONAL SYNONYM	Equivalent to *Juncus roemerianus* Chesapeake Bay Herbaceous Vegetation (CEGL006330) of the National Vegetation Classification System (TNC 1998). Similar associations are *Juncus roemerianus* High Marsh Herbaceous Vegetation [4185 in part] and *Juncus roemerianus* Low Marsh Herbaceous Vegetation [4186 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	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Juncus roemerianus* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

Juncus roemerianus Tidal Herbaceous Vegetation is a tidal herbaceous community associated with brackish (mesohaline, 5.0-18.0 ppt) and salt (polyhaline, 18.0-30.0 ppt) marshes bordering the Chesapeake Bay. Typically, these marshes are characterized by low species diversity due to high salt concentrations. However, inland brackish marshes may exhibit a slightly higher floristic diversity than those typical of more seaward brackish marshes. Generally, the frequency of tidal inundation and relative elevation determine the spatial distribution of salt marsh vegetation. *Juncus roemerianus* was found to be lower in elevation than the associated *Spartina patens* type and mixed type (Cooper and Waits 1973). In general, *Juncus roemerianus* occurs on sandy substrates (Penfound 1952). Often, the soils are poorly to very poorly drained, with standing water atop peat accumulations (averaging 15 cm in depth) which in turn overlie gleyed sands.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Juncus roemerianus*

ADDITIONAL CHARACTERISTIC SPECIES

Distichlis spicata, Spartina patens, Spartina alterniflora, Spartina cynosuroides

VEGETATION DESCRIPTION

This salt marsh community occurs in association with low salt marshes or in brackish marshes, and is characterized by discrete, dense patches usually strongly dominated by *Juncus roemerianus* with few other associates. Associates that do occur at low cover may include *Borrichia frutescens, Baccharis halimifolia, Spartina alterniflora, Distichlis spicata, Schoenoplectus robustus, Aster tenuifolius,* and *Aster subulatus*. This community may occur as isolated patches within low salt marsh, or may dominate vast areas at the heads of tidal creeks that drain the marsh.

Juncus roemerianus forms large clones or clone-like patches effectively excluding other species. Vegetation generally covers 98 to 100 percent of the ground with a small percentage of other herbs associated, which may include scattered

individuals of *Spartina alterniflora, S. patens, Limonium carolinianum*, or *Iva frutescens*.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

This community occurs in coastal marshes from Maryland south to Louisiana.

MARYLAND DISTRIBUTION

In Maryland, the *Juncus roemerianus* Tidal Herbaceous Vegetation community is restricted to the Lower Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4

RANK CONFIDENCE

High

RANK JUSTIFICATION

This community is common on the southeastern seaboard, but large undisturbed areas are of high conservation concern.

REFERENCE SITES

- Dames Quarter Marsh, Somerset County (38 09 30.0 N, 75 53 01.4 W) - precise coordinates for community occurrence at this site
- Jane's Island, Somerset County (38 00 09.0 N, 75 51 29.4 W) - precise coordinates for community occurrence at this site
- Grays Island Marsh, Dorchester County (38 19 29.03 N, 75 57 15.84 W) - precise coordinates for community occurrence at this site
- Assateague Island National Seashore, Worcester County (general reference site- no coordinates given)

COMMENTS

Although this community exhibits little floristic variation across its range, the associated animal species may vary to a greater extent. Further analysis may suggest a further subdivision of this community.

The salt marsh community (Hill 1986) and the salt marsh (Higgins et al. 1971) described from Assateague Island are partially contained within this community. The brackish marsh (Schafale and Weakley 1990, North Carolina), and the *Spartina — Distichlis — Juncus* associates described by Penfound (1952) are partially contained within this community. The *Juncus roemerianus* association of the low marsh (Adams 1963) and the *Juncus* type (Cooper and Waits 1973) described from North Carolina, the irregularly flooded salt marsh (Jenkins 1974) described from the Chesapeake Bay, the lower high marsh of South Carolina (Stalter 1973), and the needlerush — saltmeadow type described from Maryland by Nicholson and van Deusen (1954) are related to and may be synonymous with this community.

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AUTHORS

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Jason W. Harrison, 2001

Schoenoplectus americanus - Spartina patens Tidal Herbaceous Vegetation

COMMON NAME	Olney bulrush - Saltmeadow cordgrass Tidal Herbaceous Vegetation
ELEMENT CODE	6612
NATURAL COMMUNITY	Brackish Marsh, Salt Marsh
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	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

The *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation community is among those characteristic of diurnally flooded brackish (mesohaline, 5.0-18.0 ppt) and salt (polyhaline, 18.0-30.0 ppt) marshes bordering tidal rivers, tributaries, and shores of the Chesapeake Bay. Brackish wetlands systems are the predominant estuarine wetland type in Maryland (Tiner and Burke 1995). Although characterized by low species diversity (compared to oligohaline and freshwater marshes), brackish marshes still exhibit a much higher floristic diversity than inland and coastal salt marshes.

In Maryland, *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation is often found in the irregularly flooded low marsh zone and in wet depressions within the high marsh zone of moderately saline systems. This community association typically occurs along margins of sloughs, ditches, and ponds. Typically this association merges with *Spartina alterniflora* Tidal Herbaceous Vegetation in the low marsh and *Spartina patens - Distichlis spicata* Herbaceous Vegetation in the high marsh forming discrete ecotones. *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation forms dense colonies irregular in shape and varying in size from 10 m^2 to several hectares.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Schoenoplectus americanus*, *Spartina patens*

ADDITIONAL CHARACTERISTIC SPECIES

Spartina alterniflora, Spartina cynosuroides, Distichlis spicata, Pluchea odorata, Limonium carolinianum, Lythrum lineare, Sabatia stellaris, Salicornia spp.*, Agalinis maritima, Juncus roemerianus*

VEGETATION DESCRIPTION

This *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation is typical of many Maryland brackish and salt marshes. This community is dominated by colonies of *Schoenoplectus americanus* in which often accounts for 40 to 75 percent of the total vegetated cover. Usually, *Spartina patens* is intermixed with *Schoenoplectus americanus* in lesser numbers, however, may constitute up to 50 percent cover. Other species that are typically associated with this community include *Pluchea odorata, Juncus roemerianus, Spartina alterniflora, Spartina cynosuroides, Distichlis*

spicata, and *Limonium carolinianum.* This community often merges with *Spartina patens - Distichlis spicata* Herbaceous Vegetation, *Spartina alterniflora* Tidal Herbaceous Vegetation, *Spartina cynosuroides* Herbaceous Vegetation, and *Juncus roemerianus* Tidal Herbaceous Vegetation.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

Since this is a newly proposed community association, national distribution requires further determination.

MARYLAND DISTRIBUTION

In Maryland, *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation is common to brackish and salt marshes in the Lower Coastal Plain Physiographic Province occurring on both the Eastern and Western Shores of the Chesapeake Bay.

CONSERVATION RANK

S4?

RANK CONFIDENCE

Low

RANK JUSTIFICATION

More inventory data are needed to finalize conservation rank for Maryland.

REFERENCE SITES

- Thorofare Marsh, Dorchester County (38 24 37.3 N, 75 59 32.6 W) - precise coordinates for *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation occurrence at this site

COMMENTS

[none]

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AUTHOR

Jason W. Harrison, 2001

Spartina patens - Distichlis spicata Herbaceous Vegetation

COMMON NAME	Saltmeadow Cordgrass - Saltgrass Herbaceous Vegetation
ELEMENT CODE	6836
NATURAL COMMUNITY	High Brackish Marsh, High Salt Marsh
NATIONAL SYNONYM	*Spartina patens - Distichlis spicata - Borrichia frutescens* Herbaceous Vegetation (4197 in part) *Spartina patens - Distichlis spicata - Plantago maritima* Herbaceous Vegetation (6006 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	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

In Maryland, *Spartina patens - Distichlis spicata* Herbaceous Vegetation occurs in brackish (mesohaline, 5.0-18.0 ppt) and salt (polyhaline, 18.0-30.0 ppt) marshes bordering tidal rivers and shores of the Chesapeake Bay. This community is typically found in the irregularly flooded high marsh where flooding occurs less often than daily. Generally, species diversity is low, however, increases with elevation. Plant diversity is typically highest near the upland interface or where salt concentrations are the lowest. However, in these high marsh areas, where flooding is less frequent and of shorter duration, the influence of land runoff may not be sufficient to counteract the effects of evapotranspiration and transpiration and the interstitial water becomes more, not less, salty (Weigert 1990). This condition favors the formation of *Spartina patens - Distichlis spicata* Herbaceous Vegetation. The spatial distribution of *Spartina patens - Distichlis spicata* Herbaceous Vegetation and other communities in brackish and salt marshes is largely dependant on the frequency and duration of tidal flooding. Often these communities will intermingle forming a mosaic-like pattern across the landscape rather than distinct vegetation "zones". *Spartina patens - Distichlis spicata* Herbaceous Vegetation will typically appear "meadow-like" because of its overall short-statured vegetation. The substrate is primarily composed of accumulated peat of varying depths overlying sand. Ditching and water diversion remain the primary anthropogenic disturbances within these systems.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Spartina patens, Distichlis spicata*

ADDITIONAL CHARACTERISTIC SPECIES

Spartina alterniflora, Pluchea odorata, Limonium carolinianum, Lythrum lineare, Sabatia stellaris, Salicornia spp.*, Agalinis maritima, Juncus roemerianus, Iva frutescens, Baccharis halimifolia, Myrica cerifera*

VEGETATION DESCRIPTION

This herbaceous community is characteristic among brackish and salt marshes dominated by *Spartina patens* and *Distichlis spicata*. Typically, *Spartina patens* and *Distichlis spicata* form large, dense meadows within higher, less frequently flooded areas of the marsh. This community often intermingles with *Juncus roemerianus* Herbaceous Vegetation and *Spartina alterniflora* Herbaceous Vegetation as elevation decreases (becoming wetter). Associates that occur at low cover include *Pluchea odorata, Lythrum lineare, Agalinis maritima, Baccharis halimifolia, Iva frutescens, Limonium carolinianum, Solidago sempervirens, Spartina alterniflora, Aster tenuifolius,* and *Aster subulatus*.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

This community occurs in coastal marshes from Maine south to Florida.

MARYLAND DISTRIBUTION

In Maryland, the *Spartina patens - Distichlis spicata* Herbaceous Vegetation community is restricted to the Lower Coastal Plain Physiographic Province occurring on the Eastern Shore of the Chesapeake Bay.

CONSERVATION RANK

S5

RANK CONFIDENCE

High

RANK JUSTIFICATION

Rank accounts for known occurrences and the probable distribution in Maryland.

REFERENCE SITES

- Thorofare Marsh, Dorchester County (38 24 37.9 N, 75 59 32.9 W) - precise coordinates for site only and not necessarily for the community occurrence
- Dames Quarter Marsh, Somerset County (38 09 28.9 N, 75 53 01.4 W) - precise coordinates for site only and not necessarily for the community occurrence

COMMENTS

[none]

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AUTHOR

Jason W. Harrison, 2001

Phragmites australis Tidal Herbaceous Vegetation

COMMON NAME	Common Reed Tidal Herbaceous Vegetation
ELEMENT CODE	4187
NATURAL COMMUNITY	Common Reed marsh
NATIONAL SYNONYM	*Phragmites australis* Tidal Herbaceous Vegetation
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Tidal Temperate or Subpolar Grassland
ALLIANCE	*Phragmites australis* Tidal Herbaceous Alliance

ENVIRONMENTAL DESCRIPTION

This community is a dense tall grassland indicative of disturbance. It occurs in a range of wetland habitats from fresh to brackish in salinity. At Assateague Island NS, the soil profile is characterized by a shallow organic layer overlying sand.

MOST ABUNDANT SPECIES

Strata	Species
Herbaceous	*Phragmites australis*

ADDITIONAL CHARACTERISTIC SPECIES

VEGETATION DESCRIPTION

This community is a broadly-defined reed-grass marsh. It is characterized by dense stands of *Phragmites australis*, a species that tends to grow in colonies of tall, stout, leafy plants often to the exclusion of all other vascular plant species. Associated species are highly variable, depending on the community that has been invaded.

On Assateague Island NS, *Phragmites australis* most frequently invaded stands of the following communities: *Myrica cerifera / Hydrocotyle* spp. (Wet) Shrubland, *Myrica cerifera — Baccharis halimifolia / Spartina patens* Shrubland, or *Myrica (cerifera, pensylvanica) — Vaccinium corymbosum* shrubland. Spreading in large colonies, *Phragmites* eventually dominates disturbed areas at coverage up to 100 percent. More typically, though, scattered individuals of other species may occur, such as sparse *Myrica cerifera* shrubs, *Kosteletzyka virginica, Calystegia sepium, Boehmeria cylindrica, Typha angustifolia, Apocynum cannabinum, Rosa palustris, Polygonum* sp., and *Mikania scandens*. Vines of *Toxicodendron radicans* are also frequent, but typically occur at low cover.

OTHER NOTEWORTHY SPECIES

[none]

RANGE

This community has a broad geographic range, including eastern and midwestern states, as well as Canada.

MARYLAND DISTRIBUTION

This community is widespread in Maryland.

CONSERVATION RANK

N/A

RANK CONFIDENCE

N/A

RANK JUSTIFICATION

This community is not only globally secure, but its growing distribution is highly undesirable from a conservation perspective.

REFERENCE SITES

- Morgan Creek, Kent County (39 14 29.81 N, 76 02 42.68 W) - precise coordinates for site only and not necessarily for the community occurrence
- Assateague Island National Seashore, Worcester County (general reference site- no coordinates given)

COMMENTS

Although *Phragmites australis* rhizomes have been noted in salt marsh sediments exceeding three thousand years in age (Niering and Warren 1977) and is thus a native component of salt marshes, the growth of the species in its native condition was likely to have been significantly different than the dense monotypic stands that characterize this community. The presence of the *Phragmites australis* community in wetlands today generally indicates human-induced disturbance, either through direct habitat manipulation or through passive introduction of reproductive material to naturally disturbed substrates. In cases where *Phragmites australis* is a significant component of the vegetation, but the vegetation retains sufficient species composition to retain its identity, the site is considered an unhealthy or degraded example of that community. In cases where *Phragmites australis* cover is so high that native species have been excluded and the original community is no longer recognizable, the occurrence then falls within the *Phragmites australis* Herbaceous Vegetation.

The following state Natural Heritage program communities are contained within this community: *Phragmites australis* community (Metzler and Barrett 1992, Connecticut); *Phragmites australis* tidal marsh association (Clancy 1993, Delaware).

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AUTHORS

Lesley Sneddon and M. Ashton Berdine, 1995
Jason W. Harrison, 2001

Reference Sites

Lower Marshyhope Creek

COUNTY

Dorchester County, Maryland

USGS QUAD

Rhodesdale, MD

PRIMARY REASON FOR SELECTION

Lower Marshyhope Creek contains high quality occurrences and one of Maryland's best examples of the *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472) and the *Acorus calamus* Tidal Herbaceous Vegetation (6833).

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

SITE DESCRIPTION

Lower Marshyhope Creek contains a large (ca. 4 hectares) occurrence of *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation bordering the main channel of Marshyhope Creek. This site is bordered by the town of Brookview to the west and Marshyhope Creek to the east. According to data collected on 21 July 1999, salinity varied between 0.0 and 0.5 ppt. *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation along this section of Marshyhope Creek is expansive, occurring more or less discontinuously along the main channel to its confluence with the Nanticoke River. In transitional areas, beds of *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation intermix with *Peltandra virginica*, *Acorus calamus*, and *Zizania aquatica* as elevation increases and bottom sediments become more consolidated.

Approximately 0.8 km downstream on the east side of Marshyhope Creek is a large (ca. 20 hectares) occurrence of *Acorus calamus* Tidal Herbaceous Vegetation. This community borders a band of *Nuphar lutea* ssp. *advena* and *Peltandra virginica* occupying the subtidal, lower intertidal, and midtidal zones. Progressing further from these zones into the high marsh, *Acorus calamus* becomes lodged and is interspersed with *Impatiens capensis, Peltandra virginica, Polygonum arifolium,* and *Leersia virginicus.*

Tidal swamp forests dominated by *Nyssa sylvatica*, *Fraxinus profunda*, *F. pennsylvanica*, *Magnolia virginiana*, and *Acer rubrum* border herbaceous wetland communities and uplands along most of Marshyhope Creek. In the uplands surrounding land-use is primarily agricultural.

Small patches of *Phragmites australis* have invaded portions of marshes adjacent to the *Acorus calamus* Tidal Herbaceous Vegetation occurrence.

At least four plant species considered rare, threatened or endangered in Maryland are known to occur within 1 km of this reference site. In addition, this reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Lower Marshyhope Creek was chosen as a reference site primarily because it is habitat to one of the best examples of the *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation and the *Acorus calamus* Tidal Herbaceous Vegetation known in Maryland. These wetland community types are secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. These particular occurrences are part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

These occurrences are very typical of that defined in the Vegetation Description for *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation and *Acorus calamus* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation and *Acorus calamus* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as the *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation and the *Acorus calamus* Tidal Herbaceous Vegetation are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Snow geese, Canada geese) could also have severe impacts on wetlands systems.

Currently, the Lower Marshyhope Creek reference site is subject to invasion by *Phragmites australis*. On the east side of Marshyhope Creek, just below Becky Taylor Branch, small colonies of *Phragmites australis* grow adjacent to Marshyhope Creek. Further advancement of *Phragmites australis* could displace the native wetland vegetation (lowering species diversity), and therefore is a threat to this reference site. Monitoring and control of this invasive species is highly recommended.

PROTECTION COMMENTS

Lower Marshyhope Creek occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations.

OCCURRENCE RANK

These particular occurrences of *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation and *Acorus calamus* Tidal Herbaceous Vegetation at Lower Marshyhope Creek rank as "A" or excellent examples when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Waters of the State

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 34' 22.72" N, 75° 47' 14.03" W

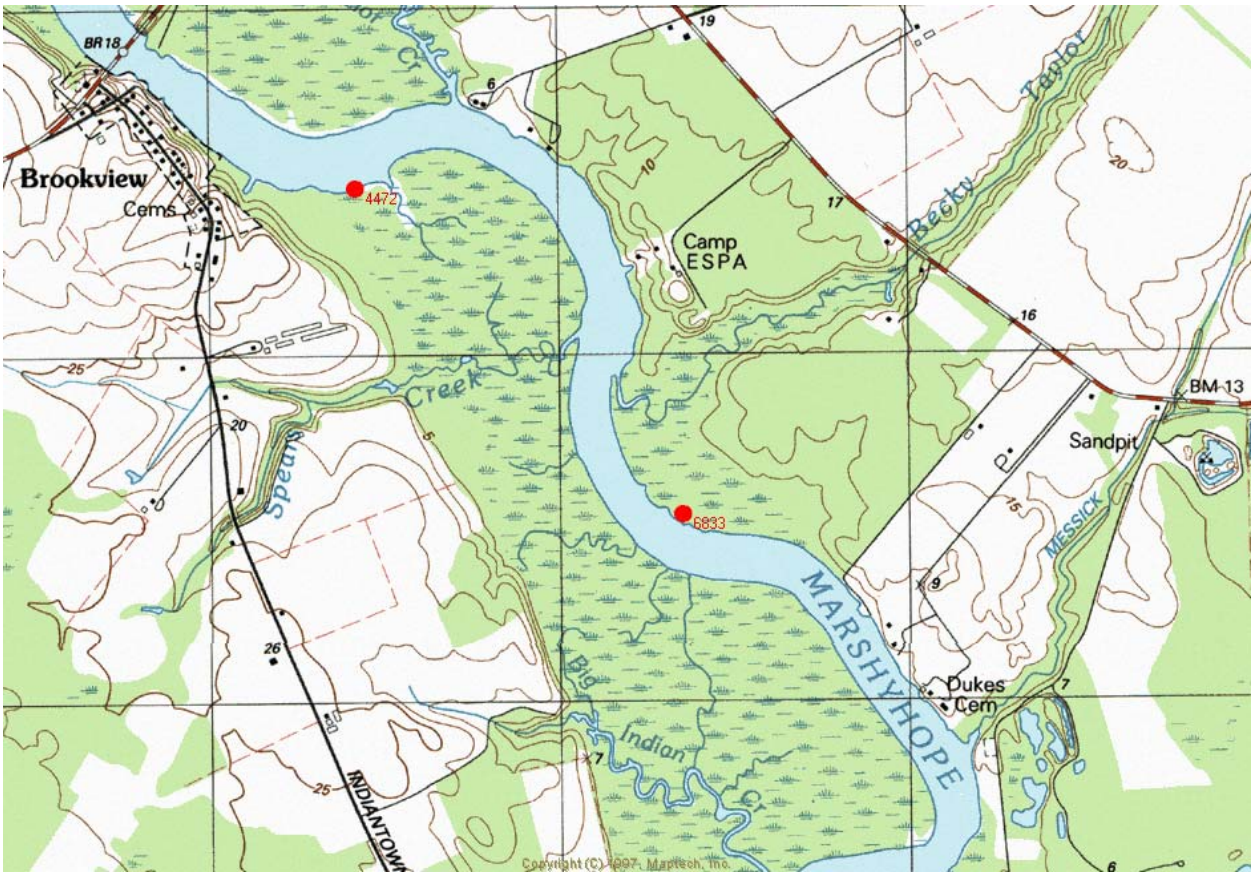
Nuphar lutea ssp. *advena* Tidal Herbaceous Vegetation

38° 33' 52.32" N, 75° 46' 35.00" W

Acorus calamus Tidal Herbaceous Vegetation

Lower Marshyhope Creek

Dorchester County, Maryland
Rhodesdale, MD USGS Quad



38° 34' 22.72" N, 75° 47' 14.03" W – Precise coordinates for *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472) at this site

38° 33' 52.32" N, 75° 46' 35.00" W – Precise coordinates for site only and not necessarily for the *Acorus calamus* Tidal Herbaceous Vegetation (6833) at this site

Marshyhope Creek – Skinners Run

COUNTY

Dorchester County, Maryland

USGS QUAD

Federalsburg, MD

PRIMARY REASON FOR SELECTION

Marshyhope Creek contains a high quality occurrence and one of Maryland's best examples of *Zizania aquatica* Tidal Herbaceous Vegetation (4202).

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

SITE DESCRIPTION

Marshyhope Creek-Skinners Run contains a large (ca. 24 hectares) occurrence of *Zizania aquatica* Tidal Herbaceous Vegetation adjacent the main channel of Marshyhope Creek. This site lies just south of Federalsburg and occupies the east and west sides of Marshyhope Creek near its confluence with Skinners Run. According to data collected on 22 July 1999, salinity varied between 0.0 and 1.0 ppt. The *Zizania aquatica* Tidal Herbaceous Vegetation along this section of Marshyhope Creek accounts for approximately 80 percent of the total vegetative cover and was inundated in shallow water (<30 cm) during high tide. In transitional areas, *Peltandra virginica, Acorus calamus*, and *Nuphar lutea* ssp. *advena* intermix with *Zizania aquatica.*

Tidal swamp forests dominated by *Nyssa sylvatica*, *Fraxinus profunda*, *F. pennsylvanica*, *Magnolia virginiana*, and *Acer rubrum* form a boundary between herbaceous wetlands and dry sand ridges along most of Marshyhope Creek. Surrounding land-use is primarily agricultural.

Although not currently present at this reference site, small patches of *Phragmites australis* have invaded nearby marshes further downstream.

At least seventeen plant species considered rare, threatened or endangered in Maryland are known to occur within 5 km of this reference site. In addition, this reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Marshyhope Creek-Skinners Run was chosen as a reference site primarily because it is habitat to one of the best examples of *Zizania aquatica* Tidal Herbaceous Vegetation known in Maryland. This wetland community type currently rare to uncommon in Maryland with the number of occurrences typically in the range of 21 to 100. This reference site is a type location for this community; it is one of a set of similar communities used to define and classify this community type for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Zizania aquatica* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Zizania aquatica* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as the *Zizania aquatica* Tidal Herbaceous Vegetation are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Snow geese, Canada geese) could also have severe impacts on wetlands systems.

As indicated in Unit 1 of this report, the *Zizania aquatica* Tidal Herbaceous Vegetation community is sensitive to sedimentation (increase in elevation) and pulses of higher salinity. Slight changes in elevation often lead to a shift in the community composition and may result in the exclusion of *Zizania aquatica* by out competing species. The Marshyhope Creek-Skinners Run reference site is subject to invasion by *Phragmites australis*. Known occurrences of *Phragmites australis* have been documented (Berdine et al. 1999) on lower sections of the Marshyhope Creek. Further advancement of *Phragmites australis* could displace the native wetland vegetation (lowering species diversity), and therefore is a threat to this reference site. Monitoring and control of this invasive species is highly recommended.

PROTECTION COMMENTS

Marshyhope Creek-Skinners Run occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations.

OCCURRENCE RANK

The *Zizania aquatica* Tidal Herbaceous Vegetation at Marshyhope Creek-Skinners Run is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Waters of the State

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

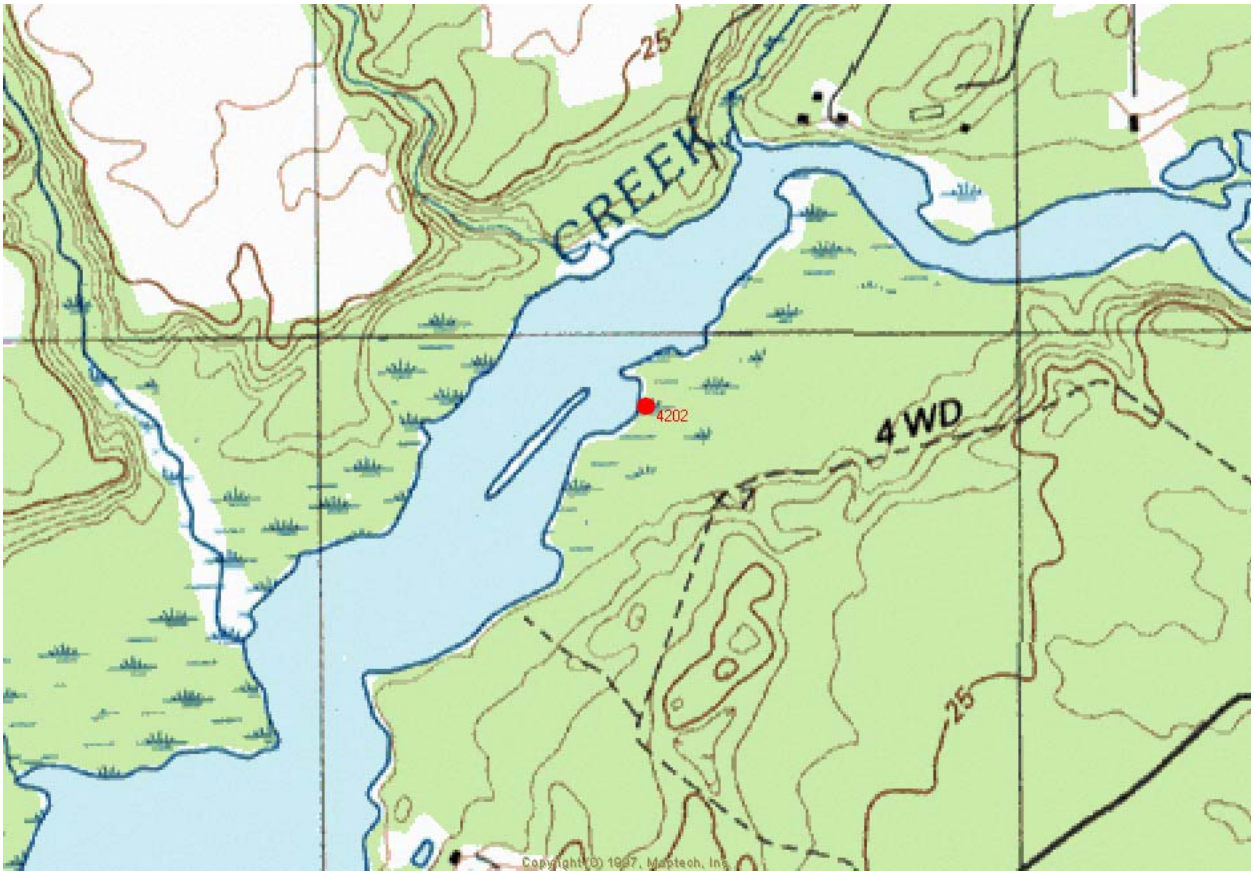
LATITUDE / LONGITUDE COORDINATES

38° 39' 27.84" N, 75° 47' 56.87" W

Zizania aquatica Tidal Herbaceous Vegetation

Marshyhope Creek - Skinners Run

Dorchester County, MD
Federalsburg, MD USGS Quad



38° 39' 27.84" N, 75° 47' 56.87" W – Precise coordinates for site only and not necessarily for the *Zizania aquatica* Tidal Herbaceous Vegetation (4202) occurrence

Watts Creek

COUNTY

Caroline County, Maryland

USGS QUAD

Hobbs, MD

PRIMARY REASON FOR SELECTION

Watts Creek contains high quality occurrences and one of Maryland's best examples of *Peltandra virginica – Pontederia cordata* Tidal Herbaceous Vegetation (4706) and *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472).

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

SITE DESCRIPTION

Watts Creek is a tributary of the Choptank River situated approximately 3.5 km northwest of Williston. Bordering this meandering tidal freshwater creek are expansive beds of *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation. Monotypic stands of *Nuphar lutea* ssp. *advena* occur directly adjacent to the creek channel in approximately 2 meters of water. Beyond this zone of *Nuphar lutea* ssp. *advena*, a high quality example of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation has established in slightly elevated areas. This particular occurrence of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation is a pure stand of *Peltandra virginica* in which parallels the entire length of Watts Creek. Other species well represented include *Typha angustifolia, Acorus calamus, Leersia oryzoides, Lycopus americanus, Impatiens capensis, Rosa palustris,* and *Carex lacustris.* Salinity was measured at 0.0 ppt on 26 May 1999.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Both *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation and *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation are secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. These particular occurrences are part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus type localities.

These occurrences are very typical of that defined in the Vegetation Description for *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation and *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for precise definitions of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation and *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as those bordering Watts Creek are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

PROTECTION COMMENTS

Watts Creek occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations.

OCCURRENCE RANK

These particular occurrences of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation and *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation at Watts Creek Preserve rank as "A" or excellent examples when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Waters of the State

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 51' 6.6" N, 75° 49' 11.4" W

Peltandra virginica Tidal Herbaceous Vegetation

38° 51' 8.3" N, 75° 49' 11.9" W

Nuphar lutea ssp. *advena* Tidal Herbaceous Vegetation

Watts Creek

Caroline County, MD
Hobbs, MD USGS Quad

38° 51' 6.6" N, 75° 49' 11.4" W – Precise coordinates for site only and not necessarily for the *Peltandra virginica* Tidal Herbaceous Vegetation (4706) occurrence

38° 51' 8.3" N, 75° 49' 11.9" W – Precise coordinates for site only and not necessarily for the *Nuphar lutea* ssp. *advena* Tidal Herbaceous Vegetation (4472) occurrence

Morgan Creek

COUNTY

Kent County, Maryland

USGS QUAD

Chestertown, MD

PRIMARY REASON FOR SELECTION

Morgan Creek contains a high quality occurrence and one of Maryland's best examples of *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation (6834).

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

SITE DESCRIPTION

Morgan Creek is a small tributary of Chester River situated northeast of Chestertown in which contains a large (ca. 20 hectares) occurrence of *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation. A large meander in Morgan Creek northwest of Route 291 gives way to a well-developed tidal freshwater/oligohaline marsh in which supports the *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation association, as well as an example of *Spartina cynosuroides* Herbaceous Vegetation (4195) further downstream. Other species such as *Zizania aquatica*, *Leersia oryzoides, Hibiscus moscheutos,* and *Polygonum hydropiperoides* occur at low cover. Salinity was measured at 0.0 ppt on 5 May 1999. The microtopography of this reference site is flat and the substrate is characterized as silty muck.

South of Route 291, large circular colonies of *Phragmites australis* have out competed much of the *Spartina cynosuroides* Herbaceous Vegetation bordering Morgan Creek. Adjacent uplands bordering Morgan Creek are high use residential and agricultural areas. This reference site falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Morgan Creek was chosen as a reference site primarily because it is habitat to one of the best examples of *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation known in Maryland. This wetland community type is secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. This particular occurrence is part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Nutria, Muskrats, Mute swans, Canada geese) could also have severe impacts on wetlands systems.

Known occurrences of *Phragmites australis* have been documented (Berdine et al. 1999) at stations just south of this reference site below the Route 291 Bridge. Further advancement of *Phragmites australis* could displace the native wetland vegetation (lowering species diversity), and therefore is a threat to this reference site. Monitoring and control of this invasive species is highly recommended.

PROTECTION COMMENTS

Morgan Creek occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations.

OCCURRENCE RANK

The *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation at Morgan Creek is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Waters of the State

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

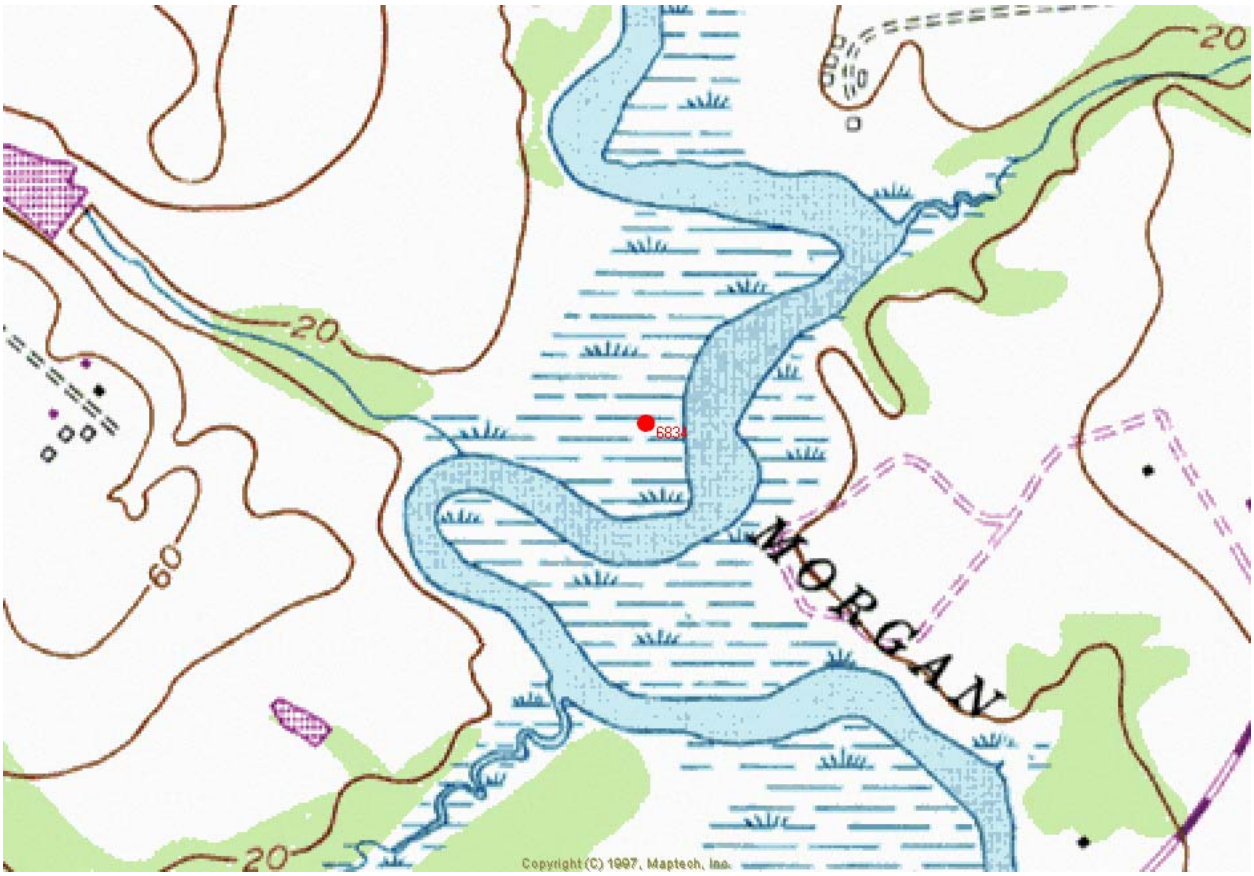
LATITUDE / LONGITUDE COORDINATES

39° 14' 35.4" N, 76° 02' 32.2" W

Peltandra virginica - Impatiens capensis - Typha angustifolia Tidal Herbaceous Vegetation

Morgan Creek

Kent County, MD
Chestertown, MD USGS Quad



39° 14' 35.4" N, 76° 02' 32.2" W – Precise coordinates for *Peltandra virginica - Impatiens capensis - Typha angustifolia* Tidal Herbaceous Vegetation occurrence at this site

King's Creek Preserve

COUNTY

Talbot County, Maryland

USGS QUAD

Fowling Creek, MD

PRIMARY REASON FOR SELECTION

King's Creek Preserve contains high quality occurrences and one of Maryland's best examples of *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation (4201) and *Panicum virgatum* Tidal Herbaceous Vegetation (6150).

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

SITE DESCRIPTION

King's Creek Preserve contains an oligohaline (slightly brackish) marsh bordering the Choptank River just southwest of Kingston Landing. Typical *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation and *Panicum virgatum* Tidal Herbaceous Vegetation each account for approximately 20 hectares at this site. Species diversity and richness within the King's Creek Preserve is high as indicated by the number of freshwater and brackish species. Associated species include *Sium suave, Pontederia cordata, Peltandra virginica, Amaranthus cannabinus, Mikania scandens, Schoenoplectus validus, Galium palustris, Sagittaria latifolia, Rumex verticillatus, Carex stricta, Carex hormathodes, Polygonum arifolium, Cicuta maculata,* and *Ptilimnium capillaceum*. Many of these species integrate in transitional areas (low marsh - high marsh - upland) forming subtle ecotones between different community types. Distinct patches of *Panicum virgatum* Tidal Herbaceous Vegetation occur in these transitional areas between the high marsh and upland interface. Typical *Panicum virgatum* Tidal Herbaceous Vegetation also occurs on slight hummocks in the high marsh. Salinity was measured at 4 ppt on 30 July 1999.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations. King's Creek Preserve has a boat dock and 2,000-foot boardwalk that is open year-round for public use.

COMMUNITY DESCRIPTION

Both *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation and *Panicum virgatum* Tidal Herbaceous Vegetation are secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. These particular occurrences are part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus type localities.

These occurrences are very typical of that defined in the Vegetation Description for *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation and *Panicum virgatum* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for precise definitions of *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation and *Panicum virgatum* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands are susceptible to many direct and indirect threats. These threats account for significant

qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

The foremost threat to the King's Creek Preserve is further advancement of *Phragmites australis.* Dense stands of *Phragmites australis* occur in several areas throughout King's Creek Preserve and should be monitored for expansion. Efforts to eradicate established and incipient populations are recommended.

PROTECTION COMMENTS

King's Creek Preserve is a Nature Conservancy Preserve, thus receiving some conservation attention.

OCCURRENCE RANK

These particular occurrences of *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation and *Panicum virgatum* Tidal Herbaceous Vegetation at King's Creek Preserve rank as "A" or excellent examples when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

King's Creek Preserve is owned by The Nature Conservancy

BEST INFORMATION SOURCE

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

LATITUDE / LONGITUDE COORDINATES

38° 46' 19.86" N, 75° 58' 35.25" W

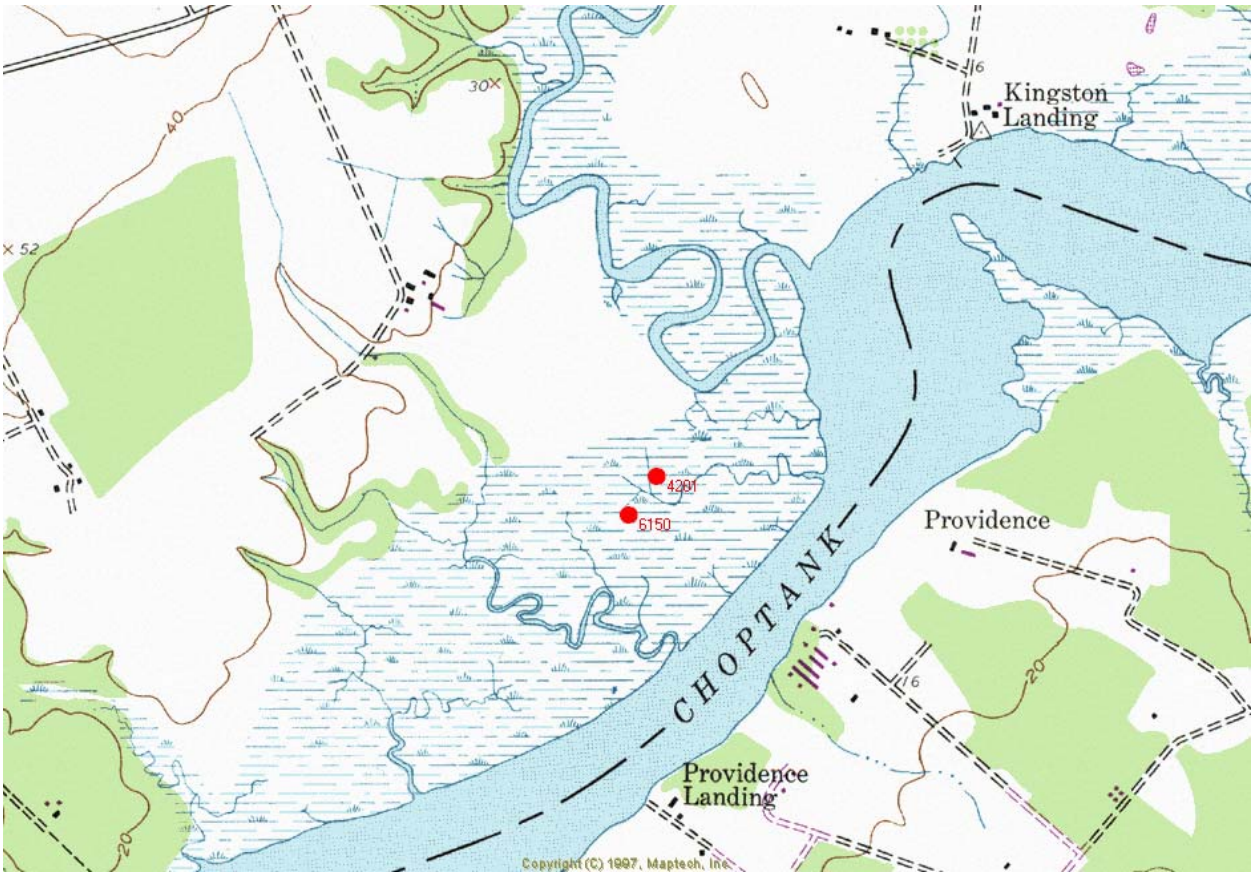
Typha (angustifolia, latifolia) - Hibiscus moscheutos Herbaceous Vegetation

38° 46' 19.27" N, 75° 58' 38.56" W

Panicum virgatum Tidal Herbaceous Vegetation

King's Creek Preserve

Talbot County, MD
Fowling Creek, MD USGS Quad



38° 46' 19.86" N, 75° 58' 35.25" W – Precise coordinates for *Typha (angustifolia, latifolia) - Hibiscus moscheutos* Herbaceous Vegetation (4201) at this site

38° 46' 19.27" N, 75° 58' 38.56" W – Precise coordinates for *Panicum virgatum* Tidal Herbaceous Vegetation (6150) occurrence at this site

Cypress Swamp

COUNTY

Worcester County, Maryland

USGS QUAD

Kingston, MD

PRIMARY REASON FOR SELECTION

Cypress Swamp contains a high quality occurrence and one of Maryland's best examples of *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation (6837).

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

SITE DESCRIPTION

Cypress Swamp contains a large oligohaline marsh bordering the east side of Pocomoke River. Typical *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation occurs in small and slightly depressed pockets that are irregularly flooded. Embedded within the *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation are small patches of *Carex hyalinolepis, Typha angustifolia, Peltandra virginica, Sium suave, and Hibiscus moscheutos.* Bordering this occurrence of *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation is a matrix community of *Peltandra virginica.* This variant of *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (4706) forms large irregular hummocky patches between drainage sloughs and mudflats. Salinity was measured at 2 ppt on 20 May 1999.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Cypress Swamp was chosen as a reference site primarily because it is habitat to one of the best examples of the *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation in Maryland. This wetland community type has been reported from Maryland, but without persuasive documentation that would provide a basis for either accepting or rejecting the report. Subject to this status, the *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation has been preliminarily ranked SR. This particular occurrence is part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff,

agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

PROTECTION COMMENTS

Cypress Swamp occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations. This reference site is also owned and managed by the Maryland Department of Natural Resources thus receiving some conservation and protection attention.

OCCURRENCE RANK

This particular occurrence of *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation at Cypress Swamp ranks as "A" or excellent example of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Hickory Point Natural Heritage Area, Maryland Department of Natural Resources / State of Maryland

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

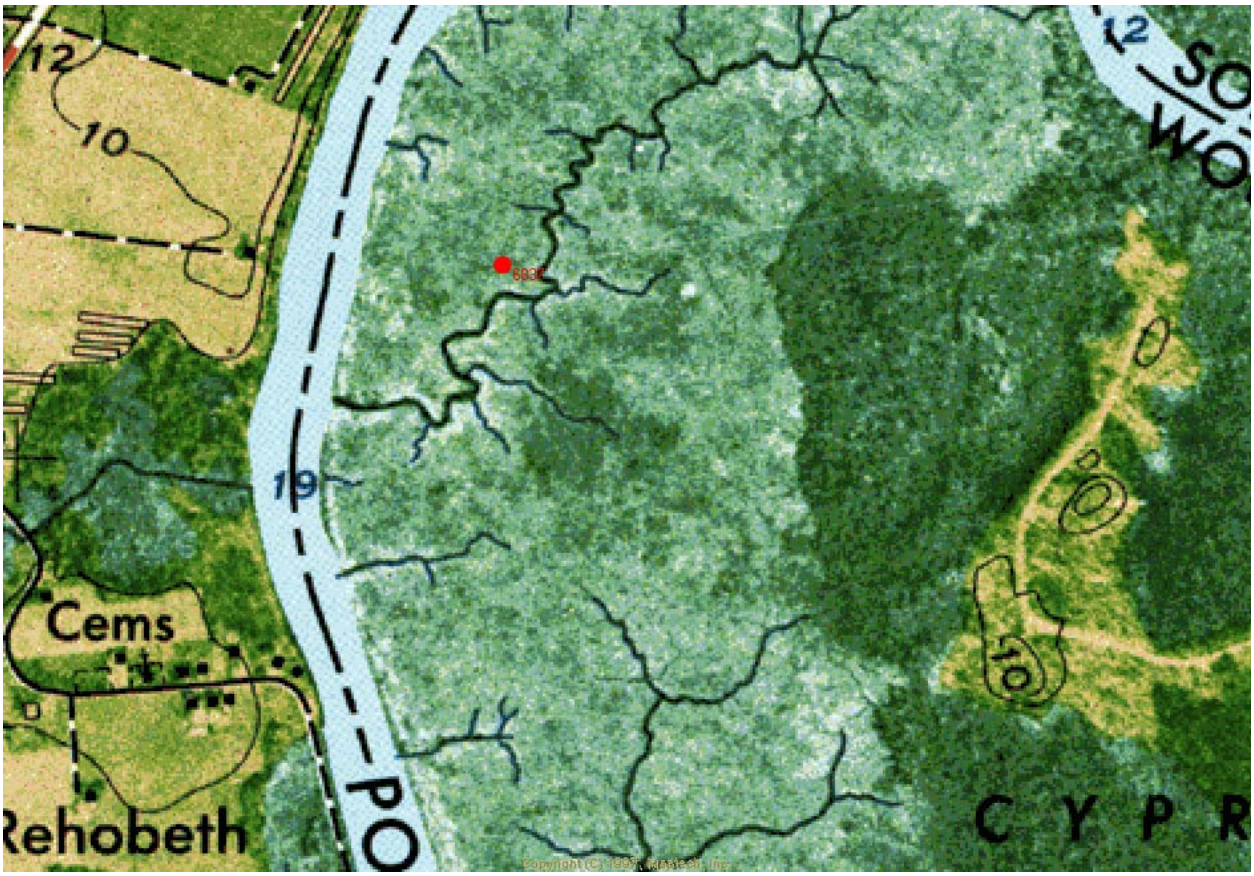
LATITUDE / LONGITUDE COORDINATES

38° 02' 39.0" N, 75° 39' 31.5" W

Eleocharis (fallax, rostellata) Tidal Herbaceous Vegetation

Cypress Swamp

Worcester County, MD
Kingston, MD USGS Quad



38° 02' 39.0" N, 75° 39' 31.5" W – Precise coordinates for *Eleocharis (fallax, rostellata)* Tidal Herbaceous Vegetation (6837) occurrence at this site

Nanticoke Central

COUNTY

Wicomico County, Maryland

USGS QUAD

Mardela Springs, MD

PRIMARY REASON FOR SELECTION

Nanticoke Central contains a high quality occurrence and one of Maryland's best examples of the *Spartina cynosuroides* Herbaceous Vegetation (4195).

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

SITE DESCRIPTION

Nanticoke Central contains a large (ca. 120 hectares) occurrence of *Spartina cynosuroides* Herbaceous Vegetation embedded within a mesohaline marsh system bordering the Nanticoke River and Rewastico Creek. According to data collected on 15 July 1999, salinity was 6.0 ppt. *Spartina cynosuroides* Herbaceous Vegetation at Nanticoke Central is expansive, occurring more or less discontinuously along the regularly flooded margins of Rewastico Creek forming a large, linear stand. Further inland (irregularly flooded high marsh), stands of *Spartina cynosuroides* Herbaceous Vegetation broaden as it intermixes with *Spartina patens* and *Schoenoplectus americanus*. Soil texture at this reference site is characterized as muck.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Nanticoke Central was chosen as a reference site primarily because it is habitat to one of the best examples of the *Spartina cynosuroides* Herbaceous Vegetation in Maryland. This wetland community type is secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. This particular occurrence is part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Spartina cynosuroides* Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Spartina cynosuroides* Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as the *Spartina cynosuroides* Herbaceous Vegetation are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling

projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

Currently, the Nanticoke Central reference site is subject to invasion by *Phragmites australis*. If detected, the monitoring and control of incipient populations of *Phragmites australis* are highly recommended.

PROTECTION COMMENTS

Nanticoke Central occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations. This reference site is also owned and managed by the Maryland Department of Natural Resources thus receiving some conservation and protection attention.

OCCURRENCE RANK

This particular occurrence of *Spartina cynosuroides* Herbaceous Vegetation at Nanticoke Central ranks as "A" or excellent examples when compared to all other known Maryland examples of the same community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Nanticoke Wildlife Management Area, Maryland Department of Natural Resources / State of Maryland

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

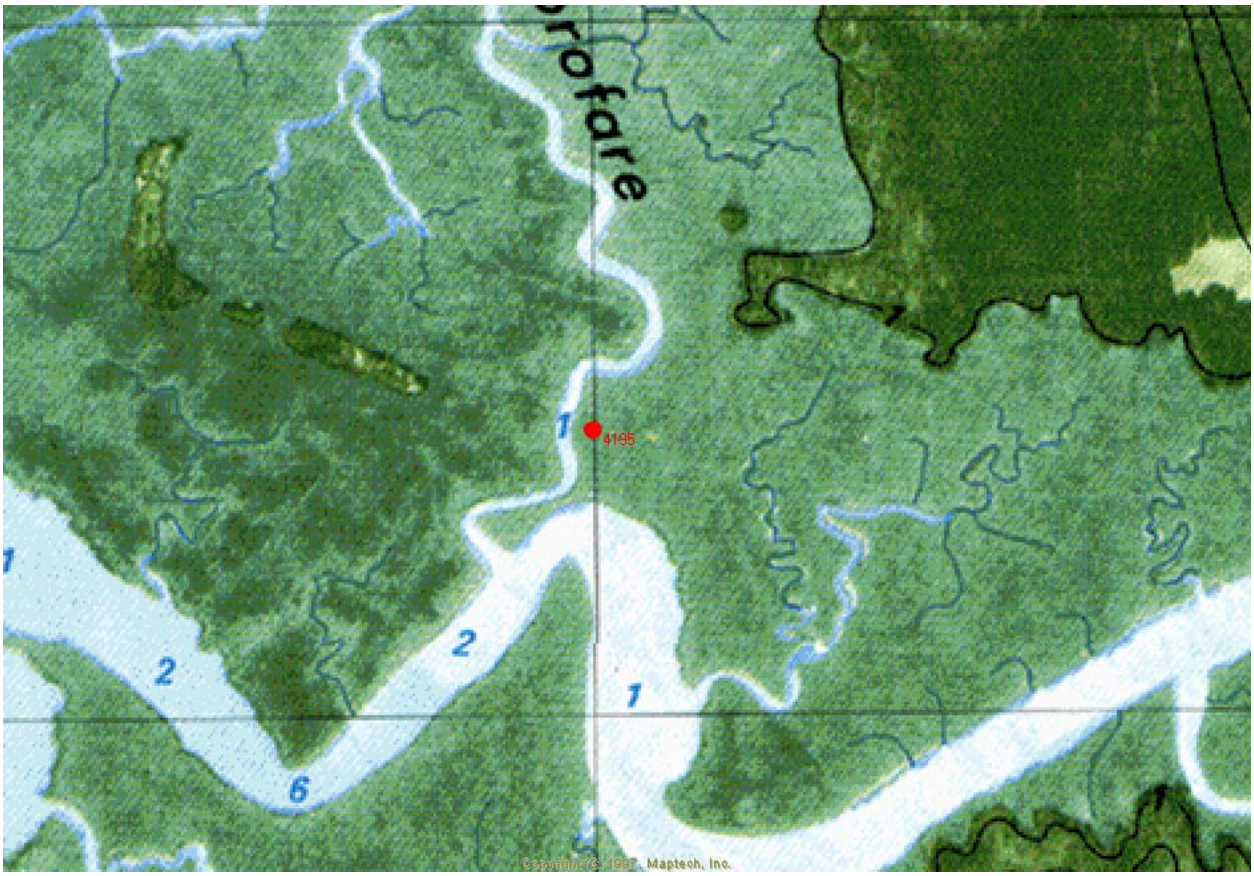
LATITUDE / LONGITUDE COORDINATES

38° 23' 30.61" N, 75° 49' 28.08" W

Spartina cynosuroides Herbaceous Vegetation

Nanticoke Central

Wicomico County, MD
Mardela Springs, USGS Quad



38° 23' 30.61" N, 75° 49' 28.08" W – Precise coordinates for site only and not necessarily for the *Spartina cynosuroides* Herbaceous Vegetation (4195) occurrence

Grays Island Marsh

COUNTY

Dorchester County, Maryland

USGS QUAD

Nanticoke, MD

PRIMARY REASON FOR SELECTION

Grays Island Marsh contains a high quality occurrence and one of Maryland's best examples of *Spartina alterniflora* Tidal Herbaceous Vegetation (4192).

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

SITE DESCRIPTION

Grays Island Marsh is situated northeast of Elliott Island on the eastern side of Fishing Bay. This reference site represents a very small portion of a much larger mesohaline marsh complex that occupies several thousand hectares. Typical *Spartina alterniflora* Tidal Herbaceous Vegetation dominates the lower and wetter sections of this site, which are often inundated in shallow water (<30 cm). *Spartina alterniflora* in this area accounts for approximately 30 percent of the total vegetative cover with very few associates. In transitional areas, discrete ecotones are evident as *Distichlis spicata, Spartina patens, Schoenoplectus americanus,* and *Pluchea odorata* intermix with *Spartina alterniflora* in slightly higher portions (less frequently inundated) of the marsh. Bordering the *Spartina alterniflora* Tidal Herbaceous Vegetation are vast areas of *Spartina patens - Distichlis spicata* Herbaceous Vegetation. Salinity was measured at 16 ppt on 20 July 1999.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Grays Island Marsh was chosen as a reference site primarily because it is habitat to one of the best examples of the *Spartina alterniflora* Tidal Herbaceous Vegetation in Maryland. In Maryland, this wetland community type is demonstrably secure under present conditions and is preliminarily ranked S5. This particular occurrence is part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Spartina alterniflora* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Spartina alterniflora* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as the *Spartina alterniflora* Tidal Herbaceous Vegetation are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other

pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

The foremost threat to Grays Island Marsh is mechanical damage by Nutria as indicated by the numerous "eat-outs" throughout a large majority of the area. Efforts to control Nutria are highly recommended. Known occurrences of *Phragmites australis* have also been documented (Berdine et al. 1999) at Grays Island Marsh and adjacent areas. Further advancement of *Phragmites australis* could displace much of the native wetland vegetation and is a threat to this reference site. Monitoring and control of established and incipient populations is highly recommended.

PROTECTION COMMENTS

Grays Island Marsh occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations. This reference site is also owned and managed by the Maryland Department of Natural Resources thus receiving some conservation and protection attention.

OCCURRENCE RANK

This particular occurrence of *Spartina alterniflora* Tidal Herbaceous Vegetation at Grays Island Marsh ranks as "A" or excellent example when compared to all other known Maryland examples of the same community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Fishing Bay Wildlife Management Area, Maryland Department of Natural Resources / State of Maryland

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

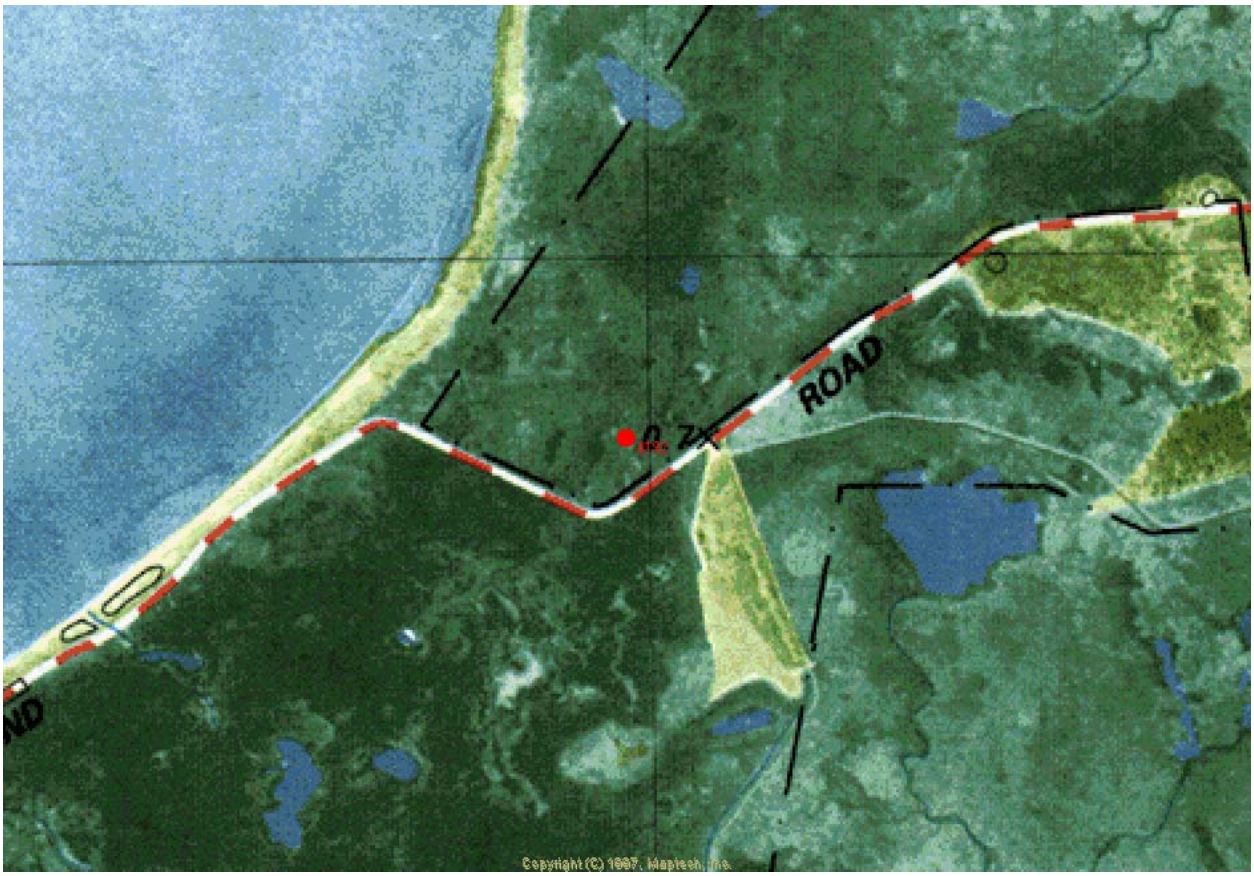
LATITUDE / LONGITUDE COORDINATES

38° 19' 17.99" N, 75° 57' 40.50" W

Spartina alterniflora Tidal Herbaceous Vegetation

Grays Island Marsh

Dorchester County, MD
Nanticoke, MD USGS Quad



38° 19' 17.99" N, 75° 57' 40.50" W – Precise coordinates for *Spartina alterniflora* (4192) Tidal Herbaceous Vegetation occurrence at this site

Dames Quarter Marsh

COUNTY

Somerset County, Maryland

USGS QUAD

Deal Island, MD

PRIMARY REASON FOR SELECTION

Dames Quarter Marsh contains a high quality occurrence and one of Maryland's best examples of *Juncus roemerianus* Tidal Herbaceous Vegetation (6330).

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

SITE DESCRIPTION

Dames Quarter Marsh is characterized by a brackish marsh that contains a large occurrence (ca. 200 hectares) of *Juncus roemerianus* Tidal Herbaceous Vegetation. The *Juncus roemerianus* Tidal Herbaceous Vegetation at Dames Quarter Marsh is a component of a much larger matrix containing various vegetation associations such as the *Spartina patens - Distichlis spicata* Tidal Herbaceous Vegetation and the *Spartina alterniflora* Tidal Herbaceous Vegetation. Monospecific stands of *Juncus roemerianus* dominate the low, wet edges of tidal creeks, guts, and ditches that are irregularly flooded. Very few associates occur in these dense stands. Associated plant species that may occur at low cover (less than one percent cover) include *Sesuvium maritimum, Atriplex patula* var. *hastata, Spartina alterniflora,* and *Distichlis spicata*. In areas slightly higher in elevation, the *Juncus roemerianus* Tidal Herbaceous Vegetation often abruptly merges with the *Spartina patens - Distichlis spicata* Tidal Herbaceous Vegetation. Salinity was measured at 19 ppt on 23 June 1999.

COMMUNITY DESCRIPTION

Dames Quarter Marsh was chosen as a reference site primarily because it is habitat to one of the best examples of *Juncus roemerianus* Tidal Herbaceous Vegetation known in Maryland. This wetland community type is secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. This particular occurrence is part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus a type locality.

This occurrence is very typical of that defined in the Vegetation Description for *Juncus roemerianus* Tidal Herbaceous Vegetation (Unit 1 of this report). See Vegetation Description section of this report for a precise definition of *Juncus roemerianus* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff,

agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

Known occurrences of *Phragmites australis* have been documented (Berdine et al. 1999) at stations just south of this reference site. Further advancement of *Phragmites australis* could displace the native wetland vegetation (lowering species diversity), and therefore is a threat to this reference site. Monitoring and control of this species is highly recommended.

PROTECTION COMMENTS

Dames Quarter Marsh occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations.

OCCURRENCE RANK

The *Juncus roemerianus* Tidal Herbaceous Vegetation at Dames Quarter Marsh is an "A" ranked (excellent example) occurrence when compared to all other known Maryland examples of this community type.

MANAGED AREA NAME / TRACT OWNERSHIP

Deal Island Wildlife Management Area, State of Maryland

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

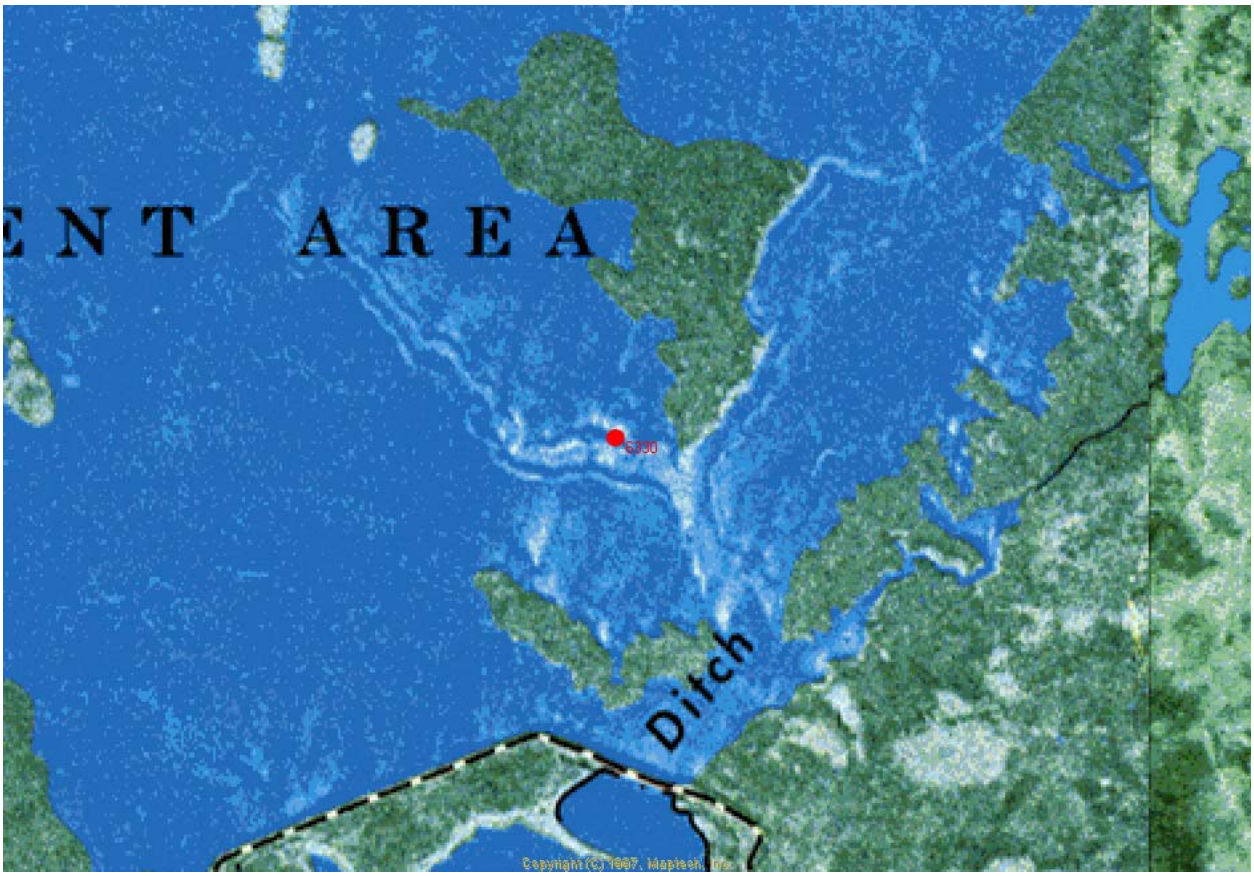
LATITUDE / LONGITUDE COORDINATES

38° 09' 30.0" N, 75° 53' 01.4" W

Juncus roemerianus Tidal Herbaceous Vegetation

Dames Quarter Marsh

Somerset County, MD
Deal Island, MD USGS Quad



38° 09' 30.0" N, 75° 53' 01.4" W – Precise coordinates for *Juncus roemerianus* Tidal Herbaceous Vegetation occurrence at this site

Thorofare Marsh

COUNTY

Dorchester County, Maryland

USGS QUAD

Chicamicomico, MD

PRIMARY REASON FOR SELECTION

Thorofare Marsh contains high quality occurrences and one of Maryland's best examples of *Spartina patens - Distichlis spicata* Herbaceous Vegetation (6836) and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation (6612).

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

SITE DESCRIPTION

Thorofare Marsh is situated just south of Bestpitch, Maryland and north of Fishing Bay along the Transquaking River. This reference site is part of a large marsh complex encompassing several hundred hectares. Several mesohaline wetland community types (e.g., *Spartina cynosuroides* Herbaceous Vegetation, *Juncus roemerianus* Tidal Herbaceous Vegetation) are well represented within this large matrix, however, this specific location supports high quality examples of *Spartina patens - Distichlis spicata* Herbaceous Vegetation and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation. Linear stands of *Spartina cynosuroides* Herbaceous Vegetation occur along the Transquaking River and are frequently interrupted by discrete colonies of *Juncus roemerianus* (lower areas) and shrubs of *Iva frutescens* and *Baccharis halimifolia* (higher areas). Beyond this zone of vegetation in the high marsh, *Spartina patens - Distichlis spicata* Herbaceous Vegetation is the dominant wetland type. Interspersed amongst this "meadow-like" community is *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation in slightly wetter depressions. Together, the various wetland types represented at Thorofare Marsh form an intricate mosaic across the landscape. Salinity was measured at 15 ppt on 16 June 1999.

This reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Thorofare Marsh was chosen as a reference site primarily because it is habitat to one of the best examples of *Spartina patens - Distichlis spicata* Herbaceous Vegetation and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation in Maryland. The *Spartina patens - Distichlis spicata* Herbaceous Vegetation community type is demonstrably secure under present conditions in Maryland and is preliminarily ranked S5. The *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation is secure under present conditions in Maryland and ranked S4, a designation meaning that more than 100 occurrences are known in the state or fewer occurrences if they contain a large number of individuals. These particular occurrences are part of a set of similar communities used to define and classify the community types for the Maryland Vegetation Classification, thus type localities.

These occurrences are very typical of that defined in the Vegetation Description for *Spartina patens - Distichlis spicata* Herbaceous Vegetation and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation (Unit 1 of this

report). See Vegetation Description section of this report for precise definitions of *Spartina patens - Distichlis spicata* Herbaceous Vegetation and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation.

MANAGEMENT COMMENTS / MONITORING NEEDS

Tidal herbaceous wetlands such as those found at Thorofare Marsh are susceptible to many direct and indirect threats. These threats account for significant qualitative and quantitative changes in wetland community structure, composition, and function. Tiner and Burke (1995) summarize the major causes of wetland loss and degradation in Maryland by the following: 1) Discharges of materials (e.g., pesticides, herbicides, other pollutants, nutrient loading from domestic sewage, urban runoff, agricultural runoff, and sediments from dredging and filling projects, agricultural lands, and other land development) into waters and wetlands, 2) Filling for dredged spoil and other spoil disposal, roads and highways, and commercial, residential, and industrial development, 3)Dredging and stream channelization for navigation channels, marinas, flood protection, coastal housing developments, and reservoir maintenance, 4) Construction of dikes, dams, levees, and seawalls for flood control, shoreline protection, water supply, and irrigation, 5) Drainage for crop production, timber production, and mosquito control, 6) Alteration of wetland hydrology and disruption of natural river flows through diversion of fresh water for human uses (e.g., water supply, industry, and agriculture), 7) Flooding wetlands for creating ponds, waterfowl impoundments, reservoirs, and lakes, 8) Clearing of native vegetation and cultivation of agricultural crops, 9) Conversion of "natural" forested wetlands to pine siliviculture plantations, 10) Sediment diversion by dams, deep channels, and other structures, and 11) Hydrologic alterations by canals, spoils banks, roads, and other structures. Natural threats such as droughts, subsidence/sea level rise, storm events, erosion, and mechanical damage by wildlife (e.g., Muskrats, Mute swans, Nutria, Canada geese) could also have severe impacts on wetlands systems.

Thorofare Marsh is threatened by several of the disturbances listed above. The foremost threat is mechanical damage by Nutria as indicated by the numerous "eat-outs" throughout a large majority of the area. Efforts to control Nutria are highly recommended. Known occurrences of *Phragmites australis* have also been documented (Berdine et al. 1999) in adjacent areas along the Transquaking River. Further advancement of *Phragmites australis* could displace much of the native wetland vegetation and therefore is a threat to this reference site. Monitoring and control of established and incipient populations is highly recommended.

PROTECTION COMMENTS

Thorofare Marsh occurs entirely within the Chesapeake Bay Critical Area and is subject to additional protection regulations. This reference site is also owned and managed as a Wildlife Management Area by the Maryland Department of Natural Resources thus receiving some conservation and protection attention.

OCCURRENCE RANK

These particular occurrences of *Spartina patens - Distichlis spicata* Herbaceous Vegetation and *Schoenoplectus americanus - Spartina patens* Tidal Herbaceous Vegetation at Thorofare Marsh rank as "A" or excellent examples when compared to all other known Maryland examples of these community types.

MANAGED AREA NAME / TRACT OWNERSHIP

Fishing Bay Wildlife Management Area, Maryland Department of Natural Resources / State of Maryland

BEST INFORMATION SOURCE

Wildlife and Heritage Division, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 24' 37.9" N, 75° 59' 32.9" W

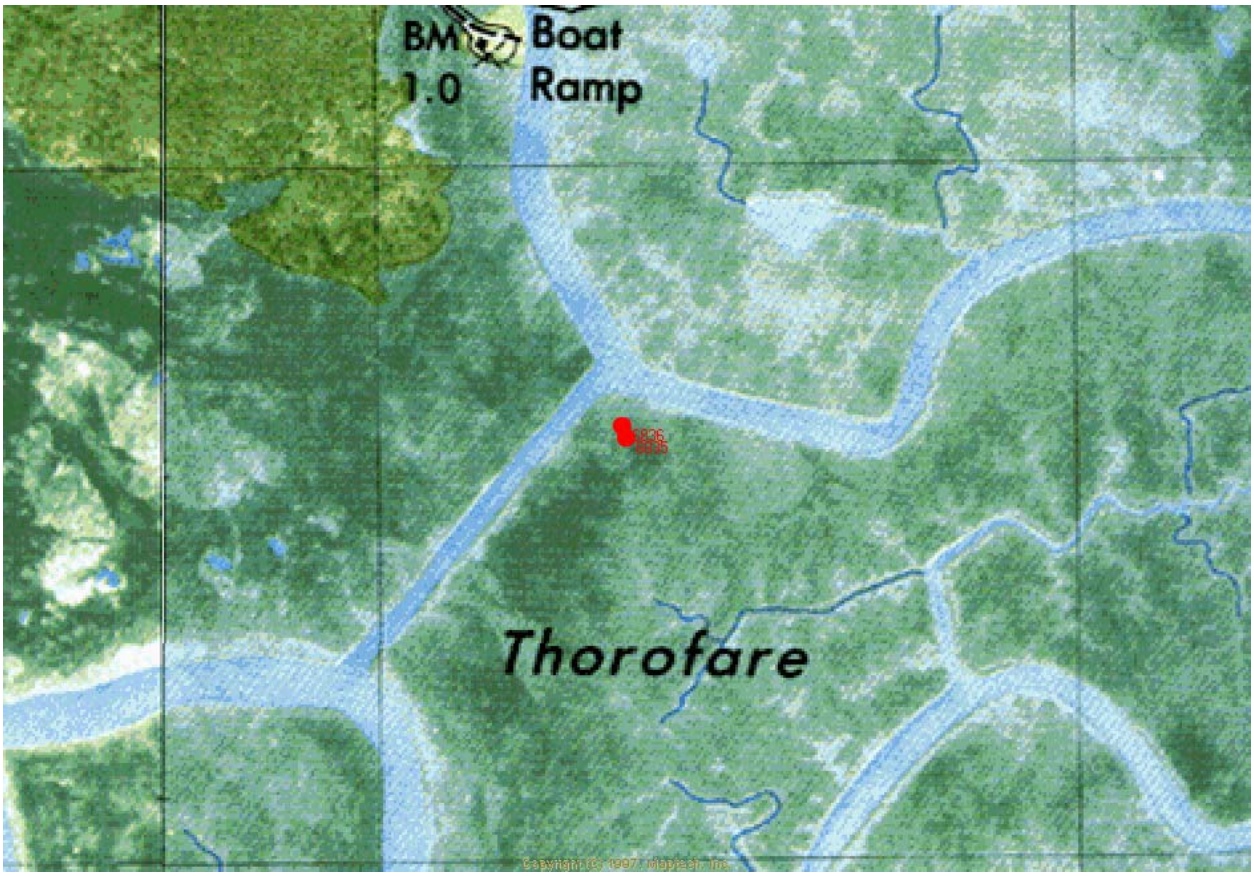
Spartina patens - Distichlis spicata Herbaceous Vegetation

38° 24' 37.3" N, 75° 59' 32.6" W

Schoenoplectus americanus - Spartina patens Tidal Herbaceous Vegetation

Thorofare Marsh

Dorchester County, MD
Chicamicomico, MD USGS Quad



38° 24' 37.9" N, 75° 59' 32.9" W – Precise coordinates for *Spartina patens* - *Distichlis spicata* Herbaceous Vegetation occurrence (6836) at this site

38° 24' 37.3" N, 75° 59' 32.6" W – Precise coordinates for *Schoenoplectus americanus* - *Spartina patens* (6612) Tidal Herbaceous Vegetation 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.

SITE SURVEY SUMMARY (The Nature Conservancy, 1993)

Site name:		Macrosite / Megasite Name:	

SITE VISIT CHRONOLOGY:

Date (year) (mo) (day)	Time	Surveyor	Source Code
_____-_____-_____	_____to_____	_____ _	F_____
_____-_____-_____	_____to_____	_____	F_____
_____-_____-_____	_____to_____	_____ _	F_____
_____-_____-_____	_____to_____	_____	F_____
_____-_____-_____	_____to_____	_____ _	F_____

LOCATION: State:_____ County:_____ Quad:_____

Townrange:_____ Section:_____ Meridian:_____ / Town/Township:_____

Precise Location:
(distance and direction from a prominent feature shown on the topographic map, or some other map)

Road Directions to Site:

Location of Site Access Point:
(where to park, location of important trail)

ELEMENT OCCURRENCES:

Under "Element Name" list all elements sought, reported, or confirmed from the site. If known, record the Occurrence Numbers for each. Generate simple letter or number codes which identify each element occurrence on the base map; these codes help keep the base map uncluttered. Indicate whether the element was found (Y, N, N/A) on the date of the site visit, and whether a return visit is needed.

			Date	Date	Date	Date	Date	
Element name	Occ. number	Code on base map	Found?	Found?	Found?	Found?	Found?	Revisit needed?

SITE DESCRIPTION:

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 #):

STEWARDSHIP:

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.

Form 1: Transect, site survey summary addendum Draft: Spring, 1993

A. Identifiers / Location (general EOR information)

1.Site name: 2.Survey site name: 3.Quad name(s): 4.Quad code(s): 5.County name(s): 6.County code(s):
7.Town (LOCALJURIS): 8.Directions:
9.Sourcecode: 10.Survey date: __.__.__ 11.State:
12.Surveyors:

B. Topography

13. Transect

14.Reconnaissance diagram: Scale:

C. Vegetation / Habitat

15. Observation point 1	Observation point 2	Observation point 3
16.Name: 17.Releve?	Name: Releve?	Name: Releve?
18.General description (physiognomy, char./dom. spp. of tree, shrub, herb, bryophyte layers)	General description:	General description:

Reconnaissance Diagram: Scale:

Observation Point 4	Observation Point 5	Observation Point 6	Observation Point 7
Name: Releve?	Name: Releve?	Name: Releve?	Name: Releve?
General Description:	General Description:	General Description:	General Description:

Form 2: Community Ranking and General Description Draft: Spring, 1993

A. Identifiers / Location (general EOR information)

Sci.name: 1. SNAME 2.GNAME:
3.Site name:
4.Survey site name:
5.Quad name(s): 6.Quad code(s):
7.County name(s): 8.County code(s):
9.Town (LOCALJURIS):
10.Directions:
12.Sourcecode: 13.Survey date: .
14.Last obs: . . 15.First obs: . . 16.State:
17.Surveyors:

B. General Community Description (General EOR information) 17.Transect: 18.Observation point number:
19.Community Description (EODATA):(brief word picture of community; include characteristic spp., inclusion of other communities. If commun ity occurs as mosaic, depict spatial distribution and associated community types)
20.Fauna (EODATA):
21.Evidence of community processes (EODATA):
22.Minimum elevation: ft. 23.Maximum elevation: ft. 24.Size: acres (0=unknown)
25.General description (Describe landscape context of EO (GEN DESC):
26.Management comments and monitoring needs (MGMTCOM):
27.Protection comments (PROTCOM):
28.Owners:
29.Owner comments (OWNERCOM):
30.Comments:

C. Specific community description (EOR-C information)

31.Survey type: ___ Qualitative ___ Quantitative
32.Landform:_____ 33.Geology comments:_____ 34.Soil type:
35.Hydrological influence:
36.System: __ Terrestrial __ Palustrine __ Estuarine 37.Physiognomic type:
38.Strata/life form: height % cover most abundant / characteristic species

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

D. Element occurrence ranking information

39.Size, relative to other occurrences (state whether full extent of occurrence is known):
40.Age, successional stage:
41.Quality Rank:
42.Known land use history:
43.Inferred land use history:
44.Other anthropogenic or unnatural disturbance:
45.Pesticides (known or suspected):
46.Condition rank:
47.Presence of invasives:
48.Alterations in natural processes:
49.Integrity / fragmentation of community:
50.**Viability Rank**:___51.Threats (on-site):
52.Threats (off-site):
53.**Defensibility rank**:
54.EO Rank comments:
55.(Overall) Element Occurrence Rank:

Form 3: Quantitative Community Characterization Draft: Spring, 1993

A. Identifiers / Location (general EOR information)

Sci. name: 1.SNAME:_____ 2.GNAME:_____ 3.Site name:
4.Survey site name:_____ 5.Quad name(s):_____ 6.Quad code(s):
7.County name(s):_____ 8.County code(s):_____ 9.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:

B. ENVIRONMENTAL DESCRIPTION

15.Transect / Observation point #	16.Image annotation #	17.Elevation:
18.Topographic position: _Interfluve _Backslope _High slope _Step in slope _High level _Lowslope _Midslope _Toeslope _Low level _Channel wall _Channel bed _Basin _Other	19.Topographic sketch:	20.Slope degrees: 21.Slope aspect: 22.Parent material:
27.Soil profile description: note depth, texture, and color of each horizon. Note significant changes such as depth to mottling, depth to water table, root penetration depth (SOILCOM) Organic horizon depth: Organic horizon type: Average pH of mineral soil:	34.Soil moisture regime: _Extremely dry _Somewhat wet _Very dry _Wet _Dry _Very wet _Somewhat moist _Permanently inundated _Moist _Periodically inundated	31.Stoniness: _Stone free <0.1% _Moderately stony 0.1-1% _Stony 3-15% _Very stony 15-50% _Exceedingly stony 50-90% _Stone piles >90%
	32.Soil drainage: _Excessively drained _Somewhat poorly _Well drained drained _Moderately well _Poorly drained drained _Very poorly drained	Average texture: _ sand _ clay loam _ sandy loam _ clay _ loam peat _ silt loam _ muck _ other
	33.Inundation: _Never inundated _Periodic inundation, frequency unknown _Infrequently inundated _Always submerged by shallow water < 30 cm _Regularly inundated _Always submerged by deep water > 30 cm _Frequently inundated for periods greater than 6 months	
	35.Unvegetated surface: __ % Bedrock __ % Litter, duff __ % Large rocks (cobbles, boulders > 10 cm) __ % Wood (> 1 cm) __ % Small rocks (gravel, 0.2-10 cm) __ % Water __ % Sand (0.1-2 mm) __ % Other: __ % Bare soil 36.Environmental Comments: Note homogeneity of vegetation, erosion / sedimentation, inundation, etc. 37.Plot representativeness:	

C. VEGETATION

45.System: __ Terrestrial __ Palustrine __ Estuarine Plot size:___ Plot number:

41.Leaf type:	42.Leaf phenology:	43.Physiognomic type:			Height % cover
_Broad-leaf	_Deciduous	_Forest	_Woodland		T1 Tree canopy
_Semi-broad-leaf	_Semi-deciduous	_Sparse woodland	_Scrub thicket		T2 Tree sub-canopy
_Semi-needle-leaf	_Semi-Evergreen	_Shrubland	_Sparse shrubland		S1 Tall shrub
_Needle-leaf	_Evergreen	_Dwarf shrubland	_Dwarf scrub thicket		S2 Short shrub
_Graminoid	_Perennial	_Sparse dwarf shrubland	_Herbaceous		H Herbaceous
_Broad-leaf herbaceous	_Annual	_Non-vascular	_Sparsely vegetated	_Pteridophyte	N Non-vascular
					E Epiphyte
					V Vine / liana

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.