SHRUBLAND TIDAL WETLAND COMMUNITIES OF MARYLAND'S EASTERN SHORE:

Identification, Assessment and Monitoring

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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 United States National Vegetation Classification System (USNVC; Grossman *et al.* 1998) is a current priority of NatureServe 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 USNVC (Grossman *et al.* 1998) are hierarchically more finely divided classifications at the regional and state levels. This project contributes to the development of the Natural Community Classification of Maryland (Harrison 2002) which is used for management within the state, comparison to other states, and fine tuning community alliances and associations of the USNVC (Grossman *et al.* 1998). The Natural Community Classification of Maryland (Harrison 2002) 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 wetlands 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 shrubland 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 shrubland 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 classify and describe shrubland tidal wetlands on Maryland's Eastern Shore in an effort to develop a more complete understanding of these communities. The classification generated by this study and presented in this report will be used to augment the ongoing Natural Community Classification of Maryland (Harrison 2002) and the USNVC (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 Service, 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 shrubland tidal wetlands was primarily based on that defined within the literature. For the purposes of this

study, shrubland tidal wetlands are defined as diurnal to irregularly flooded palustrine or estuarine wetlands dominated by woody vegetation less than 6m in height and ≥ 5% total cover.

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 digital orthophotographic quadrangles coupled with National Wetland Inventory maps. At the completion of the Landscape Analysis phase of the project, over 450 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 January 2002 to April 2002.

Spatial Distribution of Vegetation: Implications for Sampling Design
An effective and accurate vegetation classification requires sampling the full range of compositional heterogeneity, but the complex spatial nature of vegetation presents a number of problems when designing an optimal sampling scheme at the landscape scale (Grossman *et al.* 1994). Some characteristics of a good sampling approach are flexibility, replicability, and cost effectiveness; it attempts to characterize as many vegetation patterns possible with efficiency in mind (Grossman *et al.* 1994). Due to time, budgetary constraints, and large geographic area of Maryland's Eastern Shore, 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 eastern shore region of Maryland. Attempts were made to capture the full range of variation in local conditions, including hydrological regime, inundation frequency, salinity, soil drainage class, soil texture, and elevation. 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 occurred during the 2002 growing season and followed standard vegetation sampling protocols utilized by The Nature Conservancy and the network of state Natural Heritage Programs (Sneddon 1993). 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). Botanical nomenclature follows that of Kartesz (1999).

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 and then converted to the appropriate cover class (Table 1). 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. 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. Six classes were used to define the total vegetative cover for each stratum and are as follows: very sparse (0-5%), sparse (5-25%), very open (25-40%), open (40-60%), moderately dense (60-80%), and dense (80-100%).

Table 1. Cover class scores used in field sampling and data analysis

Estimated Percent Cover	Cover Class	Cover Class Midpoints (%)
Trace	1	0.05
< 1%	2	0.55
1 – 2%	3	1.50
2 – 5%	4	3.50
5 – 10%	5	7.50
10 – 25%	6	17.5
25 – 50%	7	37.5
50 – 75%	8	62.5
75 – 100%	9	87.5

Appendix 1 (Maryland NHP Community Survey, page 2) contains a sample field form used by the Maryland Natural Heritage Program to record vegetation sample plot data.

Environmental Parameters

At each vegetation sample plot, environmental data (Table 2) were recorded in the appropriate sections of the field forms (see Appendix 1). Topographic position was determined in the field using USGS 7.5 minute quadrangle maps. Elevation measurements were obtained at the sample plot using the Magellan Meridian global positioning system (GPS) units and later verified utilizing Maptech® Terrain Navigator (Version 4.01) mapping software. Slope inclination and aspect were estimated visually in the field. Soil drainage class, soil moisture regime, slope, and slope shape were determined using scalar values. Assignment of hydrologic regime and determination of inundation frequency were based on site position relative to water sources, examination of soil surveys and National Wetlands Inventory maps, and on-site assessment. Salinity measurements were obtained from a BIO-MARINE® Aquafauna refractometer and

averaged on-site after three readings. Finally, surface substrate cover was estimated visually such that all values sum to 100 %.

Table 2. Environmental data reported for each vegetation sample plot.

System	Soil Moisture Regime	Inundation	Surface Substrate (% cover)
A – terrestrial	A – very xeric	A – never	Decaying wood
B – palustrine	B – xeric (moist for brief time)	B – infrequently	Bedrock
C – estuarine	C – somewhat xeric (moist for short time)	C – regularly; for <6 mos	Boulders (>24" diameter)
D – marine	D – submesic (moist for mod. short time)	D – regularly; for >6 mos	Stones (>10" round or >15" flattened)
E – riverine	E – mesic (moist for sig time)	E – always submerged by shallow water.	Cobbles (3-10"; rounded)
Physiographic Province	F – subhygric (wet for sig part of growing season (mottles<20cm)	F – always submerged by deep water	Channery (thin; <6")
A – coastal plain (Upper)	G – hygric (wet for most of the growing season perm seepage/mottling	**Hydrological Regime**	Gravel
B – coastal plain (Lower)	H – subhydric (water table at or above surface for most of the year.	A - Terrestrial	Mineral soil
C – fall line	I – hydric (water table at or above surface year round)	Tidal	Organic matter
D – piedmont	__ - ephemeral seepage/ subsurface water pres locally in plot	A – Irregularly exposed	Water
E – blue ridge	**Soil Drainage Class**	B – Regularly flooded	Other:
F – ridge and valley	A – very poorly drained	C – Irregularlly flooded	Moss/lichen cover
G – Appalachian plateau	B – poorly drained	D – Wind tidally flooded	**Slope**
Topographic Position	C – somewhat poorly	Non-Tidal	A – 0-3% (level or nearly so)
A – plain/level	D – moderately drained	A – Permanently flooded	B – 3-8 (gentle/undulating)
B – toe	E – well drained	B – Semiperman. flooded	C – 8-16 (sloping/rolling)
C – lower slope	F – rapidly drained	C – Seasonally flooded	D – 16-30 (moderately/hilly)
D – middle slope		D – Intermittently flooded	E – 30-65 (steep)
E – upper slope		E – Temporarily flooded	F – 65-75 (very steep)
F – escarpment		F – Saturated	G – 75-100 (extremely steep)
G – ledge/terrace		**Salinity/Halinity**	H – hummock and hollow microtopography
H – crest		A – Saltwater	I – irregular craggy/bouldery microtopography
I – basin/depression		B – Brackish	
J – floodplain		C – Oligohaline	
K – stream bottom		D – Freshwater	
		_____ ppt	

Slope Shape		Aspect	
Vertically		F (Flat)	
Horizontally			
C-concave	C-concave	V (Variable)	
X-convex	X-convex	N	NE
S-straight	S-straight	E	SE
		S	SW

Appendix 1 (Maryland NHP Community Survey, page 1) contains a sample field form for recording environmental parameters.

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 and Magellan Meridian global positioning system (GPS) units coupled with Maptech® Terrain Navigator (Version 4.01) mapping software. Comments on management needs, protection, ownership, disturbances, and threats 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 (Maryland NHP Community Survey, page 1) contains a sample field form for recording site descriptors.

Metadata
The location of each community plot was measured in the field using Magellan Meridian global positioning system (GPS) units or subsequently determined from USGS 7.5 minute quadrangle maps and/or Maptech® Terrain Navigator (Version 4.01) mapping software. Each sample plot was assigned a alphanumeric identifier for database use. 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 digital photograph of the entire plot. A site sketch map and cross sectional map accompanied each field form (See Appendix 1; Maryland NHP Community Survey, page 1) indicating orientation of the plot, location of photo point(s), and distances and directions to any landmarks.

Field surveys occurred in the time period from April 2002 to November 2002.

Data Compilation and Analysis
After the completion of field surveys, a complete species and plot code list for the project was determined and transcribed to an Excel spreadsheet. To ensure consistency with the USNVC, botanical nomenclature follows that of Kartesz (1999). Cover class scores for each species was then entered for each vegetation sample 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 and numerical indices derived from descriptive scalars (e.g. inundation). The Excel spreadsheet files were then converted to PC-ORD format (Version 4.25; McCune and Mefford 1999).

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 (Version 4.25; McCune and Mefford 1999) 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).

Two-way indicator species analysis or TWINSPAN implemented in PC-ORD (Version 4.25; McCune and Mefford 1999) was performed on the entire untransformed data set. Default settings of minimum group size for division (5), maximum number of indicators for division (5), and maximum level of divisions (6) were selected. Pseudospecies cut levels selected were user defined and set to the nine cover class scores (Table 1) determined from cover estimations. Cluster analysis performed in PC-ORD (Version 4.25; McCune and Mefford 1999) used the Lance-Williams Flexible-Beta linkage method (Lance and Williams 1967, 1968) with distance measure set to Sorensen (Bray-Curtis) (Bray and Curtis 1957) and beta (β) set to the default value of –0.25. Initial analyses involved clustering 164 vegetation sample plots using raw cover class scores. This procedure resulted in a dendrogram containing three primary clades that coarsely represented 1) tidal freshwater shrublands, 2) tidal oligohaline shrublands, and 3) tidal mesohaline shrublands. Plots representing each clade were then separated into data subsets and reclustered independently into compositionally similar vegetation types (associations).

Vegetation types recognized using these classification statistics were refined through subsequent interpretation and comparison with other data. Compositional summary statistics (Table 3) for each type were then calculated using a customized Excel macro written in Visual Basic by Philip P. Coulling of the Virginia Natural Heritage Program. These statistics were used to guide the selection of diagnostic and 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 in the USNVC using the Ecology Access Reporting Tool (Version 2.66; NatureServe 2002) and regional classifications from various states.

Table 3. Compositional Summary Statistics (adapted from Fleming and Coulling 2001)

Compositional Statistic	Definition
Frequency	The number of samples in a group in which a species occurs
Mean Cover	Back-transformed cover class value corresponding to mean percent cover calculated from midpoint values of cover class ranges
Relative Cover	The arithmetic difference between mean cover (for a given group of samples) and total mean cover (for the entire dataset)(= Mean Cover – Total Mean Cover)
Constancy	The proportion of samples in a group in which a species occurs (= frequency / number of samples in a group x 100)
Fidelity	The degree to which a species is restricted to a group, expressed as the proportion of total frequency that frequency in a give group constitutes (= frequency / total frequency x 100)
Indicator Value (IV)	(= Constancy x Fidelity / 100)
Indicator Value Adjusted by Cover, Scale	(Adj IV [scaled]) (= Indicator Value x Mean Cover / 9)
Indicator Value Adjusted by Cover, Unscaled	(Adj IV [unscaled]) (= Indicator Value x $2^{\text{relative cover}}$)
Mean Species Richness	The average number of species present per plot *(S)*; only species rooted inside plot boundaries were included in this calculation
Homoteneity	The mean constancy of the *S* most constant species, expressed as a fraction; higher values for homoteneity indicate a greater uniformity in species composition among plots.

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, 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 Maptech® Terrain Navigator (Version 4.01) mapping software.

Data compilation and analysis occurred during the time period from December 2002 to January 2003.

RESULTS

Of the over 450 sites initially identified as potential tidal shrublands to visit, 119 were visited and quantitative data was collected from 164 plots. The analysis of these data yielded nine associations representing seven shrubland alliances of the USNVC. Of the seven alliances recognized, four are newly proposed to ensure proper placement within the hierarchy of the USNVC. Eight of the nine shrubland associations identified in Maryland are newly defined for the USNVC. Additionally, two of the nine associations are considered provisional based on the lack of sufficient plot data.

Community Descriptions

The interpretation of ecological statistics was used as a tool to clarify relationships of field observations. The classification of tidal shrublands on the eastern shore of Maryland ascertained nine shrubland associations:

- ***Alnus maritima / Acorus calamus* Tidal Shrubland (CEGL006841)**
- ***Alnus serrulata – Viburnum recognitum / Impatiens capensis* Tidal Shrubland (CEGL006842)**
- ***Salix nigra* Tidal Shrubland (CEGL006843) [provisional]**
- ***Amorpha fruticosa* Tidal Shrubland (CEGL006844) [provisional]**
- ***Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* Tidal Shrubland (CEGL004656)**
- ***Morella cerifera – Baccharis halimifolia / Eleocharis fallax* Tidal Shrubland (CEGL006846)**
- ***Iva frutescens / Spartina cynosuroides* Tidal Shrubland (CEGL006847)**
- ***Iva frutescens / Spartina patens* Tidal Shrubland (CEGL006848)**
- ***Baccharis halimifolia – Iva frutescens / Panicum virgatum* shrubland (CEGL006063)**

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 nine vegetation 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: Marshyhope Creek, Kings Creek, Upper Patuxent River, Lower Sassafras River, Big Creek, Upper Transquaking River, Frazier Point-Choptank River, Richardson Marsh, and Barren Island. 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 450 potential sites were identified for assessment. The most productive method used to determine these sites was analyzing digital orthophotography in conjunction with National Wetlands Inventory maps. Several sites were also identified through consultation with regional ecologists and from de novo surveys. During the field surveys for this project, 119 of the over 450 potential sites were visited for assessment. Approximately 30 sites were not sampled due to severely degraded habitats caused by shoreline stabilization efforts, ditching, and invasive species such as Common reed *(Phragmites australis)* and Nutria *(Myocastor coypus)*. The remaining sites were not visited due to time constraints. Also, after a preliminary understanding of these community types on the Eastern Shore was established, the need to collect additional data tapered and sites were not visited. However, several days were spent collecting plot data from the Patuxent River on the Western Shore of Maryland. This proved to be extremely beneficial in understanding the statewide distribution of certain shrubland communities and helped to validate a potentially new community type (*Salix nigra* Tidal Shrubland [CEGL006843]) which was known from only one location on the Eastern Shore.

The diversity of community types within Maryland's tidal shrublands was as expected, slightly higher in freshwater and oligohaline systems when compared to mesohaline systems. After the preliminary classification was developed, sites were visited to check this classification and data was collected only in suspected new community types. As a rule of thumb, between five and ten vegetation sample plots for each community type are best for an accurate classification. Since this classification has nine community types, the 164 plots are considered ample for their description.

Classification
This project yielded nine shrubland associations found within 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 regional community classifications. 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, elevation, duration of tidal flooding, and frequency of tidal flooding.

Wetland Conditions
Many high quality examples of tidal shrublands were encountered on Maryland's Eastern Shore. Despite these exceptional examples, several areas on the Eastern Shore 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 such as Common reed *(Phragmites australis)* and Nutria *(Myocastor coypus)* 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). Tidal shrublands are often linear biologically rich islands bordered by open water, emergent marshes, and tidal swamp forests. Such communities 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 shrubland 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 Service, 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 Service 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 Service 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 Service'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 Service. Although this option is available, Wildlife and Heritage Service 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 NatureServe and 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 shrubland 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. Additional data are needed from other "western shore" watersheds in Maryland such as the Patuxent and Potomac Rivers. A multitude of birds, reptiles, odinates, lepidoptera, and other insects use these wetlands and may play a vital role in their function. Intensive study of these taxa and others that utilize these wetlands would prove beneficial in understanding the complexity of these highly diverse systems.

TIDAL FRESHWATER SHRUBLANDS

Community Descriptions

ALNUS MARITIMA / ACORUS CALAMUS TIDAL SHRUBLAND
Seaside alder / Sweetflag Tidal Shrubland Vegetation

GLOBAL ELEMENT CODE CEGL006841

NATIONAL SYNONYM [none]

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Alnus maritima* Tidal Shrubland Alliance [proposed]

ENVIRONMENTAL DESCRIPTION
Tidal shrubland of diurnally flooded freshwater systems bordering the upper reaches of Maryland's coastal plain rivers and tributaries. Salinity typically ranges from 0 to 0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources however, spring high tides or low river discharge may result in pulses of higher salinity. Salinity data collected at time of study indicates a range of 0 to 1.0 ppt (mean ppt = .38). *Alnus maritima / Acorus calamus* tidal shrublands form physiognomically distinct patches along ecotones between tidal freshwater emergent marshes and tidal swamp forests. Stand sizes range from very small patches to large (> 10 hectares) stands. Hummock and hollow microtopographic features are characteristic of this community type. Soils are poorly drained slightly acidic tidal muck consisting of variable amounts of silt or fine sands mixed with partially decomposed peat.

VEGETATION DESCRIPTION
Alnus maritima / Acorus calamus tidal shrublands are best characterized by a moderately dense (60-80% cover) to dense (80-100%) shrub stratum strongly dominated by *Alnus maritima. Alnus maritima* typically grows in clumps of several trunks forming a dense canopy however, can exist as a single-trunked tree (Stibolt, 1981). In dense stands *Alnus maritima* will often attain high cover often exceeding 80% with few or no associated shrub species. Such species may include *Viburnum recognitum, Toxicodendron radicans,* and *Cornus amomum.* The herbaceous layer is dominated by many species associated with tidal freshwater marshes however, *Acorus calamus* is most consistent and often locally abundant. *Acorus calamus* frequently contributes to at least 50% of the total herbaceous cover. Other frequent and characteristic herbs include *Impatiens capensis, Peltandra virginica, Polygonum sagittatum, Leersia oryzoides, Cinna arundinacea, Polygonum arifolium, Boehmeria cylindrica, Thalictrum polygamum,* and *Sambucus canadensis*.

SUMMARY STATISTICS
Range of species richness of 17 sample plots is 20-28 species • 225 m^2.
Mean species richness of 17 sample plots is 24 species • 225 m^2.
Homoteneity = 0.650

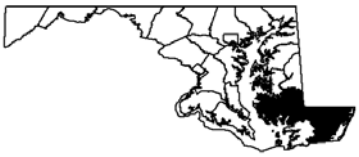
DIAGNOSTIC SPECIES
[none]

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Alnus maritima*
Vine	*Mikania scandens, Toxicodendron radicans*
Herbaceous	*Acorus calamus, Impatiens capensis, Peltandra virginica*

NOTEWORTHY SPECIES
State rare (S1 to S3) plant species that may or are known to occur within this community include *Alnus maritima* and *Carex hyalinolepis.*

DISTRIBUTION
Alnus maritima / Acorus calamus tidal shrubland is a newly proposed community association, therefore national distribution requires further determination. In Maryland, this community is supported by data from seventeen vegetation sample plots, which are located from the Nanticoke (Barren Creek, Marshyhope Creek), Pocomoke (Nassawango Creek), and Wicomico River drainages.



CONSERVATION RANK
S3.1

REFERENCE PLOTS (some plots may represent a single stand)
- BARREN1, Barren Creek, Wicomico County (38° 27' 02: N, 075° 45' 51" W)
- MAHO1, Marshyhope Creek, Dorchester County (38° 35' 318" N, 075° 48' 268" W)
- MAHO2, Marshyhope Creek, Dorchester County (38° 35' 390" N, 075° 48' 457" W)
- MAHO3, Marshyhope Creek, Dorchester County (38° 35' 585" N, 075° 48' 507" W)
- MAHO4, Marshyhope Creek, Dorchester County (38° 35' 605" N, 075° 48' 524" W)
- MAHO5, Marshyhope Creek, Dorchester County (38° 35' 638" N, 075° 48' 571" W)
- MAHO6, Marshyhope Creek, Dorchester County (38° 35' 678" N, 075° 48' 609" W)
- MAHO7, Marshyhope Creek, Dorchester County (38° 34' 31" N, 075° 47' 09" W)
- MAHO8, Marshyhope Creek, Dorchester County (38° 33' 23" N, 075° 46' 06" W)
- MAHO9, Marshyhope Creek, Dorchester County (38° 32' 13" N, 075° 45' 34" W)
- NASSA1, Nassawango Creek, Worcester County (38° 09' 964" N, 075° 25' 855" W)
- NASSA4, Nassawango Creek, Worcester County (38° 32' 04" N, 075° 44' 46" W)
- WICO1, Wicomico River, Wicomico County (38° 20' 413" N, 075° 39' 548" W)
- WICO2, Wicomico River, Wicomico County (38° 20' 442" N, 075° 39' 544" W)
- WICO3, Wicomico River, Wicomico County (38° 20' 19" N, 075° 40' 25" W)
- WICO4, Wicomico River, Wicomico County (38° 20' 27" N, 075° 40' 06" W)
- WICO5, Wicomico River, Wicomico County (38° 20' 35" N, 075° 39' 37" W)

COMMENTS
Alnus maritima is currently ranked as globally rare and extant to Maryland, Delaware, Oklahoma, and Georgia. Stibolt (1981) notes the relationship between *Alnus maritima* and *Alnus serrulata* on the Delmarva Peninsula as interesting because where these species occur together, *Alnus maritima* typically displaces *Alnus serrulata* at and beyond the waterline, often growing partially submerged in water. Where *Alnus serrulata* occurs without *Alnus maritima*, it occupies all the available habitat and frequently grows partially submerged in water. During our study of tidal shrublands, *Alnus serrulata* was found in only one of the seventeen vegetation sample plots dominated by *Alnus maritima*.

REFERENCES
Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

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ALNUS SERRULATA – VIBURNUM RECOGNITUM / IMPATIENS CAPENSIS TIDAL SHRUBLAND
Smooth Alder – Smooth Arrow-wood / Jewelweed Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006842

NATIONAL SYNONYM Related in part to *Alnus (incana ssp. Rugosa, serrulata)* – *Cornus amomum* shrubland [CEGL006337] of the USNVC.

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Alnus (incana, serrulata)* Tidal Shrubland Alliance

ENVIRONMENTAL DESCRIPTION
This tidal shrubland community is characteristic of diurnally flooded freshwater systems bordering the upper reaches of Maryland's coastal plain rivers and tributaries. Salinity typically ranges from 0 to 0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources however, spring high tides or low river discharge may result in pulses of higher salinity. Typically, *Alnus serrulata – Viburnum recognitum / Impatiens capensis* shrublands form small (< 0.4 hectare) linear patches on narrow floodplains between tidal freshwater emergent marshes and tidal swamp forests. On narrow or constricted floodplains this shrubland often occurs along ecotones or transitional areas and may not be as physiognomically distinct. However, broader floodplains of estuary meanders tend to support distinct stands that are much larger (> 0.4-2.0 hectares) and non-linear. Usually these shrublands are proximate to the main channel and subject to long hydroperiods due to regular tidal flooding. Pronounced hummock and hollow microtopography is characteristic and contributes to relatively high species richness with most species confined to irregularly flooded hummocks. Hollows are diurnally flooded and typically contain only those species tolerant of frequent inundation. Soils are best characterized as slightly acidic tidal muck containing variable mixtures of silt or fine sands and partially decomposed peat.

VEGETATION DESCRIPTION
Alnus serrulata – Viburnum recognitum / Impatiens capensis tidal shrublands are characterized by a diverse and moderately dense (60-80% cover) shrub stratum not exceeding six meters in height. *Alnus serrulata* and *Viburnum recognitum* are recognized as the most consistent and dominant species in the shrub canopy often accounting for as much as 75% cover. Other taxa frequent to this stratum include *Ilex verticillata*, *Cornus amomum*, *Acer rubrum*, *Lindera benzoin*, and to a lesser extent *Rosa palustris*. Occasionally, scattered and sparse (5-25% cover) individuals of *Fraxinus pennsylvanica, Acer rubrum,* and *Nyssa sylvatica* extend beyond the shrub canopy less than ten meters in height. Although ubiquitous throughout many types of tidal shrublands vine species such as *Toxicodendron radicans, Smilax rotundifolia,* and *Mikania scandens* can be dense and locally abundant. High species diversity in the herbaceous layer can be attributed to hummock and hollow microtopography in conjunction with species recruitment from adjacent swamps and marshes. Characteristic herbs include *Impatiens capensis, Carex stricta, Polygonum sagittatum, Zizania aquatica, Apios Americana, Symphyotrichum novi-belgii (= Aster novi-belgii), Sium suave, Thalictrum polygamum, Cinna arundinacea, Peltandra virginica,* and *Leersia oryzoides.*

SUMMARY STATISTICS
Range of species richness of 16 sampled plots is 19-31 taxa • 225 m^2.
Mean species richness of 16 sampled plots is 24 taxa • 225 m^2.
Homoteneity = 0.699

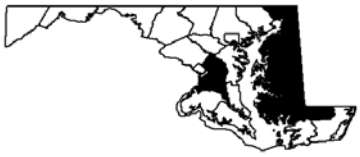
DIAGNOSTIC SPECIES
Alnus serrulata, Ilex verticillata, Carex stricta, Viburnum recognitum, Lindera benzoin, Cornus amomum

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Alnus serrulata, Ilex verticillata, Viburnum recognitum*
Vine	*Toxicodendron radicans*
Herbaceous	*Polygonum sagittatum, Impatiens capensis*

NOTEWORTHY SPECIES
State rare (S1 to S3) plant species that may or are known to occur within this community include *Alnus maritima, Carex hyalinolepis,* and *Sphenopholis pensylvanica.*

DISTRIBUTION
The *Alnus serrulata – Viburnum recognitum / Impatiens capensis* tidal shrubland is a newly proposed community association, therefore national distribution requires further determination. In Maryland, this community is supported by data from 16 vegetation sample plots, which are located in the Chester (Morgan Creek), Choptank (Kings Creek, Tuckahoe Creek), Nanticoke (Chicone Creek), Patuxent, and Sassafras (Little Blackduck Creek) River drainages. Although not documented with sample plots, additional occurrences have been observed in the upper portions of the Wicomico, Chicamacomico, Elk, and Bohemia River drainages.



CONSERVATION RANK
S4

REFERENCE PLOTS (some plots may represent a single stand)
CC1, Chicone Creek, Dorchester County (38° 30' 50" N, 075° 49' 27" W)
CC2, Chicone Creek, Dorchester County (38° 30' 19" N, 075° 49' 11" W)
FC1, Tuckahoe Creek, Talbot County (38° 51' 18" N, 075° 55' 38" W)
FC2, Tuckahoe Creek, Talbot Creek (38° 51' 07" N, 075° 55' 77" W)
FC3, Tuckahoe Creek, Talbot County (38° 50' 45" N, 075° 55' 33" W)
JUG1, Patuxent River, Prince Georges County (38° 46' 50" N, 076° 42' 40" W)
JUG2, Patuxent River, Prince Georges County (38° 46' 51" N, 076° 42' 40" W)
KC2, Kings Creek, Talbot County (38° 47' 40" N, 075° 59' 16" W)
KC3, Kings Creek, Talbot County (38° 47' 46" N, 075° 59' 11" W)
KING7, Kings Creek, Talbot County (38° 47' 59" N, 075° 58' 45" W)
KING8, Kings Creek, Talbot County (38° 47' 912" N, 075° 58' 561" W)
MC1, Morgan Creek, Kent County (39° 16' 32" N, 076° 01' 20" W)
MC2, Morgan Creek, Kent County (39° 16' 18" N, 076° 01' 33" W)
PAX1, Patuxent River, Prince Georges County (38° 47' 37" N, 076° 42' 38" W)
PAX2, Patuxent River, Prince Georges County (38° 48' 43" N, 076° 42' 37" W)
LBC1, Little Blackduck Creek, Cecil County (39° 26' 77" N, 075° 50' 45" W)

COMMENTS
This shrubland is most likely related in part to *Alnus serrulata – Salix nigra / Pilea Fontana* tidal shrublands described by Coulling (2002) from wetlands bordering Accotink Bay in Virginia.

REFERENCES
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SALIX NIGRA TIDAL SHRUBLAND [Provisional]
Black Willow Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006843

NATIONAL SYNONYM [none]

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Salix Nigra* Tidal Shrubland Alliance (Proposed)

ENVIRONMENTAL DESCRIPTION
This tidal shrubland community is characteristic of diurnally flooded freshwater systems bordering the upper reaches of tidal rivers in Maryland. Salinity typically ranges from 0 to 0.5 ppt due to the dilution of tidal inflow from sufficient upstream freshwater sources however, spring high tides or low river discharge may result in pulses of higher salinity. This community occurs between tidal emergent marshes and adjacent upland vegetation. Overall stand sizes range from approximately 4.0 to 10.3 hectares. Microtopography within this community is variable and ranges from having the characteristic marsh hollows and hummocks to being relatively flat and elevated. Soils are poorly drained and contain a variable mixture of partially decomposed peat mixed with silt and fine sands.

VEGETATION DESCRIPTION
Salix nigra tidal shrublands are characterized by a very diverse and relatively open (40-60% cover) shrub canopy dominated by *Salix nigra* (25-50% cover) with *Cephalanthus occidentalis* as a close associate (5-10% cover). Other frequent taxa found in this highly diverse stratum include *Acer negundo, Acer rubrum, Alnus serrulata, Cornus amomum, Fraxinus pennsylvanica, Rosa palustris,* and *Viburnum recognitum.* Characteristic vines include *Toxicodendron radicans* and *Mikania scandens*. The herbaceous layer is also diverse with vegetation generally restricted to the hummocks. Characteristic herbs include *Symphyotrichum novi-belgii (= Aster novi-belgii), Boehmeria cylindrica, Galium obtusum, Hibiscus moscheutos* ssp. *moscheutos, Impatiens capensis, Leersia oryzoides, Peltandra virginica, Pilea pumila, Polygonum arifolium, Polygonum punctatum, Polygonum sagittatum, and Thalictrum polygamum*.

SPECIES RICHNESS
Range of species richness of 3 sampled plots is 18-34 species • 225 m^2.
Mean species richness of 3 sampled plots is 28 species • 225 m^2.
Homoteneity = 0.750

DIAGNOSTIC SPECIES
Salix nigra, Symphyotrichum novi-belgii (= Aster novi-belgii), Toxicodendron radicans, Polygonum arifolium, Cephalanthus occidentalis, Alnus serrulata, Cornus amomum

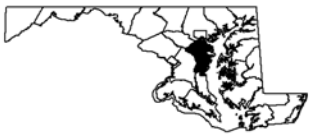
MOST ABUNDANT SPECIES

Strata	Species
Shrub	*Salix nigra, Cephalanthus occidentalis, Acer negundo*
Vine	*Toxicodendron radicans*
Herbaceous	*Polygonum arifolium, Polygonum sagittatum*

NOTEWORTHY SPECIES
State rare (S2/S3) *Carex hyalinolepis* is known to occur adjacent to this community type.

DISTRIBUTION

The *Salix nigra* tidal shrubland is a newly proposed community association, therefore national distribution requires further determination. In Maryland, this community is supported by data from 3 vegetation sample plots, which are located along the upper reaches of the Patuxent and Chester (Morgan Creek) River drainages.



CONSERVATION RANK

S?

REFERENCE PLOTS (SALIX1 and SALIX2 represent a single stand)

- MC2, Morgan Creek, Queen Annes County (39° 16' 18" N, 076° 01' 33" W)
- SALIX1, Patuxent River, Anne Arundel County (38° 48' 15" N, 076° 42' 26" W)
- SALIX2, Patuxent River, Anne Arundel County (38° 48' 18" N, 076° 42' 26" W)

COMMENTS

The extent of this tidal shrubland community in Maryland is not fully known. Only two occurrences were documented during this project and it is believed additional occurrences may be identified pending further fieldwork. This community type is believed to be partially related or perhaps equivalent to the *Alnus serrulata – Salix nigra / Thelypteris palustris* var. *pubescens* tidal shrublands described by Coulling (2002) from Accotink Bay, Virginia. Current status is provisional based on insufficient plot data.

REFERENCES

Coulling, P. P. 2002. A preliminary classification of tidal marsh, shrub swamp, and hardwood swamp vegetation and assorted non-tidal, chiefly non-maritime, herbaceous wetland communities of the Virginia coastal plain. Natural Heritage Tech. Rep. 02-18. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished report. 30 pp.

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

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AMORPHA FRUTICOSA TIDAL SHRUBLAND [Provisional]
Tall Indigo Bush Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006844

NATIONAL SYNONYM [none]

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Amorpha fruticosa* Tidal Shrubland Alliance (Proposed)

ENVIRONMENTAL DESCRIPTION
This tidal shrubland community occurs in irregularly flooded freshwater (0-0.5 ppt) systems bordering tidal rivers of the upper Chesapeake Bay. *Amorpha fruticosa* tidal shrublands commonly occur on sandy levees and shorelines above the mean high tides along large tidal rivers such as the Sassafras River. This community type frequently extends inland beyond the sand levees or barrier beaches into low, mucky depressions that border upland or cultural vegetation. Stands are irregularly flooded or overwashed by the tides however, may receive significant freshwater input from groundwater sources. Stands are typically small patch and narrow ranging from 4.0 to 8.2 hectares. Microtopography within this community is variable and ranges from having pronounced hummock and hollow features in the depressions to being relatively flat on the levees. Soils are variable ranging from well drained sands and mud gravel on the levees to poorly drained mucky peats in the depressions.

VEGETATION DESCRIPTION
Amorpha fruticosa tidal shrublands are characterized by a moderately diverse and relatively open (40-60% cover) shrub canopy. The shrub stratum is dominated by *Amorpha fruticosa* with *Decodon verticillata* as a close associate. Less frequent taxa found within this stratum include *Acer rubrum, Fraxinus pennsylvanica, Ilex verticillata* and *Rosa palustris.* The herbaceous layer is very diverse and dominated by *Osmunda regalis* var. *spectabilis, Hibiscus moscheutos* ssp. *moscheutos,* and *Thelypteris palustris* var. *pubescens.* Other herbs found include *Boehmeria cylindrica, Leersia oryzoides, Peltandra virginica, Polygonum sagittatum, Sium suave and Typha angustifolia.*

SPECIES RICHNESS
Range of species richness of 3 sampled plots is 17-27 species • 225 m^2.
Mean species richness of 3 sampled plots is 21 species • 225 m^2.
Homoteneity = 0.778

DIAGNOSTIC SPECIES
Amorpha fruticosa, Decodon verticillata, Osmunda regalis var. *spectabilis, Thelypteris palustris* var. *pubescens, Hibiscus moscheutos* ssp. *moscheutos*

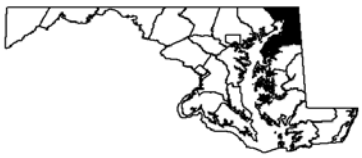
MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Amorpha fruticosa, Decodon verticillata*
Vine	*Mikania scandens*
Herbaceous	O*smunda regalis* var. *spectabilis, Thelypteris palustris* var. *pubescens, Hibiscus moscheutos* ssp. *moscheutos*

NOTEWORTHY SPECIES
State rare (S1) *Equisetum fluviatile* is known to occur within this community.

DISTRIBUTION

The *Amorpha fruticosa* tidal shrubland is a newly proposed community association, therefore national distribution requires further determination. In Maryland, this community is supported by data from 3 vegetation sample plots, which are located near the mouth of the Sassafras River drainage.



CONSERVATION RANK

S?

REFERENCE PLOTS (Plots represent a single stand)

- SR1, Sassafras River, Kent County (39° 21' 60" N, 076° 00' 14" W)
- SR2, Sassafras River, Kent County (39° 21' 59" N, 076° 00' 18" W)
- SR3, Sassafras River, Kent County (39° 21' 58" N, 076° 00' 21" W)

COMMENTS

The extent of this community type is not fully known. During this project, occurrences were only documented from the Sassafras River. It is believed that this community type also occurs sporadically near the mouth of the Bohemia, Elk, Susquehanna, and Potomac (C. Lea, pers. comm.) Rivers. A revision of this community description may occur in the near future pending additional data. Current status is provisional based on insufficient plot data supporting type.

REFERENCES

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

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TIDAL OLIGOHALINE SHRUBLANDS

Community Descriptions

MORELLA CERIFERA – ROSA PALUSTRIS / THELYPTERIS PALUSTRIS VAR. PUBESCENS TIDAL SHRUBLAND
Wax Myrtle – Swamp Rose / Royal Fern Tidal Shrubland

GLOBAL ELEMENT CODE CEGL004656

NATIONAL SYNONYM Equivalent to *Morella cerifera – Rosa palustris / Thelypteris palustris var. pubescens* shrubland [CEGL004656] of the USNVC.

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Evergreen Shrubland
PHYSIOGNOMIC GROUP Temperate Broad-leaved Evergreen Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Broad-leaved Evergreen Temperate Shrubland
ALLIANCE *Morella cerifera – Rosa palustris* Tidal Shrubland Alliance

ENVIRONMENTAL DESCRIPTION
Tidal shrublands of oligohaline conditions bordering middle to upper sections of Maryland's coastal plain rivers and tributaries. Salinity typically ranges from 0.5 to 5.0 ppt however, pulses of higher salinity may occur during periods of spring high tides and low river discharge. Salinity data collected at time of study indicate a range of 0.5 to 11.0 ppt (mean ppt = 2.6) for 30 sample plots. *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrublands form linear to irregular stands along tidal channels usually positioned between adjacent tidal marshes and swamp forests. Stands of narrow floodplains most often occur along ecotones as "fringes" intergrading with adjacent tidal swamp forests. Such stands are proximate to tidal channels and subject to regular tidal flooding. Stands occupying rather expansive marshes or large estuary meanders on broader floodplains are commonly fronted or surrounded by emergent marshes forming depositional islands. Slightly elevated and distanced from tidal influence, these stands tend to be less frequently flooded (regularly, for <6 months). Stand sizes range from 2 to 20 hectares. Hummock and hollow microtopography is characteristic of these shrublands and contributes to higher species richness as does species recruitment from adjacent tidal marshes and tidal swamp forests. Soils are best characterized as slightly acidic tidal muck consisting of a mixture of silt, fine sands and partially decomposed peat.

VEGETATION DESCRIPTION
Tidal oligohaline shrublands characterized by a low (0.5-6 m tall), open (40-60% cover) to moderately dense (60-80% cover) shrub canopy dominated by *Morella cerifera (= Myrica cerifera)* with *Rosa palustris* as a frequent associate. *Morella cerifera* is most constant and typically occupies 25 to 50% of the shrub stratum. In general, *Rosa palustris* is slightly less abundant (10-25% mean cover) than *Morella cerifera* however, can occasionally be dominant (> 75% cover) in some stands. Other less frequent taxa in the shrub stratum include *Acer rubrum, Viburnum recognitum, Baccharis halimifolia,* and dense vine growth of *Toxicodendron radicans and Mikania scandens*. Stands along ecotones or in less frequently flooded situations may contain emergent individuals of *Pinus taeda, Liquidambar styraciflua, Fraxinus pennsylvanica, Fraxinus profunda, Nyssa biflora,* and *Juniperus virginiana* in a scattered and very sparse (0-5% cover) overstory. Species richness in the herbaceous layer is very high and indicative of slight oligohaline conditions, species recruitment from adjacent communities, and considerable microtopographic variation. *Osmunda regalis* var. *spectabilis* is consistent and dominant in the herbaceous layer with *Thelypteris palustris* var. *pubescens* in close association although not as abundant. Associated species include species characteristic of freshwater marshes such as *Leersia oryzoides, Polygonum punctatum,* and *Peltandra virginica* and species more tolerant of mesohaline conditions such as *Hibiscus moscheutos* ssp. *moscheutos,* and *Carex hormathodes*. Other characteristic herbs include *Apios Americana, Cuscuta gronovii, Sium suave, Polygonum*

arifolium, Ptilimnium capillaceum, Cinna arundinacea, Thalictrum polygamum, Typha latifolia, Cicuta maculata, and *Boehmeria cylindrica.*

SUMMARY STATISTICS
Range of species richness of 30 sampled plots is 12-43 taxa • 225 m^2.
Mean species richness of 30 sampled plots is 25 taxa • 225 m^2.
Homoteniety = 0.589

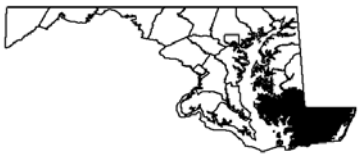
DIAGNOSTIC SPECIES
Rosa palustris, Thelypteris palustris var. *pubescens, Leersia oryzoides, Mikania scandens*

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Morella cerifera, Rosa palustris, Acer rubrum*
Vine	*Toxicodendron radicans*
Herbaceous	*Osmunda regalis* var. *spectabilis, Thelypteris palustris* var. *pubescens, Leersia oryzoides*

NOTEWORTHY SPECIES
State rare (S1 to S3) plant species that may or are known to occur within this community include *Carex hyalinolepis* and *Persea palustris.*

DISTRIBUTION
The *Morella cerifera – Rosa palustris / Thelypteris palustris var. pubescens* tidal shrubland is known to occur in North Carolina, Virginia, and Maryland. In Maryland, this community is supported by data from 30 vegetation sample plots, which are located in the Chicamacomico, Little Blackwater (Hughs Dam Creek, Pitcher Dam Creek), Pocomoke (Little Mill Creek), and Nanticoke (Big Creek, Bradleys Creek, Mill Creek) River drainages.



CONSERVATION RANK
S3S4

REFERENCE PLOTS (some plots may represent a single stand)
BIGCRE1, Big Creek, Dorchester County (38° 30’ 53 N, 075° 46’ 36” W)
BIGCRE2, Big Creek, Dorchester County (38° 30’ 55” N, 075° 46’ 35” W)
BRADLEY1, Bradleys Creek, Dorchester County (38° 30’ 18” N, 075° 47’ 42” W)
CH1, Chicamacomico River, Dorchester County (38° 26’ 47” N, 075° 54’ 05” W)
CH2, Chicamacomico River, Dorchester County (38° 26’ 53” N, 075° 54’ 13” W)
CH3, Chicamacomico River, Dorchester County (38° 27’ 24” N, 075° 54’ 19” W)
CH4, Chicamacomico River, Dorchester County (38° 25’ 28” N, 075° 56’ 05” W)
CHICK3, Chicamacomico River, Dorchester County (38° 26’ 98” N, 075° 54’ 25” W)
CHICK4, Chicamacomico River, Dorchester County (38° 26’ 98” N, 075° 54’ 26” W)
CHICK5, Chicamacomico River, Dorchester County (38° 27’ 15” N, 075° 54’ 30” W)
CHICK6, Chicamacomico River, Dorchester County (38° 27’ 12” N, 075° 54’ 26” W)
CHICK7, Chicamacomico River, Dorchester County (38° 28’ 12” N, 075° 54’ 09” W)
CHICK8, Chicamacomico River, Dorchester County (38° 26’ 16” N, 075° 54’ 53” W)
HDAM1, Hughs Dam Creek, Dorchester County (38° 28’ 49” N, 076° 04’ 25” W)
HICK1, Pocomoke River, Worcester County (38° 01’ 53” N, 075° 38’ 10” W)
HICK2, Pocomoke River, Worcester County (38° 01’ 52” N, 075° 38’ 06” W)
HICK3, Pocomoke River, Worcester County (38° 02’ 30” N, 075° 38’ 59” W)
HICK4, Pocomoke River, Worcester County (38° 01’ 37” N, 075° 38’ 57” W)

HICK5, Pocomoke River, Somerset County (38° 01' 05" N, 075° 38' 57" W)
HICK6, Pocomoke River, Somerset County (38° 01' 05" N, 075° 38' 58" W)
LBR1, Little Blackwater River, Dorchester County (38° 29' 40" N, 076° 05' 49" W)
LBR2, Little Blackwater River, Dorchester County (38° 29' 17" N, 076° 05' 30" W)
LBR3, Little Blackwater River, Dorchester County (38° 28' 57" N, 076° 05' 19" W)
LMILL1, Little Mill Creek, Somerset County (37° 59' 59" N, 075° 35' 39" W)
LMILL2, Little Mill Creek, Somerset County (38° 00' 10" N, 075° 35' 37" W)
MILL1, Mill Creek, Dorchester County (38° 27' 48" N, 075° 50' 20" W)
NANT1, Nanticoke River, Dorchester County (38° 29' 11" N, 075° 48' 01" W)
NANT2, Nanticoke River, Dorchester County (38° 29' 43" N, 075° 47' 10" W)
NANT3, Nanticoke River, Dorchester County (38° 29' 46" N, 075° 47' 06" W)
PITDAM1, Pitcher Dam Creek, Dorchester County (38° 28' 14" N, 076° 04' 07" W)

COMMENTS

This shrubland is compositionally similar to *Morella cerifera – Salix caroliniana / Thelypteris palustris* var. *pubescens* tidal shrublands described by Coulling (2002) from wetlands bordering the Northwest and North Landing Rivers in Virginia. In addition, a single occurrence has been documented from Assawoman Creek on Virginia's Eastern Shore. During this study, *Persea palustris* was located in two sample plots (HICK1 and HICK2) from Cypress Swamp bordering the Pocomoke River in Worcester County, Maryland.

REFERENCES

Coulling, P. P. 2002. A preliminary classification of tidal marsh, shrub swamp, and hardwood swamp vegetation and assorted non-tidal, chiefly non-maritime, herbaceous wetland communities of the Virginia coastal plain. Natural Heritage Tech. Rep. 02-18. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished report. 30 pp.

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MORELLA CERIFERA – BACCHARIS HALIMIFOLIA / ELEOCHARIS FALLAX TIDAL SHRUBLAND
Wax Myrtle – Groundsel-Tree / Creeping Spikerush Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006846

NATIONAL SYNONYM [none]

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Evergreen Shrubland
PHYSIOGNOMIC GROUP Temperate Broad-leaved Evergreen Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Broad-leaved Evergreen Shrubland
ALLIANCE *Morella cerifera – Baccharis halimifolia* Tidal Shrubland Alliance [proposed]

ENVIRONMENTAL DESCRIPTION
Tidal shrublands of oligohaline conditions bordering middle to upper sections of Maryland's coastal plain rivers and tributaries. Salinity typically ranges from 0.5 to 5.0 ppt however, pulses of higher salinity may occur during periods of spring high tides and low river discharge. Drought conditions during sampling resulted in higher salinity with a range of 11.0 to 14.0 ppt (mean ppt = 12.2) for 13 vegetation sample plots. *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrublands form linear to irregular stands along tidal channels usually positioned between adjacent tidal marshes and swamp forests. Stands that form in narrow floodplains most often occur along ecotones intergrading with adjacent tidal swamp forests or upland forests. These stands are proximate to tidal channels and frequent to regular tidal flooding. Stands occurring in large expansive marshes or on broad estuary meanders of broad floodplains are commonly fronted or surrounded by emergent marshes forming depositional islands. Slightly elevated and distanced from tidal influence, these stands tend to be less frequently tidally flooded (regularly, for <6 months). Stands occurring along upland ecotones may receiving significant freshwater input from groundwater sources. Stand sizes are variable and range from 0.4 to 30 hectares. Microtopography is generally flat without pronounced hummock and hollow features. Soils consist of a layer of firm, partially decomposed peat overlying a mixture of sands and mucky peat.

VEGETATION DESCRIPTION
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrublands are associated with diurnal to irregularly flooded oligohaline systems bordering coastal plain rivers and tributaries in Maryland. This community type is best characterized by an open (40-60% cover) to moderately dense (60-80%) shrub stratum. The shrub canopy is low (0.5-6 m in height) and dominated by *Morella cerifera (= Myrica cerifera)* which can be noted as having densities greater than 75% in some stands. Although less frequent than *Morella cerifera, Baccharis halimifolia* is a common associate in the shrub canopy and also characteristic of this community type. *Baccharis halimifolia* cover is quite variable often comprising 10-25% of the shrub canopy however, can be noticeably absent in some stands. Small, scattered individuals of *Pinus taeda* and *Acer rubrum* may also be present in the shrub canopy. Dense vine growth of *Toxicodendron radicans* is constant and rather abundant in some stands. The herbaceous layer of this shrubland is considerably diverse containing a mixture of freshwater and brackish species however, strongly dominated by *Eleocharis fallax*. *Eleocharis fallax* is constant in all stands of this type and often attains high cover (>75% cover, 25-50% = mean cover). In addition to *Eleocharis fallax,* species more tolerant of higher salinities such as *Kosteletskya virginica, Hibiscus moscheutos* ssp. *moscheutos,* and *Typha angustifolia* are also constant and locally abundant in some stands. Other characteristic herbs include *Polygonum punctatum, Cyperus filicinus, Panicum virgatum, Schoenoplectus olneyi, Amaranthus cannabinus, Hydrocotyle verticillata, Pluchea purpurescens, Spartina alterniflora, Lythrum lineare, Asclepias incarnata, Ptilimnium capillaceum,* and *Carex hormathodes.*

SUMMARY STATISTICS
Range of species richness of 13 sampled plots is 16-24 taxa • 225 m^2.
Mean species richness of 13 sampled plots is 20 taxa • 225 m^2.
Homoteniety = 0.654

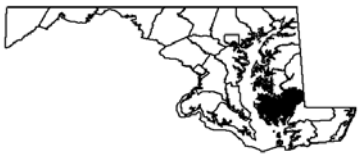
DIAGNOSTIC SPECIES
Lippia lanceolata, Cyperus filicinus, Kosteletskya virginica, Eleocharis fallax

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Morella cerifera, Baccharis halimifolia*
Vine	*Toxicodendron radicans*
Herbaceous	*Eleocharis fallax, Cyperus filicinus, Polygonum punctatum, Hibiscus moscheutos* ssp. *moscheutos*

NOTEWORTHY SPECIES
[none]

DISTRIBUTION
The *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland is a newly proposed community association, therefore national distribution requires further determination. In Maryland, this community is supported by data from 13 vegetation sample plots, which are located in the Blackwater (Buttons Creek) and Transquaking River drainages. Although not documented with sample plots, additional occurrences have been observed in the upper portions of Quantico Creek (Wicomico County) just south of Cherrywalk.



CONSERVATION RANK
S3

REFERENCE PLOTS (some plots may represent a single stand)
BUTTON1, Buttons Creek, Dorchester County (38° 28’ 01 N, 076° 09’ 03” W)
BUTTON2, Buttons Creek, Dorchester County (38° 28’ 03” N, 076° 09’ 05” W)
BUTTON3, Buttons Creek, Dorchester County (38° 27’ 42” N, 076° 08’ 49” W)
BUTTON4, Buttons Creek, Dorchester County (38° 27’ 43” N, 076° 08’ 51” W)
TRANS2, Transquaking River, Dorchester County (38° 27’ 34” N, 076° 00’ 28” W)
TRANS3, Transquaking River, Dorchester County (38° 27’ 34” N, 076° 00’ 29” W)
TRANS4, Transquaking River, Dorchester County (38° 27’ 09” N, 076° 00’ 31” W)
TRANS5, Transquaking River, Dorchester County (38° 27’ 10” N, 075° 00’ 32” W)
TRANS6, Transquaking River, Dorchester County (38° 30’ 55” N, 075° 46’ 35” W)
TRANS7, Transquaking River, Dorchester County (38° 26’ 53” N, 075° 00’ 37” W)
TRANS2, Transquaking River, Dorchester County (38° 26’ 53” N, 075° 00’ 35” W)
TRANSD1, Transquaking River, Dorchester County (38° 27’ 45” N, 076° 00’ 01” W)
TRANSD2, Transquaking River, Dorchester County (38° 27’ 44” N, 076° 00’ 01” W)
TRANSD3, Transquaking River, Dorchester County (38° 27’ 52” N, 075° 59’ 58” W)

COMMENTS
[none]

REFERENCES
Coulling, P. P. 2002. A preliminary classification of tidal marsh, shrub swamp, and hardwood swamp vegetation and assorted non-tidal, chiefly non-maritime, herbaceous wetland communities

of the Virginia coastal plain. Natural Heritage Tech. Rep. 02-18. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished report. 30 pp.

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Harrison, J. W. and P. Stango III. 2002. Community field forms. Wildlife and Heritage Service, Maryland Department of Natural Resources, Annapolis, Maryland.

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TIDAL MESOHALINE SHRUBLANDS

Community Descriptions

IVA FRUTESCENS / SPARTINA CYNOSUROIDES TIDAL SHRUBLAND
Marsh Elder / Big Cordgrass Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006847

NATIONAL SYNONYM Related in part to *Baccharis halimifolia – Iva frutescens / Spartina patens* shrubland [CEGL003921] of the USNVC.

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Baccharis halimifolia – Iva frutescens* Tidal Shrubland Alliance

ENVIRONMENTAL DESCRIPTION
This tidal shrubland community is characteristic of diurnal to irregularly flooded oligohaline and mesohaline systems bordering tidal rivers and shores of the Chesapeake Bay. Salinity typically ranges from 0.5 to 5.0 ppt in oligohaline systems and 5.0 to 18.0 ppt in mesohaline systems. Data collected during this study indicate a range of 7.0 to 20.0 ppt (mean = 14.0 ppt) for 14 vegetation sample plots. The vegetation and community structure of these systems are closely associated with the frequency and duration of tidal flooding, with species diversity generally increasing in elevation. Typically, *Iva frutescens / Spartina cynosuroides* shrublands form linear stands along narrow levees bordering tidal rivers and guts. Stand sizes range from 1.2 hectares to 8.1 hectares. Levee microtopography is relatively flat without pronounced hummock or hollow features. Soils are poorly drained and contain a firm surface layer of partially decomposed peat overlying a mixture of sand and mucky peat.

VEGETATION DESCRIPTION
Iva frutescens / Spartina cynosuroides tidal shrublands are characterized by a moderately dense (60-80% cover) shrub canopy co-dominated by *Iva frutescens* and *Spartina cynosuroides*. The shrub canopy is low, however individuals of *Iva frutescens* along the levees are generally more robust due to the slight increase in elevation. Although infrequent, other taxa in this stratum may include *Baccharis halimifolia* and *Hibiscus moscheutos* ssp. *moscheutos*. The herbaceous layer is typically species-poor and sparse (5-25% cover), particularly in stands with dense canopy coverage of *Iva frutescens.* Compositional overlap between stands and surrounding herbaceous communities is common along the edges often contributing to slightly higher species diversity. Species frequent to this stratum may include *Amaranthus cannabinus, Atriplex patula, Lythrum lineare, Polygonum punctatum, Schoenoplectus olneyi, Solidago sempervirens, Spartina alterniflora* and *Spartina patens.* In many cases the *Iva frutescens / Spartina cynosuroides* often intergrades with the *Iva frutescens / Spartina patens* tidal shrubland [CEGL006848] association. Additionally, *Phragmites australis* has been observed to displace *Spartina cynosuroides* in areas of increased disturbance.

SUMMARY STATISTICS
Range of species richness of 14 sampled plots is 5-13 species • 225 m^2.
Mean species richness of 14 sampled plots is 8 species • 225 m^2.
Homoteneity = 0.571

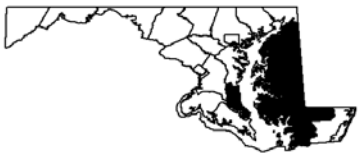
DIAGNOSTIC SPECIES
Spartina cynosuroides

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Iva frutescens*
Vine	[none]
Herbaceous	*Spartina cynosuroides*

NOTEWORTHY SPECIES
[none]

DISTRIBUTION
Iva frutescens / Spartina cynosuroides tidal shrubland is a newly proposed community association; therefore national distribution requires further determination. In Maryland, this community is supported by data from fourteen vegetation sample plots, which are located from the Chester (Langford Creek), Choptank (Miles Creek), Manokin, Nanticoke (Wetipquin Creek), Patuxent (St. Leonard Creek), Pocomoke, (Marumsco Creek, Pocomoke Sound), and Wye East River drainages. Although not documented with plot data, additional occurrences have been observed on the Transquaking and Wicomico (below Whitehaven Ferry) Rivers.



CONSERVATION RANK
S4

REFERENCE PLOTS (some plots may represent a single stand)
- DEAL2, Manokin River, Somerset County (38° 07' 616" N, 075° 55' 663" W)
- DEAL3, Manokin River, Somerset County (38° 07' 616" N, 075° 55' 678" W)
- FRA2, Choptank River, Caroline County (38° 42' 060" N, 075° 58' 985" W)
- HOG1, Choptank River, Caroline County (38° 43' 520" N, 076° 00' 759" W)
- LANG1, Langford Creek, Kent County (39° 05' 45" N, 076° 10' 07" W)
- LEON2, Patuxent River, Calvert County (38° 24' 59" N, 076° 29' 04" W)
- MARUM1, Pocomoke Sound, Somerset County (37° 58' 40.88" N, 075° 40' 19" W)*
- MILES1, Miles Creek, Talbot County (38° 41' 07" N, 075° 59' 25" W)
- POPUL1, Hunting Creek, Caroline County (38° 41' 27" N, 075° 57' 31" W)
- POPUL2, Hunting Creek, Caroline County (38° 41' 29" N, 075° 57' 33" W)
- POPUL3, Hunting Creek, Caroline County (38° 41' 262" N, 075° 57' 388" W)
- PSOUND1, Pocomoke Sound, Somerset County (37° 58' 19" N, 075° 42' 08" W)
- SKIPCR1, Skipton Creek, Talbot County (38° 53' 04" N, 076° 05' 59" W)
- WETIP1, Wetipquin Creek, Wicomico County (38° 19' 29" N, 075° 50' 32" W)

COMMENTS
Iva frutescens / Spartina cynosuroides tidal shrublands form very narrow and linear stands along levees and are prone to considerable compositional overlap with adjacent communities.

REFERENCES
Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

Harrison, J. W. and P. Stango III. 2002. Community field forms. Wildlife and Heritage Service, Maryland Department of Natural Resources, Annapolis, Maryland.

NatureServe. 2002. International classification of ecological communities: terrestrial vegetation. Natural Heritage Central Databases. NatureServe, Arlington, Virginia.

* Precise coordinates for site only and not necessarily for the community occurrence

Tiner, R. W. and D. G. Burke. 1995. Wetlands of Maryland. U.S. Fish and Wildlife Service, Ecological Services, Region 5, Hadley, MA and Maryland Department of Natural Resources, Annapolis, MD. Cooperative publication.

IVA FRUTESCENS / SPARTINA PATENS TIDAL SHRUBLAND
Marsh Elder / Saltmeadow Cordgrass Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006848

NATIONAL SYNONYM Related in part to *Baccharis halimifolia – Iva frutescens / Spartina patens* shrubland [CEGL003921] of the USNVC.

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Baccharis halimifolia – Iva frutescens* Tidal Shrubland Alliance

ENVIRONMENTAL DESCRIPTION
Iva frutescens / Spartina patens tidal shrublands are characteristic of diurnal to irregularly flooded mesohaline (5.0-18.0 ppt) systems bordering tidal rivers and shores of the Chesapeake Bay. In Maryland, mesohaline or brackish marshes are the most common and predominant estuarine wetland type. The vegetation and community structure of mesohaline systems are closely linked to the frequency and duration of tidal flooding, with species diversity generally increasing with elevation. *Iva frutescens / Spartina patens* tidal shrublands is the most commonly found tidal mesohaline shrubland type in Maryland. Stand sizes are quite variable and range from 1.2 hectares to 40.7 hectares. Microtopographic features are highly variable and range from having the characteristic marsh hummocks and hollows to being relatively flat and elevated. Soils are best described as a dense layer of accumulated peat of variable depths overlying sands. Salinity data collected at time of sampling indicate a range of 12.0 to 33.0 ppt (mean = 18.0 ppt).

VEGETATION DESCRIPTION
Species-poor tidal shrubland characterized by an open (40-60% cover) and frequently monotypic shrub stratum not exceeding two meters in height. *Iva frutescens* is the dominant and most consistent in the shrub canopy often accounting for as much as 100% cover. Typically, individuals of *Iva frutescens* are low statured, not usually exceeding one meter in height. *Spartina patens* is the most constant and abundant species in the herb layer often attaining 100% cover. Regularly flooded stands proximate to tidal channels often contain high cover of *Spartina alterniflora* and *Distichlis spicata*. Other characteristic species include *Cuscuta gronovii, Limonium carolinianum, Lythrum lineare,* and *Solidago sempervirens.*

SPECIES RICHNESS
Range of species richness of 25 sampled plots is 3-10 species • 225 m^2.
Mean species richness of 25 sampled plots is 7 species • 225 m^2.
Homoteneity = 0.686

DIAGNOSTIC SPECIES
Distichlis spicata

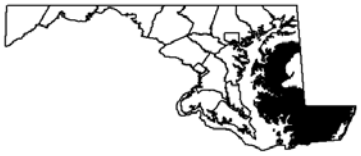
MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Iva frutescens*
Vine	[none]
Herbaceous	*Spartina patens, Distichlis spicata, Spartina alterniflora*

NOTEWORTHY SPECIES
[none]

DISTRIBUTION

Iva frutescens /Spartina patens Tidal shrubland is a newly proposed community association; therefore national distribution requires further determination. In Maryland, this community is supported by data from 25 vegetation sample plots, which are located from the Big Annemessex (Hall Creek), Choptank (Harris Creek), Honga, Manokin (St. Peters Creek, Dame's Quarter Marsh), Tred Avon (Goldsborough Creek), Wicomico, Wye (Wye Narrows), and Wye East River drainages. In addition, occurrences are also documented from Parker Bay, Pocomoke Sound (Marumsco Creek), Tangier Sound and Wicomico River (Dame's Quarter Marsh).



CONSERVATION RANK

S5

REFERENCE PLOTS (some plots may represent a single stand)

- CEDAR1, Cedar Island, Somerset County (37° 57' 75.89" N, 075° 52' 20.9" W)
- CEDAR2, Cedar Island, Somerset County (37° 56' 16" N, 075° 53' 31" W)
- DAMES1, Dames Quarter Marsh, Somerset County (38° 10' 962" N, 075° 52' 591" W)
- DAMES2, Dames Quarter Marsh, Somerset County (38° 10' 981" N, 075° 52' 606" W)
- FLATY1, Goldsborough Creek, Talbot County (38° 41' 33" N, 076° 08' 43" W)
- FLATY2, Goldsborough Creek, Talbot County (38° 41' 35" N, 076° 08' 43" W)
- FLATY3, Goldsborough Creek, Talbot County (38° 41' 43.99" N, 076° 08' 52.1" W)*
- FLATY4, Goldsborough Creek, Talbot County (38° 41' 45.13" N, 076° 08' 52.04" W)*
- HALL1, Big Annemessex River, Somerset County (38° 05' 13.7" N, 075° 47' 47.1" W)*
- H.NECK1, Big Annemessex River, Somerset County (38° 05' 16.9" N, 075° 46' 32.5" W)*
- HONGA2, Honga River, Dorchester County (38° 17' 02" N, 076° 07' 40" W)
- MARUM2, Pocomoke Sound, Somerset County (37° 58' 42" N, 075° 40' 21" W)*
- MYRTLE1, Big Annemessex River, Somerset County (38° 05' 34.9" N, 075° 46' 44.9" W)*
- PETE'S1, St. Peter's Creek, Somerset County (38° 09' 00" N, 075° 48' 42" W)
- PETE'S2, St. Peter's Creek, Somerset County (38° 09' 53" N, 075° 48' 53" W)
- PSOUND2, Pocomoke Sound, Somerset County (37° 58' 21" N, 075° 42' 05" W)
- RUMBLY1, Rumbly Point, Somerset County (37° 59' 32" N, 075° 43' 43" W)
- VAUGHN1, Parker Bay, Worchester County (38° 02' 15" N, 075° 21' 24" W)
- VAUGHN2, Parker Bay, Worchester County (38° 02' 12" N, 075° 21' 47" W)
- WITT1, Cummings Creek, Talbot County (38° 46' 51" N, 076° 17' 49" W)
- WITT2, Harris Creek, Talbot County (38° 46' 36" N, 076° 17' 44" W)
- WYEE1, Wye East River, Queen Annes County (38° 52' 743" N, 076° 07' 732" W)
- WYEE2, Wye East River, Queen Annes County (38° 52' 726" N, 076° 07' 684" W)
- WYEN1, Wye Narrows, Queen Annes County (38° 53' 695" N, 076° 07' 299" W)
- WYER1, Wye River, Queen Annes County (38° 52' 179" N, 076° 10' 272" W)

COMMENTS

[none]

REFERENCES

Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United

* Precise coordinates for site only and not necessarily for the community occurrence

States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

Harrison, J. W. and P. Stango III. 2002. Community field forms. Wildlife and Heritage Service, Maryland Department of Natural Resources, Annapolis, Maryland.

NatureServe. 2002. International classification of ecological communities: terrestrial vegetation. Natural Heritage Central Databases. NatureServe, Arlington, Virginia.

Tiner, R. W. and D. G. Burke. 1995. Wetlands of Maryland. U.S. Fish and Wildlife Service, Ecological Services, Region 5, Hadley, MA and Maryland Department of Natural Resources, Annapolis, MD. Cooperative publication.

BACCHARIS HALIMIFOLIA – IVA FRUTESCENS / PANICUM VIRGATUM TIDAL SHRUBLAND
Groundsel Tree – Marsh Elder / Switch Grass Tidal Shrubland

GLOBAL ELEMENT CODE CEGL006063

NATIONAL SYNONYM Equivalent to *Baccharis halimifolia – Iva frutescens / Panicum virgatum* shrubland [CEGL006063] of the USNVC.

TNC SYSTEM Terrestrial
PHYSIOGNOMIC CLASS Shrubland
PHYSIOGNOMIC SUBCLASS Deciduous Shrubland
PHYSIOGNOMIC GROUP Cold-deciduous Shrubland
PHYSIOGNOMIC SUBGROUP Natural/Semi-natural
FORMATION Tidal Cold-deciduous Shrubland
ALLIANCE *Baccharis halimifolia – Iva frutescens* Tidal shrubland Alliance

ENVIRONMENTAL DESCRIPTION
Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrublands are characteristic of diurnal to irregularly flooded mesohaline (5.0-18.0 ppt) systems bordering tidal rivers and shores of the Chesapeake Bay. The vegetation and community structure of mesohaline systems are closely linked to the frequency and duration of tidal flooding, with species diversity generally increasing with elevation. This tidal shrubland community typically occurs along ecotones between higher marsh zones and adjacent upland vegetation. Higher in elevation, this community is less frequently flooded and typically contains a diverse herbaceous layer. Stands are typically linear, conforming to the upland edge and are variable in size. Stand sizes are generally small and range from 1.2 hectares to 4.1 hectares. Soils consist of a firm and dense layer of accumulated peat of variable depths overlying sands. Microtopography of this shrubland is generally flat without distinct hummock and hollow features. Salinity of sampled plots indicate a range of 10.0 to 24.0 ppt (mean = 14 ppt).

VEGETATION DESCRIPTION
Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrublands are characterized by a moderately dense (60-100% cover) shrub canopy co-dominated by *Iva frutescens* and *Baccharis halimifolia*. Other taxa characteristic of the shrub stratum include *Morella cerifera* and *Juniperus virginiana.* Scattered and sparse individuals of *Pinus taeda* and *Diospyros virginiana* may be common indicating the proximity of this shrubland to upland vegetation. Although low in cover, *Toxicodendron radicans* is a frequent vine associate. The herbaceous layer is diverse and includes species such as *Panicum virgatum* in close association with *Spartina patens* and *Distichlis spicata.* Less frequent, however, characteristic species include *Solidago sempervirens, Spartina alterniflora,* and *Atriplex patula*.

SUMMARY STATISTICS
Range of species richness of sampled plots is 8-18 species • 225 m^2.
Mean species richness of sampled plots is 12 species • 225 m^2.
Homoteneity = 0.575

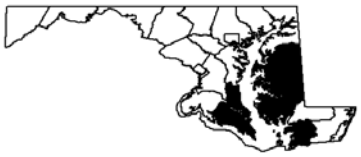
DIAGNOSTIC SPECIES
Baccharis halimifolia, Morella cerifera

MOST ABUNDANT SPECIES

Stratum	Species
Shrub	*Baccharis halimifolia, Iva frutescens, Morella cerifera*
Vine	*Toxicodendron radicans*
Herbaceous	*Spartina patens, Panicum virgatum, Distichlis spicata, Phragmites australis*

NOTEWORTHY SPECIES
[none]

DISTRIBUTION
The *Baccharis halimifolia – Iva frutescens / Panicum virgatum* Tidal shrubland community occurrence has been identified along the Atlantic coastal region from Rhode Island south through Virginia. In Maryland, this community is supported by data from ten vegetation sample plots, which are located from the Big Annemessex (Jones Creek), Chester, Choptank, Honga, Patuxent (Sam Abell Cove), and Manokin River drainages. Occurrences have also been documented from Eastern Bay and the Pocomoke Sound (Marumsco Creek).



CONSERVATION RANK
S5

REFERENCE PLOTS
- BARRENI1, Barren Island, Dorchester County (38° 19' 31.3" N, 076° 15' 16.8" W)
- CLAI1, Eastern Bay, Talbot County (38° 50' 10" N, 076° 16' 47" W)
- CLARK1, Patuxent River, St. Mary's County (38° 19' 59" N, 076° 30' 10" W)
- DEAL1, Deal Island, Somerset County (38° 07' 957" N, 075° 55' 373" W)
- FRA1, Frazier Point, Caroline County (38° 42' 083" N, 075° 58' 987" W)
- HONGA1, Honga River, Dorchester County (38° 16' 30" N, 076° 08' 50" W)
- JONES1, Big Annemessex River, Somerset County (38° 01' 34.04" N, 075° 49' 29.6" W)*
- LEON3, Patuxent River, Calvert County (38° 23' 29" N, 076° 29' 43" W)
- RIVERV1, Chester River, Queen Annes County (39° 09' 03.35" N, 076° 03' 50.2" W)*
- RUMBLY2, Rumbly Point, Somerset County (37° 59' 31" N, 075° 43' 45" W)

COMMENTS
Panicum virgatum Tidal Herbaceous Vegetation [CEGL006150] typically occurs in close association with this community type.

REFERENCES
Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

Harrison, J. W. and P. Stango III. 2002. Community field forms. Wildlife and Heritage Service, Maryland Department of Natural Resources, Annapolis, Maryland.

NatureServe. 2002. International classification of ecological communities: terrestrial vegetation. Natural Heritage Central Databases. NatureServe, Arlington, Virginia.

Tiner, R. W. and D. G. Burke. 1995. Wetlands of Maryland. U.S. Fish and Wildlife Service, Ecological Services, Region 5, Hadley, MA and Maryland Department of Natural Resources, Annapolis, MD. Cooperative publication.

* Precise coordinates for site only and not necessarily for the community occurrence

REFERENCE SITES

Marshyhope Creek — Dorchester County, Maryland

USGS QUAD

Rhodesdale, MD

PRIMARY REASON FOR SELECTION

Marshyhope Creek contains high quality occurrences and one of Maryland's best examples of the *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841).

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 contains a large (>20 hectares) occurrence of *Alnus maritima / Acorus calamus* tidal shrubland community bordering the main channel of Marshyhope Creek. This site is just north of the town of Brookview and south of the town of Hurlock. Salinity data collected at time of study indicate a range of 0.0 to 1.0 ppt with a mean of 0.38 ppt. *Alnus maritima / Acorus calamus* tidal shrubland along this section of Marshyhope Creek is expansive, often growing in dense, impenetrable islands, and occurring more or less discontinuously along the main channel to its confluence with the Nanticoke River. This community occurs along an ecotone, bordered by *Nuphar lutea* ssp. *advena* tidal herbaceous vegetation and a tidal swamp forest dominated by *Nyssa sylvatica*, *Fraxinus profunda*, *Fraxinus pennsylvanica*, *Magnolia virginiana*, and *Acer rubrum.*

Tidal swamp forests dominated by *Nyssa sylvatica*, *Fraxinus profunda*, *Fraxinus pennsylvanica*, *Magnolia virginiana*, and *Acer rubrum* border tidal shrubland communities, 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 lower portions of the Marshyhope Creek typically within 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 the tidal regions of the Marshyhope Creek. 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 was chosen as a reference site primarily because it is habitat to one of the best examples of the *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community association known in Maryland. This wetland community type is ranked S3.1, a "watch list" community that is actively tracked by the Natural Heritage Program based on the global significance of Maryland occurrences. For instance, a G3 S3 species or community is globally rare to uncommon, and although it is not currently threatened with extirpation in Maryland, its occurrences in Maryland may be critical for long-term viability. 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 *Alnus maritima / Acorus calamus* tidal shrublands (CEGL006841). See Vegetation Description section of this report for a precise definition of *Alnus maritima / Acorus calamus* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Alnus maritima / Acorus calamus* tidal shrublands 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 silviculture 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.

Marshyhope Creek is a high quality system, however the lower portions of this Creek are 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 (Harrison 2001). Further advancement of *Phragmites australis* could displace the native wetland vegetation of adjacent community reference sites, and therefore *Phragmites australis* is an indirect threat to the composition of the *Alnus maritima / Acorus calamus* tidal shrubland community. Monitoring and control of this invasive species is highly recommended.

PROTECTION COMMENTS

Alnus maritima / Acorus calamus tidal shrublands bordering Marshyhope Creek occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from nine (six are listed below) vegetation sample plots, *Alnus maritima / Acorus calamus* tidal shrublands bordering the 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

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 35’ 318” N, 075° 48’ 268” W (MAHO1)
Alnus maritima / Acorus calamus tidal shrubland community

38° 35’ 390” N, 075° 48’ 457” W (MAHO2)
Alnus maritima / Acorus calamus tidal shrubland community

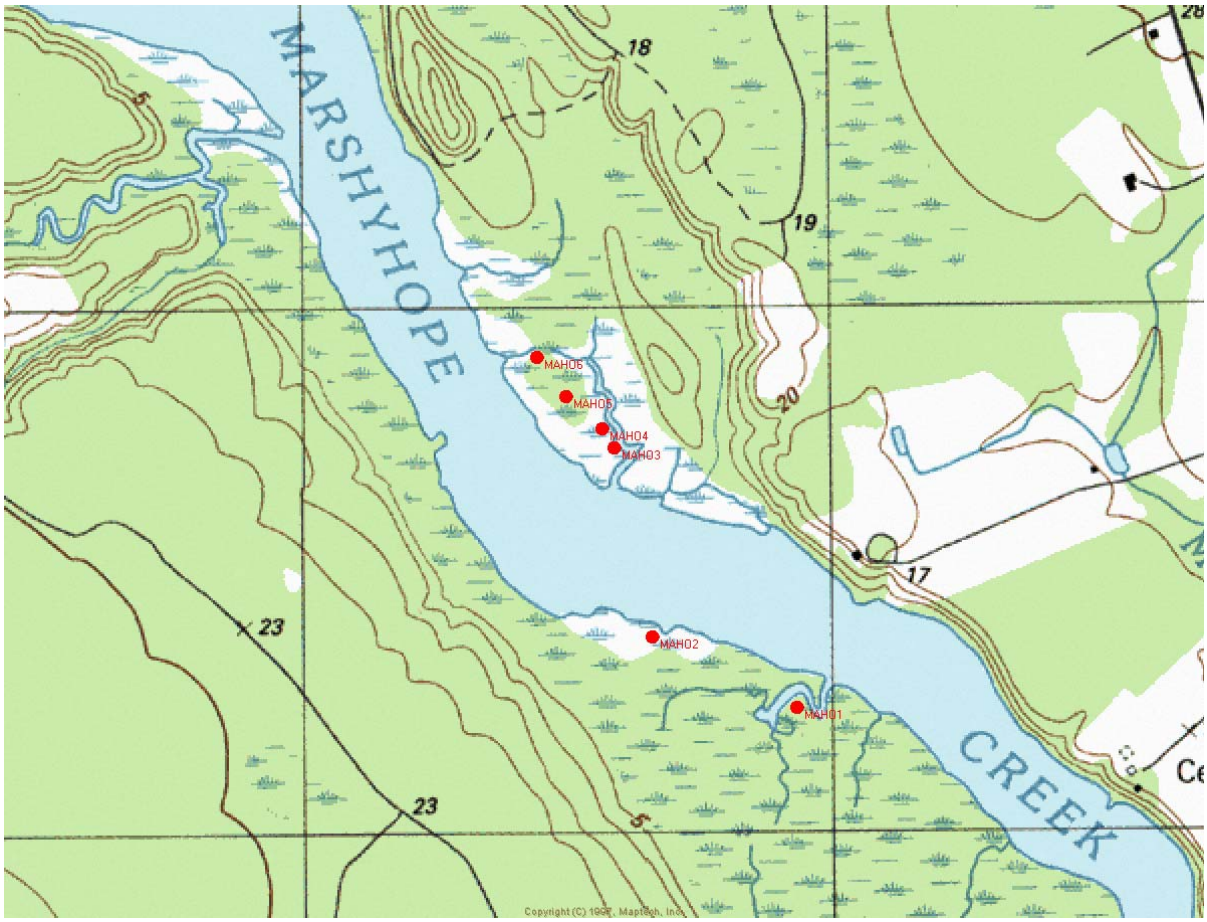
38° 35’ 585” N, 075° 48’ 507” W (MAHO3)
Alnus maritima / Acorus calamus tidal shrubland community

38° 35’ 605” N, 075° 48’ 524” W (MAHO4)
Alnus maritima / Acorus calamus tidal shrubland community

38° 35’ 638” N, 075° 48’ 571” W (MAHO5)
Alnus maritima / Acorus calamus tidal shrubland community

38° 35’ 678” N, 075° 48’ 609” W (MAHO6)
Alnus maritima / Acorus calamus tidal shrubland community

Marshyhope Creek
Dorchester County, Maryland
Rhodesdale, MD USGS Quad



MAHO1 (38° 35’ 318” N, 075° 48’ 268” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

MAHO2 (38° 35’ 390” N, 075° 48’ 457” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

MAHO3 (38° 35’ 585” N, 075° 48’ 507” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

MAHO4 (38° 35’ 605” N, 075° 48’ 524” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

MAHO5 (38° 35’ 638” N, 075° 48’ 571” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

MAHO6 (38° 35’ 678” N, 075° 48’ 609” W)- Precise coordinates for *Alnus maritima / Acorus calamus* tidal shrubland (CEGL006841) community at this site.

Kings Creek — Talbot County, Maryland

USGS QUAD

Fowling Creek, MD

PRIMARY REASON FOR SELECTION

Kings Creek contains high quality occurrences and one of Maryland's best examples of the *Alnus serrulata – Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842).

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

Kings Creek, a small tributary of the Choptank River, contains a large (>2 hectares) occurrence of *Alnus serrulata – Viburnum recognitum / Impatiens capensis* tidal shrubland community bordering the main channel of Kings Creek. This site is just north of Kingston Road, located along the upper reaches of Kings Creek. Salinity data collected at time of study indicate a range of 0.0 to 0.5 ppt. The *Alnus serrulata – Viburnum recognitum / Impatiens capensis* tidal shrubland community occur on dense depositional islands or in linear stands along ecotones, often within meanders or along river channels, more or less in a discontinuous fashion. This community is found between an emergent community composed of species such as *Peltandra virginica, Impatiens capensis* and *Typha angustifolia* and the upland edge or tidal swamp forest. The microtopography within this community is composed of hummocks and hollows with vegetation mainly occurring on the hummocks. However, species such as *Peltandra virginica* and *Nuphar lutea* ssp. *advena,* which are tolerant of regular tidal inundation, occur within the hollows.

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

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

COMMUNITY DESCRIPTION

Kings Creek was chosen as a reference site primarily because it is habitat to one of the best examples of the *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842) community association known in Maryland. This wetland community type is ranked S4, a designation meaning that more than 100 occurrences are known in the state of 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.

This occurrence is very typical of that defined in the Vegetation Description for *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrublands (CEGL006842). See Vegetation Description section of this report for a precise definition of *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrublands 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 silviculture 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 portion of Kings Creek is subject to invasion by *Phragmites australis,* especially near the mouth. Areas within the Choptank River and along the mouth of Kings Creek are being heavily degraded due to large stands of *Phragmites australis*. 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

Alnus serrulata - Viburnum recognitum / Impatiens capensis tidal shrublands bordering Kings Creek occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from 17 (four are listed below) vegetation sample plots, *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrublands bordering the Kings 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

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 47’ 40” N, 075° 59’ 16” W (KC2)

Alnus serrulata - Viburnum recognitum / Impatiens capensis tidal shrubland community

38° 47’ 46” N, 075° 59’ 11” W (KC3)

Alnus serrulata - Viburnum recognitum / Impatiens capensis tidal shrubland community

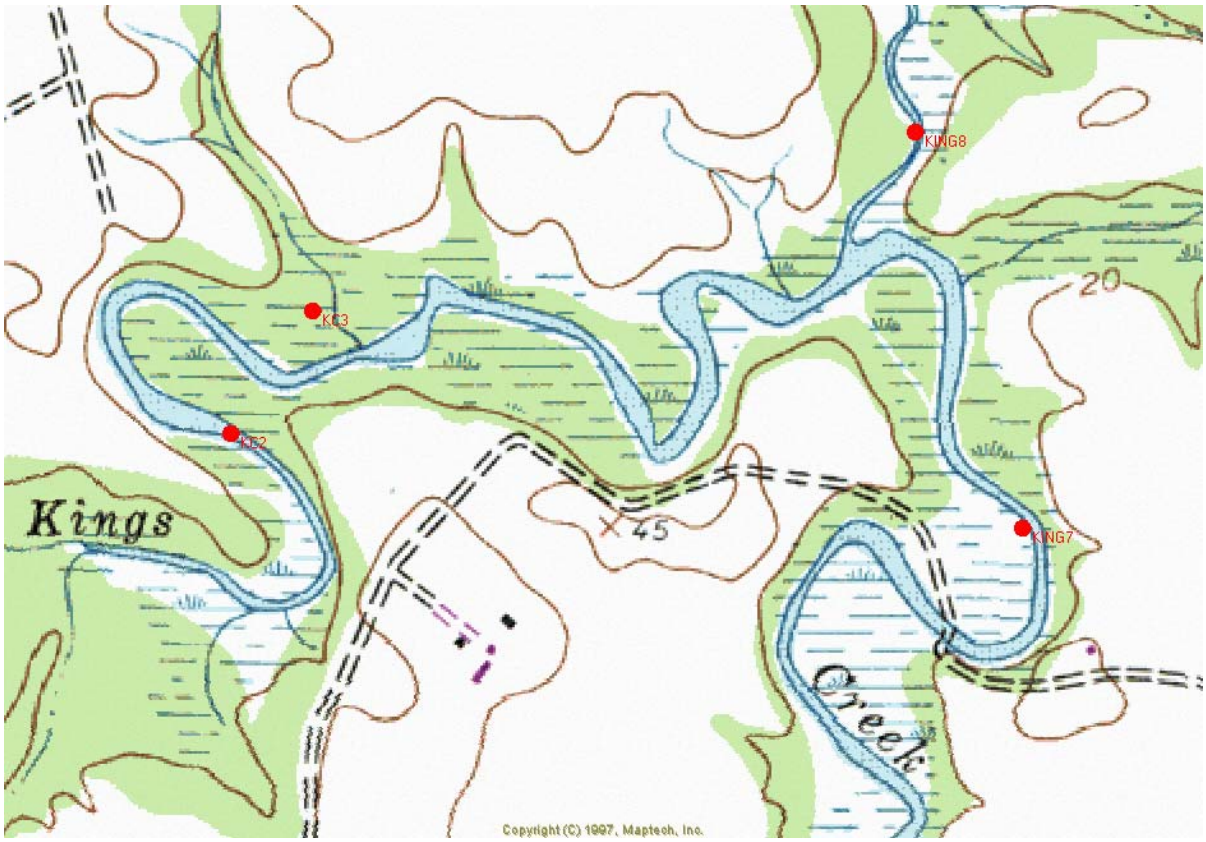
38° 47’ 59” N, 075° 58’ 45” W (KING7)

Alnus serrulata - Viburnum recognitum / Impatiens capensis tidal shrubland community

38° 35’ 912” N, 075° 58’ 561” W (KING8)

Alnus serrulata - Viburnum recognitum / Impatiens capensis tidal shrubland community

Kings Creek
Talbot County, Maryland
Fowling Creek, MD USGS Quad



KC2 (38° 47’ 40” N, 075° 59’ 16” W)- Precise coordinates for *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842) community at this site.

KC3 (38° 47’ 46” N, 075° 59’ 11” W)- Precise coordinates for *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842) community at this site.

KING7 (38° 47’ 59” N, 075° 58’ 45” W)- Precise coordinates for *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842) community at this site.

KING8 (38° 35’ 912” N, 075° 58’ 561” W)- Precise coordinates for *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland (CEGL006842) community at this site.

Upper Patuxent River — Anne Arundel County, Maryland

USGS QUAD

Bristol, MD

PRIMARY REASON FOR SELECTION

Upper Patuxent River contains high quality occurrences and one of Maryland's best examples of the *Salix nigra* tidal shrubland (CEGL006843).

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

Upper Patuxent River contains a large (>10 hectares) occurrence of *Salix nigra* tidal shrubland community bordering the main channel of the Patuxent River. This site is just south of Mill Creek and north of the Chesapeake Bay National Estuarine Research Reserve – Jug Bay. Salinity data collected at time of study indicate a range of 0.0 to 0.5 ppt. The *Salix nigra* tidal shrubland community is located along the upper reaches of the Patuxent River, behind an elevated levee and surrounded by large communities of emergent vegetation on three sides. The emergent community consists of species such as *Pontederia cordata, Impatiens capensis, Polygonum punctatum* and *Leersia oryzoides.* Despite the elevated levee that borders the *Salix nigra* tidal shrubland community along the channel of the Patuxent River, this community is regularly flooded. This is mainly due to the community's proximity to the tidal guts that stem from Mill Creek and Galloway Creek, which eventually encircles this community and isolates it, forming a large depositional island. Within the shrub community, the canopy is relatively open allowing for a very diverse shrub and herb layer. The microtopography within this community is relatively flat, with only a few pronounced hummocks surrounded by shallow hollows.

The natural levee bordering the *Salix nigra* shrubland community is composed of *Fraxinus pennsylvanica, Acer negundo, Diospyros virginica, Salix nigra* and *Asimina triloba.* Sedges, including *Carex hyalinolepis,* mainly dominate the understory of the levee community. Large expansive stands of *Zizania aquatica* and *Nuphar lutea* var. *advena* tidal herbaceous vegetation communities occur approximately two kilometers down river from this location.

Salix nigra tidal shrubland is not widespread and has only been found in two locales during the field season. Because of this, further work is needed to fully understand its range throughout Maryland. At least one species considered rare, threatened or endangered in Maryland is known to occur within this community type. In addition, this reference site also falls within the Chesapeake Bay Critical Area and is therefore subject to additional protection regulations.

COMMUNITY DESCRIPTION

Upper Patuxent River was chosen as a reference site primarily because it is habitat to one of the best examples of the *Salix nigra* tidal shrubland (CEGL006843) community association known in Maryland. However, because of insufficient community data, this community has not yet been ranked and is therefore being provisionally labeled S?.

This occurrence is very typical of that defined in the Vegetation Description for *Salix nigra* tidal shrublands (CEGL006843). See Vegetation Description section of this report for a precise definition of *Salix nigra* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Salix nigra* tidal shrublands 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 silviculture 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.

No noticeable degradation caused by invasive species such as *Phragmites australis* or Nutria (*Myocastor coypus*) was recorded from this area.

PROTECTION COMMENTS

Salix nigra tidal shrublands bordering Upper portion of the Patuxent River occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from three (two are listed below) vegetation sample plots, *Salix nigra* tidal shrublands bordering the Upper portion of the Patuxent River rank as "A" or excellent examples when compared to all other known Maryland examples of these community types. (This community has also been located along the upper portion of Morgan Creek, a tributary of Chester River.)

MANAGED AREA NAME / TRACT OWNERSHIP

The Nature Conservancy

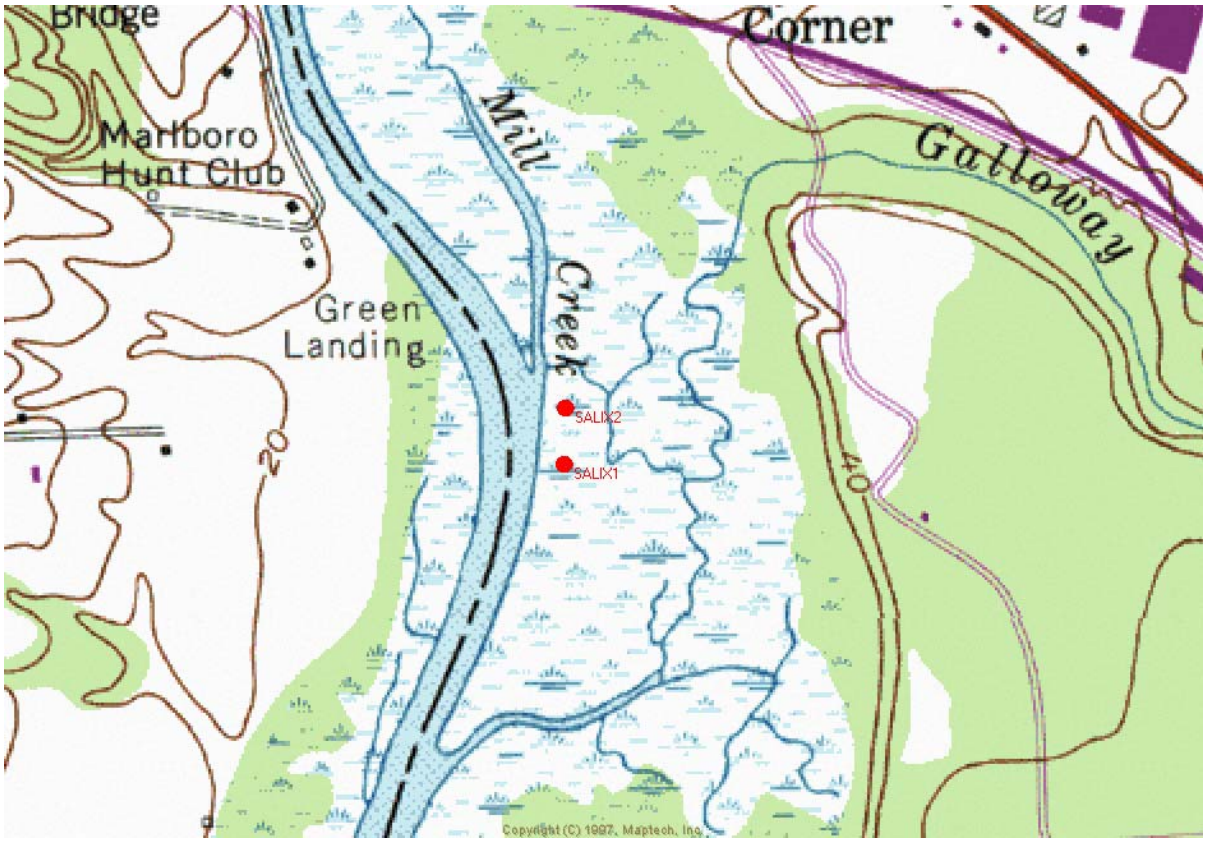
BEST INFORMATION SOURCE

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

LATITUDE / LONGITUDE COORDINATES

38° 48’ 15” N, 076° 42’ 26” W (SALIX1)
Salix nigra tidal shrubland community
38° 48’ 18” N, 076° 42’ 26” W (SALIX2)
Salix nigra tidal shrubland community

Upper Patuxent River
Anne Arundel, Maryland
Bristol, MD USGS Quad



SALIX1 (38° 48’ 15” N, 076° 42’ 26” W)- Precise coordinates for *Salix nigra* tidal shrubland (CEGL006843) community at this site.

SALIX2 (38° 48’ 18” N, 076° 42’ 26” W)- Precise coordinates for *Salix nigra* tidal shrubland (CEGL006843) community at this site.

Lower Sassafras River — Kent County, Maryland

USGS QUAD

Betterton, MD

PRIMARY REASON FOR SELECTION

Lower Sassafras River contains high quality occurrences and one of Maryland's best examples of the *Amorpha fruticosa* tidal shrubland (CEGL006844).

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 Sassafras River contains a large (>8 hectares) occurrence of *Amorpha fruticosa* tidal shrubland bordering the main channel of the Sassafras River. This site is located just east of the town of Betterton. Salinity data collected at time of study indicate a range of 0.0 to 0.1 ppt. The *Amorpha fruticosa* tidal shrubland community along this section of the Sassafras River is relatively large, and it occurs linearly between an elevated sand levee and an upland forested community. This site gradually increases in elevation from the first plot west and is subject to irregular flooding. Subsequently, the microtopography moves from consisting of hummocks and hollows in the low-lying eastern portion of this community to gradually becoming flat and firm westward. The shrub stratum within this community consists of *Amorpha fruticosa* and *Decodon verticillata* as the two most consistent and dominant species. Due to this communities open canopy, the herb stratum was diverse, though the two most consistent species were *Osmunda regalis and Thelypteris palustris*. Along the base of the upland forested community, a freshwater depressional pool occurs due to a slight decrease in elevation.

Approximately 4 km east and west of this community are two large occurrences of *Alnus serrulata - Viburnum recognitum / Impatiens capensis* tidal shrubland communities (CEGL006842) approximately 8.1 hectares in size (Turner Creek and Lloyd Creek).

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

COMMUNITY DESCRIPTION

The Lower portion of the Sassafras River was chosen as a reference site primarily because it is habitat to one of the best examples of the *Amorpha fruticosa* tidal shrubland (CEGL006844) community association known in Maryland. However, because of insufficient community data, this community has not yet been ranked and is therefore being provisionally labeled S?.

This occurrence is very typical of that defined in the Vegetation Description for *Amorpha fruticosa* tidal shrublands (CEGL006844). See Vegetation Description section of this report for a precise definition of *Amorpha fruticosa* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Amorpha fruticosa* tidal shrublands 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 silviculture 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.

PROTECTION COMMENTS

Amorpha fruticosa tidal shrublands bordering the Lower portion of the Sassafras River occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from three vegetation sample plots, *Amorpha fruticosa* tidal shrublands bordering the Lower Sassafras River 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

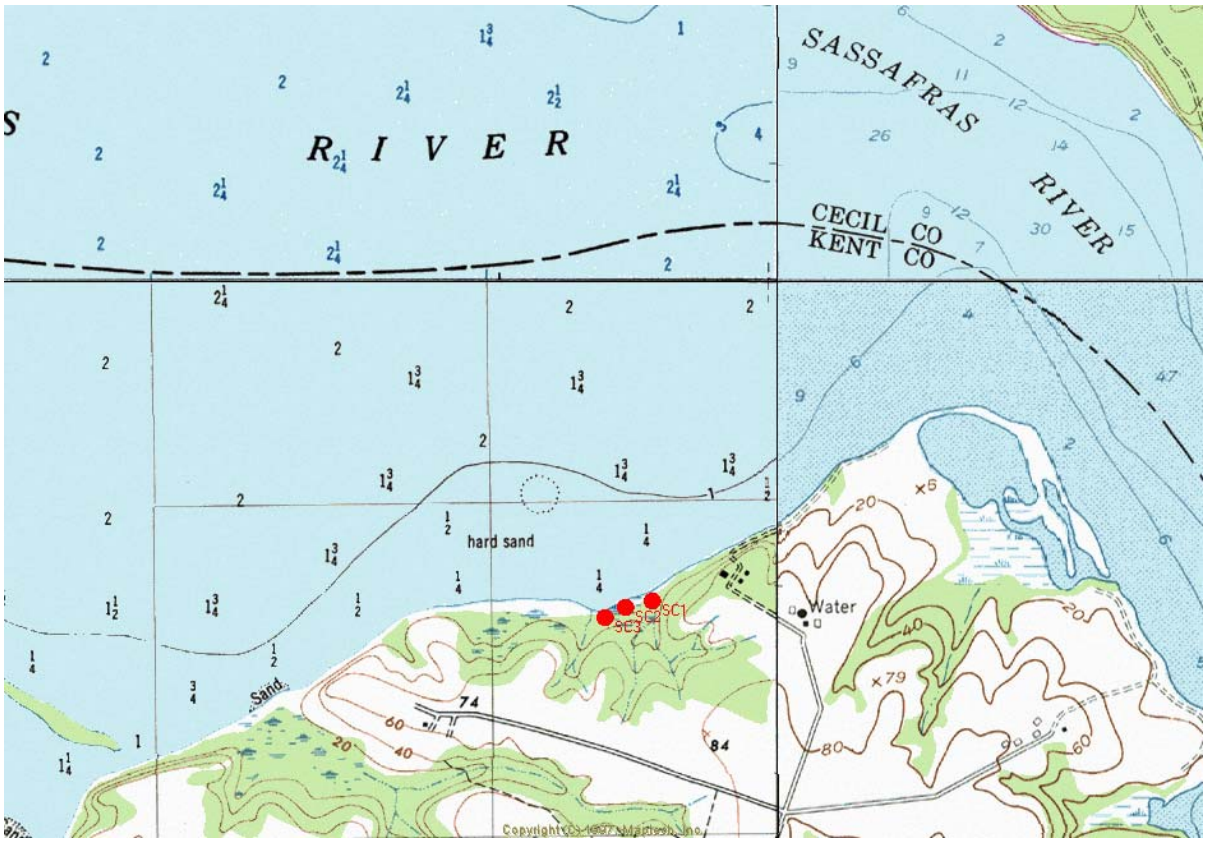
BEST INFORMATION SOURCE

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

39° 21' 60" N, 076° 00' 14" W (SR1)
Amorpha fruticosa tidal shrubland community
39° 21' 59" N, 076° 00' 18" W (SR2)
Amorpha fruticosa tidal shrubland community
39° 21' 58" N, 076° 00' 21" W (SR3)
Amorpha fruticosa tidal shrubland community

Lower Sassafras River
Kent County, Maryland
Betterton, MD USGS Quad



SR1 (39° 21’ 60” N, 076° 00’ 14” W)- Precise coordinates for *Amorpha fruticosa* tidal shrubland (CEGL006844) community at this site.

SR2 (39° 21’ 59” N, 076° 00’ 18” W)- Precise coordinates for *Amorpha fruticosa* tidal shrubland (CEGL006844) community at this site.

SR3 (39° 21’ 58” N, 076° 00’ 21” W)- Precise coordinates for *Amorpha fruticosa* tidal shrubland (CEGL006844) community at this site.

Big Creek — Dorchester County, Maryland

USGS QUAD

Rhodesdale, MD

PRIMARY REASON FOR SELECTION

Big Creek contains high quality occurrences and one of Maryland's best examples of the *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland (CEGL004656).

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

Big Creek contains an immensely large (>40 hectares) occurrence of *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland bordering the main channel of Big Creek, a tributary of Marshyhope Creek. This site is located northeast of Vienna and southwest from the mouth of the Marshyhope Creek. Salinity data collected at time of study indicate a range of 0.5 to 11.0 ppt with a mean of 2.6 ppt. Because of the slight oligohaline conditions, coupled with seasonal or diurnal pulses of freshwater, this community contains species typically associated with freshwater communities along with common brackish species. Along the majority of Big Creek, about 2.5 – 3 kilometers, the channel is bordered by an expansive tidal swamp forest dominated by *Nyssa sylvatica*, *Fraxinus profunda*, *Fraxinus pennsylvanica*, *Magnolia virginiana*, and *Acer rubrum.* The tidal swamp forest community gives way at the head of this creek and opens up into a very large bowl like landscape containing a highly intricate web of creeks and guts that eventually converge into three main creeks. The *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland community is expansive, occurring more or less discontinuously throughout the upper region of Big Creek. This community occurs as depositional islands surrounded by emergent communities such as the *Peltandra virginica – Impatiens capensis – Typha angustifolia* tidal herbaceous vegetation (CEGL006834) or bordered by tidal swamp forests communities.

In the uplands, surrounding land-use is primarily agricultural. Small patches of *Phragmites australis* have invaded portions of marshes throughout the Nanticoke River system.

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

COMMUNITY DESCRIPTION

Big Creek was chosen as a reference site primarily because it is habitat to one of the best examples of the *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland (CEGL004656) community association known in Maryland. This wetland community type is ranked S3S4, a designation meaning that more than 100 occurrences are known in the state of 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.

This occurrence is very typical of that defined in the Vegetation Description for *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland (CEGL004656). See Vegetation Description section of this report for a precise definition of *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrublands 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 silviculture 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, portions of the Nanticoke River are subject to invasion by *Phragmites australis*. 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

Morella cerifera – Rosa palustris / Thelypteris palustris var. *pubescens* tidal shrublands bordering Big Creek occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from 30 (two are listed below) vegetation sample plots, *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrublands bordering the Big 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

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

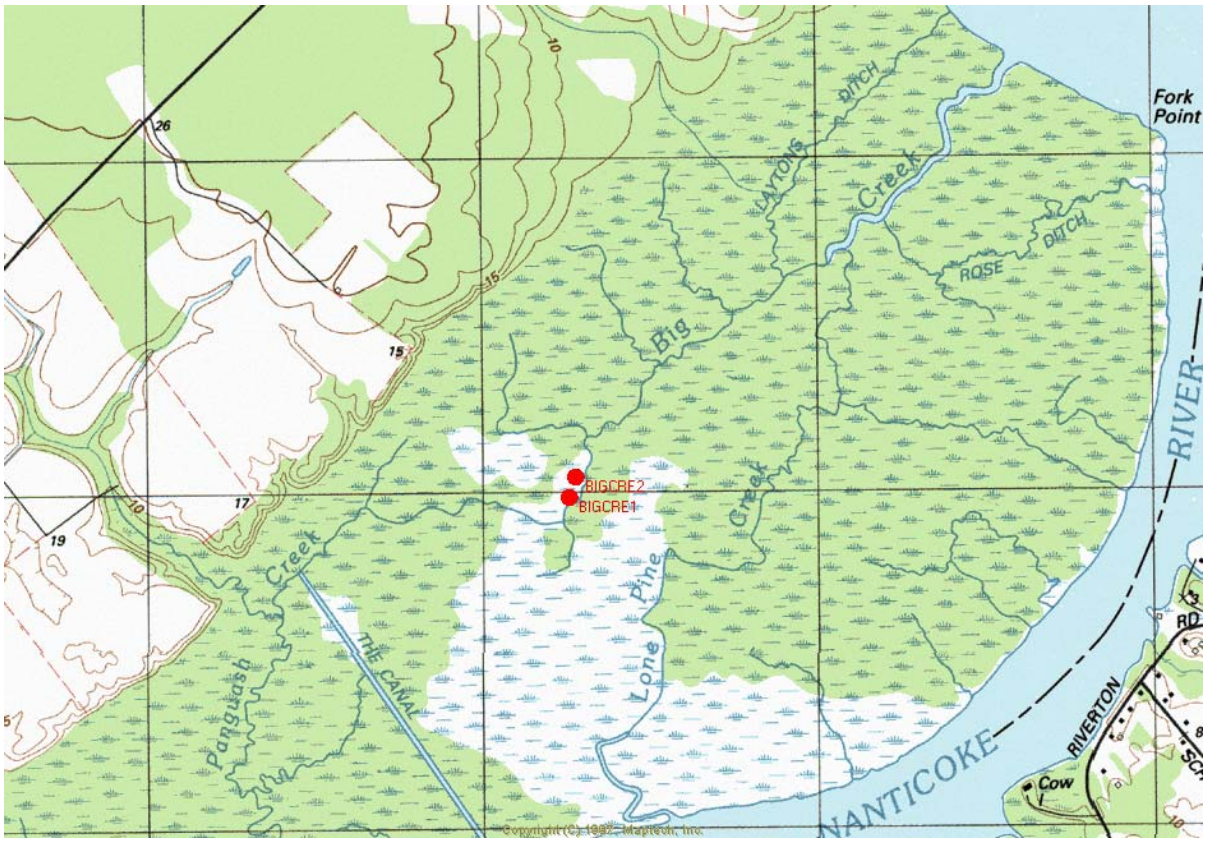
38° 30’ 53” N, 075° 46’ 36” W (BIGCRE1)

Morella cerifera – Rosa palustris / Thelypteris palustris var. *pubescens* tidal shrubland community

38° 30’ 55” N, 075° 46’ 35” W (BIGCRE2)

Morella cerifera – Rosa palustris / Thelypteris palustris var. *pubescens* tidal shrubland community

Big Creek
Dorchester County, Maryland
Rhodesdale, MD USGS Quad



BIGCRE1 (38° 30’ 53” N, 075° 46’ 36” W)- Precise coordinates for *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland (CEGL004656) community at this site.

BIGCRE2 (38° 30’ 55” N, 075° 46’ 35” W)- Precise coordinates for *Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* tidal shrubland (CEGL004656) community at this site.

Upper Transquaking River — Dorchester County, Maryland

USGS QUAD

Blackwater River, MD

PRIMARY REASON FOR SELECTION

Upper Transquaking River contains high quality occurrences and one of Maryland's best examples of the *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846).

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

Upper Transquaking River contains a large (>8 hectares) occurrence of *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland bordering the main channel of Transquaking River. This site is just south of DeCoursey Bridge and north of the Blackwater National Wildlife Refuge. Salinity data collected at time of study indicate a range of 0.5 to 11.0 ppt. *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland along the Transquaking River is expansive, typically occurring more or less discontinuously along the high marsh region till its convergence with the Chicamacomico River. This community is often situated between emergent vegetation comprised of *Spartina alterniflora, Spartina patens* and *Distichlis spicata* and the upland edge consisting mainly of a *Pinus taeda* stand. Species of indicative of freshwater conditions include *Polygonum punctatum, Ptilimnium capillaceum, Typha angustifolia, Typha latifolia* and *Iris versicolor* are also found within this community, possibly suggesting freshwater intrusion from upland runoff or ground water intrusion.

The surrounding upland forested community is comprised mainly of *Pinus taeda*, possibly natural, but more likely due to silviculture or selective cutting. In the uplands, surrounding land-use is primarily agricultural or silviculture.

Invasive species such as *Phragmites australis* and Nutria (*Myocastor coypus*) have invaded portions of this River. Nutria (*Myocastor coypus*) damage is very prevalent throughout this region, especially in portions of the Transquaking River.

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

COMMUNITY DESCRIPTION

Upper Transquaking River was chosen as a reference site primarily because it is habitat to one of the best examples of the *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community association known in Maryland. This wetland community type is ranked S3, a designation meaning that this community is rare to uncommon with the number of occurrences typically in ranging from 21 to 100 in Maryland. This community may have smaller occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. This is a watch list community, however the Natural Heritage Program is not actively tracking it. 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.

This occurrence is very typical of that defined in the Vegetation Description *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846). See Vegetation Description section of this report for a precise definition of *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrublands 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 silviculture 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 Upper Transquaking reference site is subject to invasion by *Phragmites australis* and intense degradation due to Nutria (*Myocastor coypus*). Further advancement of *Phragmites australis* and Nutria (*Myocastor coypus*) could displace or remove the native wetland vegetation (causing increased loss of sediments and lowering species diversity), and therefore is a threat to this reference site. Monitoring and control of these invasive species is highly recommended.

PROTECTION COMMENTS

Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrublands bordering Transquaking River occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Supported by data from 13 (five are listed below) vegetation sample plots, *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrublands bordering the Upper portion of the Transquaking River 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

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 27’ 45” N, 076° 00’ 01” W (TRANSD1)
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrubland community

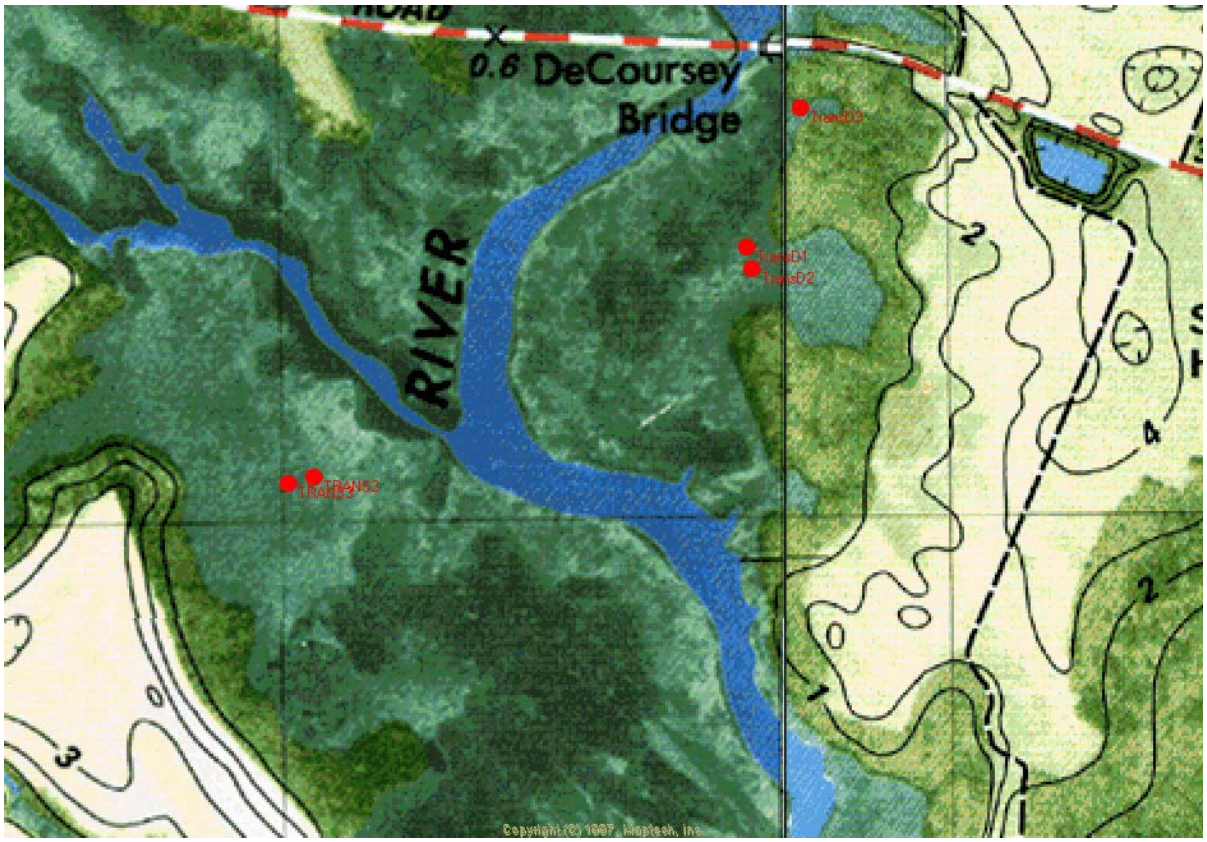
38° 27’ 44” N, 076° 00’ 01” W (TRANSD2)
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrubland community

38° 27’ 52” N, 076° 59’ 58” W (TRANSD3)
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrubland community

38° 27’ 34” N, 076° 00’ 28” W (TRANS2)
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrubland community

38° 27’ 34” N, 076° 00’ 29” W (TRANS3)
Morella cerifera – Baccharis halimifolia / Eleocharis fallax tidal shrubland community

Upper Transquaking River
Dorchester County, Maryland
Blackwater River, MD USGS Quad



TRANSD1 (38° 27’ 45” N, 076° 00’ 01” W)- Precise coordinates for *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community at this site.

TRANSD2 (38° 27’ 44” N, 076° 00’ 01” W)- Precise coordinates for *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community at this site.

TRANSD3 (38° 27’ 52” N, 076° 59’ 58” W)- Precise coordinates for *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community at this site.

TRANS2 (38° 27’ 34” N, 076° 00’ 28” W)- Precise coordinates for *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community at this site.

TRANS3 (38° 27’ 34” N, 076° 00’ 29” W)- Precise coordinates for *Morella cerifera – Baccharis halimifolia / Eleocharis fallax* tidal shrubland (CEGL006846) community at this site.

Frazier Point – Choptank River — Caroline County, Maryland

USGS QUAD

Preston, MD

PRIMARY REASON FOR SELECTION

Frazier Point – Choptank River contains high quality occurrences and one of Maryland's best examples of the *Iva frutescens / Spartina cynosuroides* tidal shrubland (CEGL006847).

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

Frazier Point contains a relatively sizable (0.8 hectare) occurrence of *Iva frutescens / Spartina cynosuroides* tidal shrubland bordering the main channel of the Choptank River. This site is east of Lloyd Landing and west of the town of Preston. Salinity data collected at time of study indicate a range of 7.0 to 20 ppt with a mean of 14 ppt. The *Iva frutescens / Spartina cynosuroides* tidal shrubland community along this section of Choptank River occurs linearly more or less discontinuously along the main channel, typically on an elevated levee. Frazier Point consists of three community transitions. *Iva frutescens / Spartina cynosuroides* tidal shrubland occurs immediately along the channel, and is then preceded by an *Iva frutescens / Spartina patens* tidal shrubland community (CEGL006848). The final transition before reaching the upland wooded edge consists of the *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063).

In the uplands, surrounding land-use is primarily agricultural or silviculture. Small patches of *Phragmites australis* have invaded portions of the Choptank River, within close proximately to this site.

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

COMMUNITY DESCRIPTION

Frazier Point was chosen as a reference site primarily because it is habitat to one of the best examples of the *Iva frutescens / Spartina cynosuroides* tidal shrubland (CEGL006847) community association known in Maryland. This wetland community type is ranked S4, a designation meaning that more than 100 occurrences are known in the state of 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.

This occurrence is very typical of that defined in the Vegetation Description for *Iva frutescens / Spartina cynosuroides* tidal shrubland (CEGL006847). See Vegetation Description section of this report for a precise definition of *Iva frutescens / Spartina cynosuroides* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Iva frutescens / Spartina cynosuroides* tidal shrublands 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 silviculture 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, areas within close proximity to this reference site are subject to invasion by *Phragmites australis*. Just north of this reference site, along Hog Neck, large colonies of *Phragmites australis* grow adjacent to Choptank River. 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

Iva frutescens / Spartina cynosuroides tidal shrublands bordering Choptank River occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Represented by 14 (one is listed below) vegetation sample plots, *Iva frutescens / Spartina cynosuroides* tidal shrublands bordering the Choptank River 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

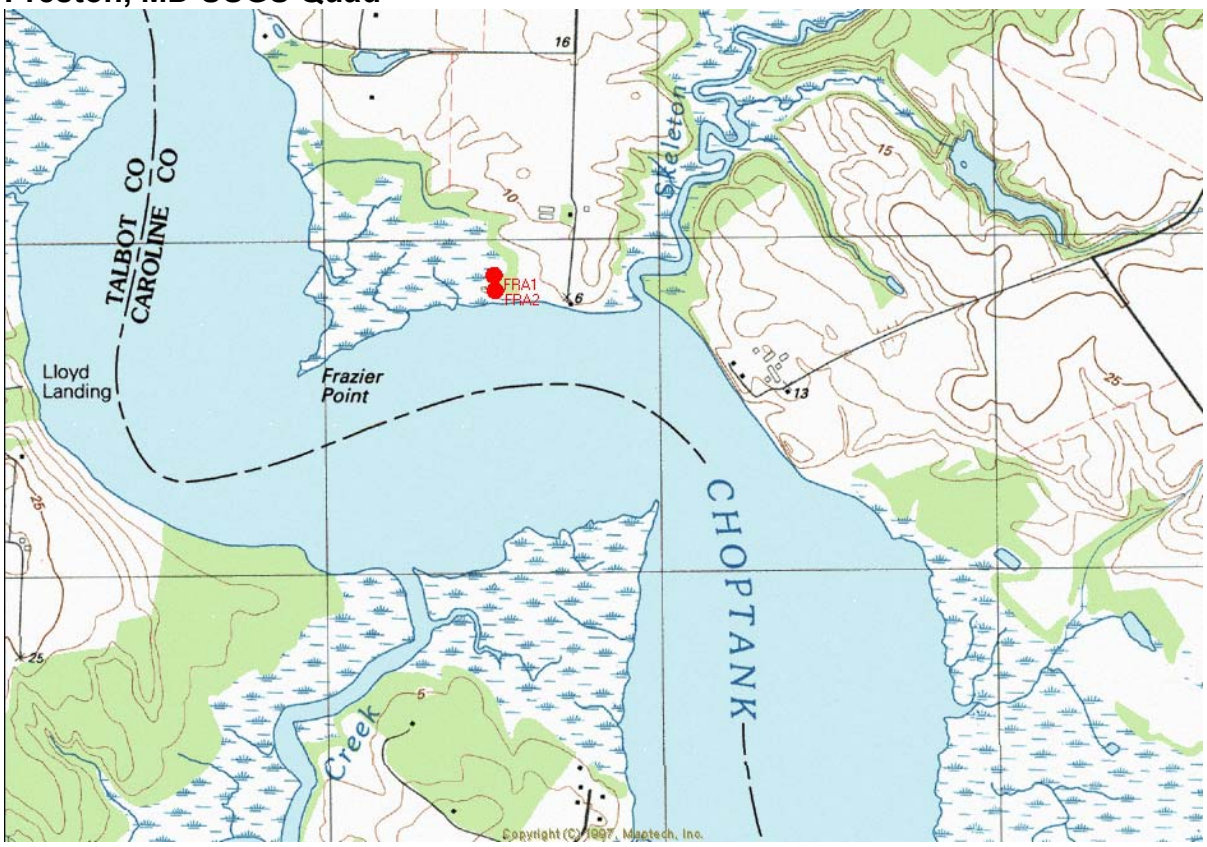
BEST INFORMATION SOURCE

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 42' .083" N, 075° 58' .987" W (FRA1)
Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrubland community
38° 42' .060" N, 075° 58' .985" W (FRA2)
Iva frutescens / Spartina cynosuroides tidal shrubland community

Frazier Point – Choptank River
Caroline County, Maryland
Preston, MD USGS Quad



FRA1 (38° 42' .083" N, 075° 58' .987" W)- Precise coordinates for *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063) community at this site.
FRA2 (38° 42' .060" N, 075° 58' .985" W)- Precise coordinates for *Iva frutescens / Spartina cynosuroides* tidal shrubland (CEGL006847) community at this site.

Richardson Marsh — Somerset County, Maryland

USGS QUAD

Saxis, MD

PRIMARY REASON FOR SELECTION

Richardson Marsh contains high quality occurrences and one of Maryland's best examples of the *Iva frutescens / Spartina patens* tidal shrubland (CEGL006848).

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

Richardson Marsh contains a large (41 hectares) occurrence of *Iva frutescens / Spartina patens* tidal shrubland. This site extends into the Pocomoke Sound and is approximately 11 kilometers east of the town of Crisfield. Salinity data collected at time of study indicate a range of 12 to 33 ppt with a mean of 18 ppt. The *Iva frutescens / Spartina patens* tidal shrubland is expansive throughout Richardson Marsh forming small islands surrounded by emergent vegetation consisting of *Spartina patens* and *Distichlis spicata*. The microtopography is variable throughout, however it is typically composed of hummocks and hollows with vegetation limited to the hummocks. Open water (exposed muck during low tide) and small patches of elevated, less frequently flooded shrub thickets are also scattered throughout. Along the base of the upland wooded edge, discontinuous, linear occurrences of *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063) can also be found.

In the uplands, surrounding land-use is primarily agricultural or silviculture. Small patches of *Phragmites australis* have invaded portions of Richardson Marsh, within close proximately to this site.

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

COMMUNITY DESCRIPTION

Richardson Marsh was chosen as a reference site primarily because it is habitat to one of the best examples of the *Iva frutescens / Spartina patens* tidal shrubland (CEGL006848) community association known in Maryland. This wetland community type is ranked S5, a designation meaning that this community is demonstrably secure in Maryland under the present conditions. 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.

This occurrence is very typical of that defined in the Vegetation Description for *Iva frutescens / Spartina patens* tidal shrubland (CEGL006848). See Vegetation Description section of this report for a precise definition of *Iva frutescens / Spartina patens* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Iva frutescens / Spartina patens* tidal shrublands 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 silviculture 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, portions of the Richardson Marsh reference site are subject to invasion by *Phragmites australis*. 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

Iva frutescens / Spartina patens tidal shrublands found upon Richardson Marsh occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Represented by 25 (one is listed below) vegetation sample plots, *Iva frutescens / Spartina patens* tidal shrublands found upon Richardson Marsh 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

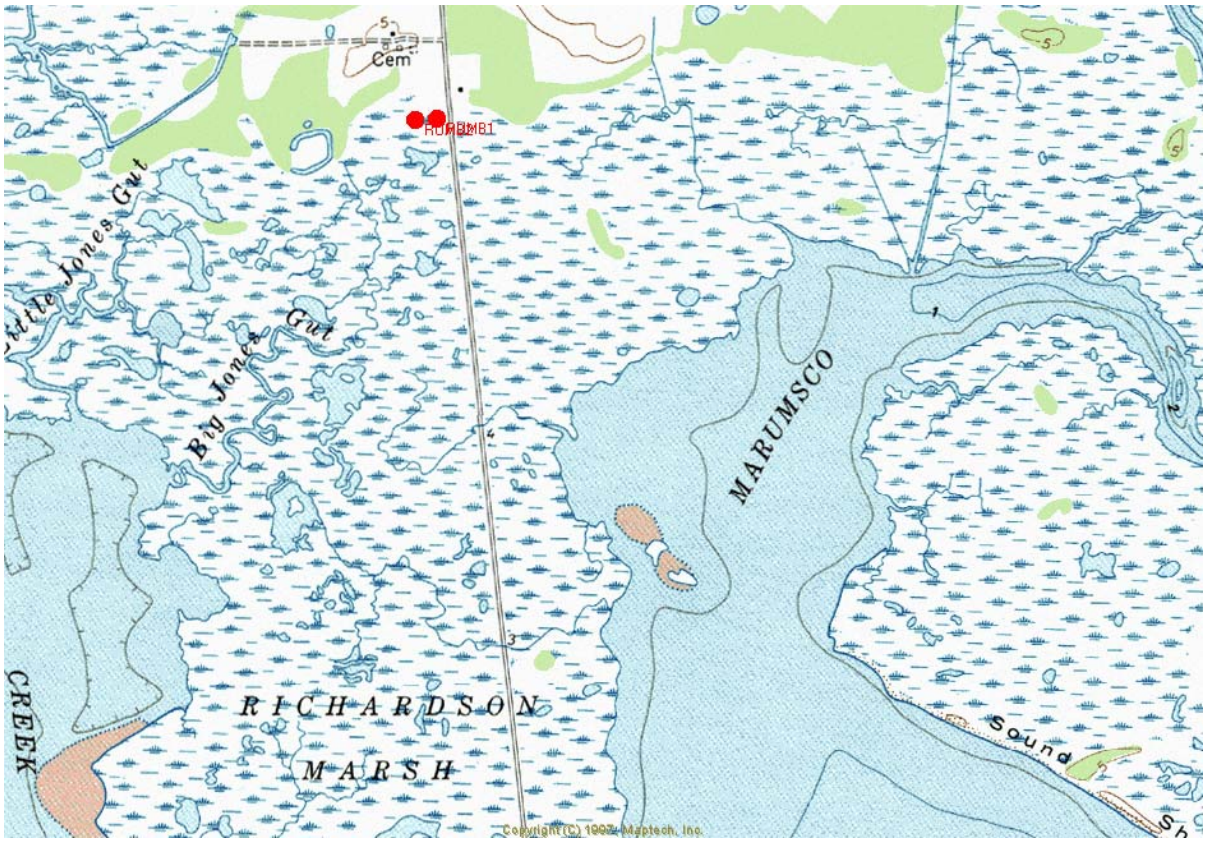
BEST INFORMATION SOURCE

Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

37° 59' 32" N, 075° 43' 43" W (RUMBLY1)
Iva frutescens / Spartina patens tidal shrubland community
37° 59' 31" N, 075° 43' 45" W (RUMBLY2)
Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrubland community

Richardson Marsh
Somerset, Maryland
Saxis, MD USGS Quad



RUMBLY1 (37° 59’ 32” N, 075° 43’ 43” W)- Precise coordinates for *Iva frutescens / Spartina patens* tidal shrubland (CEGL006848) community at this site.

RUMBLY1 (37° 59’ 31” N, 075° 43’ 45” W)- Precise coordinates for *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063) community at this site.

Barren Island — Dorchester County, Maryland

USGS QUAD

Barren Island, MD

PRIMARY REASON FOR SELECTION

Barren Island contains high quality occurrences and one of Maryland's best examples of the *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063).

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

Barren Island contains a moderate size (0.8 hectare) occurrence of *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland. This site is located within the Chesapeake Bay, west of Upper Hooper Island. Salinity data collected at time of study indicate a range of 10 to 24 ppt with a mean of 14 ppt. The *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland community is found along the base of a wooded *Pinus taeda* upland edge located within the central portion of this island. The microtopography within this community is relatively flat with minimal hummock and hollow formations. The adjacent marsh is a patch mosaic of *Iva frutescens / Spartina patens* tidal shrublands (CEGL006848) surrounded by *Spartina patens – Distichlis spicata* herbaceous vegetation (CEGL006836).

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

COMMUNITY DESCRIPTION

Barren Island was chosen as a reference site primarily because it is habitat to one of the best examples of the *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063) community association known in Maryland. This wetland community type is ranked S5, a designation meaning that this community is demonstrably secure in Maryland under the present conditions. 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.

This occurrence is very typical of that defined in the Vegetation Description for *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063). See Vegetation Description section of this report for a precise definition of *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrublands.

MANAGEMENT COMMENTS / MONITORING NEEDS

Wetlands such as *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrublands 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 silviculture 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.

PROTECTION COMMENTS

Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrublands found upon Barren Island occur entirely within the Chesapeake Bay Critical Area and therefore, subject to additional protection regulations.

OCCURRENCE RANK

Represented by ten (one is listed below) vegetation sample plots, *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrublands found upon Barren Island 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

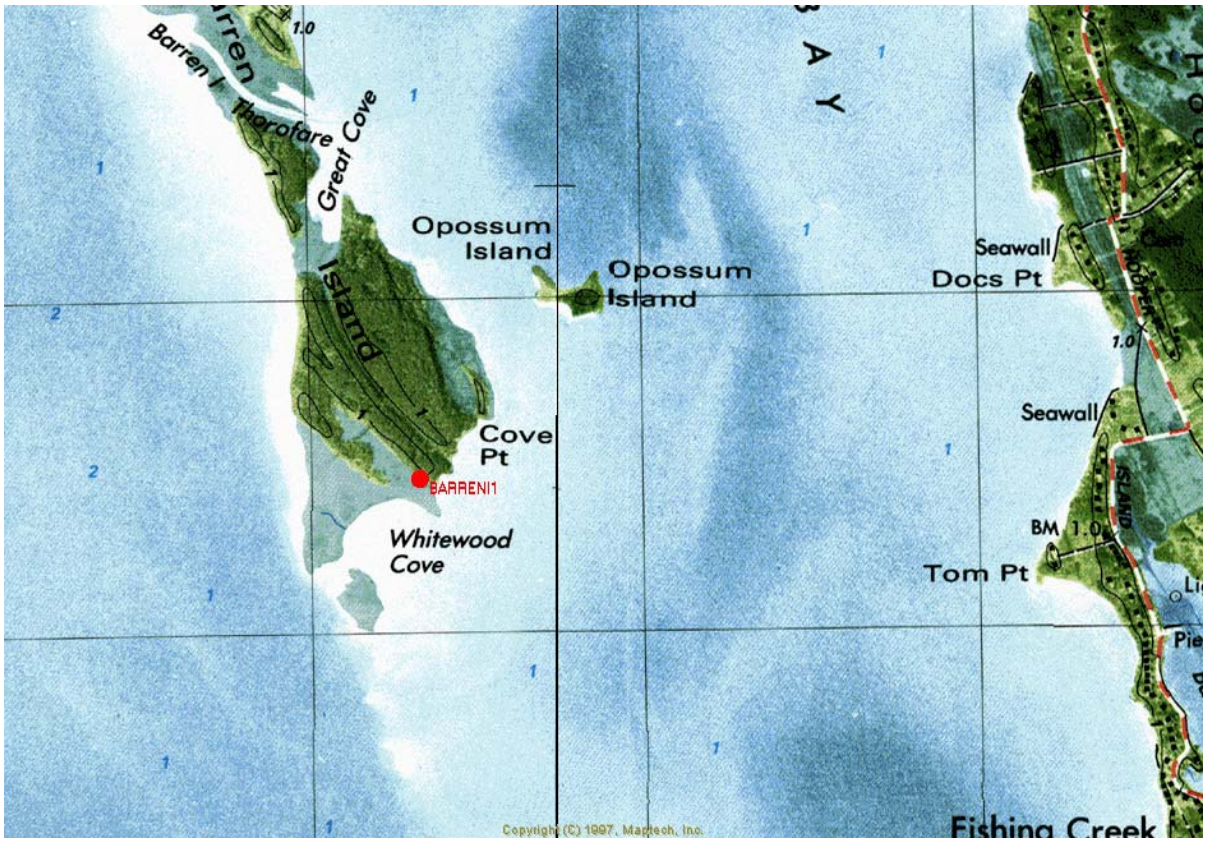
Maryland Natural Heritage Program, Maryland Department of Natural Resources

LATITUDE / LONGITUDE COORDINATES

38° 19' 31.3" N, 076° 15' 16.8" W (BARRENI1)

Baccharis halimifolia – Iva frutescens / Panicum virgatum tidal shrubland community

Barren Island
Dorchester County, Maryland
Barren Island, MD USGS Quad



BARRENI1 (38° 19’ 31.3” N, 076° 15’ 16.8” W)- Precise coordinates for *Baccharis halimifolia – Iva frutescens / Panicum virgatum* tidal shrubland (CEGL006063) community at this site.

PICTORIAL OVERVIEW

SHRUBLAND TIDAL WETLAND COMMUNITIES OF MARYLAND

***Alnus maritima / Acorus calamus* Tidal Shrubland (CEGL006841)**
Barren Creek, Wicomico County **Photograph by: J.W. Harrison**

***Alnus maritima / Acorus calamus* Tidal Shrubland (CEGL006841)**
Nassawango Creek, Worcester County **Photograph by: J.W. Harrison**

Alnus serrulata – Viburnum recognitum / Impatiens capensis **Tidal Shrubland (CEGL006842)**
Patuxent River, Prince Georges County **Photograph by: J.W. Harrison**

Alnus serrulata – Viburnum recognitum / Impatiens capensis **Tidal Shrubland (CEGL006842)**
Patuxent River, Prince Georges County **Photograph by: J.W. Harrison**

Alnus serrulata – Viburnum recognitum / Impatiens capensis **Tidal Shrubland (CEGL006842)**
Patuxent River, Prince Georges County **Photograph by: J.W. Harrison**

***Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* Tidal Shrubland(CEGL004656)**
Pocomoke River, Worcester County **Photograph by: J.W. Harrison**

***Morella cerifera – Rosa palustris / Thelypteris palustris* var. *pubescens* Tidal Shrubland (CEGL004656)**
Pocomoke River, Worcester County **Photograph by: J.W. Harrison**

Morella cerifera – Baccharis halimifolia / Eleocharis fallax **Tidal Shrubland (CEGL006846)**
Quantico Creek, Wicomico County **Photograph by: J.W. Harrison**

Morella cerifera – Baccharis halimifolia / Eleocharis fallax **Tidal Shrubland (CEGL006846)**
Quantico Creek, Wicomico County **Photograph by: J.W. Harrison**

Morella cerifera – Baccharis halimifolia / Eleocharis fallax **Tidal Shrubland (CEGL006846)**
Quantico Creek, Wicomico County **Photograph by: J.W. Harrison**

Morella cerifera – Baccharis halimifolia / Eleocharis fallax **Tidal Shrubland (CEGL006846)**
Little Blackwater River, Dorchester County **Photograph by: J.W. Harrison**

***Iva frutescens / Spartina cynosuroides* Tidal Shrubland (CEGL006847)**
Quantico Creek, Wicomico County

Photograph by: J.W. Harrison

***Iva frutescens / Spartina cynosuroides* Tidal Shrubland (CEGL006847)**
Miles Creek, Talbot County Photograph by: J.W. Harrison

***Iva frutescens / Spartina patens* Tidal Shrubland (CEGL006848)**
Wye East River, Queen Annes County Photograph by: J.W. Harrison

Iva frutescens / Spartina patens **Tidal Shrubland (CEGL006848)**
Cummings Creek, Talbot County **Photograph by: J.W. Harrison**

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APPENDIX 1

The following pages are sample field forms used by the Maryland Natural Heritage Program for collecting quantitative data on the survey of natural communities.

MARYLAND NHP COMMUNITY SURVEY FORM

Plot Code:

I. Plot Location / Habitat

Survey site Name:_____ Site Name:_____ Quad:_____
Managed Area Name:_____ State:_____ County:_____
Surveyor(s):_____ Date:_____-_____-_____ Plot Size:_____ sq. m
Plot dimensions ____ by ____ m ; ____ m radius Land Owner:_____ Phone #: (___)___-_____

General Site Information:

Site Sketch Map
(include plot numbers and boundaries of community occurrences if known)

Cross sectional sketch map

WPT:_____ (1) Latitude _____° _____ ' _____" N (2) Longitude _____° _____ ' _____" W (3) Elevation _____ft. / _____ m (4) EOSize:_____

Community Name: (use as many descriptive words as possible. ie. acidic, barren, circumneutral, depression, glade…) -

Description of Community:

Disturbances/Threats: (Circle) Logging, clearing, erosion, livestock grazing, stream entrenchment, excessive deer browse, ditching, pine bark beetle, gypsy moth, exotic plants, nutria damage, fire

Protection/Management Comments:_____

Overall EO Rank: (A) (B) (C) (D) **Comments:**_____

System
A – terrestrial
B – palustrine
C – estuarine
D – marine
E – riverine

Physiographic Province
A – coastal plain (Upper)
B – coastal plain (Lower)
C – fall line
D – piedmont
E – blue ridge
F – ridge and valley
G – Appalachian plateau

Topographic Position
A – plain/level
B – toe
C – lower slope
D – middle slope
E – upper slope
F – escarpment
G – ledge/terrace
H – crest
I – basin/depression
J – floodplain
K – stream bottom

Soil Moisture Regime
A – very xeric
B – xeric (moist for brief time)
C – somewhat xeric (moist for short time)
D – submesic (moist for mod. short time)
E – mesic (moist for sig time)
F – subhygric (wet for sig part of growing season (mottles<20cm)
G – hygric (wet for most of the growing season perm seepage/mottling
H – subhydric (water table at or above surface for most of the year.
I – hydric (water table at or above surface year round)
__ - ephemeral seepage/ subsurface water pres locally in plot

Soil Drainage Class
A – very poorly drained
B – poorly drained
C – somewhat poorly
D – moderately drained
E – well drained
F – rapidly drained

Inundation
A – never
B – infrequently
C – regularly; for <6 mos
D – regularly; for >6 mos
E – always submerged by shallow water.
F – always submerged by deep water

Hydrological Regime
A - Terrestrial

Tidal
A – Irregularly exposed
B – Regularly flooded
C – Irregularlly flooded
D – Wind tidally flooded

Non-Tidal
A – Permanently flooded
B – Semiperman. flooded
C – Seasonally flooded
D – Intermittently flooded
E – Temporarily flooded
F – Saturated

Salinity/Halinity
A – Saltwater
B – Brackish
C – Oligohaline
D – Freshwater
_____ ppt

Surface Substrate (% cover)
Decaying wood
Bedrock
Boulders (>24" diameter)
Stones (>10" round or >15" flattened)
Cobbles (3-10"; rounded)
Channery (thin; <6")
Gravel
Mineral soil
Organic matter
Water
Other:
Moss/lichen cover

Slope
A – 0-3% (level or nearly so)
B – 3-8 (gentle/undulating)
C – 8-16 (sloping/rolling)
D – 16-30 (moderately/hilly)
E – 30-65 (steep)
F – 65-75 (very steep)
G – 75-100 (extremely steep)
H – hummock and hollow microtopography
I – irregular craggy/bouldery microtopography

Slope Shape

Vertically	Horizontally
C-concave	C-concave
X-convex	X-convex
S-straight	S-straight

Aspect
F (Flat)
V (Variable)
N NE
E SE
S SW

Soil Profile Description

Horizon	Depth(cm)	Texture,Structure,Consistence

Additional Comments:

NWI SIGNATURE

II. Vegetation Structure and Physiognomy
Note: Circle the code of each stratum present in the plot. Record all herbaceous species and woody species less than 0.5m tall in the herb stratum. Record woody vines and epiphytic herbs in the appropriate tree or shrub stratum.

Cover		Tree strata Height (m) ← 35	← 20	← 10	← 6	Shrub 0.5 – 6m	Herb aver. Height ____cm	Moss/ Lichen
dense	100% – 80%	35 – 80	20 – 80	10 – 80	6 – 80	S – 80	H – 80	M – 80
somewhat open	80% – 60%	35 – 60	20 – 60	10 – 60	6 – 60	S – 60	H – 60	M - 60
open	60% – 40%	35 – 40	20 – 40	10 – 40	6 – 40	S – 40	H – 40	M - 40
very open	40% – 25%	35 – 25	20 – 25	10 – 25	S – 25	S – 25	H – 25	M – 25
sparse	25% – 5%	35 – 5	20 – 5	10 – 5	6 – 5	S – 5	H – 5	M – 5
very sparse	5% – 0%	35 – 0	20 – 0	10 – 0	6 – 0	S – 0	H – 0	M – 0
Physiognomy		D DE ED E	D DE ED E	D DE ED E	D DE ED E	D DE ED E	P F G ER	M LIC LIV

Visual Representation:

(% cover)

	5 –25	25 – 40	40 – 60	60 – 80	80 – 100
35 – 60m					
Tree 20 – 35m					
10 –20m					
6 – 10m					
Shrub 0.5 – 6m					
Herb					
Moss					

III. Species Composition and Cover Class by Stratum. Record species cover in the following cover classes: **1** = trace, **2** = a few (<1%), **3** = 1 – 2%, **4** = 3 – 5%, **5** = 6 – 10%, **6** = 11 - 25%, **7** = 26 – 50%, **8** = 51 – 75%, **9** = 76 – 100%. Starting with the uppermost stratum record all taxa and total plot cover (**TC**) for each stratum. Record **DBH** in column for woody stems >/= 2.5cm DBH in plot; record in 5m classes in <40cm DBH; record to the nearest cm if DBH > 40cm.

Taxon	TC	DBH	Taxon	TC	DBH
			Species Richness **N=**		

APPENDIX 2

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

GLOBAL RANK

G1 Highly globally rare. Critically imperiled globally because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Globally rare. Imperiled globally because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or distributed locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; typically with 21 to 100 estimated occurrences.

G4 Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.

GH No known extant occurrences (i.e., formerly part of the established biota, with the expectation that it may be rediscovered).

GU Possibly in peril range-wide, but its status is uncertain; more information is needed.

GX Believed to be extinct throughout its range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? The species has not yet been ranked.

_Q Species containing a "Q" in the rank indicates that the taxon is of questionable or uncertain taxonomic standing (i.e., some taxonomists regard it as a full species, while others treat it at an infraspecific level).

_T Ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

STATE RANK

S1 Highly State rare. Critically imperiled in Maryland because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres in the State) or because of

some factor(s) making it especially vulnerable to extirpation. Species with this rank are actively tracked by the Natural Heritage Program.

S2 State rare. Imperiled in Maryland because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the Natural Heritage Program.

S3 Watch List. Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Species with this rank are not actively tracked by the Natural Heritage Program.

S3.1 A "Watch List" species that is actively tracked by the Natural Heritage Program because of the global significance of Maryland occurrences. For instance, a G3 S3 species is globally rare to uncommon, and although it may not be currently threatened with extirpation in Maryland, its occurrences in Maryland may be critical to the long term security of the species. Therefore, its status in the State is being monitored.

S4 Apparently secure in Maryland with typically more than 100 occurrences in the State or may have fewer occurrences if they contain large numbers of individuals. It is apparently secure under present conditions, although it may be restricted to only a portion of the State.

S5 Demonstrably secure in Maryland under present conditions.

SA Accidental or a vagrant in Maryland.

SE Established, but not native to Maryland; it may be native elsewhere in North America.

SH Historically known from Maryland, but not verified for an extended period (usually 20 or more years), with the expectation that it may be rediscovered.

SP Potentially occurring in Maryland or likely to have occurred in Maryland (but without persuasive documentation).

SR Reported from Maryland, but without persuasive documentation that would provide a basis for either accepting or rejecting the report (e.g., no voucher specimen exists).

SRF Reported falsely (in error) from Maryland, and the error may persist in the literature.

SU Possibly rare in Maryland, but of uncertain status for reasons including lack of historical records, low search effort, cryptic nature of the species, or concerns that the species may not be native to the State. Uncertainty spans a range of 4 or 5 ranks as defined above.

SX Believed to be extirpated in Maryland with virtually no chance of rediscovery.

S? The species has not yet been ranked.

_B This species is a migrant and the rank refers only to the breeding status of the species. Such a migrant may have a different rarity rank for non-breeding populations.

FEDERAL STATUS

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

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

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

PE Taxa proposed to be listed as endangered.

PT Taxa proposed to be listed as threatened.

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

STATE STATUS

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

E Endangered; a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.

I In Need of Conservation; an animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.

T Threatened; a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.

X Endangered Extirpated; a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.

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

APPENDIX 3

The following is a list of all vascular plants referenced in shrubland tidal wetland communities of Maryland's Eastern Shore. Scientific and common names follow Kartesz (1999) with synonyms listed parenthetically.

Taxon	Common Name
Acer negundo	Box-elder
Acer rubrum	Red Maple
Acorus calamus	Sweet Flag
Agalinis maritima	Sea-side Agalinis
Alisma trivale	Northern Water Plantain
Alnus maritima	Seaside Alder
Alnus serrulata	Smooth Alder
Althea officinalis	Marshmallow
Amaranthus cannabinus	Water-hemp
Amelanchier arborea	Downy Serviceberry
Amelanchier canadensis	Canada Serviceberry
Amorpha fruticosa	Tall Indigobush
Ampelopsis brevipedunculata	Peppervine
Apios americana	Groundnut
Apocynum cannabinum	Indian-hemp
Arisema triphylum	Jack-in-the-Pulpit
Asclepias incarnata	Swamp Milkweed
Asparagus officinalis	Garden Asparagus
Atriplex patula var. hastata	Halberd-leaf Orach
Baccharis halimifolia	Groundsel-tree
Betula nigra	River Birch
Bidens aristosa	Bearded Beggarticks
Bidens coronata	Tickseed
Bidens frondosa	Stick-tight
Bidens laevis	Beggarticks
Bidens polylepis	Tickseed-sunflower
Boehmeria cylindrica	False Nettle
Boltonia asteroides	White Doll's Daisy
Calamagrostis canadensis	Bluejoint
Callitriche heterophylla	Larger Water Sandwort
Calystegia septium	Hedge Bindweed
Campsis radicans	Trumpetvine
Cardamine parviflora	Small-flowered Cress
Carex alata	Winged Sedge
Carex comosa	Comosa Sedge
Carex crinita	Fringed Sedge
Carex hormathodes	Necklace Sedge
Carex hyalinolepis	Shoreline Sedge
Carex lurida	Sallow Sedge
Carex seorsa	Separated Sedge
Carex stipata	Crowded Sedge

Carex straminea	Straw-colored Sedge
Carex stricta	Tussock Sedge
Cephalanthus occidentalis	Buttonbush
Chasmanthium laxa	Slender Spikegrass
Chionanthus virginicus	Fringe-tree
Cicuta maculata	Southern Poison-hemlock
Cinna arundinacea	Stout Woodreed
Clemantis crispa	Clematis
Clethra alnifolia	Coastal Sweet-pepperbush
Cornus ammomum	Silky Dogwood
Cornus foemina	Stiff Dogwood
Cuscuta campestris	Prairie Dodder
Cuscuta gronovii	Dodder
Cuscuta polygonorum	Orange-colored Dodder
Cynodon dactylon	Bermuda Grass
Cyperus filicinus	Nuttall's Cyperus
Cyperus odoratus	Fragrant Galingale
Cyperus strigosus	Straw-colored Cyperus
Decodon verticillatus	Swamp-loosestrife
Dicanthelium acuminatum	Panicgrass
Dioscorea villosa	Wild Yam
Diospyrus virginiana	Eastern Persimmon
Distichilis spicata	Saltgrass
Echinochloa crus-galli	Barnyard Grass
Echinochloa walteri	Stout Barnyard Grass
Echinodorus tenellus	Slender Burhead
Elatine triandra v. americanus	Waterwort
Eleocharis fallax	Creeping Spikerush
Eleocharis palustris	Marsh Spikerush
Eleocharis parvula	Dwarf Spikerush
Eleocharis quadrangulata	Squarestem Spikerush
Eleocharis rostellata	Beaked Spikerush
Eleocharis tuberculosa	Tubercled Spikerush
Elymus riparius	Streamside Wild Rye
Elymus virginica	Virginia Wild Rye
Equisitum fluviatile	Water Horsetail
Eragrostis pilosa	Lovegrass
Eupatorium perfoliatum	Common Boneset
Fimbristylis caroliniana	Tufted Fimbry
Fimbristylis castanea	Chestnut Fimbry
Fraxinus pennsylvanica	Green Ash
Fraxinus profunda	Pumpkin Ash
Galium obtusum	Blunt-leaf Bedstraw
Galium palustre	Bedstraw
Galium tinctorium	Clayton's Bedstraw
Galium trifidum	Smal Bedstraw
Habinaria ciliaris	Yellow Fringed Orchis
Hedra helix	English Ivy

Helianthus tuberosus	Jerusalem Artichoke
Hibiscus moscheutos	Eastern Rose-mallow
Hydrocotyle americana	American Water Pennywort
Hydrocotyle ranunculoides	Swamp Pennywort
Hydrocotyle umbellata	Marsh Pennywort
Hydrocotyle verticillata	Whorled Pennywort
Hypericum tubulosum	St. John's-wort
Hypericum virginicum	Marsh St. John's-wort
Ilex glabra	Little Gallberry
Ilex opaca	American Holly
Ilex verticillata	Winterberry
Impatiens capensis	Orange Jewelweed
Ipomea lacinosa	Morning-glory
Iris pseudoacorus	Water Flag
Iris versicolor	Blue Flag
Itea virginica	Virginia-willow
Iva frutescens	Maritime Marsh-elder
Juncus biflorus	Rush
Juncus canadensis	Canada Rush
Juncus dichotomus	Forked Rush
Juncus effusus	Soft Rush
Juncus gerardi	Black-grass
Juncus roemarianus	Black Needlerush
Juncus tenuis	Poverty Rush
Juncus validus	Swamp Rush
Juniperus virginiana	Eastern Red-cedar
Kosteletzkya virginica	Seashore-mallow
Leersia oryzoides	Rice Cutgrass
Leersia virginicus	White Cutgrass
Lemna minor	Lesser Duckweed
Leptochloa fusca ssp. fascicularis	Maritime Bearded Sprangletop
Leucothoe racemosa	Swamp Doghobble
Liliopsis chinensis	Marsh Grasswort
Lilium superbum	Turk's Cap Lily
Limonium carolinianum	Marsh Rosemary
Limosella aquatica	Awlwort
Lindera benzoin	Northern Spicebush
Lippia lanceolata	Lippia
Liquidambar styraciflua	Sweetgum
Lobelia cardinalis	Cardinal-flower
Lolium temulentum	Fescue
Lonicera japonica	Japanese Honeysuckle
Lotus tenuis	Birdsfoot-Trefoil
Ludwegia palustris	Water-Purslane
Lycopus americanus	American Water-horehound
Lycopus virginicus	Virginia Water-horehound
Lythrum lineare	Saltmarsh Loosestrife
Maclura pomifera	Osage-orange

Magnolia virginiana	Sweetbay
Melilotus officinalis	Sweet Clover
Mentha arvensis	Mint
Mikania scandens	Climbing Hempvine
Morella cerifera	Wax-myrtle
Morus rubra	Red Mulberry
Nuphar lutea ssp. advena	Broadleaf Pondlily
Nyssa biflora	Swamp Blackgum
Nyssa sylvatica	Blackgum
Onoclea sensibilis	Sensitive Fern
Osmunda cinnamonea	Cinnamon Fern
Osmunda regalis var. spectabilis	Royal Fern
Panicum clandestinum	Deer-Tongue Grass
Panicum commutatum	Variable Panic Grass
Panicum dichotomum	Delicate Panic Grass
Panicum lanuginosum	Hairy Panic Grass
Panicum virgatum	Switchgrass
Parthenosisus quinquefolia	Virginia Creeper
Peltandra virginica	Green Arrow-arum
Persea palustris	Swampbay
Phoradendron leucarpum	American Mistletoe
Phragmites australis	Common Reed
Physostegia virginiana	Obedient Plant
Pilea pumila	Richweed
Pinus taeda	Loblolly Pine
Platanthera clavellata	Small Green Wood Orchid
Pluchia purpurescens	Salt-marsh Fleabane
Polygonum amphibium	Water Smartweed
Polygonum arifolium	Halberd-leaf Tearthumb
Polygonum coccinea	Aquatic Smartweed
Polygonum cuspidatum	Japanese Knotweed
Polygonum hydropiperoides	False Water-pepper
Polygonum punctatum	Dotted Smartweed
Polygonum sagittatum	Arrow-leaved Tearthumb
Polyonum prolificum	Proliferous Knotweed
Pontederia cordata	Pickerelweed
Prunus serotina	Black Cherry
Ptilimnium capillaceum	Mock Bishopweed
Pyrus arbutifolia	Red Chokecherry
Quercus phellos	Willow Oak
Ranunculus scleratus	Cursed Crowfoot
Rhododendron viscosum	Swamp Azalea
Rhus copillinum	Winged Sumac
Robinia pseudo-acacia	Black Locust
Rosa multiflora	Multiflora Rose
Rosa palustris	Swamp Rose
Rotala ramosiror	Tooth-cup
Rubus argutus	Southern Blackberry

Rubus cuneifolius	Sand Blackberry
Rumex verticillatus	Swamp Dock
Sagittaria graminea	Grassleaf Arrowhead
Sagittaria latifolia	Broadleaf Arrowhead
Salicornia europaea	European Saltwort
Salix nigra	Black Willow
Sambucus canadensis	American Elder
Samolus parviflorus	Water Pimpernel
Saururus cernuus	Lizard's-tail
Schenoplectus americanus	Chairmaker's Bulrush
Schenoplectus cylindricus	cylindrical Bulrush
Schenoplectus fluviatilis	River Bulrush
Schenoplectus olneyi	Bulrush
Schenoplectus pungens	Threesquare
Schenoplectus robustus	Alkali Bulrush
Schenoplectus validus	Great Bulrush
Scutellaria galericulata	Marsh Skullcap
Scutellaria lateriflora	Mad-dog Scullcap
Sesuvium maritimum	Slender Sea-purslane
Sium suave	Hemlock Water-Parsnip
Smilax laurifolia	Blaspheme-vine
Smilax pseudochina	Long-Stalk Greenbrier
Smilax rotundifolia	Common Greenbrier
Smilax walterii	Coral Greenbrier
Solanum carolinense	Carolina Horse-nettle
Solidago sempervirens	Seaside Goldenrod
Spartina alterniflora	Saltmarsh Cordgrass
Spartina cynosuroides	Giant Cordgrass
Spartina patens	Saltmeadow Cordgrass
Spiraea alba	White Meadowsweet
Stachys palustris	Marsh Hedge Nettle
Suadea maritima	Bay-cedar
Symphyotrichum novae-angliae	New England Aster
Symphyotrichum novi-belgii	New York Aster
Symphyotrichum subulatus	Annual Salt Marsh Aster
Symphyotrichum tenuifolius	Saline Aster
Symplocarpus foetidus	Skunk Cabbage
Taxodium distichum	Bald-cypress
Teucrium canadense	Wild Germander
Thalictrum pubescens	Tall Meadow Rue
Thelypteris palustris	Marsh Fern
Toxicodendron radicans	Poison-ivy
Tripsacum dactyloides	Eastern Gammagrass
Typha angustifolia	Narrowleaf Cattail
Typha latifolia	Broadleaf Cattail
Vaccinium corymbosum	Highbush Blueberry
Vernonia noveborancensis	New York Ironweed
Viburnum nudum	Wild Raisin

Viburnum prunifolium	Smooth Black-haw
Viburnum recognitum	Smooth Arrow-wood
Viola cucullata	Marsh Blue Violet
Viola sororia	Woolly Blue Violet
Vitis aestivalis	Summer Grape
Woodwardia areolata	Netted Chainfern
Woodwardia virginica	Virginia Chainfern
Xanthium strumarium	Rough Cocklebur
Zizania aquatica	Indian Wild Rice

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