CLASSIFICATION OF VEGETATION COMMUNITIES OF MARYLAND: FIRST ITERATION

A Subset of the International Classification of Ecological Communities: Terrestrial Vegetation of the United States

MARCH 2004

Maryland Department of Natural Resources
Maryland Natural Heritage Program
Annapolis, Maryland

CLASSIFICATION OF VEGETATION COMMUNITIES OF MARYLAND: FIRST ITERATION

A Subset of the International Classification of Ecological Communities: Terrestrial Vegetation of the United States

Compiled by:

Jason W. Harrison
Maryland Department of Natural Resources
Maryland Natural Heritage Program
Annapolis, Maryland

Data provided by:

NatureServe
1101 Wilson Blvd., 15th floor
Arlington, VA 22209

MARCH 2004

ACKNOWLEDGMENTS

The author of this report was responsible for crosswalking the current National Vegetation Classification to the 1998 Maryland Vegetation Classification (Berdine 1998) and to more recent vegetation classification work in Maryland. This subset report of the International Classification of Ecological Communities (ICEC) reflects vegetation alliances and associations currently attributed to, and those that are potential to Maryland. These data were extracted from The Natural Heritage Central Databases housed by NatureServe. A fully searchable and periodically updated on-line source for the ICEC is at http://www.natureserveexplorer.org. Alliance and association text in this document were adapted from The Natural Heritage Central Databases. In addition, portions of the introductory text describing the classification background, hierarchy, applications, nomenclature and database fields were modified from Weakley *et al.* (1998) and Weakley *et al.* (1997). The vegetation alliances and associations presented here represent the Maryland portion of a more comprehensive classification of the terrestrial vegetation of the United States developed by NatureServe and its member programs. NatureServe (formerly called "Association for Biodiversity Information" ("ABI")) is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean.

These data are extracted from:
NatureServe. 2003. International Classification of Ecological Communities: Terrestrial Vegetation. Natural Heritage Central Databases. NatureServe, Arlington, VA.

This report may be cited as:
Harrison, J.W. 2004. Classification of vegetation communities of Maryland: First iteration. NatureServe and Maryland Natural Heritage Program, Wildlife and Heritage Service, Maryland Department of Natural Resources. Annapolis, MD.

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND OF THE NATIONAL VEGETATION CLASSIFICATION

The purpose of the classification system is to provide a complete standardized listing and description of all vegetation types that represent the variation in biological diversity at the community level, and to identify those communities that require protection (Grossman *et al.* 1994). The classification system focuses on existing vegetation rather than potential natural vegetation, "climax vegetation" or physical habitats. The vegetation types described in the classification range from the emphemeral to the stable and persistent. Recognizing and accommodating this variation is fundamental is protecting biological diversity. The manner in which a community is occurs is, in part, an intrinsic property of the vegetation itself. A classification that is not restricted to static vegetation types ensures that the units are useful both for inventory/site description, and as the basis for building dynamic ecological models. The classification will be consistent throughout the United States and elsewhere at appropriate scales for conservation planning, the management and long-term monitoring of ecological communities and ecosystems, and will have applications as a vegetation data layer in landscape and ecosystem characterization.

The national vegetation classification includes all existing vegetation, whether natural or cultural, but the Maryland Natural Heritage Program has emphasized vegetation types that are considered "natural" since they are the focus of biodiversity conservation. Therefore, this document is limited to types classified as natural and semi-natural vegetation. All natural vegetation types occur spontaneously without regular human management, maintenance, or planting, and generally have a strong component of native species. Natural types include a range of naturalness, namely, "natural (narrowly defined)," "semi-natural" and "modified" vegetation, which together reflect differences in the natural and anthropogenic disturbance regimes, but all types have a strong component of native species (see below). Natural vegetation, narrowly defined, includes plant communities that appear not to have been modified by human activities. The term semi-natural can include "plant communities where the structure of vegetation has been changed through human activities, but where the species composition is natural" (van der Maarel and Klötzli 1996), though some authors would restrict it to "vegetation in which the dominant or constant species are undoubtedly native species and the structure of the vegetation conforms to the structure of presumed natural vegetation" (Birks 1996). The first definition allows for more deviation from a strictly natural condition. Regardless, the use of the term "natural" in this classification is broadly inclusive. Apart from this broad distinction, issues of naturalness are dealt with through a quality ranking process of actual community occurrences rather than through classification concepts.

The National Vegetation Classification is a combination of physiognomic and florisitic systems. It has been developed for terrestrial vegetation; that is, all upland terrestrial vegetation and all wetland vegetation with rooted vascular plants. In relation to Cowardin *et al.* (1979), terrestrial as defined here includes those portions of the palustrine, lacustrine, riverine, estuarine, and marine systems that have rooted vegetation. Classification of this vegetation (*i.e.* the Terrestrial System) is distinct from that of unvegetated deep-water habitats (Freshwater and Marine Systems) and unvegetated subterranean habitats (Subterranean System), all of which will have their own classification systems (*e.g.* Lammert *et al.* 1997). The rationale for coupling physiognomic and floristic systems has developed over many years (e.g., Rubel 1930, Whitaker 1962, Ellenberg 1963, Webb *et al.* 1970, Westhoff 1967, Beard 1973, Werger and Spangers 1982, Borhidi 1991). These studies have found a good correlation between floristics and physiognomic classifications of the same vegetation. In the United States, Driscoll *et al.* (1984) recommended the development of a joint system using the physiognomic units of UNESCO (1973) and the floristic units of habitat types, of which an example has been provided by Dick-Peddie (1993) for New Mexico. Vankat (1990) developed a physiognomic-dominance type classification for forest types in North America. Strong *et al.* (1990) in Canada also proposed a combined physiognomic-floristic approach.

The combined physiognomic/floristic system used here allows identification of units from both a "top-down" (divisive) and "bottom-up" (agglomerative) approach. The top-down approach allows the use of physiographic distinctions to help map vegetation, to stratify sampling, and to delimit vegetation units where floristic information is lacking. A bottom-up approach employs plot sampling and floristic analysis as the primary means for defining associations. Where physiognomy is variable, the bottom-up approach can also be used to help to determine the important physiognomic distinctions. The relationships between physiognomy and floristics are not always simple; when they do not correspond, precedent may be given to the floristic relationships over the physiognomic structure. The basic unit of inventory, the plant association or community element, is uniform in structure, composition, and habitat. The uniformity of the plant community makes the comparison and identification of protection priorities more objective than would be possible at more heterogeneous scales. The plant association is a suitable unit for conservation planning because it encompasses all the layers of vegetation in a stand, reflects ecological and human-caused processes including management activities, and is a repeating unit in different landscapes. From a site-based perspective, there may be many different community types at a given location. In fact, it is relatively rare that a site contains only a single community type. However, community elements tend to combine in predictable ways to create repeatable landscape mosaics. Thus, the particular mosaic of community elements present at a site and their distribution across the landscape provide information that is fundamental to any type of ecological land management.

THE VEGETATION CLASSIFICATION SYSTEM (THE HIERARCHY)

SYSTEM LEVEL

The top division of the classification hierarchy separates vegetated communities (Terrestrial System) from those of unvegetated deepwater habitats (Aquatic System) and unvegetated subterranean habitats (Subterranean System). The Terrestrial System of the national hierarchy is broadly defined and includes vegetation of uplands as well as emergent and rooted submerged vegetation of lakes, ponds, rivers, and marine shorelines. It includes, then, the portions of the Cowardin *et al*. (1979) palustrine, lacustrine, riverine, estuarine, and marine systems that have rooted vegetation. Communities of the Aquatic System lack rooted vegetation and are generally dominated by fish or invertebrates or floating vegetation. The Aquatic System includes non-vegetated (faunal) and vegetated communities and the Cowardin *et al*. (1979) marine, estuarine, riverine, and lacustrine systems beyond the limits of rooted vegetation. The Subterranean System includes terrestrial cave communities which are generally dominated by fauna. There are different hierarchical divisions below each of the three Systems. The hierarchy for the Terrestrial System is now complete (Grossman *et al.* 1998). It has seven levels: the five highest levels are physiognomic (physiognomic class, physiognomic subclass, formation group, formation subgroup, and formation) and the two lowest levels are floristic (alliance and community association). The hierarchical levels of the Aquatic and Subterranean Systems are in development. The levels of the classification system below the System level are listed in Figure 1 below, and described in the following sections (see also Table 1).

FIGURE 1. Vegetation Classification System

	SYSTEM						
	CLASS						
		SUBCLASS					
			GROUP				
Physiognomic levels				**FORMATION**			
Floristic levels					**ALLIANCE**		
						PLANT ASSOCIATION	

PHYSIOGNOMIC LEVELS

The physiognomic portion of the Conservancy's classification hierarchy is a modification of the UNESCO world physiognomic classification of vegetation (1973) and incorporates some of the revisions made by Driscoll *et al*. (1984) for the United States.

The UNESCO vegetation classification system used physiognomy (outward appearance) and structure of the vegetation to define the units. It was intended to provide a comprehensive framework for the preparation of vegetation maps at a scale of 1:1,000,000 or smaller. The system was designed to include all natural and semi-natural vegetation, and excluded modified or "cultural" vegetation (wheat fields, vineyards, etc.).

The UNESCO hierarchy is fairly complex, and little information is provided that explains the criteria used to define each of the four hierarchical levels. The same criteria are sometimes used at different levels to define the units. The Conservancy modified the UNESCO system to improve the consistency and clarity of the classification hierarchy while maintaining its ecological meaning, and to make it applicable for classification and mapping at scales of 1:24,000 or larger.

To improve the classification of wetland formations, the Conservancy further modified the UNESCO system by including more explicit hydrologic modifiers at the formation level. The hydrologic modifiers introduced by Cowardin *et al*. (1979) were chosen since these have been used extensively to map wetlands across the United States. However, these also were modified before inclusion into the hierarchy.

Physiognomic class

The physiognomic class is based on the structure (see Figure 2) of the vegetation. This is determined by the height and relative percentage of cover of the dominant life-forms: tree, shrub, dwarf-shrub, herbaceous and nonvascular. This level has seven mutually exclusive classes: forest, woodland, shrubland, dwarf-shrubland, herbaceous vegetation, nonvascular vegetation, and sparse vegetation.

Figure 2. Physiognomic Class Structure

Forest	Trees with their crowns overlapping (generally forming 60 percent to 100 percent cover)
Woodland	Open stands of trees with crowns not usually touching (generally forming 25 percent to 60 percent cover)
Shrubland	Shrubs generally greater than 0.5 meters tall with individuals or clumps overlapping to not touching (generally forming greater than 25 percent cover). Vegetation dominated by woody vines is generally treated in this class.
Dwarf-shrubland	Low-growing shrubs, usually less than 0.5 meters tall, with individuals or clumps to not touching (generally forming greater than 25 percent cover, with trees and tall shrubs generally forming less than 25 percent cover)
Herbaceous	Herbaceous plants dominant (generally forming at least 25 percent cover, with trees, shrubs, and dwarf-shrubs generally forming less than 25 percent cover)
Nonvascular	Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25 percent cover)
Sparse Vegetation	Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation typically forming less than 25 percent cover)

Physiognomic subclass

The physiognomic subclass is determined by the predominant leaf phenology of classes defined by a tree, shrub or dwarf-shrub stratum (evergreen, deciduous, mixed evergreen-deciduous), the persistence and growth form of herbaceous and nonvascular vegetation, and particle size of the substrate for sparse vegetation (e.g., consolidated rocks, gravel/cobble). Examples include: Evergreen forest, Deciduous forest, Deciduous shrubland, Perennial graminoid vegetation, Consolidated rock sparse vegetation.

Group
The group (or formation group) generally represents a grouping of vegetation units based on leaf characters, such as broad-leaf, needle-leaf, microphyllous, and xeromorphic. These units are identified and named with broadly defined macroclimatic types to provide a structural-geographic orientation, but the ecological climate terms do not define the groups *per se*. Examples include: Temperate or subpolar needle-leaved evergreen forest, Cold-deciduous forest, Cold-deciduous shrubland, Temperate or subpolar grassland, Sparsely vegetated cliffs.

Subgroup
The subgroup (or formation subgroup) represents a distinction between natural vegetation, including natural, semi-natural and some modified vegetation, and cultural vegetation (planted/cultivated). Each formation is divided into either a natural subformation group or a cultural subformation group. The classification presented here only includes planted/cultivated subgroups in some (forested) classes. Examples include: Natural temperate and subpolar needle-leaved evergreen forest; Cultural temperate and subpolar needle-leaved evergreen forest (*e.g.*, pine and spruce plantations)

Formation
The formation represents a grouping of community types that share a definite physiognomy or structure and broadly defined environmental factors, such as elevation and hydrologic regime. Structural factors such as crown shape and lifeform of the dominant lower stratum are used in addition to the physiognomic characters already specified at the higher levels. The hydrologic regime modifiers were adapted from Cowardin *et al*. (1979; see Appendix IV), and are somewhat more explicit in defining vegetation units. With or without an organized hierarchy as presented here, the formation is a widely used vegetation concept (Whittaker 1962, Schrader-Frechette and McCoy 1993). Examples include: Rounded-crowned temperate or subpolar needle-leaved evergreen forest, Seasonally flooded cold-deciduous forest, Semipermanently flooded cold-deciduous shrubland, Tall sod temperate grassland, Cliffs with sparse vascular vegetation.

FLORISTIC LEVELS

Alliance
The alliance is a physiognomically uniform group of plant associations (see below) sharing one or more diagnostic species (dominant, differential, indicator or character), which, as a rule, are found in the dominant and/or uppermost strata of the vegetation (see Mueller-Dombois and Ellenberg 1974). The alliance level includes existing (not just “climax” or potential) vegetation types.

The concept of an alliance is similar to a “cover type.” An alliance is equivalent to a cover type when the dominant species also have diagnostic value. The alliance may be finer than a cover type when the dominant species extend over large geographic areas and varied environmental conditions especially when a diagnostic species occurs in different climate zones or in both upland and wetland situation. The concept for the alliance is also similar to the concept of the “series.” Alliances, however, are described by the diagnostic species for <u>all</u> existing vegetation types, whereas series are restricted to climax types and are described by the primary dominant species (see Pfister and Arno 1980). Examples include:

- PICEA RUBENS SATURATED FOREST ALLIANCE
- FAGUS GRANDIFOLIA - QUERCUS RUBRA - QUERCUS ALBA FOREST ALLIANCE
- ACER NEGUNDO TEMPORARILY FLOODED FOREST ALLIANCE
- CHAMAECYPARIS THYOIDES SEASONALLY FLOODED WOODLAND ALLIANCE
- MORELLA CERIFERA SATURATED SHRUBLAND ALLIANCE
- HUDSONIA TOMENTOSA DWARF-SHRUBLAND ALLIANCE
- CAREX HYALINOLEPIS TIDAL HERBACEOUS ALLIANCE
- JUSTICIA AMERICANA TEMPORARILY FLOODED HERBACEOUS ALLIANCE

Association

The association (or plant association) is the finest level of the classification system. For the terrestrial system, plant association is defined as "a plant community of definite floristic composition, presenting a uniform physiognomy, and growing in uniform habitat conditions" (Flahault and Schroter 1910). This basic concept has been used by most schools of vegetation classification (Whittaker 1962, Braun-Blanquet 1965, Westhoff and van der Maarel 1978). In this traditional sense, the plant association concept applies to existing vegetation regardless of successional status. The concept of an association is also used in habitat type methodology developed by Daubenmire (1952), but in that system it is restricted to climax or late seral vegetation (Pfister and Arno 1980).

The plant association is differentiated from the alliance level by additional plant species, found in any stratum, which indicate finer scale environmental patterns and disturbance regimes. This level is derived from analyzing complete floristic composition of the vegetation unit when plot data are available. In the absence of a complete data set, approximation of this level is reached by using available information on the dominant species or environmental modifiers, and their hypothesized indicator species. The Conservancy will primarily use the plant association as the level at which community inventory and conservation action are aimed.

While this definition of a plant association is still generally accepted as an international standard, a few clarifications of the use of the definition for the classification system may be helpful:

- "Habitat" refers to the combination of environmental conditions and ecological processes influencing the community.
- Uniformity of physiognomy and habitat conditions may include patterned heterogeneity (e.g., hummock/hollow).
- As a rule, community elements occur repeatedly over the natural landscape.
- The scale of the community element varies. Among other factors, the variation is determined by the size and apparent homogeneity of the occurrences across the landscape, the amount of data that has been collected and the interpretation of these data by the field experts.
- The community element may be composed of a complex of plant associations that constitutes a functioning ecological unit if the plant associations always occur together (e.g., prairie pothole, wooded dune and swale complex).

A few examples include:

- Picea rubens - (Tsuga canadensis) / Rhododendron maximum Saturated Forest
- Acer saccharum - Betula alleghaniensis - Prunus serotina Forest
- Quercus (falcata, alba, velutina) / Gaylussacia baccata - Vaccinium pallidum Forest
- Morella cerifera - Rosa palustris / Thelypteris palustris var. pubescens Shrubland
- Hudsonia tomentosa / Panicum amarum var. amarulum Dwarf-shrubland
- Calamagrostis canadensis - Phalaris arundinacea Herbaceous Vegetation
- Cakile edentula ssp. edentula - Chamaesyce polygonifolia Sparse Vegetation

TABLE 1. Illustration of the Classification System Hierarchy.

Class	Forest	Woodland	Shrubland
Subclass	Deciduous Forest	Evergreen Woodland	Evergreen Shrubland
Group	Cold-deciduous Forest	Temperate or Subpolar Needle-leaved Evergreen Woodland	Temperate Broad-leaved Evergreen Shrubland
Subgroup	Natural/Semi-natural	Natural/Semi-natural	Natural/Semi-natural
Formation	Lowland or Submontane Cold-deciduous Forest	Rounded-crowned temperate or Subpolar Needle-leaved Evergreen Woodland	Tidal Broad-leaved Evergreen Temperate Shrubland
Alliance	*Fagus grandifolia – Quercus rubra – Quercus alba* Forest Alliance	Pinus pungens – (Pinus rigida) Woodland Alliance	*Morella cerifera – Rosa palustris* Tidal Shrubland Alliance
Association	*Fagus grandifolia – Quercus alba – Liriodendron tulipifera – Carya* spp. Forest	Pinus (pungens, rigida) / Quercus ilicifolia / Gaylussacia baccata Woodland	*Morella cerifera – Rosa palustris / Thelypteris palustris var. pubescens* tidal shrubland

APPLICATION OF THE CLASSIFICATION SYSTEM

The ability to apply conservation ranks to vegetation units is integral to the success of the classification system as a tool in biodiversity conservation. Associations are ranked by their relative endangerment to determine their relative conservation priority. These ranks are based on factors such as present geographic extent, threats, number of distinct occurrences, degree of decline from historic extent, and degree of alteration of natural processes affecting the dynamics, composition, or function of the type. Ranks are customarily assigned by the various members of the Natural Heritage Programs and of the national, regional, and state offices of The Nature Conservancy. For a given community type, ranks are assigned at three declining hierarchical levels of geography, from global or rangewide (the Global Rank or GRANK), through national or country (the National Rank or NRANK), to state, province, or other subnational unit (the State Rank or SRANK).

Imperiled community types (and species), those ranked G1 through G3, are often regarded as the principal targets for conservation action, although the Conservancy is dedicated to the conservation of all native community types. Special attention is generally given to taxa of high endangerment, as opportunities for their conservation may be limited in space and time. However, some highly ranked community types may be essentially secure because of their occurrence in areas that are remote from human alteration, that already have high degrees of protection, or that are unsuitable as human habitat. Others are essentially secure because of their intrinsic resistance to alteration or degradation. The conservation status of highly ranked communities should be assessed and steps should be taken to ensure their adequate protection.

More common and less imperiled community types, those ranked G4 and G5, are also conservation priorities. In most parts of the world, these more common community types have generally been highly altered and degraded by human action, and have often also been fragmented and their functioning impaired. For the conservation of many rare and common species, these relatively secure communities are of critical importance. In eastern North America, a large tract of a common forest type in pristine condition that occurs in an essentially intact landscape with relatively intact ecological processes is of high priority for conservation. Though the type itself is common, large, high quality examples are rare and the opportunity to conserve such an example may be very limited. Generally, the conservation of lower ranked community

types should be focused on examples in especially good condition, of large extent, with high landscape integrity/connectivity, and with ancillary conservation benefits.

Because a primary purpose of the National Vegetation Classification is to help set conservation priorities for natural community types, the recognition and naming of units reflects their relative naturalness. There generally exists a strong correlation between naturalness and conservation priority.

The dynamic nature of vegetation presents some additional complications in the evaluation of the naturalness and conservation priority of community units. Early- and mid-seral vegetation may be readily classifiable as distinct in composition and physiognomy from later seral vegetation, but may be transient on the landscape. Transience makes this vegetation difficult to "track" and the conservation of seral sequences will generally be dependent on the conservation of large landscapes that contain a mosaic of seral stages.

Also, disturbances cannot be clearly and cleanly classified as "natural" or "anthropogenic". Some anthropogenic disturbances are similar enough to natural disturbances that the resulting successional communities cannot be clearly distinguished, while others may create unique and unprecedented communities that do not occur in the natural landscape.

We therefore have developed categories and a resulting ranking system for communities that go beyond those used for species conservation. The various ranks used for communities presented in this document are listed and briefly described below.

G1 - Critically imperiled globally;
G2 - Imperiled globally;
G3 - Rare or uncommon;
G4 - Widespread, abundant, and apparently secure, but with cause for long-term concern;
G5 - Demonstrably widespread, abundant, and secure;
G? - Unranked;
GH - Historic;
GX - Extinct;
GC - Planted/cultivated vegetation;
GW - Ruderal vegetation, or vegetation dominated by invasive alien species;
GM - Vegetation resulting from the management or modification of natural vegetation, it is readily restorable by management or time, and/or the restoration of ecological processes.

FORMAT OF THIS DOCUMENT

This publication presents a Maryland subset of the current International Classification of Ecological Communities. Data used have been extracted from NatureServe biological conservation databases and are current as of April 2003. The format in which the classification is presented, and the current completeness of information in various fields in the classification, requires some explanation.

General
The classification is presented in the order of the hierarchy. Only those hierarchy units currently documented or suspected to occur in Maryland with a high degree of confidence are presented. The hierarchy is presented in full in Grossman *et al.* 1998. The complete hierarchy offers a broad perspective on the physiographic/floristic structure on the classification. The hierarchical presentation of the alliances and associations generally places closely related vegetation types near one another. Thus, the Forest Class (vegetation dominated by closed canopies of trees) is followed by the Woodland Class (vegetation dominated by open canopies of trees). All mixed needle-leaved evergreen-cold-deciduous forests will be found together in the Mixed Evergreen-Deciduous Forest Subclass. Of course, such a linear ordering of types that does not and cannot capture all relationships, and sometimes communities that are closely related floristically are

separated widely by the physiographic hierarchy. For instance, Mixed Needle-leaved Evergreen –Cold deciduous woodlands are group together in II.C, separate from the Mixed Needle-leaved Evergreen-Cold deciduous Forests. Some examples of close relationships that are particularly prone to cut across the hierarchy are:

Forests (I) and Woodlands (II). The structure of the hierarchy between the Forest Class and the Woodland Class is relatively parallel, and in many cases, forests and woodlands with similar composition may be found in both classes.

In the "woody classes," Forests (I), Woodlands (II), Shrublands (III), and Dwarf-shrublands (IV), there are often close relationships between "mixed evergreen - deciduous" (Subclass C) and both "evergreen" (Subclass A) and "deciduous" (Subclass B). This is especially true in most parts of the Southeast, where there is not a strong dominance of either deciduous or evergreen life strategies; species with both strategies often occur in variable mixtures, and two closely related associations may be best placed in different subclasses because of a difference in prevalent dominance of several evergreen and deciduous species.

Woodlands (II) and Shrublands (III) with particularly open woody structure are often closely related to herbaceous types (V), especially grasslands (V.A).

Sparsely Vegetated (VII), Nonvascular (VI), and Herbaceous (V) are often closely related.

ALLIANCE AND ASSOCIATION NOMENCLATURE AND DESCRIPTIONS

Nomenclature
Alliances are named for constant dominants or codominants in the uppermost canopy layer. When a group concept contains two layers of vegetation (e.g. Tall temperate grassland with sparse broad-leaved evergreen shrubs), the alliance is named after species in the dominant stratum, while the association name includes species from the dominant and upper-most strata.

Associations are named with species from the alliance name, and have additional species that represent dominants or indicators from any layer of the vegetation. When an association has several layers, an attempt is made to include species that are dominants or indicators from at least the two most dominant layers. Indicator species are those species, other than dominants, which have been chosen to distinguish an association or alliance from others like it, or to indicate specific environmental conditions that have a controlling influence on vegetation in the community. However, the indicator species are seldom limited to controlling influence on vegetation in the community. Descriptive terms such as wetland, mesic, serpentine, etc., are used sparingly, when species composition for a type is not known well enough to provide full representation using species alone.

Parentheses around one or more species in a name indicate that the species may or may not occur within the alliance or association, and may or may not be present in combination with the other species within the parentheses. For instance, the *Quercus alba – (Quercus rubra, Carya* spp.*)* Forest Alliance includes forests dominated by a mixture of *Quercus alba* (approximately 25-75 percent and always present) and either or both *Quercus rubra* and *Carya* spp. (approximately 25-75 percent in combination; see I.B.2.N.a.27).

Descriptions
The various components of text in the alliance and association descriptions have been provided by NatureServe through central databases that house the International Classification of Ecological Communities. Some alliances or associations may not have all field completed. Below is an explanation of the field descriptors:

Global alliance code* and *global scientific name:
The alliance code represents its position in the hierarchy as a series of Roman numerals, letters, and Arabic numerals, with a terminal sequential number. The global scientific name is the name of the alliance or association using scientific botanical nomenclature. Some associations repeat the species of the alliance name and are labeled "Provisional." These associations are placeholders for the one or many association(s) that remain to be developed in the alliance. They often represent a large, heterogeneous group of stands that are likely to be divided into separate associations following analysis of additional information**.** It should be noted that "Provisionals" are attributed based on geographic gaps, not necessarily classification gaps. That is, the listing of a state in the distribution field for a "Provisional" association only means that we suspect that the alliance in which the "Provisional" is placed occurs within that state, and that none of the associations so far developed has been attributed to that state. When an alliance is known to occur within a state and a "Provisional" association exists under that alliance, the absence of a state in the distribution field does not imply that all of the associations for that state have been fully entitated.

Translated name:
This is the same as the alliance/association scientific name but with common names instead of scientific names for the species.

GRANK:
The global rank. Values are G1, G2, G3, G4, G5, GH, GX, G?, as defined earlier in this report (SEE ALSO Appendix I).

SRANK:
The state rank. Values are either S1, S2, S3, S4, S5, SH, SX, S?, as defined in Appendix I.

Concept (alliance/association description):
Description of the conceptual borders of the alliance/association in terms of vegetation composition and structure, expected geographic distribution, and expected environmental factors (such as characteristic landscape position, rock type, soil texture, hydrology, etc.).

Comments:
This field contains miscellaneous additional comments, such as information about the range and variability of the type, local information which has not been globally reviewed, sources of information, problems to be resolved, etc.

Range (Distribution):
This gives the states (United States and Mexico), provinces (Canada), and other countries in which the alliance is known or suspected to occur. A state, province, or country shown without a "?" indicates that the alliance is documented to occur there, or is very likely to occur there. A "?" indicates that the distribution is uncertain or speculative -- the uncertainty often related to taxonomic questions about the circumscription of the alliance, but sometimes simply the result of lack of information. For most alliances, this listing is intended to be (and should be) comprehensive. For some alliances, particularly those that are peripheral to our region from north, west, or south (tropical), the listing may only represent partial information, generally biased towards political units in close proximity to our area of concern. Note that a state, province, or country may be listed for an alliance and not for any association in that alliance; this generally indicates that other associations remain to be described in the alliance.

Other States/Provinces:
A listing of the two-digit abbreviations of states in which the alliance or association occurs. For Associations, the state abbreviation is sometimes followed by a state rank (S1, S2, S3, S4, S5, S?, SH, SX) as it appears in the NatureServe databases.

TNC Ecoregions:
TNC Ecoregions are listed, along with an indication of the confidence with which the association is attributed to the ecoregion. TNC Ecoregions are modified from Bailey (1981, 1994) and are defined as a geographically distinct assemblage of vegetation types that share a large majority of their species, ecological dynamics, and similar environmental conditions, and whose ecological interactions are critical for their long-term persistence. Confidence levels are appended to each ecoregion listed and are defined as follows: "C" - Certain, the association is confidently assumed or known to occur in the ecoregion; >95% certain; "P" - Probable, the association is predicted to occur in the ecoregion based on the presence of suitable habitat or environmental conditions, or based on historical record and/or presence in an adjacent area; at least 80% certain; "?" - Possible, the association possibly or potentially occurs in the ecoregion, the likelihood of occurrence is between 80% and 10%. Distribution and confidence levels for USFS subsections (Keys et al. 1995) have been developed for alliances and associations and are available, but are not printed in this document.

Physiographic Province, Section and Subsection:
Distribution and confidence levels for USFS subsections (Keys *et al.* 1995) have been developed for alliances and associations. These are assigned a hierarchical code that references the Province and Section. The codes are listed for the full range of the alliance/association. A full listing of the codes for the U.S. can be found in Keys *et al.* (1995). The subsection code is followed by a colon and up to three digits of confidence levels (e.g. 232Ac:CCC). The first three digits of the code refer to the physiographic province; the next capital letter refers to the section; the next lower case letter refers to the subsection. After the colon are values for confidence in the province, section, and subsection in that order. A value of C=confident or certain that it occurs in the province, section, or subsection; P=predicted or probably that it occurs in the province, section, or subsection based on fact patterns (e.g. suitable habitat and present in adjacent section); ?=possible occurrence in the province, section, or subsection.

Federal Lands:
This field lists federal land units (such as National Park Service units, individual National Forests, etc.) within which the association occurs. This field is incompletely populated. The intent is to develop a comprehensive listing of the occurrence of vegetation types on the lands of important federal land-managing agencies, especially (in the Southeast) the U.S. Forest Service, Department of Defense, National Park Service, U.S. Fish and Wildlife Service, and Corps of Engineers. Because the field is in the process of being populated, the absence of a federal land management unit should not be considered to indicate that the type is absent on that unit, but the listing of a federal land management unit is generally a reliable indication of the type's likely occurrence there. The information is currently most complete for U.S. Forest Service units, and for selected other units on which effort has been concentrated.

Synonymy:
Synonymy is given for some other vegetation or natural community classifications. For alliances, synonymy is provided to the Society of American Foresters (SAF) classification of forest cover types (Eyre 1980). Synonymy to state Heritage Program classifications is given, but this synonymy is not fully populated. Synonymy is also given to names used in the scientific literature, especially when that literature has been used as a primary source for development of the taxonomic unit and its description.

References:
This field is more fully populated for alliances than for associations. It provides a listing, by no means complete at this time, of literature which deals with the alliance or association. References listed are those that have contributed directly to the concept of the alliance or development of the association.

Responsible authors:
Initials of responsible authors are listed in parentheses following the name.

Confidence:
This code describes the degree of confidence associated with the classification of the element. This is based on the quality and type of data used in its development, as well as the extent to which the entire (or potential) range of the element was considered. Values are 1=strong; 2=moderate; 3=weak. This latter category may be used for a new type for which supporting data is limited.

Identifier:
For alliances, this is a sequential counter assigned by the database in which the data are maintained (e.g. A.1062). For associations, this is a ten-digit alphanumeric code that identifies the association (e.g. CEGL003950).

I. FOREST

I.A.8.N.b. Rounded-crowned temperate or subpolar needle-leaved evergreen forest

I.A.8.N.b.5. PINUS ECHINATA FOREST ALLIANCE

Shortleaf Pine Forest Alliance

Concept: This alliance includes forests dominated by *Pinus echinata*, which on very dry sites may be virtually the only tree species present. This is a wide-ranging alliance; it is currently known from wide areas of the eastern United States from the central Appalachians south, through the Southern Blue Ridge and Cumberland Plateau and Mountains, possibly extending into the Piedmont, and in the central United States in the Ouachita Mountains and Ozarks, extending south into the Gulf Coastal Plain. Other pine species may be present in small amounts; these vary with geography and include *Pinus taeda, Pinus virginiana, Pinus pungens*, and *Pinus rigida*. Typical hardwood associates include *Quercus alba, Quercus falcata, Quercus velutina, Quercus coccinea, Quercus marilandica, Nyssa sylvatica, Liquidambar styraciflua, Carya alba*, and *Carya glabra*. Understory species vary across the range of the alliance, but some common components are *Vaccinium arboreum, Vaccinium pallidum, Vaccinium stamineum, Symplocos tinctoria, Ulmus alata, Diospyros virginiana, Acer rubrum, Cornus florida*, and *Oxydendrum arboreum*. One association in the West Gulf Coastal Plain of Arkansas has *Vaccinium elliottii, Aesculus pavia var. pavia*, and *Chasmanthium laxum*. Common herbaceous species in this Coastal Plain association include *Smilax glauca, Silphium compositum, Pteridium aquilinum var. latiusculum, Scleria oligantha, Piptochaetium avenaceum*, and *Tephrosia virginiana*. Some associations can result from natural or anthropogenic disturbances such as fire or windstorms, while others occur naturally on the landscape, are maintained by edaphic situations, and may even be 'climax' on these sites. Soils of these forests are acidic and are derived from sandstone, chert or granitic rock situated on ravines, ridges, and steep, often south-facing, slopes; the surface is often rocky. In the Coastal Plain, this alliance is particularly typical of clay soils, on hillsides, ridges, flats, and low hills. In the Ouachita Mountains and Ozarks, forests of this alliance typically occur on south-facing slopes and saddles, and rocky outcrops and bluffs, but may also occur on lower, north-facing slopes and flat uplands, especially in the Piedmont.
Comments: Stands have suffered some damage from the southern pine beetle (*Dendroctonus frontalis*).
Range: This is a wide-ranging alliance; it is currently known from wide areas of the eastern United States from the central Appalachians south, through the Southern Blue Ridge and Cumberland Plateau and Mountains, possibly extending into the Piedmont, and in the central United States in the Ouachita Mountains and Ozarks, extending south into the Gulf Coastal Plain. Associations in this alliance are found in southern Missouri, Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and possibly in West Virginia.
States/Provinces: AL AR GA KY LA MD MO MS NC OK SC TN TX WV?
TNC Ecoregions: 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:P, 53:C, 59:C
USFS Ecoregions: 221Db:CCC, 221Ha:CCP, 221Hc:CCC, 221He:CCC, 221Jb:CCC, 221Jc:CCP, 222A:CC, 222Ej:CPP, 222En:CP?, 222Eo:CPP, 222Hc:CCC, 231Aa:CCC, 231Ab:CCP, 231Ac:CCP, 231Ad:CC?, 231Ae:CCC, 231Ag:CCP, 231Ah:CCP, 231Ai:CCP, 231Aj:CCP, 231Ak:CCP, 231Al:CCC, 231Am:CCP, 231An:CCP, 231Ao:CCP, 231Ap:CCP, 231Bb:CPP, 231Bc:CPP, 231Bd:CPP, 231Be:CPP, 231Bg:CP?, 231Bk:CP?, 231Ca:C??, 231Da:CP?, 231Dc:CPP, 231Ea:CCC, 231Ef:CCC, 231Ej:CCC, 231Fa:CPP, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ba:CCC, 232Bb:CCP, 232Bd:CC?, 232Bj:CC?, 232Bk:CC?, 232Bm:CCC, 232Fe:CCC, 234Ab:CCC, M221A:CC, M221B:C?, M221Ca:CC?, M221Cd:CCP, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC, M222A:CC, M231Aa:CCP, M231Ab:CCC, M231Ac:CCC
Federal Lands: DOD (Camp Robinson); NPS (Buffalo, Cowpens, Great Smoky Mountains?, Kings Mountain, Shiloh); TVA (Tellico); USFS (Angelina, Bienville, Chattahoochee, Cherokee?, Daniel Boone, Davy Crockett, De Soto, Holly Springs, Mark Twain, Nantahala, Oconee, Ouachita, Ozark, Sabine NF, St. Francis, Sam Houston, Sumter, Talladega?, Tombigbee, Tuskegee)
Synonymy: IA6a. Dry Shortleaf Pine - Oak - Hickory Forest, in part (Allard 1990); IA7a. Xeric Shortleaf Pine - Oak Forest, in part (Allard 1990); Dry Shortleaf Pine - Oak Forest, in part (Foti 1994b); *Pinus echinata* forest alliance, in part (Hoagland 1998a); Pine--Oak/Heath, in part (Nelson 1986); Shortleaf Pine CP, BR, RV (Pyne 1994); T1A9bI1a. *Pinus echinata* (Foti et al. 1994); Shortleaf Pine: 75, in part (Eyre 1980); Shortleaf Pine - Oak:

76, in part (Eyre 1980)
References: Allard 1990, Allred and Mitchell 1955, Bruner 1931, Cain and Shelton 1994, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Fountain and Sweeney 1987, Frothingham et al. 1926, Hoagland 1998a, Nelson 1986, Pyne 1994, Racine 1966
Authors: D.J. ALLARD, RW, Southeast **Identifier:** A.119

PINUS ECHINATA / VACCINIUM (PALLIDUM, STAMINEUM) - KALMIA LATIFOLIA FOREST
Shortleaf Pine / (Hillside Blueberry, Deerberry) - Mountain Laurel Forest
Appalachian Shortleaf Pine Forest **G4? (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Xeric Shortleaf Pine Woodlands and Forests (401-30; n/a)

Concept: This association includes forest vegetation with greater than 75% of the canopy cover of *Pinus echinata*, occurring over a shrub stratum dominated by ericaceous species, typically *Vaccinium pallidum, Vaccinium stamineum*, and *Kalmia latifolia*. Deciduous species make-up less than 25% of the canopy coverage and may include *Quercus falcata, Quercus coccinea*, or, in the southern part of this association's range, *Quercus stellata* and *Quercus marilandica*. This community often has a midstory tree stratum with *Oxydendrum arboreum, Carya pallida, Cornus florida*, or *Diospyros virginiana*. Other characteristic species include *Smilax glauca, Silphium compositum, Pteridium aquilinum var. latiusculum, Scleria oligantha, Piptochaetium avenaceum*, and *Tephrosia virginiana*. These forests occur in the lower elevations (below 2400 feet) of the southern Appalachian Mountains on ridges and upper slopes, typically with southern to western exposures.
Comments: Includes successional forests with a hardwood shrub/sapling stratum.
Range: These forests occur in the lower elevations of the southern Appalachian Mountains.
States/Provinces: GA:S?, KY:S5, MD:S?, NC:S4,S4, SC:S?, TN:S?
TNC Ecoregions: 51:C, 52:P
USFS Ecoregions: 222Hc:CCC, M221A:CC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCP
Federal Lands: NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, Nantahala, Sumter)
Synonymy: Shortleaf Pine, BR (Pyne 1994), IA6a. Dry Shortleaf Pine - Oak - Hickory Forest (Allard 1990) B. in part, Shortleaf pine/heath forest of dry, acidic steep slopes (CAP pers. comm. 1998), Low Mountain Pine Forest (Shortleaf Pine Subtype) (Schafale 1998b)
References: Allard 1990, CAP pers. comm. 1998, Evans 1991, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Pyne 1994, Schafale 1998b, Schafale and Weakley 1990
Authors: S. Simon, G. Kauffman, D. Danley, SCS **Confidence:** 2 **Identifier:** CEGL007078

I.A.8.N.b.13. PINUS STROBUS - TSUGA CANADENSIS FOREST ALLIANCE
Eastern White Pine - Eastern Hemlock Forest Alliance

Concept: Forests codominated by *Pinus strobus* and *Tsuga canadensis* occurring from eastern Wisconsin and the upper peninsula of Michigan to eastern Pennsylvania and Maine, south through the Appalachians to northern Georgia and South Carolina. Isolated occurrences could potentially occur in the Cumberland Plateau of Kentucky and Tennessee. Generally, *Tsuga canadensis* and *Pinus strobus* are codominant, but other common associates can include *Fagus grandifolia, Acer rubrum, Betula lenta, Betula alleghaniensis, Quercus rubra*. *Picea rubens* is often a component in the northeastern part of range, while *Liriodendron tulipifera* and *Betula lenta* are the common associates in the southern Appalachians. Typical shrubs/saplings include *Acer spicatum, Hamamelis virginiana*, and *Acer pensylvanicum* (in the north), and *Ilex opaca, Leucothoe fontanesiana, Rhododendron maximum* (in the south). The herbaceous stratum may be sparse and generally depauperate, including *Clintonia borealis, Cypripedium acaule, Gaultheria procumbens, Lycopodium* spp., *Maianthemum canadense*, and *Trientalis borealis* (in the north), and *Chimaphila maculata, Mitchella repens, Galax urceolata, Viola blanda*, and *Polystichum acrostichoides* (in the south). Stands of this alliance are found on acidic, nutrient-poor, usually moderately well-drained soils such as sandy loams. Communities of the eastern portion of the range (New England) generally occur on well-drained midslopes, and apparently are not significantly affected by aspect. In the southern Appalachian Mountains and Cumberland Plateau, these forests occur on alluvial terraces and steep, protected gorge slopes. Communities of this alliance are commonly established following disturbance, either natural (fire, windthrow, catastrophic flood events) or anthropogenic (logging). Old-growth examples of the alliance are known, and these forests were likely to have been widespread prior to European settlement. However, without periodic disturbance, communities of this alliance will eventually succeed to other alliances (Barnes 1991).

Comments: Forests within this alliance can have significant numbers of associated trees and can thus be similar to several other alliances, but it is distinguished by occurring in non-wetland situations and having a canopy dominated by the two nominal species, with less than 25% canopy coverage by deciduous trees. Disjunct occurrences of *Pinus strobus* are also known from Kentucky's Shawnee Hills (Todd County), but these may be better covered in the *Pinus strobus* Forest Alliance (A.128).
Range: This alliance is found in northern Wisconsin, Michigan, from western Pennsylvania to Maine, including Connecticut, Massachusetts, Maryland (?), New Hampshire, and New York (?), and in Canada in southern Ontario and possibly southern Quebec. It may occur farther south in the Appalachian Mountains to Virginia and West Virginia. This alliance is also found in Georgia, Kentucky, North Carolina, South Carolina, and Tennessee.
States/Provinces: CT GA KY MA MD ME MI NB NC NH NY ON PA QC? RI SC TN VA VT WI WV
TNC Ecoregions: 44:P, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Ea:CCC, 212Eb:CCC, 212Ec:CCP, 212Ed:CCP, 212Ee:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Ha:CC?, 212Hb:CC?, 212He:CCP, 212Hh:CCP, 212Hi:CCP, 212Hj:CCC, 212Hk:CC?, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCC, 212Hp:CCP, 212Hq:CCP, 212Hr:CCP, 212Hu:CC?, 212Hv:CCP, 212Hw:CCP, 212Hx:CCP, 212Hy:CCC, 212Ja:CCC, 212Jb:CCP, 212Jc:CCC, 212Je:CCP, 212Jf:CCP, 212Jj:CCC, 212Jl:CCC, 212Jm:CCC, 212Jn:CCP, 212Jo:CCP, 212Js:CCC, 221Aa:CCP, 221Ab:CCP, 221Ac:CCP, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Ah:CCP, 221Ai:CCC, 221Aj:CCP, 221Ak:CCC, 221Al:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:C??, 221Db:C??, 221Ea:CCP, 221Eb:CCP, 221Ec:CCP, 221Fa:CCP, 221Hc:CCC, 221He:CCC, 221Ja:C??, 222Dg:C??, 222Eo:CCC, 222Ia:C??, 222Ib:C??, 222Ic:C??, 222Ie:C??, 222If:C??, 222Ja:C??, 222Ob:CCP, 231Aa:CC?, 231Ae:CC?, 231Ak:CCC, 231Al:CC?, 231Ap:CCP, M212Aa:CCC, M212Ab:CCC, M212Ac:CC?, M212Ad:CCC, M212Ae:CCC, M212Ba:CCP, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCP, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CCP, M221Bb:CCC, M221Bc:CCP, M221Bd:CCC, M221Be:CCP, M221Bf:CCP, M221Ca:CCP, M221Cb:CCP, M221Cc:CC?, M221Cd:CC?, M221Da:CCC, M221Db:CC?, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Acadia, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)
Synonymy: IA5b. Southern Appalachian Hemlock Cove Forest, in part (Allard 1990); Canada Hemlock Forest, in part (Schafale and Weakley 1990); White Pine - Hemlock: 22, in part (Eyre 1980); Eastern White Pine: 21, in part (Eyre 1980); beech-hemlock association (Morey 1936); *Pinus - Tsuga* (Morey 1936); hemlock - white pine group (Brown et al. 1982b); hemlock - beech forest type (Gordon 1937b); white pine region, in part (Bromley 1935); Northern Hardwoods - Hemlock - White Pine Forest (Swain and Kearsley 2001); Spruce - Fir - Northern Hardwoods Forest (Swain and Kearsley 2001)
References: Allard 1990, Barnes 1991, Bromley 1935, Brown et al. 1982b, DeYoung 1979, Eyre 1980, Faber-Langendoen et al. 1996, Gordon 1937b, Hinkle 1978, Morey 1936, Patterson 1994, Rawinski et al. 1996, Schafale and Weakley 1990, Seischab 1990, Swain and Kearsley 2001, Thomas 1966, Thomas 1989, Tobe et al. 1992
Authors: M.P. SCHAFALE/A.S. WEAKLE, RW, East **Identifier:** A.127

PINUS STROBUS - TSUGA CANADENSIS / ACER PENSYLVANICUM / POLYSTICHUM ACROSTICHOIDES FOREST
Eastern White Pine - Eastern Hemlock / Striped Maple / Christmas Fern Forest
Central Appalachian White Pine - Eastern Hemlock Forest **G4? (01-09-28)**
Ecological Group (SCS;MCS): Appalachian Highlands Upland Eastern Hemlock Forests (420-40; n/a)
Northern Mesic Conifer-(Hardwood) Forests (490-13; 2.5.1.6)

Concept: This dry-mesic white pine - hemlock forest of the Central Appalachian Mountains and High Allegheny Plateau occurs on well-drained, nutrient-poor acidic soils. The vegetation is a closed-canopy conifer forest dominated by *Pinus strobus* and/or *Tsuga canadensis*. Canopy associates include *Fagus grandifolia, Acer rubrum, Betula lenta, Betula alleghaniensis, Quercus rubra*, and *Liriodendron tulipifera*. The sparse shrub layer contains *Acer spicatum, Hamamelis virginiana, Acer pensylvanicum*, and *Viburnum acerifolium*. *Rhododendron maximum* also occurs in this association in northern Pennsylvania. The sparse herb layer includes *Cypripedium acaule, Gaultheria procumbens, Lycopodium* spp., *Maianthemum canadense, Trientalis borealis, Mitchella repens, Medeola virginiana*, and *Polystichum acrostichoides*.
Comments: The compositional and environmental factors that differentiate these community types need further

scrutiny. Additional inventory and data collection is needed for further evaluation of this vegetation type's distribution and characterization.
Range: The range of this community type includes the northern Blue Ridge, Ridge and Valley province, and Appalachian Mountains in Virginia, West Virginia, and Maryland. In Virginia, the type has been documented primarily from the northern Blue Ridge but is probably scattered throughout the state's mountain region north of the New River. One outlier apparently belonging to this association has been documented in the western Piedmont.
States/Provinces: MD:S?, PA:S?, VA:S?, WV:S?
TNC Ecoregions: 52:C, 59:C
USFS Ecoregions: 212F:CC, 212G:CC, 221F:CC, 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCP, M221Bf:CCP, M221C:CC, M221Da:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: *Tsuga canadensis - Pinus strobus - Fagus grandifolia / Polystichum acrostichoides* Forest (Fleming and Coulling 2001), Northern conifer forest (Smith 1983) B. in part, Hemlock - beech consociation (Lutz 1930), *Tsuga canadensis / Ilex verticillata / Osmunda regalis* Association (Rawinski et al. 1996), White Pine - Hemlock: 22 (Eyre 1980) B. in part
References: Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming et al. 2001, Lutz 1930, Rawinski et al. 1996, Smith 1983
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 3 **Identifier:** CEGL006019

I.A.8.N.b.16. PINUS TAEDA FOREST ALLIANCE

Loblolly Pine Forest Alliance

Concept: This alliance includes both successional forests, following cropping or site conversion, and natural forests in the Piedmont, Cumberlands and Ridge and Valley, and Coastal Plain of the southeastern United States. Other canopy and subcanopy species that may be present in successional stands are *Liriodendron tulipifera, Acer rubrum, Liquidambar styraciflua, Pinus virginiana, Juniperus virginiana var. virginiana, Quercus stellata, Quercus velutina, Ulmus rubra, Quercus alba, Nyssa sylvatica, Ulmus alata, Cornus florida, Prunus serotina var. serotina*, and *Carya* spp. *Vaccinium* spp., especially *Vaccinium stamineum*, are common in these forests. One association in this alliance occurs on barrier islands in the Mid-Atlantic Coastal Plain. Along with the dominant *Pinus taeda*, canopy associates often include *Quercus falcata, Acer rubrum, Prunus serotina var. serotina*, and *Sassafras albidum*. The tall-shrub layer is comprised of *Morella cerifera (= Myrica cerifera)* and *Vaccinium formosum*. Vines and lianas are always present in abundance; *Vitis rotundifolia* is most commonly present, but *Toxicodendron radicans, Smilax rotundifolia, Smilax glauca*, and *Parthenocissus quinquefolia* are usually present in abundance as well. The herbaceous layer may be sparse, particularly if shrubs and vines are dense, but *Chasmanthium laxum* may be fairly abundant in this community. Other herbs include *Panicum amarum var. amarulum, Eupatorium hyssopifolium*, and *Elephantopus nudatus*. In southern Virginia and North Carolina, *Quercus virginiana* and *Gelsemium sempervirens* may also be present, but *Quercus virginiana* is never abundant and when present is usually restricted to the understory. *Pinus taeda* may occur rarely in the Ouachita Mountains and Ozarks of Arkansas where the species is becoming naturalized, expanding from its native range in the Coastal Plain, where it naturally occurs in low, moist areas (e.g., deep, well-drained soils of floodplains). However, a natural *Pinus taeda* forest association is not recognized for the Ozark or Ouachita region.
Comments: On the Bankhead National Forest in the Cumberland Plateau of northern Alabama, this alliance includes streamside terraces that are presumed to have been previously farmed. Associations occurring as plantations are classed in *Pinus taeda* Planted Forest Alliance (A.99).
Range: This alliance is found in the Cumberland Plateau, Piedmont and Coastal Plains of the southeastern United States, from Delaware and Maryland south and west to Texas, and in the interior to Tennessee and possibly West Virginia.
States/Provinces: AL AR DE FL GA LA MD MS NC OK SC TN TX VA
TNC Ecoregions: 31:P, 39:C, 40:C, 41:C, 42:P, 43:C, 44:C, 50:C, 52:C, 53:C, 55:?, 56:C, 57:C, 58:C, 59:C, 62:C
USFS Ecoregions: 221D:CC, 221Jb:CCC, 222Cb:CCC, 222Dc:CCC, 222Dd:CCC, 222Eb:CCC, 222Ec:CCC, 222Eg:CCC, 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ag:CCC, 231Ah:CCC, 231Ai:CCC, 231Aj:CCC, 231Ak:CCC, 231Al:CCC, 231Am:CCC, 231An:CCC, 231Ao:CCP, 231Ba:CCC, 231Bb:CCP, 231Bc:CCP, 231Bd:CCC, 231Be:CCP, 231Bf:CCP, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CC?, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCC, 231Cf:CCC, 231Cg:CCP, 231Da:CCP, 231Dc:CCC, 231De:CC?, 231Ea:CCC, 231Eb:CC?,

231Ec:CC?, 231Ed:CC?, 231Ef:CC?, 231Eg:CCP, 231Eh:CCC, 231Ei:CC?, 231Ej:CC?, 231Ek:CCP, 231En:CC?, 231Fa:CPP, 231Fb:CP?, 232Ac:CCC, 232Ba:CCC, 232Bb:CC?, 232Bc:CC?, 232Bd:CC?, 232Be:CC?, 232Bg:CCC, 232Bh:CC?, 232Bi:CC?, 232Bj:CCC, 232Bk:CC?, 232Bl:CC?, 232Bm:CCC, 232Bn:CC?, 232Bo:CC?, 232Bp:CC?, 232Bq:CCC, 232Br:CCC, 232Bt:CC?, 232Bu:CC?, 232Bv:CC?, 232Bx:CC?, 232Bz:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CC?, 232Ce:CCC, 232Cf:CC?, 232Cg:CC?, 232Ci:CC?, 232Da:CC?, 232Dc:CCC, 232Fa:CC?, 232Fb:CC?, 232Fe:CCC, 255Da:PPP, M221D:??
Federal Lands: DOD (Arnold, Fort Benning, Fort Gordon); NPS (Assateague Island, Cape Hatteras, Chickamauga-Chattanooga, Cowpens, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Ninety Six, Shiloh?); TVA (Tellico); USFS (Angelina, Apalachicola, Bankhead, Bienville, Chattahoochee, Conecuh, Croatan, Davy Crockett, De Soto, Francis Marion, Holly Springs, Homochitto, Kisatchie, Land Between the Lakes, Oconee, Ouachita, Sabine NF, Sam Houston, Sumter, Talladega, Tombigbee, Tuskegee, Uwharrie); USFWS (Chincoteague)
Synonymy: Lowland Pine - Oak Forest (Foti 1994b); Upland Mixed Forest (FNAI 1992a); Upland Mixed Forest, Gumbo Loblolly Forest subtype (FNAI 1992b); T1A9bII2a. *Pinus taeda* (Foti et al. 1994); Loblolly Pine: 81, in part (Eyre 1980)
References: Cain and Shelton 1994, Eyre 1980, FNAI 1992a, FNAI 1992b, Felix et al. 1983, Foti 1994b, Foti et al. 1994, Martin and Smith 1991, Martin and Smith 1993
Authors: D.J. ALLARD, RW, Southeast **Identifier:** A.130

PINUS TAEDA / LIQUIDAMBAR STYRACIFLUA - ACER RUBRUM VAR. RUBRUM / VACCINIUM STAMINEUM FOREST

Loblolly Pine / Sweetgum - Red Maple / Deerberry Forest
Successional Loblolly Pine Forest
Ecological Group: Semi-natural Wooded Uplands (900-40; 8.0.0.1)

Concept: This successional forest of the Piedmont and Upper East Gulf Coastal Plain is dominated by *Pinus taeda* over a subcanopy of hardwoods with *Acer rubrum var. rubrum* and *Liquidambar styraciflua* dominant in this stratum. The forest develops following site preparation, with or without site conversion, and also following agriculture. It ranges from the Piedmont of Virginia, through North Carolina, South Carolina, Georgia and Alabama, extending into the adjacent eastern end of the Upper East Gulf Coastal Plain (e.g., Talladega National Forest). Variability exists in species composition and density of subcanopy hardwoods across the geographic range. Stands typically have more-or-less closed canopies, understories dominated by fire-intolerant hardwoods, and shrub-dominated lower strata.
Environment: This forest follows agricultural cropping or silvicultural site preparation on a variety of sites, and presumably is more likely on moderately dissected topography where fire is a rare occurrence. This community usually is not present on steep slopes and does not occur on wet soils. It occurs on well- to moderately well-drained soils, usually Ultisols, on sites that formerly were under hardwood cover or subjected to agriculture.
Vegetation: The tree canopy of *Pinus taeda* is at least 60%. Tree subcanopy density varies with stand history of burning and herbicide application, but generally is <50%. Shrub and herb layer coverages do not exceed 25% and decrease with increasing age of the stand. Other species of pine, especially *Pinus echinata* and *Pinus virginiana* may be sparingly present in the canopy. Other species that may be present in the subcanopy include *Quercus coccinea, Quercus velutina, Quercus alba, Nyssa sylvatica, Carya glabra, Carya alba, Diospyros virginiana, Prunus serotina, Cornus florida, Liriodendron tulipifera*, and *Sassafras albidum* (NatureServe Ecology unpubl. data). Other species that may be present in the shrub stratum include *Juniperus virginiana, Vaccinium arboreum, Rhus copallinum, Gaylussacia baccata, Callicarpa americana*, and probably others. The herbaceous layer usually forms <5% cover and contains such species as *Gelsemium sempervirens, Chimaphila maculata, Polystichum acrostichoides*, and *Potentilla canadensis*. An example from Oconee National Forest has a thinned canopy and grassy herbaceous layer.
Dynamics: Stands of this forest develop following site preparation, with or without site conversion, and possibly also following agriculture. It is presumably more likely on moderately dissected topography where fire is a rare occurrence.
Range: This forest ranges from the Piedmont of Virginia, through North Carolina, South Carolina, Georgia and Alabama, extending into the adjacent eastern end of the Upper East Gulf Coastal Plain (e.g., Talladega National Forest).
States/Provinces: AL:S?, GA:S?, MD:S?, NC:S?, SC:S?, VA:S?

TNC Ecoregions: 43:C, 52:C, 58:?
USFS Ecoregions: 221D:CC, 231Aa:CCC, 231B:CC, 232:C, M221D:??
Federal Lands: NPS (Cowpens); USFS (Oconee, Sumter, Talladega, Uwharrie?)
Synonymy: IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B. in part, Loblolly Pine: 81 (Eyre 1980) B. Loblolly Pine - Hardwood: 82 (Eyre 1980) B. Loblolly Pine (21) (USFS 1988)
References: Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data
Authors: R. Roecker, mod. S. Landaal **Confidence: 3** **Identifier:** CEGL006011

PINUS TAEDA / MORELLA CERIFERA / VITIS ROTUNDIFOLIA FOREST
Loblolly Pine / Wax-myrtle / Muscadine Forest
Mid-Atlantic Coastal Loblolly Pine Forest **G3 (99-11-30)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Maritime Stable Dune Forests and Woodlands (240-50; n/a)

Concept: This mid-Atlantic coastal upland loblolly pine forest occurs on the Outer Coastal Plain and on barrier islands in sheltered backdunes protected from salt spray and overwash. The substrate is rapidly drained, nutrient-poor sands or sandy loams. This community is dominated by *Pinus taeda*, which can be the sole canopy component or can be associated with *Quercus falcata, Acer rubrum, Prunus serotina var. serotina*, and *Sassafras albidum*. The tall-shrub layer is comprised of *Morella cerifera (= Myrica cerifera)* and *Vaccinium corymbosum*. Vines and lianas are always present in abundance; *Vitis rotundifolia* is most common, but *Toxicodendron radicans, Smilax rotundifolia, Smilax glauca*, and *Parthenocissus quinquefolia* are usually present in abundance as well. The herbaceous layer may be sparse, particularly if shrubs and vines are dense, but *Chasmanthium laxum* may be fairly abundant in this community. Other herbs include *Panicum amarum var. amarulum, Eupatorium hyssopifolium*, and *Elephantopus nudatus*. In southern Virginia and North Carolina, *Quercus virginiana* and *Gelsemium sempervirens* may also be present, but *Quercus virginiana* is never abundant and when present is usually restricted to the understory.
Comments: This community has floristic affinity with communities of the *Quercus virginiana - (Sabal palmetto)* Forest Alliance (A.55) but is differentiated by a strong dominance by *Pinus taeda* and lack of species of southern maritime forests such as *Sabal minor* and *Osmanthus americanus*. This community also shares a number of species in common with *Prunus serotina / Morella cerifera / Smilax rotundifolia* Shrubland (CEGL006319) but is differentiated by a strong dominance by *Pinus taeda*, a structure characterized by generally taller and straighter trees, a better developed herbaceous layer, and in general, a more protected position in backdunes.
Range: This association occurs along the mid-Atlantic coast from Delaware to North Carolina.
States/Provinces: DE:S2, MD:S?, NC:S1, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Bx:CC?, 232Bz:CCC
Federal Lands: NPS (Assateague Island, Cape Hatteras); USFWS (Chincoteague)
Synonymy: *Pinus taeda / Myrica cerifera / Vitis rotundifolia* Forest: *Pinus taeda / Myrica* coastal forest association (Clancy 1993a) =, Mature loblolly pine forest of dry sites (Bratton and Davison 1987) =. at Cape Hatteras., *Pinus taeda* community (Harvill 1967) =, Pine woodland (Stalter 1990) F. Virginia portion Assateague Island., Pine-deciduous hardwood woodland (Stalter 1990) F. Virginia portion Assateague Island., Upland forest (Klotz 1986) B. Virginia., Mature loblolly pine stand (Fleming 1978) =. at Angola Neck, Delaware., Woodland community (Hill 1986) B. Assateague Island., Mesic forest (Clampitt 1991) B. at Virginia Beach., Maritime forest (Clampitt 1991) B. at Virginia Beach., *Pinus taeda / Myrica* spp. coastal forest association (Clancy 1993b)
References: Bratton and Davison 1987, Clampitt 1991, Clancy 1993a, Clancy 1993b, Fleming 1978, Fleming 1998, Fleming et al. 2001, Harvill 1967, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990, Stalter 1990, Stalter and Lamont 1990
Authors: L.A. Sneddon, ECS **Confidence:** 2 **Identifier:** CEGL006040

I.A.8.N.b.17. PINUS VIRGINIANA FOREST ALLIANCE
Virginia Pine Forest Alliance

Concept: This alliance includes forests dominated by *Pinus virginiana* and occurring in the Piedmont from Pennsylvania south to Alabama, and ranging west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau. Forests in this alliance may have admixtures of *Pinus taeda, Pinus echinata, Pinus pungens*, and/or *Pinus rigida*. These other species, if present, can have canopy coverage between 1 and 50%. Other associated species vary with the geographic distribution of the

alliance. In many associations, a dense ericaceous shrub stratum is typical. This alliance includes both early successional forests resulting from natural or anthropogenic disturbance and natural forests in edaphically extreme situations. Typically, *Pinus virginiana* communities are short-lived as a forest and are more common as woodland communities [see II.C.3.N.a *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677)]. Associated species vary with the geographic distribution of the alliance.
Comments: Appalachian pine-dominated associations need to be revisited in relation to the ecology of shortleaf pine, *Pinus echinata*. Are some stands of this type ones that historically were dominated by shortleaf pine? (MP 2002-03).
Range: Forests in this alliance are possible in the Piedmont from Pennsylvania south to Alabama, and ranging west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau. The range of the alliance includes parts of Alabama, Delaware, Georgia, Kentucky, New Jersey, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, West Virginia, Virginia, Ohio, and Indiana.
States/Provinces: AL GA IN KY MD NC NJ OH PA SC TN VA WV
TNC Ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 58:P, 59:C, 61:C
USFS Ecoregions: 221Da:CCP, 221Db:CCC, 221Ea:CC?, 221Eb:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCC, 221Jb:CCC, 221Jc:CCC, 222Da:CCC, 222Dc:CCC, 222Dd:CCC, 222Dg:CCC, 222Dj:CCC, 222Eb:CCC, 222Eg:CCC, 222Eh:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 222Eo:CCC, 222Fc:CCC, 222Fd:CCC, 222Ff:CCC, 231Aa:CCC, 231Ab:CCC, 231Ac:CCP, 231Ad:CCC, 231Ae:CCC, 231Af:CCP, 231Ag:CCP, 231Ah:CCP, 231Ai:CCP, 231Aj:CCP, 231Ak:CCP, 231Al:CCP, 231Am:CCP, 231An:CCP, 231Ao:CCP, 231Ap:CCP, 231Bc:CCC, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCC, 231Dc:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CC?, M221Bd:CCP, M221Be:CCP, M221Ca:CCP, M221Cb:CCP, M221Cc:CCC, M221Cd:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: DOD (Fort Jackson); NPS (Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Shiloh); TVA (Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Land Between the Lakes?, Nantahala, Oconee, Pisgah, Sumter, Talladega, Uwharrie?)
Synonymy: IA7a. Xeric Shortleaf Pine - Oak Forest, in part (Allard 1990); Appalachian pine-oak forest, in part (Evans 1991); Pine--Oak/Heath, in part (Schafale and Weakley 1990); Pine--Oak/Heath, in part (Nelson 1986); Virginia Pine CUPL, BR, RV (Pyne 1994); Virginia Pine - Mixed Oaks HR (Pyne 1994); Virginia Pine: 79, in part (Eyre 1980)
References: Allard 1990, Andreu and Tukman 1995, Barden 1977, Burns and Honkala 1990a, Chapman 1957, Cooper 1963, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Frothingham et al. 1926, Gettman 1974, Malter 1977, Nelson 1986, Pyne 1994, Racine 1966, Schafale and Weakley 1990, Whittaker 1956
Authors: D.J. ALLARD/K.D. PATTERSO, RW, Southeast **Identifier:** A.131

PINUS VIRGINIANA - PINUS (RIGIDA, ECHINATA) - (QUERCUS PRINUS) / VACCINIUM PALLIDUM FOREST
Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Rock Chestnut Oak) / Hillside Blueberry Forest
Appalachian Low-Elevation Mixed Pine / Hillside Blueberry Forest **G4? (01-02-11)**
Ecological Group (SCS;MCS): Appalachian Highlands Xeric Virginia / Shortleaf Pine Woodlands (401-27; 2.5.3.1)

Concept: This community includes *Pinus virginiana*-dominated forests of low-elevation ridges and steep upper slopes, occurring primarily in the Appalachian provinces of the eastern United States, from central Pennsylvania, south and west to northern Georgia and northern Alabama. This community occurs on narrow ridges, steep slopes, and other exposed topographic positions, over shallow, infertile soils. This mainly evergreen forest is often of low stature, with a somewhat open to closed canopy, sparse to very dense shrub cover dominated by ericaceous species, and a sparse herb stratum. *Pinus virginiana* is the canopy dominant throughout the range of the type. In some parts of the range, other *Pinus* species may be canopy associates, as well as dry site *Quercus* species (e.g., *Quercus prinus, Quercus coccinea*). Deciduous species may form a subcanopy or sapling stratum, particularly in areas where fire has been excluded. Common shrub dominants include *Vaccinium pallidum, Vaccinium stamineum*, and *Kalmia latifolia*. Herbs vary with geography but are typical of infertile, xeric habitats. Some typical herbs in this forest are *Baptisia tinctoria, Chimaphila maculata, Dichanthelium commutatum, Epigaea repens, Euphorbia corollata, Galax urceolata, Hypoxis hirsuta, Iris verna, Pityopsis graminifolia var. latifolia, Pteridium aquilinum var. latiusculum*, and *Schizachyrium scoparium*.
Comments: Some vegetation formerly placed (at least conceptually) in the *Pinus virginiana - Quercus (coccinea,*

prinus) Forest Alliance (A.408) and its provisional association *Pinus virginiana - Quercus (coccinea, prinus)* Forest (CEGL005040), has been transferred here, with this association (CEGL007119) becoming more geographically inclusive. In Indiana examples, the substrate is primarily a matrix of acidic siltstone, shale, and sandstone. Rarely are cliffs formed; instead the setting is mostly very steep slopes with high hills and deep ravines. This association also includes vegetation from the transition between the Cumberland Plateau / Southern Ridge and Valley and the Upper East Gulf Coastal Plain in Alabama. Though located in the Coastal Plain, these occurrences are physiographically and floristically similar to this montane association.

Early successional vegetation associated with old fields, old pastures, clearcuts, and burned or eroded areas and dominated by *Pinus virginiana* is classified as *Pinus virginiana* Successional Forest (CEGL002591). Appalachian xeric oak forests with similar floristics, but with a mainly deciduous canopy are classed in *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). Appalachian shale forests and woodlands with *Pinus virginiana* occur on steep, shaley slopes and have a stunted canopies and sparse herb and shrub strata, characterized by species adapted to shaley substrates. These shale communities are classed in *Pinus virginiana - Quercus (coccinea, prinus)* Forest Alliance (A.408) and *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677).

Range: This community occurs primarily in the Appalachian region of the United States, ranging from central Pennsylvania, south and west through the Ridge and Valley, Blue Ridge, and Cumberland Plateau to northern Georgia and Alabama, extending westward to scattered areas in the Interior Low Plateau and eastward into the upper Piedmont. It is reported from the states of Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Pennsylvania, Indiana, Ohio, and is probably in Maryland, Virginia, and West Virginia.

States/Provinces: AL:S?, GA:S?, IN:S?, KY:S5,S5, MD?, NC:S4, OH:S?, PA:S?, SC:S?, TN:S?, VA?, WV:S?

TNC Ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:P

USFS Ecoregions: 221Ea:CC?, 221Eb:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCP, 221He:CCC, 221Ja:CCC, 221Jb:CCC, 222Da:CCC, 222Dc:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 222Eo:CCC, 222Fd:CCC, 222Ff:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCC, 231Bc:CCC, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bd:CCP, M221Be:CCP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: NPS (Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain, Mammoth Cave); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, Land Between the Lakes?, Nantahala, Pisgah, Sumter, Talladega)

Synonymy: Xeric Pine Forest, Pine - Heath Ridge Forest (Ambrose 1990a) B, Virginia Pine - Mixed Oaks, HR (Pyne 1994) B, Virginia Pine, BR, R&V, CUPL (Pyne 1994) B, IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) B, Virginia Pine: 79 (Eyre 1980) B, Virginia Pine - Oak: 78 (Eyre 1980) B, Virginia pine forest (CAP pers. comm. 1998), Oligotrophic Forest (Rawinski 1992) B, Low Mountain Pine Forest (Montane Pine Subtype) (Schafale 1998b)

References: Allard 1990, Ambrose 1990a, Barden 1977, Burns and Honkala 1990a, CAP pers. comm. 1998, Cooper 1963, Core 1966, Evans 1991, Eyre 1980, Fike 1999, Gettman 1974, Homoya pers. comm., Malter 1977, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson et al. 1999, Peet et al. 2002, Pyne 1994, Racine 1966, Rawinski 1992, Schafale 1998b, Schafale and Weakley 1990, Walton et al. 1997, Whittaker 1956

Authors: K.D. Patterson, SCS **Confidence:** 1 **Identifier:** CEGL007119

I.A.8.N.g. Saturated temperate or subpolar needle-leaved evergreen forest

I.A.8.N.g.4. PICEA RUBENS SATURATED FOREST ALLIANCE

Red Spruce Saturated Forest Alliance

Concept: Wetland forests dominated by *Picea rubens* or mixtures of *Picea rubens* and *Tsuga canadensis*, occurring outside the main range of *Abies balsamea*. These forests often have a dense shrub layer dominated by *Rhododendron maximum* and may have coverage by *Sphagnum* species. Some occurrences have *Taxus canadensis* in the understory. *Listera smallii* is characteristic in the sparse herb stratum. Other characteristic herbs include *Oclemena acuminata (= Aster acuminatus), Huperzia lucidula*, and *Dryopteris campyloptera*. Forests in this alliance occur on saturated substrates, where surface water is seldom present, but the soil is saturated to surface for extended periods during the growing season. These forests are known from poorly

drained bottomlands, above 3500 feet elevation (1070 m) in the Southern Blue Ridge, but also occur in the northern Ridge and Valley and central Appalachians. It historically occurred in Tennessee.
Comments: Forests in this alliance are distinguished by having a forest structure and lacking *Abies balsamea* and by having little herbaceous cover and low species richness. Examples from the Southern Blue Ridge include Alarka Laurel and Long Hope Valley, North Carolina.
Range: This alliance is found in North Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia.
States/Provinces: MD NC PA TN VA? WV
TNC Ecoregions: 51:C, 59:C, 60:C
USFS Ecoregions: 212Fb:CCC, 212Fd:CCC, 212G:CC, 221Bd:CCP, M212Ea:CCC, M221Aa:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Dc:CCC
Federal Lands: USFS (George Washington, Jefferson?, Nantahala, Pisgah)
Synonymy: Swamp Forest-Bog Complex, Spruce Subtype (Schafale and Weakley 1990); Red Spruce: 32, in part (Eyre 1980); Red spruce palustrine forest (Fike 1999); Red spruce palustrine woodland (Fike 1999); Boreal Conifer Swamp, in part (Smith 1991)
References: Eyre 1980, Fike 1999, Schafale and Weakley 1990, Smith 1991, Weakley and Schafale 1994
Authors: M.P. SCHAFALE/A.S. WEAKLE, RW, East **Identifier:** A.198

PICEA RUBENS - (TSUGA CANADENSIS) / RHODODENDRON MAXIMUM SATURATED FOREST
Red Spruce - (Eastern Hemlock) / Great Rhododendron Saturated Forest
Swamp Forest - Bog Complex (Spruce Type) **G2? (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Forested Bogs (470-10; n/a)

Concept: This spruce-hemlock wetland forest of the central and southern Appalachian Mountains occurs on relatively flat terrain in poorly drained bottomlands of small streams at high elevations (above 3500 feet elevation in the Southern Blue Ridge to above 2000 feet in the central Appalachians). It historically occurred in Tennessee. Soils are seasonally to semipermanently saturated due to a high water table or seepage from adjacent slopes. The tree canopy is dominated by *Picea rubens* or mixtures of *Picea rubens* and *Tsuga canadensis*. Other tree species that may occur in the canopy or subcanopy include *Tsuga canadensis, Betula alleghaniensis, Acer rubrum var. rubrum, Taxus canadensis*, and *Amelanchier arborea*. This forest often has a dense shrub layer dominated by *Rhododendron maximum* with other associates often including *Kalmia latifolia, Ilex verticillata, Ilex collina, Viburnum nudum var. cassinoides, Photinia melanocarpa (= Aronia melanocarpa)*, and *Vaccinium* spp. The herbaceous layer is sparse, with the majority of herbaceous species restricted to openings, and includes *Carex trisperma, Carex folliculata, Glyceria melicaria, Osmunda cinnamomea, Osmunda regalis*, and *Maianthemum canadense*. *Listera smallii, Oclemena acuminata (= Aster acuminatus), Huperzia lucidula*, and *Dryopteris campyloptera* are characteristic herbs. The bryophyte layer is of variable cover but is dominated by *Sphagnum*. The absence of *Abies balsamea* and the importance of *Rhododendron maximum* differentiate this forest from *Picea rubens - Abies balsamea / Sphagnum magellanicum* Forest (CEGL006311).
Comments: This community is rare in the Southern Blue Ridge, and remaining examples are in poor condition throughout its range. It is known from the Blue Ridge of North Carolina (Alarka Laurel, Long Hope Valley), and was historic in Tennessee.
States/Provinces: MD:S?, NC:S1, PA:S?, TN:SH, VA?, WV:S?
TNC Ecoregions: 51:C, 59:C, 60:C
USFS Ecoregions: 212Fb:CCC, 212Fd:CCC, 212G:CC, 221Bd:CCP, M212Ea:CCC, M221Aa:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Dc:CCC
Federal Lands: USFS (Nantahala, Pisgah)
Synonymy: Red spruce-hemlock/great laurel swamp (CAP pers. comm. 1998), IIE1a. Southern Appalachian Bog Complex (Allard 1990) B. in part, Swamp Forest-Bog Complex (Spruce Subtype) (Schafale 1998a), Oligotrophic Forest (Rawinski 1992), Red Spruce: 32 (Eyre 1980) B, Red Spruce-Northern Hardwoods (17) (USFS 1988)
References: Allard 1990, Anderson 1990, Anderson et al. 1990, CAP pers. comm. 1998, Eyre 1980, Fike 1999, Peet et al. 2002, Rawinski 1992, Rawinski et al. 1994, Richardson and Gibbons 1993, Schafale 1998a, Schafale and Weakley 1990, Stotler and Crandall-Stotler 1977, USFS 1988, Weakley and Schafale 1994
Authors: M.G. Anderson, mod. K.D. Patterson, ECS **Confidence:** 2 **Identifier:** CEGL006277

I.A.8.N.g.300. PINUS TAEDA SATURATED FOREST ALLIANCE
Loblolly Pine Saturated Forest Alliance

Concept: Saturated forests dominated by *Pinus taeda* that may occur adjacent to salt marsh on the bay side of barrier islands. *Acer rubrum, Persea palustris*, and *Liquidambar styraciflua* also may be present in the canopy. The understory may have strong dominance by vine species including *Smilax rotundifolia, Toxicodendron radicans*, and *Parthenocissus quinquefolia*.
Comments: Assateague association may be better placed in a temporarily flooded formation (G. Fleming pers. comm.).
Range: This alliance is found in North Carolina, Delaware, Maryland, and Virginia, and possibly elsewhere. Occurs on the Northwest and North Landing rivers in North Carolina.
States/Provinces: DE MD NC NJ VA
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Bx:CCP, 232Bz:CCC, 232C:CC
Federal Lands: NPS (Assateague Island)
Synonymy: Estuarine Fringe Loblolly Pine Forest (Schafale and Weakley 1990); pine woodland, in part (Higgins et al. 1971); Woodland community, in part (Hill 1986); mature loblolly pine stands of wet sites, in part (Bratton and Davison 1987); loblolly pine association, in part (Brush et al. 1980); coniferous swamp (Shreve et al. 1910); Loblolly Pine: 81, in part (Eyre 1980)
References: Bratton and Davison 1987, Brush et al. 1980, Eyre 1980, Fleming pers. comm., Higgins et al. 1971, Hill 1986, Schafale and Weakley 1990, Shreve et al. 1910
Authors: L. SNEDDON, MP, East **Identifier:** A.3009

PINUS TAEDA / MORELLA CERIFERA / OSMUNDA REGALIS VAR. SPECTABILIS FOREST
Loblolly Pine / Wax-myrtle / Royal Fern Forest
North Atlantic Coastal Loblolly Pine Wetland Forest **G2G3 (98-12-07)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Maritime Stable Dune Forests and Woodlands (240-50; n/a)

Concept: This maritime/coastal wetland forest occurs in backdune depressions with high water tables ranging from Delaware to North Carolina. Examples are characterized by a closed to partially open canopy dominated by *Pinus taeda*. Other canopy associates may be absent, or may include *Acer rubrum, Persea palustris*, or *Liquidambar styraciflua*. The understory is made up of vines, strongly dominated by *Smilax rotundifolia*, with lesser amounts of *Toxicodendron radicans* and *Parthenocissus quinquefolia*. In addition to comprising the majority of the ground layer of these forests, these vines are relatively large-stemmed lianas that contribute significant cover to the canopy by covering the lower branches of trees. *Morella cerifera (= Myrica cerifera)* is a typical shrub of this community. The herbaceous layer is usually relatively sparse, characterized most frequently by ferns such as *Woodwardia areolata, Osmunda regalis var. spectabilis*, or *Osmunda cinnamomea*, and farther south (in North Carolina) by *Chasmanthium laxum*. *Polygonum pensylvanicum* may also occur. On Assateague Island National Seashore, *Pinus taeda* dominates the canopy, with occasional *Acer rubrum*. *Smilax rotundifolia* is the strongly dominant vine of the understory, with lesser amounts of *Toxicodendron radicans* and *Parthenocissus quinquefolia*. *Morella cerifera* is also a minor component of this vegetation. Despite the shallow water table and presence of muck, there is little reflection of the influence of hydrology on the vegetation. Trees tend to occur on slightly elevated hummocks, with standing water evident in hollows. *Phragmites australis, Rubus argutus, Panicum virgatum*, and *Polygonum pensylvanicum* also occur within this community on Assateague Island National Seashore. Tree diameters range from 12-36 cm dbh. This community occurs primarily on the bay side of the island adjacent to salt marsh. Soils are characterized by moderately shallow muck (15 cm) overlying organic matter-stained sands. This vegetation occurs adjacent to salt marshes, sometimes even forming small 'islands' within high salt marsh.
Range: This community ranges from the coast of Delaware to North Carolina.
States/Provinces: DE:S?, MD:S?, NC:S3?, NJ:S1?, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Bx:CCP, 232Bz:CCC, 232C:CC
Federal Lands: NPS (Assateague Island)
Synonymy: Estuarine Fringe Pine Forest (Loblolly Pine Subtype) (Schafale 2000), Pine woodland (Higgins et al. 1971) B. in part, Woodland community (Hill 1986) B. in part, Mature loblolly pine stands of wet sites (Bratton and Davison 1987) B. at Cape Hatteras., Loblolly pine association (Brush et al. 1980) B. in part, Coniferous swamp (Shreve et al. 1910) =. from eastern Maryland., Loblolly Pine: 81 (Eyre 1980) B. in part
References: Bratton and Davison 1987, Breden et al. 2001, Brush et al. 1980, Eyre 1980, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Schafale 2000, Schafale and Weakley 1990, Shreve et al. 1910

Authors: ECS **Confidence:** 2 **Identifier:** CEGL006137

I.A.8.N.g.7. TSUGA CANADENSIS SATURATED FOREST ALLIANCE

Eastern Hemlock Saturated Forest Alliance

Concept: This alliance, found in the Great Lakes states and northeastern United States, is characterized by wetland forests strongly dominated by *Tsuga canadensis*. Canopy associates include *Chamaecyparis thyoides* (in the eastern portion of this alliance's range), *Acer rubrum, Acer saccharum, Nyssa sylvatica* (in the east), *Pinus strobus, Betula alleghaniensis*, and *Thuja occidentalis* (in the center and west). The forest floor generally receives little light due to the dense canopy and thus has poorly developed herb and shrub layers. Shrubs occur in low abundance and may include *Corylus cornuta* (in the west), *Vaccinium corymbosum, Lindera benzoin* (in the east and center), and *Ilex verticillata*. *Osmunda* spp. and *Viola* spp. are often found in these communities across their range while *Onoclea sensibilis* is common in the east and in the west *Maianthemum canadense, Cornus canadensis*, and *Coptis trifolia* can usually be found.

Soils of this alliance vary from saturated muck to imperfectly drained mineral soils and are often acidic. Communities in this alliance occur in upland valleys created by bedrock depressions, on lower slopes, or adjacent to streams and lakes. In most cases they are transitional between wetland and upland communities. Microtopography is sometimes characterized by mounds and depressions caused by uprooted trees.
Range: This alliance is found in northern Wisconsin, Michigan, northern Ohio, Maine, New Hampshire, Vermont, New Jersey, Maryland, and New York. It is in Canada in Ontario and possibly Quebec.
States/Provinces: CT MA MD ME MI? NB NH NJ NS? NY OH ON PA RI VT WI WV
TNC Ecoregions: 47:P, 48:C, 49:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Ea:CCC, 212Eb:CC?, 212Ec:CCC, 212Ed:CCC, 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Ha:CCC, 212Hb:CCP, 212Hh:CCP, 212Hl:CCP, 212Hm:CCP, 212Ho:CCP, 212Hr:CCP, 212Ht:CCP, 212Hu:CCP, 212Hv:CC?, 212Hw:CCP, 212Ia:C??, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Je:CPP, 212Jf:CPP, 212Jl:CPP, 212Jm:CPP, 212Jn:CPP, 212Jo:CPP, 221Ac:CCP, 221Ad:CCP, 221Ae:CCC, 221Af:CCP, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Aj:CCP, 221Ak:CCP, 221Al:CCP, 221Ba:CCC, 221Bb:CCP, 221Bc:CCP, 221Bd:CCC, 221Ea:CCC, 221Fa:CCC, 221Fb:CCC, 221I:CC, 222Ia:CCC, 222Ib:CC?, 222Ic:CC?, 222Id:CCP, 222Ie:CC?, 222Ja:CCC, M212Ad:CCC, M212Ae:CCP, M212Af:CCP, M212Ba:CCP, M212Bb:CCP, M212Cc:CCP, M212Cd:CCP, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Ea:CCP, M212Eb:CCP, M212Fa:CCC, M212Fb:CCC, M221Aa:CCP, M221Ac:CCC, M221Ba:CCP, M221Bb:CCC, M221Bd:CCP, M221Be:CC?, M221Bf:CCC, M221Ca:C??, M221Cb:C??, M221Da:CCC, M221Db:CCP, M221Dc:CCP
Federal Lands: USFS (Chequamegon)
Synonymy: "mixed hemlock - Atlantic white cedar - red maple - yellow birch type" (Motzkin 1991); Hemlock - Yellow Birch: 24, in part (Eyre 1980); Atlantic White-Cedar: 97, in part (Eyre 1980); Eastern Hemlock: 23, in part (Eyre 1980); *Tsuga / Maianthemum - Coptis* type. Wisconsin (Kotar et al. 1988); Hemlock-Hardwood Swamp (Swain and Kearsley 2001); Hemlock palustrine forest (Fike 1999); Northern Conifer Swamp (Smith 1991)
References: Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Kotar et al. 1988, Motzkin 1991, Smith 1991, Swain and Kearsley 2001
Authors: MCS, Midwest **Identifier:** A.201

TSUGA CANADENSIS / RHODODENDRON MAXIMUM / SPHAGNUM SPP. FOREST
Eastern Hemlock / Great Rhododendron / Peatmoss species Forest
Eastern Hemlock - Great Laurel Swamp **G? (97-12-01)**
Ecological Group (SCS;MCS): Northern Swamp Forests (490-16; n/a)
Northern Rich Conifer Swamps (490-22; 1.6.1.1)

Concept: This hemlock swamp of the Central Appalachians, southeastern New York and northern New Jersey occurs on saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, and adjacent to streams and lakes. Mounds and depressions caused by uprooted trees are typical. The tree canopy is closed or nearly closed and is dominated by *Tsuga canadensis* with associates including *Acer rubrum, Nyssa sylvatica, Pinus strobus*, and *Betula alleghaniensis*. The well-developed shrub layer is strongly dominated by *Rhododendron maximum*. Other shrubs may include *Ilex verticillata, Rhododendron viscosum, Vaccinium corymbosum*, and *Lindera benzoin*. The sparse herb layer includes a variety of sedges such as *Carex folliculata, Carex trisperma, Carex intumescens*, as well as ferns and forbs such as *Osmunda cinnamomea,*

Thelypteris palustris, Onoclea sensibilis, Maianthemum canadense, Cornus canadensis, Coptis trifolia, Symplocarpus foetidus, Trientalis borealis, and *Calla palustris*. The bryophyte layer is well-developed and strongly dominated by *Sphagnum* mosses. Other mosses may include *Aulacomnium palustre, Hypnum imponens*, and *Leucobryum glaucum* on drier hummocks.
States/Provinces: MD:S?, NJ:S1S2, NY:S4, PA:S?, WV:S?
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Ba:CCC, 221Bd:CCC, 221Ea:CCP, 221F:CC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221C:C?, M221Da:CCC
Synonymy: Hardwood-Conifer Swamp (Breden 1989)
References: Breden 1989, Breden et al. 2001, Edinger et al. 2002, Fike 1999, Karlin 1988
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006279

I.B.2.N.a. Lowland or submontane cold-deciduous forest

I.B.2.N.a.4. ACER SACCHARUM - BETULA ALLEGHANIENSIS - (FAGUS GRANDIFOLIA) FOREST ALLIANCE

Sugar Maple - Yellow Birch - (American Beech) Forest Alliance

Concept: This alliance, found in the north-central and northeastern United States and adjacent southern Canada, is composed of rich mesic forests. Stands in this forest alliance typically have a closed canopy. Most of the trees are deciduous but conifers are often scattered throughout the stands. *Acer saccharum* is dominant in the overstory and sapling layer. *Betula alleghaniensis, Fagus grandifolia* (in the eastern two-thirds of this alliance's range), and *Tilia americana* may be codominants. Other common trees include *Abies balsamea, Acer rubrum, Fraxinus americana, Ostrya virginiana, Picea glauca, Pinus strobus, Quercus rubra*, and *Tsuga canadensis*. *Picea rubens* can be found in high elevation stands in the East. The dense overstory inhibits the growth of an abundant shrub layer. *Acer pensylvanicum* (in the east), *Corylus cornuta, Hamamelis virginiana, Lonicera canadensis, Taxus canadensis*, and *Viburnum acerifolium* are typical shrubs. Many of the common herbaceous species are typical of sub-boreal communities. These include *Aralia nudicaulis, Chimaphila maculata, Clintonia borealis, Lycopodium* spp., *Maianthemum canadense, Osmorhiza claytonii, Oxalis montana, Pteridium aquilinum*, and *Streptopus lanceolatus var. longipes (= Streptopus roseus)*. Stands of this alliance are found on moderate to deep (60->150 cm) sandy loam, clay loam, or loamy sand soils. The soils are typically slightly acidic to circumneutral, mesic to wet-mesic and nutrient-rich. Most stands develop on flat to moderate slopes over glacial till. A relatively thick layer of fallen leaves covers the forest floor. Sites that support this alliance are on flat to moderately sloping terrain on glacial features such as till or moraines or on calcareous rocks, sandstone, or shale outside the glaciated region.
Range: This alliance is found in eastern Minnesota, northern and eastern Wisconsin, Michigan, West Virginia, Virginia, Pennsylvania, New York, Maryland, Connecticut, Massachusetts, New Hampshire, Vermont, and Maine. It also occurs in Canada in southern Ontario.
States/Provinces: CT MA MD ME MI MN NB NH NJ NY ON PA RI VA VT WI WV
TNC Ecoregions: 46:C, 47:C, 48:C, 49:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Ea:CPP, 212Eb:CPP, 212Ec:CPP, 212Ed:CPP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Ha:CCC, 212Hb:CCC, 212Hd:CCC, 212He:CCC, 212Hi:CCP, 212Hj:CCC, 212Hk:CCP, 212Hl:CCC, 212Hm:CCC, 212Hn:CCP, 212Ho:CCP, 212Hp:CCC, 212Hq:CCP, 212Hr:CCP, 212Hs:CCC, 212Ht:CCC, 212Hu:CCP, 212Hv:CCC, 212Hw:CCC, 212Hx:CCC, 212Hy:CCC, 212Ib:CCC, 212Ja:CCC, 212Jb:CCC, 212Jc:CCC, 212Je:CCC, 212Jf:CCP, 212Jj:CCC, 212Jl:CCC, 212Jm:CCC, 212Jn:CCP, 212Jo:CCP, 212Jr:CCC, 212Js:CCC, 212Kb:CCC, 212La:CC?, 212Lb:CCC, 212Lc:CCP, 212Ld:CCP, 212Mb:C??, 212Na:CCC, 212Nb:CCC, 212Nc:CCC, 212Nd:CCC, 212Oa:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Ea:C??, 221Fa:CCC, 222E:CC, 222Ia:CCP, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP, 222If:CCP, 222Ja:CCC, 222Kc:CCC, 222Ke:CCC, 222Kf:CCC, 222Kg:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CCC, M212Fb:CCC, M221Aa:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCP, M221Bf:CCC, M221Ca:CC?,

M221Cb:CCP, M221Ce:CCC, M221Da:CCC, M221Dc:CC?
Federal Lands: NPS (Acadia, Isle Royale, Shenandoah); USFS (George Washington, Jefferson, Monongahela)
Synonymy: Maple - Birch (Hansen et al. 1973); *Acer - Viola - Osmorhiza* type (Coffman and Willis 1977); Northern Mesic Forest, in part (Curtis 1959); Sugar Maple - Beech - Yellow Birch: 25, in part (Eyre 1980); Northern Hardwoods - Hemlock - White Pine Forest (Swain and Kearsley 2001); Spruce - Fir - Northern Hardwoods Forest (Swain and Kearsley 2001); Northern hardwood forest (Fike 1999); Black cherry - northern hardwood forest (Fike 1999); Northern Hardwood (Broadleaf) Forest (Smith 1991)
References: Coffman and Willis 1977, Curtis 1959, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Flaccus and Ohmann 1964, Hansen et al. 1973, Kotar and Burger 1989, Pregitzer and Barnes 1984, Smith 1991, Swain and Kearsley 2001, USFS 1994
Authors: ECS/MCS, RW, East **Identifier:** A.216

ACER SACCHARUM - BETULA ALLEGHANIENSIS - PRUNUS SEROTINA FOREST
Sugar Maple - Yellow Birch - Black Cherry Forest
Central Appalachian Northern Hardwood Forest **G4 (01-09-28)**
Ecological Group (SCS;MCS): Appalachian Highlands High Elevation Northern Hardwood Forests (410-20; n/a)

Concept: This northern hardwood forest of the Allegheny Plateau and Central Appalachian Mountains occurs on moderate to deep, acidic to circumneutral loams or loamy sands, mesic to wet-mesic and nutrient-rich soils, on flat to moderate slopes. A thick layer of fallen leaves often occurs. In the glaciated portion of the range, this vegetation occurs on glacial tills, and in the unglaciated portion on sandstone or shale of northern slopes and high elevations. *Prunus serotina* is an important canopy component, with *Acer saccharum, Betula alleghaniensis*, and *Fagus grandifolia*. Other associates include *Acer rubrum, Fraxinus pennsylvanica, Ostrya virginiana, Pinus strobus, Quercus rubra*, and *Tsuga canadensis*. Conifers contribute less than 25% cover, in general. The shrub layer consists of *Acer pensylvanicum, Corylus cornuta, Hamamelis virginiana, Lonicera canadensis*, and *Viburnum acerifolium*. Herbs include *Dennstaedtia punctilobula, Lycopodium* spp., *Aralia nudicaulis, Chimaphila maculata, Clintonia borealis, Lycopodium* spp., *Maianthemum canadense, Oxalis montana, Pteridium aquilinum*, and *Streptopus lanceolatus var. roseus (= Streptopus roseus)*.
Range: The principal range of this community type is the Allegheny Plateau region of southern New York and northern Pennsylvania, extending south along the high Allegheny Mountains of Maryland, Virginia, and West Virginia. In Virginia, the type is widespread only on Allegheny Mountain in northwest Highland County, but occurs locally in disjunct, high-elevation areas of the Ridge and Valley, Cumberland Mountains and, very rarely, the northern Blue Ridge.
States/Provinces: MD:S?, NY:S4,S4, PA:S?, VA:S?, WV:S?
TNC Ecoregions: 49:C, 59:C, 60:C, 61:P
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fd:CCP, 212Ga:CCC, 212Gb:CCP, 221E:C?, 221Fa:CCC, M221Aa:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Bf:CCC, M221Ce:CCC, M221Da:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: Maple-beech-birch-cherry northern hardwoods (matrix) (CAP pers. comm. 1998), *Prunus serotina - Quercus rubra / Dennstaedtia punctilobula - Carex digitalis* Association (Fleming and Moorhead 1996), Black Cherry - Maple: 28 (Eyre 1980) B, *Prunus serotina - Acer saccharum - Fagus grandifolia / Carex digitalis - (Dennstaedtia punctilobula)* Forest (Fleming and Coulling 2001) =
References: Braun 1950, CAP pers. comm. 1998, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Fowells 1965, Lundgren 2001
Authors: G. Fleming, ECS **Confidence:** 3 **Identifier:** CEGL006045

I.B.2.N.a.5. ACER SACCHARUM - FRAXINUS AMERICANA - TILIA AMERICANA FOREST ALLIANCE

Sugar Maple - White Ash - American Basswood Forest Alliance

Concept: This alliance, found in the northeastern United States and southern Canada, is broadly defined and contains a number of communities generally known as 'rich forests,' 'mixed mesophytic forests,' and 'rich northern hardwood forests.' The tree canopy of these forests is variable, but *Acer saccharum, Fraxinus americana*, and *Tilia americana* are almost always present. Associated canopy trees include *Quercus rubra, Ostrya virginiana,*

Ulmus rubra, Acer rubrum, Betula alleghaniensis, Fagus grandifolia, Juglans nigra, Liriodendron tulipifera, Magnolia acuminata, and *Prunus serotina var. serotina*. The shrub layer is variable in cover and includes *Cornus alternifolia, Hamamelis virginiana, Lonicera canadensis, Rhododendron periclymenoides (= Rhododendron nudiflorum), Staphylea trifolia*, and *Viburnum acerifolium*. The herbs include *Cardamine* (subgen. *Dentaria*) spp., *Hepatica nobilis var. obtusa, Hydrophyllum virginianum, Elymus hystrix, Osmorhiza* spp., *Trillium grandiflorum, Viola* spp., and others. Stands of this alliance occur on flat to rolling topography, and some stands may be on steep slopes. Soils are usually deep, moderately to well-drained sands, loams, silt loams, moderately acid to moderately alkaline, and of high fertility, often derived from calcareous parent materials. Soil moisture holding and cation exchange capabilities are high.
Comments: The nominal *Tilia* species is *Tilia americana var. americana*, which occurs north of the range of *Tilia americana var. heterophylla*. In the Ridge and Valley of Virginia, this alliance occurs on steep, calcareous, bouldery, slopes and may have floristic affinities with rich calcareous forests farther south.
Range: This alliance is found in lower Michigan, New York, Pennsylvania, Maine, Massachusetts, Rhode Island, Vermont, Connecticut, New Hampshire, Maryland, West Virginia, and Virginia; and in Ontario, Canada.
States/Provinces: CT KY MA MD ME MI NB NH NJ NY OH ON PA RI TN? VA VT WV
TNC Ecoregions: 47:P, 48:C, 49:C, 50:C, 52:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CCP, 212C:CP, 212Da:CCP, 212Db:CC?, 212Dc:CC?, 212Ea:CC?, 212Eb:CC?, 212Ec:CCP, 212Ed:CCP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hl:CPP, 212Hn:CPP, 212Ho:CPP, 212Hx:CPP, 212Hy:CPP, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Jl:CPP, 212Jn:CPP, 212Jo:CPP, 221Ad:CC?, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCP, 221Ak:CC?, 221Al:CCP, 221Am:CC?, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCP, 221Db:CCP, 221Dc:CCP, 221Ea:CCC, 221Eb:CCP, 221Ee:CCP, 221Fa:CCC, 221Fb:CCC, 221Ja:CCC, 222D:CC, 222E:C?, 222F:CC, 222Ia:CCP, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP, 222If:CCP, 222O:CC, 231Aa:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M212Aa:CCP, M212Ab:CCP, M212Ac:CCP, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCP, M212Ca:CCC, M212Cb:CCC, M212Cc:CCP, M212Cd:CCC, M212Da:CCC, M212Db:CCP, M212Dc:CCC, M212Dd:CCP, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221Bf:CCP, M221Ca:CCP, M221Cb:CCP, M221Cc:CC?, M221Cd:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCC
Federal Lands: USFS (Daniel Boone, George Washington, Jefferson)
Synonymy: Sugar Maple - Basswood Association (Brush et al. 1980); Sugar Maple - Basswood: 26, in part (Eyre 1980); *Fraxinus americana - Juglans cinerea / Hydrophyllum virginianum* Association (Rawinski et al. 1994); Calcareous Talus Forest / Woodland (Swain and Kearsley 2001); Rich, Mesic Forest Community (Swain and Kearsley 2001); Sugar maple - basswood forest (Fike 1999); Talus Slope Forest (Smith 1991)
References: Brush et al. 1980, Cleland et al. 1994, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Fleming 1999, Host and Pregitzer 1991, Lincoln 1961, Rawinski et al. 1994, Smith 1991, Swain and Kearsley 2001
Authors: ECS/MCS, RW, East **Identifier:** A.217

ACER (NIGRUM, SACCHARUM) - TILIA AMERICANA / ASIMINA TRILOBA / JEFFERSONIA DIPHYLLA - HYDROPHYLLUM CANADENSE FOREST

(Black Maple, Sugar Maple) - American Basswood / Common Pawpaw / Twinleaf - Mapleleaf Waterleaf Forest

Central Appalachian / Piedmont Rich Cove / Mesic Slope Forest (Twinleaf - Canada Waterleaf Type) **G4G5 (00-**
Ecological Group (SCS;MCS): Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)

Concept: This community type occurs on mesic lower slopes at low elevations, over nutrient-rich substrates in the Ridge and Valley, Cumberlands, Central Appalachians, and Piedmont. Soils may be derived from limestone, dolomite, shale, siltstone, and crystalline formations, as well as from nutrient-rich alluvium. Rock outcrops and bouldery colluvium are often prominent, but the soils supporting this unit are apparently deep, dark, and very fertile, with high mean pH and Ca levels. Canopy composition is mixed and variable, but either *Acer saccharum var. saccharum* or *Acer nigrum*, or both, are consistently important and characteristic. *Carya cordiformis, Celtis occidentalis, Fraxinus americana, Liriodendron tulipifera, Quercus muehlenbergii, Quercus rubra, Tilia americana*, and *Ulmus rubra* are frequent canopy associates. From the James River south, *Aesculus flava* is a frequent canopy associate. The most typical and abundant shrub layer species are *Asimina triloba* and *Lindera benzoin*, with shrub layers usually somewhat to very open (mean stratum cover = 35%). Herbaceous layers are dense

(>80% cover) and contain a number of leafy early-flowering species, among the most abundant of which are *Jeffersonia diphylla, Hydrophyllum canadense*, and *Caulophyllum thalictroides*. Somewhat more delicate spring ephemerals that are frequent to locally abundant include *Chaerophyllum procumbens var. procumbens, Delphinium tricorne, Dicentra canadensis, Dicentra cucullaria, Erigenia bulbosa, Erythronium americanum ssp. americanum, Floerkea proserpinacoides, Mertensia virginica, Phlox divaricata, Sanguinaria canadensis*, and *Trillium sessile*. Additional characteristic herbs are *Asarum canadense, Carex albursina, Carex jamesii, Cystopteris protrusa, Hydrophyllum virginianum, Impatiens pallida, Osmorhiza claytonii, Osmorhiza longistylis*, and *Viola pubescens var. scabriuscula (= Viola pubescens var. leiocarpon)*.

Comments: Although its canopy composition is similar to that of other rich forests, this type may be distinguished by the prevalence of *Asimina triloba* and herbaceous species that, at least in Virginia, are confined to low elevations and are absent (or mostly so) from rich forest communities of mountain coves and ravines. Likewise, mountain species characteristic of medium to high elevations are generally absent. This community may be further distinguished by its relatively low-elevation habitats bordering major streams and alluvial floodplains. Because of the proximity to floodplains, species perhaps most often associated with alluvial habitats, e.g., *Acer negundo, Celtis occidentalis, Juglans nigra, Ulmus americana, Mertensia virginica*, etc., are occasionally important, and the type, or at least its shrub and herbaceous components, may "spill over" onto fertile, well-drained floodplains.

Since many characteristic plants of this unit (e.g., *Acer nigrum, Carex jamesii, Erigenia bulbosa, Floerkea proserpinacoides, Hydrophyllum canadense, Jeffersonia diphylla, Phlox divaricata*, and *Trillium sessile*) have ranges centered west or northwest of Virginia, it seems likely that the geographic distribution of this type lies primarily west of the Appalachians. Bowen et al. (1995) describe similar vegetation in the Tennessee River Gorge as a "north slope mixed mesophytic community." In a study of Jessamine Gorge, Kentucky, Campbell and Meijer (1989) detail another similar community, among the characteristic species of which are *Acer saccharum, Quercus rubra, Fraxinus americana, Tilia* spp., *Carex albursina, Carex jamesii, Erythronium* spp., *Trillium sessile, Jeffersonia diphylla*, and *Dicentra* spp., forests of well-drained floodplain terraces in this gorge have a similar composition, but with *Fagus grandifolia, Erigenia bulbosa, Phlox divaricata*, and *Polemonium reptans* more prominent. Additional species recorded in putative (unsampled) Virginia stands of this type and not recorded in other community types of the data set include, in the Potomac River drainage, *Arabis shortii*, *Enemion biternatum, Erythronium albidum, Phacelia ranunculacea*, and *Valeriana pauciflora*; in southwestern Virginia, *Actaea rubifolia (= Cimicifuga rubifolia), Phacelia purshii, Stellaria corei, Stylophorum diphyllum*, and *Synandra hispidula*; and scattered throughout, *Allium tricoccum, Carex careyana, Ellisia nyctelea, Panax trifolius*, and *Polemonium reptans* (Fleming 1999).

Range: This community probably occurs at low elevations throughout the central Appalachian region, Cumberlands, and Piedmont in Virginia, Maryland, West Virginia, Kentucky, and probably Tennessee. Its full geographic range, however, has not been determined. In Virginia, most occurrences are along major waterways of the Piedmont and mountains, including the Potomac River, the Shenandoah River and its two forks, the James River and its major tributaries, the Roanoke (Staunton) River and its major tributaries, and the New River and its major tributaries. The status of the type in the Clinch River, Powell River, and Holston River drainages of southwestern Virginia is less certain.

States/Provinces: KY:S?, MD:S?, TN?, VA:S?, WV?

TNC Ecoregions: 50:C, 52:C, 59:C, 61:P

USFS Ecoregions: 221Db:CCP, 221Ja:CCC, 231Aa:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:C??, M221Ce:CCP, M221Da:CCC, M221Db:CC?

Federal Lands: USFS (George Washington, Jefferson)

Synonymy: *Acer (nigrum, saccharum var. saccharum) / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (Fleming 1999), *Acer (nigrum, saccharum) - Tilia americana / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (Fleming and Coulling 2001), *Aesculus flava - Acer saccharum / Dicentra cucullaria - Jeffersonia diphylla* Association (Rawinski et al. 1996), Sugar Maple - Basswood: 26 (Eyre 1980) B

References: Bowen et al. 1995, Campbell and Meijer 1989, Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Rawinski et al. 1996

Authors: G. Fleming, SCS **Confidence:** 1 **Identifier:** CEGL008412

ACER SACCHARUM - FRAXINUS AMERICANA - JUGLANS CINEREA / STAPHYLEA TRIFOLIA FOREST
Sugar Maple - White Ash - Butternut / Bladdernut Forest

G4? (01-10-01)

Ecological Group (SCS;MCS): Appalachian Highlands Mesic Circumneutral Hardwood Forests (420-15; n/a)

Concept: This semi-rich to rich forest of southern New England to Virginia occurs on talus slopes or shallow rocky soils overlying calcareous or circumneutral bedrock. Canopy dominants are *Acer saccharum* with *Fraxinus americana*. Canopy associates are *Juglans cinerea, Quercus rubra, Tilia americana, Carya cordiformis, Ostrya virginiana, Quercus muehlenbergii*, and *Carpinus caroliniana*. *Betula alleghaniensis, Fagus grandifolia* and *Ulmus* spp. may also occur. The shrub layer is fairly open, characterized by *Staphylea trifolia, Corylus* spp. and *Hamamelis virginiana* and with *Kalmia latifolia, Rubus odoratus, Parthenocissus quinquefolia, Toxicodendron radicans, Vitis* spp. This community is characterized by a fairly diverse herbaceous flora. Typical herbs include *Actaea pachypoda, Allium tricoccum, Aralia nudicaulis, Aralia racemosa, Asplenium platyneuron, Asarum canadense, Eurybia divaricata (= Aster divaricatus), Circaea lutetiana ssp. canadensis (= Circaea quadrisulcata), Cystopteris fragilis, Cystopteris bulbifera, Dryopteris* spp., *Polystichum acrostichoides, Sanguinaria canadensis, Solidago flexicaulis, Trillium erectum, Woodsia obtusa*, and others. Characteristic graminoids include *Carex laxiflora, Carex sprengelii, Carex virescens, Elymus hystrix (= Hystrix patula)*, and *Piptatherum racemosum (= Oryzopsis racemosa)*. This association grades into open woodland [see related woodland types *Tilia americana - Fraxinus americana / Acer spicatum / Cystopteris fragilis* Woodland (CEGL006204) and *Acer saccharum - Tilia americana - Fraxinus americana / Ostrya virginiana / Geranium robertianum* Woodland (CEGL005058)] and bedrock upslope.
Comments: Prominent distinguishing features of this community are its extremely steep, bouldery/gravelly mesic habitats, the infrequency of *Quercus* spp., the general abundance of *Staphylea trifolia* and *Cystopteris bulbifera*, and the prevalence of other more or less lithophytic or rock-loving species e.g., *Hydrangea arborescens, Asplenium rhizophyllum, Sedum* spp., *Mitella diphylla, Solidago flexicaulis*, etc. Although this community type's mean species richness is comparable to that of many Rich Cove and Slope Forests, its herbaceous cover is less dense because of the very rocky substrates. Conspicuously absent, or less important, are species such as *Caulophyllum thalictroides, Trillium* spp., and *Diplazium pycnocarpon*, which thrive in deep mineral soils. This community usually occurs in small patches, its distribution controlled by the prevalence of large rock outcrops and associated bouldery colluvium. It intergrades with both dry, open forests and other mesophytic forests along environmental continua defined by slope position and interrelated degrees of rock substrate and mineral soil development. As a result, transitional or intermediate stands that are difficult to classify may be encountered.

Boulderfield forests and woodlands are poorly inventoried in Virginia and regionally. Few community types have been delineated or described in the literature or the National Vegetation Classification (USNVC). Because limestone and dolomite are extensively exposed in both Kentucky and Tennessee, the potential occurrence of this or a similar community south of Virginia and West Virginia needs investigation. Additional inventory and study may indicate that the southern variants of this type (with abundant *Aesculus flava, Phacelia bipinnatifida*, etc.) should be recognized as a separate association or regional subtype.
Range: This community is reported to occur in the northern and central Appalachian regions, from Vermont and New Hampshire south to Virginia and West Virginia. In Virginia, the type is locally scattered in carbonate rock districts throughout the Ridge and Valley and Cumberland Mountains.
States/Provinces: CT:S?, MA:S3, MD:S?, NH:S?, NJ:S2, NY:S3, PA:S2?, VA:S?, VT:S3
TNC Ecoregions: 59:C, 60:?, 61:C, 64:C
USFS Ecoregions: 212F:??, 212G:??, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CPP, 221Dc:CPP, M212Bb:PPP, M212Bc:PPP, M212Bd:PPP, M212Cb:PPP, M212Cc:PPP, M221Aa:CCC, M221Ab:CCC, M221B:C?, M221Ce:CCC, M221Da:C??
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: Talus Slope Community (Breden 1989) B, *Acer saccharum / Asarum canadense* community (Metzler and Barrett 1996), *Acer (nigrum, saccharum) - Tilia americana - (Aesculus flava) / Staphylea trifolia / Cystopteris bulbifera* Forest (Fleming and Coulling 2001), Sugar maple-white ash-basswood cove forest (CAP pers. comm. 1998), *Tilia americana / Staphylea trifolia / Cystopteris bulbifera* Forest (type 1.2) (Fleming 1999), Sugar Maple - Basswood: 26 (Eyre 1980) B, SNE Calcareous Talus Forest/Woodland (Rawinski 1984), SNE rich mesic forest (circumneutral to basic) (Rawinski 1984), Transition Hardwood Talus Woodland (Thompson 1996)
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Lundgren 2000, Metzler and Barrett 1996, Metzler and Barrett 2001, Rawinski 1984, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 3 **Identifier:** CEGL006020

ACER SACCHARUM - FRAXINUS AMERICANA - TILIA AMERICANA - LIRIODENDRON TULIPIFERA / ACTAEA RACEMOSA FOREST

Sugar Maple - White Ash - American Basswood - Tuliptree / Black Cohosh Forest

G4? (01-09-28)

Ecological Group (SCS;MCS): Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)

Concept: This is a rich mesic, deciduous forest of the High Alleghenies, Western Allegheny Plateau, and Central Appalachians south to the Cumberlands of eastern Kentucky. Stands occur in coves, slope bases, lower slopes, and moderate slopes. Soils are typically deep, fertile, moderately to well-drained and are often derived from calcareous parent materials, with textures including sands, loams, and silt loams. The canopy is dominated by *Acer saccharum* with *Fraxinus americana, Liriodendron tulipifera*, and *Tilia americana* being very characteristic. Associated canopy trees include *Quercus rubra, Ostrya virginiana, Ulmus rubra, Acer rubrum, Betula alleghaniensis, Betula lenta, Fagus grandifolia, Juglans nigra, Carya cordiformis*, and *Prunus serotina*. The shrub layer is of variable composition, characterized by *Cornus alternifolia, Hamamelis virginiana, Lindera benzoin, Asimina triloba, Lonicera canadensis, Rhododendron periclymenoides (= Rhododendron nudiflorum)*, and *Viburnum acerifolium*. The herb layer is diverse and made up of *Adiantum pedatum, Asarum canadense, Actaea racemosa (= Cimicifuga racemosa), Cardamine* spp. (= *Dentaria* spp.), *Hepatica nobilis var. obtusa (= Hepatica americana), Hydrophyllum virginianum, Elymus hystrix (= Hystrix patula), Osmorhiza* spp., *Trillium grandiflorum, Viola* spp., *Dryopteris marginalis, Botrychium virginianum, Anemone quinquefolia, Geranium maculatum, Caulophyllum thalictroides, Sanguinaria canadensis, Claytonia virginica, Allium tricoccum, Cardamine concatenata, Arisaema triphyllum*, and *Laportea canadensis*.

Comments: Despite considerable compositional variation, this unit appears to be a widespread and robust vegetation type. Damman and Kershner (1977) describe similar vegetation from gneissic areas of western Connecticut, with key species including *Acer saccharum, Tilia americana, Fraxinus americana, Liriodendron tulipifera, Lindera benzoin, Carpinus caroliniana, Ulmus rubra, Carya cordiformis, Osmorhiza claytonii, Asarum canadense, Caulophyllum thalictroides, Hepatica nobilis var. obtusa (= Hepatica americana), Galearis spectabilis, Viola pubescens*, and *Deparia acrostichoides*. The Sugar Maple - Basswood - Tulip Poplar Community described by Martin (1975) from southeastern Kentucky, and the *Acer saccharum - Liriodendron tulipifera - Fraxinus americana* Community described by Andreu and Tuckman (1995) from the Tellico Lake area of eastern Tennessee are similar, but not fully comparable because only woody vegetation was analyzed in these studies.

In extreme southwestern Virginia, this community type is gradational to *Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana var. heterophylla) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) of high-elevation coves in the Southern Appalachians. However, CEGL006237 may be distinguished by generally occurring at much lower elevations, having lower species richness, and lacking (or nearly lacking) a number of primarily southern species prominent in CEGL007695, including *Actaea podocarpa, Aesculus flava, Hydrophyllum canadense, Phacelia fimbriata, Phlox stolonifera, Sanicula odorata, Stachys nuttallii*, and *Trillium sulcatum*. A few occurring frequently in CEGL006237 (especially its high-elevation subtype), including *Aconitum reclinatum, Betula alleghaniensis, Piptatherum racemosum*, and *Sanicula trifoliata*, are absent or uncommon in CEGL007695.

The exotic weed *Alliaria petiolata* is a rampant invader of some stands of this vegetation on the Northern Blue Ridge.

Range: This forest is found in the High Alleghenies, Western Allegheny Plateau, Central Appalachians, and Cumberlands from New York and New Jersey south to West Virginia, Virginia, and eastern Kentucky.

States/Provinces: KY:S?, MD:S?, NJ:S?, NY:S2S3, OH:S?, PA:S?, VA:S?, WV:S?

TNC Ecoregions: 49:C, 50:C, 59:C, 61:P

USFS Ecoregions: 212F:CC, 212G:CC, 221D:CC, 221Ea:CCC, 221Ee:CCP, 221Fa:CCC, 221Fb:CCC, 231A:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CC?

Federal Lands: USFS (Daniel Boone, George Washington, Jefferson)

Synonymy: *Acer saccharum - Tilia americana / Caulophyllum thalictroides - Laportea canadensis - Osmorhiza claytonii* Forest (Fleming and Coulling 2001), *Acer saccharum - Betula alleghaniensis / Acer pensylvanicum / Laportea canadensis - Angelica triquinata* Forest (Fleming and Coulling 2001), Sugar maple-white ash-basswood cove forest (matrix/large patch) (CAP pers. comm. 1998), *Acer saccharum var. saccharum - Tilia americana / Laportea canadensis - Caulophyllum thalictroides - Trillium grandiflorum* Forest (type 1.3) (Fleming 1999), *Acer saccharum - Tilia americana / Laportea canadensis - Caulophyllum thalictroides - Deparia acrostichoides* Forest (Coulling and Rawinski 1999), *Liriodendron tulipifera - Acer saccharum - Tilia americana / Laportea canadensis - Impatiens pallida* Association, *pro parte* (Rawinski et al. 1996), Sugar Maple - Basswood: 26 (Eyre 1980) B

References: Anderson et al. 1998, Breden et al. 2001, CAP pers. comm. 1998, Campbell 2001, Coulling and Rawinski 1999, Damman and Kershner 1977, Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Lundgren 2000, Martin 1975, Rawinski et al. 1996
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 3 **Identifier:** CEGL006237

ACER SACCHARUM - FRAXINUS AMERICANA - TILIA AMERICANA / ACER SPICATUM / ALLIUM TRICOCCUM - CAULOPHYLLUM THALICTROIDES FOREST
Sugar Maple - White Ash - American Basswood / Mountain Maple / Ramps - Blue Cohosh Forest
Sugar Maple - Ash - Basswood Northern Appalachian Rich Mesic Forest **G4? (01-09-28)**
Ecological Group (SCS;MCS): Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)
Northern Hardwood Forests (490-14; 2.5.1.7)

Concept: This rich maple - ash - basswood forest association is found from the northeastern United States and Canada to the central Great Lakes area, south to the High Alleghenies of Virginia and West Virginia. Stands occur on nutrient-rich, mesic or wet-mesic settings on sloped to rolling terrain. Slope bottoms, where colluvium collects, is a common landscape position. The surface soils are deep sand, loamy sand, or loam and may be underlain by sandy clay loam to clay loam. The sites are somewhat poorly drained to well-drained and can have a water table 0.4-2 m below the surface. Small (<1 ha) seep areas that may occur within these forests have soils that are usually saturated. This forest community has a well-developed tree canopy composed of deciduous species. Shrubs are scattered, but the herbaceous stratum is generally extensive. Bryoids are only a minor component of the ground layer, which is predominantly nitrogen-rich sugar maple leaves. *Acer saccharum* and *Fraxinus americana* are the dominant trees; *Tilia americana* is frequent but not necessarily abundant. *Ostrya virginiana* is very common as a small tree. *Quercus rubra, Acer rubrum, Betula alleghaniensis, Fagus grandifolia*, and *Prunus serotina* are typical associates. *Ulmus rubra* and *Juglans cinerea* are occasional. Shrubs that may be found in this community include *Cornus alternifolia, Viburnum lantanoides (= Viburnum alnifolium), Hamamelis virginiana, Dirca palustris*, and *Lonicera canadensis*. The ground flora, including many spring ephemerals, is diverse and consists primarily of nutrient- and light-requiring species. Many of these flower and fruit early in the spring before the tree canopy has fully leafed out; *Dicentra cucullaria, Dicentra canadensis, Hepatica* spp., *Asarum canadense, Caulophyllum thalictroides, Viola canadensis, Viola rotundifolia, Actaea pachypoda, Osmorhiza claytonii, Panax quinquefolius, Sanguinaria canadensis*, and *Erythronium americanum* are typical. Fern richness is often high, with characteristic species including *Adiantum pedatum, Cystopteris bulbifera, Deparia acrostichoides (= Athyrium thelypterioides), Dryopteris goldiana, Dryopteris filix-mas, Botrychium virginianum, Athyrium filix-femina, Phegopteris hexagonoptera (= Thelypteris hexagonoptera)*, and, especially in seepy spots, *Matteuccia struthiopteris*. Various sedges are present (particularly the Laxiflorae) such as *Carex laxiflora, Carex platyphylla, Carex plantaginea, Carex leptonervia, Carex hitchcockiana, Carex aestivalis, Carex davisii, Carex bebbii*, and others. The herbaceous flora in seeps often contains *Calamagrostis canadensis, Carex scabrata, Ageratina altissima (= Eupatorium rugosum), Glyceria melicaria, Impatiens capensis* (sometimes *Impatiens pallida* as well), and *Solidago flexicaulis*. These forests are differentiated from less-rich northern hardwood forests, e.g., *Acer saccharum - Betula alleghaniensis - Fagus grandifolia / Viburnum lantanoides* Forest (CEGL006252), primarily by their abundant and diverse herbaceous layer, as well as by the greater prominence of sugar maple and ash in the canopy and reduced importance of beech.
Comments: The attribution of this type to the Ridge and Valley subsection is based on the location of a single stand on the westernmost scarp slope of the Ridge Valley (east slope of Middle Mountain) at the Allegheny Front. The status of this association in the region between New York and the Virginias (i.e., Pennsylvania and Maryland) is uncertain.
Range: This forest association ranges generally from Ontario and New England west to Michigan and south to New Jersey and New York, with a discontinuous southward extension in the high Allegheny Mountains to western Virginia and eastern West Virginia.
States/Provinces: CT:S?, MA:S3, MD?, ME:S3, MI:S3, NB:S?, NH:S?, NJ:S2?, NY:S3, ON:S?, PA?, RI:S?, VA:S?, VT:S4, WV:S?
TNC Ecoregions: 47:P, 48:C, 59:C, 60:C, 61:C, 62:P, 63:C, 64:C
USFS Ecoregions: 212B:CC, 212D:CC, 212E:C?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hl:CPP, 212Hn:CPP, 212Ho:CPP, 212Hx:CPP, 212Hy:CPP, 212Ja:CPP, 212Jb:CPP, 212Jc:CPP, 212Jl:CPP, 212Jn:CPP, 212Jo:CPP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 222Ia:CCP, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCP, M212Ca:CCC, M212Cb:CCC, M212Cd:CCC, M212Da:CCC,

M212Db:CCP, M212Dc:CCC, M212Dd:CCP, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CCC, M221Ba:CCC, M221Bd:CC?
Federal Lands: USFS (George Washington)
Synonymy: Dry-Mesic Calcareous Forest (Breden 1989) B, SNE rich mesic forest (circumneutral to basic) (Rawinski 1984), *Acer saccharum - Tilia americana - Fagus grandifolia / Caulophyllum thalictroides - Viola blanda - (Allium tricoccum)* Forest (Fleming and Coulling 2001), Rich northern hardwood forest (NAP pers. comm. 1998), Sugar maple-white ash-basswood-bluebead cove forest (CAP pers. comm. 1998), *Acer saccharum - Tilia americana / Caulophyllum thalictroides - Laportea canadensis* Association (Fleming and Moorhead 1996), Sugar Maple - Basswood: 26 (Eyre 1980) B, Rich Northern Hardwood Forest (Thompson 1996) =
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Edinger et al. 2002, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Gawler 2002, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Sperduto 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: D. Faber-Langendoen, mod. L. Sneddon, mod. G. Fleming, ECS **Confidence:** 2 **Identifier:** CEGL005008

I.B.2.N.a.46. CARYA (GLABRA, OVATA) - FRAXINUS AMERICANA - QUERCUS (ALBA, RUBRA) FOREST ALLIANCE

(Pignut Hickory, Shagbark Hickory) - White Ash - (White Oak, Northern Red Oak) Forest Alliance

Concept: Communities of this alliance include dry, relatively 'rich' forests dominated by *Quercus* species and include *Carya* species as a prominent (rarely codominant) feature. *Fraxinus americana*, although sometimes a sporadic member, is generally characteristic of these forests. Associated canopy species include *Quercus alba, Quercus velutina, Quercus rubra, Carya ovalis, Carya glabra*, as well as other oaks and hickories. Communities of this alliance generally occur on dry upper slopes or ridgetops. Soils are usually rich, and may range from slightly acidic to circumneutral pH, on well-drained loams or sandy loams, predominantly on southern or eastern exposures. The shrub layer is usually interrupted to absent. When present, it includes *Viburnum rafinesquianum*, and occasional *Vaccinium* species. *Viburnum acerifolium* is characteristic of some communities of this alliance. Although ericaceous species may be present and occasionally locally abundant, they are not characteristic. The herbaceous layer is characterized by forbs and may be quite diverse. A characteristic sedge is *Carex pensylvanica*. Other forbs found in these communities include *Asplenium platyneuron, Schizachyrium scoparium, Hepatica nobilis var. obtusa (= Hepatica americana), Asclepias quadrifolia, Desmodium* spp., and *Arabis canadensis*. The relatively open canopy, sparse shrub layer, and dense herbaceous layer impart a park-like appearance to many of these forests. However, this vegetation is classified as forest rather than woodland because total canopy cover generally exceeds 60%, and few, if any, of the herbs may be thought of as truly shade-intolerant. Those herbs that require high light levels are generally confined to small openings. Portions of SAF type 52, White Oak - Black Oak - Northern Red Oak, are contained within this alliance. These forests are somewhat similar to Braun's (1950) 'oak-hickory forests' of the Midwest. They share many of the same canopy species, and in some cases, similar physiognomy. However, the Oak-Hickory Region of Braun supports forests that occur in close association and intergrade with prairies, and share many of the same species in the herb layer, particularly legumes. For example, *Asclepias verticillata, Lithospermum canescens, Tephrosia virginiana, Desmodium* spp., *Euphorbia corollata*, and *Liatris* spp. occur in many of the oak - hickory forests of the Ozark Plateau, and Braun (1950) suggests that they may be remnants of prairie openings invaded by forest. A few outliers of 'Oak - Hickory' forests do occur in the East, however, and these are placed within the *Quercus velutina - Quercus alba - (Quercus coccinea)* Forest Alliance (A.1911).
Comments: Portions of SAF type 52, White Oak - Black Oak - Northern Red Oak, are contained within this alliance. These forests are somewhat similar to Braun's (1950) 'oak-hickory forests' of the Midwest. They share many of the same canopy species and, in some cases, similar physiognomy. However, the Oak-Hickory Region of Braun supports forests that occur in close association and intergrade with prairies, and share many of the same species in the herb layer, particularly legumes. For example, *Asclepias verticillata, Lithospermum canescens, Tephrosia virginiana, Desmodium* spp., *Euphorbia corollata*, and *Liatris* spp. occur in many of the oak - hickory forests of the Ozark Plateau, and Braun (1950) suggests that they may be remnants of prairie openings invaded by forest.
Range: This alliance is found in New York, Pennsylvania (?), Maryland (?), New Jersey (?), Delaware (?), Vermont, Connecticut, Massachusetts, and New Hampshire.
States/Provinces: CT DE? MA MD ME NH NJ NY PA RI VA VT WV

TNC Ecoregions: 49:C, 50:?, 52:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Da:CPP, 212Ea:CC?, 212Eb:CC?, 212Ec:CCP, 212Ed:CCP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Aj:CCP, 221Ak:CCC, 221Al:CCP, 221Am:CCP, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCP, 221Dc:CCC, 221Ea:CCC, 221Eb:CCP, 221Fa:CCC, 222Ia:CCP, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP, 222If:CCP, 222O:C?, 231Ae:CCP, 231Ak:CCC, 231Al:CCC, 231Am:CCP, 231Ap:CCC, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212Db:CCP, M212Dc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CPP, M221Ab:CPP, M221Ba:CP?, M221Bb:CPP, M221Bc:CP?, M221Bd:CPP, M221Be:CPP, M221Bf:CPP, M221Ca:CPP, M221Cb:CPP, M221Da:CCC, M221Dc:CCC
Federal Lands: NPS (Harpers Ferry, Shenandoah); USFS (George Washington, Jefferson)
Synonymy: White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980); "oak-hickory forests" (Braun 1950); Hickory - Hop Hornbeam Forest / Woodland (Swain and Kearsley 2001); Dry, Rich Acidic Oak Forest (Swain and Kearsley 2001); Dry oak - mixed hardwood forest (Fike 1999); Dry-Mesic Calcareous Central Forest (Smith 1991); Xeric Central Hardwood Forest (Smith 1991)
References: Braun 1950, Eyre 1980, Fike 1999, Smith 1991, Swain and Kearsley 2001
Authors: ECS, East **Identifier:** A.258

CARYA (GLABRA, OVATA) - FRAXINUS AMERICANA - QUERCUS SPP. FOREST

(Pignut Hickory, Shagbark Hickory) - White Ash - Oak species Forest

G? (97-12-01)

Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Oak Forests and Woodlands (401-13; 2.5.3.2)

Concept: This dry, rich, closed-canopy oak - hickory forest occurs in the Lower New England - Northern Piedmont, Central Appalachians, Western Allegheny Plateau, and High Allegheny Plateau ecoregions. This association is found on dry, southern or southeastern, mid to upper slopes on slightly acidic to circumneutral, well-drained loams or sandy loams. The tree canopy is dominated by *Quercus* species with *Carya* species (typically over 20% cover *Carya*) and *Fraxinus americana* as prominent (rarely codominant) features. Associates include *Quercus alba, Quercus velutina, Quercus rubra, Quercus prinus, Carya ovalis, Carya glabra, Carya cordiformis*, and *Cornus florida*. *Acer saccharum, Acer rubrum, Celtis occidentalis, Tilia americana*, and *Betula lenta* may be present also. The interrupted shrub layer contains *Carpinus caroliniana, Corylus* spp., *Viburnum rafinesquianum, Vaccinium* spp., and *Viburnum acerifolium*. Ericaceous species are present but not prominent. The diverse herbaceous layer includes *Carex pensylvanica, Asplenium platyneuron, Schizachyrium scoparium, Hepatica nobilis var. obtusa (= Hepatica americana), Asclepias quadrifolia, Desmodium* spp., and *Arabis canadensis*.
Range: This forest occurs in the Lower New England - Northern Piedmont, Central Appalachians, Western Allegheny Plateau, and High Allegheny Plateau ecoregions.
States/Provinces: CT:S?, DE?, MA:S4, MD:S?, NH:S?, NJ?, NY:S4, PA:S?, VT:S3, WV:S?
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCP, 221Af:CCC, 221Ai:CCC, 221Bd:CCC, 221D:C?, 221Ea:CCC, 221Fa:CCC, 231A:??, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCC, M212Eb:CCC, M221A:CP, M221B:CP, M221C:CP, M221Dc:CCC
Federal Lands: NPS (Harpers Ferry)
Synonymy: SNE dry rich forest on acidic/circumneutral bedrock or till (Rawinski 1984), Mesic Transition Hardwood Forest (Mesic Oak-Hickory-Northern Hardwood Forest) (Thompson 1996)
References: Breden et al. 2001, CAP pers. comm. 1998, Edinger et al. 2002, Fike 1999, Lundgren 2000, Lundgren 2001, Metzler and Barrett 2001, Rawinski 1984, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000, Vanderhorst 2000b
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006236

QUERCUS PRINUS - QUERCUS RUBRA - CARYA OVALIS / SOLIDAGO (ULMIFOLIA, ARGUTA) - GALIUM LATIFOLIUM FOREST

Rock Chestnut Oak - Northern Red Oak - Red Hickory / (Elmleaf Goldenrod, Atlantic Goldenrod) - Purple Bedstraw Forest

Central Appalachian Basic Oak - Hickory Forest (Montane Type) **G3G4 (01-09-21)**

Ecological Group (SCS;MCS): Appalachian Highlands Mafic/Circumneutral Dry-mesic Hardwood Forests (401-15; n/a)

Concept: This community type is currently known from scattered locations on the northern Virginia Blue Ridge. Occurrences on the Maryland Blue Ridge and in the Ridge and Valley of Virginia, West Virginia, and Maryland are possible. Sites are lower to middle-elevation mountain slopes underlain by Catoctin Formation metabasalt (greenstone), layered pyroxene granulite, and metasiltstone and phyllite of the Harper's Formation. Elevation ranges from 390-995 m (1280-3260 feet). Although middle-slope positions are most typical, topographic positions from lower slopes to crests are represented, and the moisture potential of these sites was assessed as submesic or subxeric. Slopes are typically steep, with aspects ranging from northeast to southwest. This association has an open, mixed canopy dominated by several oaks and hickories. Trees tend to be slightly stunted (often <20 m tall) on the drier and more exposed sites. *Quercus prinus* and *Carya ovalis* are the most abundant canopy species, but *Quercus rubra* and *Fraxinus americana* are constant, sometimes codominant associates. *Carya ovata* and *Carya glabra* each attain codominance in a subset of stands. Few other trees co-occur, and understory layers tend to be open or sparse with scattered *Ostrya virginiana, Crataegus flabellata*, and tree saplings. *Vaccinium stamineum, Vaccinium pallidum, Rosa carolina*, and *Spiraea betulifolia var. corymbosa* commonly form a patchy, low-shrub layer. The herb layer is open but moderately diverse with drought-tolerant graminoids and forbs.
Comments: Although it has a similar canopy, this association differs significantly from *Quercus rubra - Quercus prinus - Carya ovalis / Cercis canadensis / Solidago caesia* Forest (CEGL008514) in its understory and herbaceous composition. It occupies drier, steeper sites and lacks (or nearly so) many characteristic low-elevation and mesophytic species of CEGL008514, e.g., *Liriodendron tulipifera, Quercus alba, Cercis canadensis, Asimina triloba, Actaea racemosa (= Cimicifuga racemosa), Solidago caesia, Desmodium glutinosum*, etc. Conversely, this type contains a number of montane and xerophytic species that are absent or unimportant in CEGL008514.
Range: This community type is currently known from scattered locations on the northern Virginia Blue Ridge, from Warren County south to Bedford County. Occurrences on the Maryland Blue Ridge and in the Ridge and Valley of Virginia, West Virginia, and Maryland are possible and should be sought. Within the known range, this unit can be a large-patch or matrix community type in localities of optimal habitat.
States/Provinces: MD?, VA:S?, WV?
TNC Ecoregions: 50:?, 59:C
USFS Ecoregions: M221Aa:C??, M221Ab:C??, M221Da:CCC
Federal Lands: NPS (Shenandoah); USFS (George Washington)
Synonymy: *Quercus prinus - Quercus rubra - Carya ovalis / Solidago (ulmifolia, arguta) - Galium latifolium* Forest (Fleming and Coulling 2001) =, *Quercus prinus - Quercus rubra - Carya ovalis / Cornus florida / Desmodium nudiflorum* Association: *Helianthus divaricatus - Carex pensylvanica - Dichanthelium boscii - Arabis laevigata* Subassociation, *pro parte* (Rawinski et al. 1996). see CEGL008515., White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) B
References: Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Rawinski et al. 1996
Authors: ECS **Confidence:** **Identifier:** CEGL008516

QUERCUS RUBRA - QUERCUS PRINUS - CARYA OVALIS / CERCIS CANADENSIS / SOLIDAGO CAESIA FOREST

Northern Red Oak - Rock Chestnut Oak - Red Hickory / Redbud / Wreath Goldenrod Forest

Central Appalachian Basic Oak - Hickory Forest (Submontane / Foothills Type) **G3G4 (01-06-22)**

Ecological Group (SCS;MCS): Appalachian Highlands Mafic/Circumneutral Dry-mesic Hardwood Forests (401-15; n/a)

Concept: This community type is currently known from a narrow range in the northern Blue Ridge and adjacent inner Piedmont of Virginia. It is restricted to the western Piedmont foothills and lower-elevation slopes and spurs of the main Blue Ridge. Elevation ranges from 104-719 m (340-2360 feet). Habitats are more-or-less rocky, gentle to steep, submesic slopes with a wide range of aspects. Middle-slope topographic positions are typical, but stands occasionally occur on lower or upper slopes and crests. This association is a true oak-hickory forest with mixed canopy dominance by several *Quercus* spp. and *Carya* spp. *Carya ovalis, Quercus rubra*, and *Quercus prinus* are

consistent codominants and have the highest importance values based on standard forestry statistics generated from stem diameter measurements. *Quercus alba, Carya alba, Carya glabra, Fraxinus americana*, and *Liriodendron tulipifera* are less constant canopy species but achieve codominance in some stands. *Quercus velutina* is a minor canopy associate. *Carya* spp., *Quercus* spp., *Acer rubrum, Nyssa sylvatica, Fraxinus americana*, and *Sassafras albidum* are well-represented in lower tree strata. *Cercis canadensis* and, to a lesser extent, *Cornus florida* dominate the shrub and lowest tree layers, while *Viburnum acerifolium* is a common low shrub. A large number of herbaceous species occur with low cover in the type.
Comments: In the context of the mountain dataset analyzed here, *Desmodium nudiflorum* has the highest unscaled adjusted Indicator Value among herbs of this community type. However, plots representing this association were also analyzed in a 477-plot dataset of Piedmont and inner Coastal Plain vegetation, where *Desmodium nudiflorum* attained much higher indicator status in other vegetation types. Because of these results, *Solidago caesia* was chosen as a nominal herb for this community, instead of *Desmodium nudiflorum*.

In recent years, the abundance of *Cornus florida* has been significantly reduced by mortality resulting from dogwood anthracnose. Some stands of this association have been modified by repeated cutting and are now heavily dominated by *Liriodendron tulipifera*. *Symphoricarpos orbiculatus, Polygonum caespitosum var. longisetum*, and exotics such as *Ailanthus altissima, Rubus phoenicolasius*, and *Celastrus orbiculata* often become established in canopy gaps following timber harvests or gypsy moth damage.
Range: This community type is currently known from a narrow range in the northern Blue Ridge and adjacent inner Piedmont of Virginia. The type appears to be co-extensive with Catoctin Formation metabasalt (greenstone), a mafic metamorphic rock. Since the Catoctin Formation is well-exposed along the Blue Ridge and western Piedmont of Maryland, the range very likely extends north of Virginia. Within its known distribution, this unit is a matrix community type in localities of optimal habitat and land-use history.
States/Provinces: MD?, VA:S?
TNC Ecoregions: 52:C, 59:C
USFS Ecoregions: 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M221Da:CCC
Federal Lands: NPS (Shenandoah); USFS (George Washington?)
Synonymy: White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) B, *Quercus rubra - Quercus prinus - Carya ovalis / Cercis canadensis / Solidago caesia* Forest (Fleming and Coulling 2001) =
References: Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001
Authors: G. Fleming, SCS **Confidence:** **Identifier:** CEGL008514

I.B.2.N.a.15. FAGUS GRANDIFOLIA - ACER SACCHARUM - (LIRIODENDRON TULIPIFERA) FOREST ALLIANCE

American Beech - Sugar Maple - (Tuliptree) Forest Alliance

Concept: This alliance is composed of rich, mesic forests of the east-central United States and southern Canada. The southern range of this alliance is limited by the distribution of *Acer saccharum* which is largely absent from the Coastal Plain. The forest canopy and subcanopy are typically dominated by *Acer saccharum* and *Fagus grandifolia*, although *Liriodendron tulipifera* may be an important canopy component in some parts of the range. Other common trees include *Carpinus caroliniana, Carya* spp., *Fraxinus americana, Ostrya virginiana, Quercus rubra, Tilia americana*, and *Ulmus americana*. In the southern part of this alliance's range, additional species may include *Quercus alba, Tilia americana, Liquidambar styraciflua, Aesculus glabra, Nyssa sylvatica*, and *Carya cordiformis*. Shrubs are usually rare in northern stands but become more abundant in southern stands. *Asimina triloba* and *Lindera benzoin* (in the southern parts of this alliance's range), *Diervilla lonicera, Euonymus obovata*, and *Sambucus* spp. (in the northern parts), *Morus rubra*, and *Corylus americana* are typical shrubs. The herbaceous layer is well-developed. The most abundant species include *Adiantum pedatum, Arisaema triphyllum, Claytonia virginica, Dicentra canadensis, Dryopteris intermedia, Galium aparine, Maianthemum canadense* (in the north), *Maianthemum racemosum, Menispermum canadense, Osmorhiza claytonii, Phegopteris hexagonoptera* (in the south), *Podophyllum peltatum, Polygonatum biflorum, Sanguinaria canadensis, Trillium grandiflorum*, and *Viola* spp.

Stands of this alliance are found on flat, rolling, or, in the south, dissected topography. South of the limit of glaciation there is an increasing tendency for this alliance to be found on north- or east-facing slopes. The soils are fertile well-drained, silt, silt loam, sandy loam, or loam. Those in the north have formed over glacial till almost exclusively, while stands south of the limit of Wisconsin glaciation may form from till, alluvium, sandstone, or shale.
Range: This alliance is found in southern Michigan, Ohio, Indiana, Illinois, eastern Missouri, Kentucky,

Tennessee, Pennsylvania, New York, West Virginia, and possibly Arkansas (?), Maryland (?), and Virginia (?). It is also found in Canada in southern Ontario.
States/Provinces: AL AR? CT GA IL IN KY LA? MD MI MO MS NY OH ON PA SC TN VA WV
TNC Ecoregions: 36:C, 38:C, 42:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 52:C, 57:C, 58:C, 59:C, 61:C
USFS Ecoregions: 212Fa:PP?, 212Fb:PPP, 212Ga:PPP, 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, 221Fc:CCC, 221Ha:CCP, 221Hb:CCC, 221He:CCP, 221I:CP, 221J:CC, 222Ak:CP?, 222Ao:CPP, 222Aq:CPP, 222Ca:CCP, 222Cb:CCC, 222Cc:CCC, 222Cg:CCC, 222Ch:CCP, 222Da:CCC, 222Db:CCC, 222Dc:CCC, 222De:CCC, 222Df:CCC, 222Dg:CCC, 222Dh:CCP, 222Di:CCC, 222Eb:CCC, 222Eg:CCC, 222Eh:CCC, 222Ei:CCC, 222Ek:CCC, 222El:CCC, 222Em:CCC, 222En:CCP, 222Eo:CCC, 222Fa:CCP, 222Fb:CCC, 222Fc:CCC, 222Fd:CCC, 222Fe:CCC, 222Ff:CCC, 222Ga:CCC, 222Gc:CCC, 222Gd:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCC, 222Hd:CCC, 222Hf:CCC, 222Ia:CC?, 222Ib:CC?, 222Ic:CC?, 222Id:CCP, 222If:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Jd:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Kj:CCC, 231Ac:CCP, 231Ae:CCC, 231Af:CCC, 231Ah:CCP, 231Ai:CCP, 231Ba:CC?, 231Bb:CC?, 231Bc:CCP, 231Bd:CCP, 231Be:CCP, 231Bf:CC?, 231Bh:CCP, 231Bk:CCP, 231Cd:CCC, 232Br:CCC, 234Ab:CCC, 234Ac:CCC, 234An:CCP, 251De:CCC, M221Aa:CC?, M221Ab:CCP, M221Ac:CCC, M221Ad:CCP, M221Ba:CCC, M221Bb:CCC, M221C:C?, M221Da:CPP
Federal Lands: NPS (Colonial, Shiloh); TVA (Tellico); USFS (Bankhead, Chattahoochee?, Cherokee?, Daniel Boone, Jefferson, Land Between the Lakes, Talladega, Tuskegee)
Synonymy: IA5d. Typic Mesophytic Forest (Allard 1990); Mixed Mesophytic Forest, in part (Foti 1994b); Deep soil mesophytic forest, in part (Evans 1991); Acidic mesophytic forest, in part (Evans 1991); Coastal Plain mesophytic cane forest. ? (Evans 1991); Sugar Maple-Beech-Tulip Poplar HR (Pyne 1994); *Acer/Fagus/Liriodendron/Quercus* (Pyne 1994); T1B4aI1c. *Fagus grandifolia - Acer* spp. (*rubrum, saccharum*) - *Liriodendron tulipifera* (Foti et al. 1994); Beech - Sugar Maple: 60, in part (Eyre 1980); Beech - Maple association (Braun 1950); Western Mesophytic Forest Region, in part (Braun 1950); *Fagus grandifolia - Acer saccharum - Podophyllum peltatum* association. Ohio (Pell and Mack 1977); Eastern Broadleaf Forests: 102: Beech-Maple Forest (*Fagus-Acer*) (Kuchler 1964); Tuliptree - beech - maple forest (Fike 1999); Dry-Mesic Acidic Central Forest (Smith 1991); Mesic Central Forest (Smith 1991)
References: Allard 1990, Andreu and Tukman 1995, Braun 1950, Cobbe 1943, Dodge and Harman 1985, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Kuchler 1964, Martin 1975, Muller 1982, Pell and Mack 1977, Pyne 1994, Rogers 1981, Schmalzer 1978, Schmalzer and DeSelm 1982, Schmalzer et al. 1978, Smith 1991
Authors: D. FABER-LANGENDOEN/D.J., RW, Midwest **Identifier:** A.227

FAGUS GRANDIFOLIA - ACER SACCHARUM - LIRIODENDRON TULIPIFERA UNGLACIATED FOREST
American Beech - Sugar Maple - Tuliptree Unglaciated Forest
Beech - Maple Unglaciated Forest **G4? (96-10-03)**
Ecological Group (SCS;MCS): Interior Highlands Mesic Hardwood Forests (425-05; 2.5.3.9)
Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)

Concept: This beech - maple forest is found in unglaciated areas of the east-central United States. Stands occur on unglaciated terraces and mesic slopes of maturely dissected plateaus and submontane regions. The aspect is neutral on sandy alluvial terraces and is northern to eastern on slopes. Soils are moderately well-drained, moist, rich and deep (100+ cm). The vegetation is dominated by a closed-canopy forest with a well-developed tall-shrub layer. The forest canopy is dominated by *Fagus grandifolia* and *Acer saccharum*. Other canopy species include *Liriodendron tulipifera, Liquidambar styraciflua, Fraxinus americana, Quercus rubra, Carya glabra* and *Carya cordiformis*. Shrubs commonly found in this community are *Asimina triloba* and *Lindera benzoin*. Herbaceous species are diverse, forming a dense cover. They include *Adiantum pedatum, Arisaema triphyllum, Asarum canadense, Carex blanda, Dicentra canadensis, Dioscorea quaternata, Galium circaezans, Menispermum canadense, Phegopteris hexagonoptera, Polystichum acrostichoides*, and *Sanguinaria canadensis*. The large size of dominant canopy species (over 30 m tall), herbaceous diversity, and accumulated litter emphasize the high degree of mesophytism. Community occurrences have been extensively logged, and the canopy openings favor regeneration of *Acer saccharum*. In the Appalachians of eastern Kentucky, other typical trees include *Aesculus flava* (locally abundant), *Juglans cinerea, Juglans nigra, Magnolia acuminata, Quercus muehlenbergii*, and *Ulmus rubra*.
Comments: Braun (1950, p. 141-150) describes these beech - maple forests in the Hill Section of her Western Mesophytic Forest Region. Dry-mesic forests, in which *Quercus alba, Quercus rubra*, and *Carya ovata* dominate,

often have American beech and sugar maple regeneration due to an increased availability of moisture when mature oaks are removed. Where logging is heavy in these oak - hickory stands, second-growth regeneration is often dominated by sugar maple and, to a lesser extent, American beech. Classification under these circumstances can be difficult. Conversely, where sugar maple is selectively removed by logging, American beech can occur in pure stands. Forests from the southern part of Crowley's Ridge (Arkansas) are placed in *Fagus grandifolia - Quercus alba - Liriodendron tulipifera / Hydrangea arborescens / Schisandra glabra* Forest (CEGL004663), where *Acer saccharum* is not a big component and *Quercus alba* is more common. This type may apply to other parts of Crowley's Ridge, but more information is needed.
Range: This beech - maple forest is found in unglaciated areas of the east-central United States, ranging from southern Pennsylvania and Maryland southwest to southeastern Missouri, Kentucky and Tennessee, and possibly Arkansas. This community occupies mesic slopes of maturely dissected plateaus and submontane regions of the east-central United States. These sites were not covered by Wisconsin era glaciers.
States/Provinces: AR?, IL:S?, IN:S?, KY:S2S3,S2, MD?, MO:S?, OH:S?, PA:S?, TN:S?, WV:S?
TNC Ecoregions: 38:C, 42:C, 43:C, 44:C, 45:C, 49:C, 50:P, 59:C
USFS Ecoregions: 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Eg:CCC, 221Ha:CCP, 221Hb:CCC, 221He:CCP, 221I:CP, 221J:CP, 222Ak:CP?, 222Ao:CPP, 222Aq:CPP, 222Ca:CPP, 222Ch:CPP, 222Db:CCC, 222Dc:CCC, 222De:CCC, 222Df:CCC, 222Dh:CCP, 222Di:CCC, 222Ei:CCC, 222Ek:CCC, 222El:CCC, 222Em:CCC, 222En:CCP, 222Eo:CCP, 222Fa:CCP, 222Fb:CCC, 222Fc:CCC, 222Fd:CCC, 222Fe:CCC, 222Ff:CCC, 222Gc:CCC, 222Gd:CCP, 222Hc:CCC, 234Ab:CCC, 234Ac:CCC, 234An:CCP, M221Ab:CCP, M221Ac:CCC, M221Ad:CCP, M221Ba:CCC, M221Bb:CCC, M221Da:CPP
Federal Lands: USFS (Daniel Boone?, Land Between the Lakes)
Synonymy: UNESCO FORMATION CODE: I.B.3a (UNESCO 1973) B, Eastern Broadleaf Forests: 102: Beech-Maple Forest (*Fagus-Acer*) (Kuchler 1964) B, Western Mesophytic Forest (Braun 1950) I. The terms "western mesophytic" and "mesic upland" rely upon moisture and topographic position to establish community boundaries., Beech - Maple Forest (Braun 1950) I. The "Beech - Maple Forest" community also includes a significant forest community type of the glaciated mesic forests of the northeastern United States., *Fagus - Acer saccharum - Liriodendron / Rhus radicans* community (Voigt and Mohlenbrock 1964) =, Beech-maple-tuliptree forest (matrix, large patch) (CAP pers. comm. 1998), *Fagus grandifolia - Acer saccharum* type (Franklin et al. 1993), Beech - Sugar Maple: 60 (Eyre 1980) B. Beech - Maple Unglaciated Subtype., Terrestrial: Forest: Hardwood (TNC 1985) B
References: Behler 1988, Braun 1950, Bull and Farrand 1977, CAP pers. comm. 1998, Campbell 2001, Clark and Hutchinson 1994, Craighead 1949, Duncan and Duncan 1988, Evans 1991, Eyre 1980, Faircloth 1971, Fike 1999, Fralish 1987, Fralish 1988b, Franklin et al. 1993, Illinois Nature Preserve Commission 1973, Jenkins and Pallardy 1993, Kuchler 1964, Little 1980, Mohlenbrock 1986, Niering 1979, Schafale and Weakley 1985, Schwartz and Schwartz 1959, Society of American Foresters 1967, TNC 1985, TNC 1995a, UNESCO 1973, Voigt and Mohlenbrock 1964, White and Madany 1978
Authors: M. Guetersloh, mod. D. Faber-Langendoen 04-00, MCS **Confidence:** 2 **Identifier:** CEGL002411

FAGUS GRANDIFOLIA - LIRIODENDRON TULIPIFERA - CARYA CORDIFORMIS / LINDERA BENZOIN / PODOPHYLLUM PELTATUM FOREST

American Beech - Tuliptree - Bitternut Hickory / Northern Spicebush / May-apple Forest
Northern Coastal Plain/Piedmont Basic Mesic Hardwood Forest **G4? (02-05-09)**

Concept: This association comprises luxuriant mesophytic forests of deep, sheltered ravines with base-rich soils in the northern portions of the Coastal Plain and adjacent Piedmont. In the Piedmont, these soils are derived from amphibolite and other mafic rocks. Coastal Plain habitats are in ravines that have downcut into Tertiary shell deposits or limesands. *Fagus grandifolia* and *Liriodendron tulipifera* are the principal canopy dominants, with *Carya cordiformis* and *Quercus rubra* as constant associates. Additional trees that may be locally important are *Juglans nigra, Ulmus rubra, Quercus alba, Quercus muehlenbergii*, and *Fraxinus americana*. Stands typically have dense understories dominated by *Asimina triloba* and *Lindera benzoin*. Herb layers are lush, but tend to be characterized by patch-dominance of clonal forbs and ferns. *Podophyllum peltatum, Arisaema triphyllum, Circaea lutetiana ssp. canadensis, Maianthemum racemosum ssp. racemosum*, and *Polystichum acrostichoides* are widespread and abundant herbs. More locally abundant herbs include *Cystopteris protrusa, Deparia acrostichoides, Diplazium pycnocarpon, Actaea racemosa (= Cimicifuga racemosa), Phegopteris hexagonoptera, Nemophila aphylla*, and *Actaea pachypoda*. Many additional low-cover herbaceous species are present in plot-sampled stands.
Comments: This association is based on the analysis of plot data from 12 stands in Caroline, Fluvanna,

Gloucester, Hanover, Stafford, Surry, and York counties, VA. Homogeneity = 0.642. Mean species richness = 51. This community type occurs in small to large patches, and is likely to be somewhat locally but widely distributed in the Piedmont from Virginia northward. Coastal Plain occurrences are probably very local. The scarcity of oaks, and the abundance of *Fagus* and *Liriodendron*, in documented stands may be artifacts of past logging. An outstanding occurrence of this association, containing scattered residual trees 1.0-1.5 m dbh, has been documented at Crow's Nest, Stafford County, VA. Similar vegetation is reported from calcareous ravines in southern Maryland by Rod Simmons. Comparable stands also occur in Rock Creek Park, Washington, DC (G. Fleming pers. obs.).
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 52:C, 57:C, 58:C
USFS Ecoregions: 231Ae:CCC, 231Af:CCC, 232Br:CCC
Federal Lands: NPS (Colonial)
References: Fleming et al. 2001, Fleming unpubl. data
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006055

I.B.2.N.a.17. FAGUS GRANDIFOLIA - QUERCUS RUBRA - QUERCUS ALBA FOREST ALLIANCE

American Beech - Northern Red Oak - White Oak Forest Alliance

Concept: Forests in this alliance occur in non-montane or low-elevation montane mesic situations and are dominated by *Fagus grandifolia* typically with some combination of *Quercus rubra* and/or *Quercus alba*. Associated canopy and subcanopy species can include *Liriodendron tulipifera, Acer saccharum, Magnolia tripetala, Magnolia acuminata* (Ozarks), *Tilia americana var. americana* (Ozarks), *Tilia americana var. heterophylla, Quercus muehlenbergii, Acer rubrum, Cornus florida, Ostrya virginiana, Aesculus sylvatica*, and *Ilex opaca*. Some of these forests, particularly in the Piedmont of South Carolina, the southern Ridge and Valley of Alabama, or in Arkansas, may contain *Acer barbatum* instead of *Acer saccharum*. Shrubs in this alliance include *Vaccinium stamineum, Viburnum rafinesquianum, Euonymus americana*, and, in some occurrences, *Kalmia latifolia*. The herb layer can be relatively lush with such species as *Polystichum acrostichoides, Galium circaezans, Hexastylis arifolia, Hexastylis minor, Desmodium nudiflorum, Erythronium umbilicatum ssp. umbilicatum, Hepatica nobilis var. obtusa, Epifagus virginiana, Tiarella cordifolia var. collina, Trillium* spp., *Heuchera americana, Stellaria pubera, Podophyllum peltatum, Botrychium virginianum*, and others present. These forests often occur on concave and sheltered landforms such as north-facing slopes, low slopes, high terraces along streams, and possibly other situations. The core concept of the range of this alliance includes areas inland from the Coastal Plain, as *Quercus rubra* is absent from large areas of the Coastal Plain (as in North Carolina). Forests in this alliance occur in the Cumberlands and Southern Ridge and Valley, Piedmont and Interior Low Plateau, and on protected slopes and ravines in the Ozarks, central Ouachita Mountains, and Arkansas Valley.
Comments: The relationship between this alliance and I.B.2.N.a *Fagus grandifolia - Quercus alba* Forest Alliance (A.228) needs to be clarified. There may be some problems with assignment of associations where *Quercus rubra* does, in fact, enter the Coastal Plain, as in parts of Virginia, Alabama, and western Georgia. Vegetation from this alliance is known from Ozark and Ouachita national forests RNAs (Roaring Branch and Dismal Hollow) and occurs on the Shoal Creek District of the Talladega National Forest. One association, the "Piedmont American Beech Heath Bluff" (CEGL004539) ranges peripherally into the Coastal Plain (ECO57).
Range: The core concept of the range of this alliance includes areas inland from the Coastal Plain, as *Quercus rubra* is absent from large areas of this region. Forests in this alliance occur in the Cumberlands and Southern Ridge and Valley, Piedmont, and Interior Low Plateau, and on protected slopes and ravines in the Ozarks, central Ouachita Mountains, and Arkansas Valley. This alliance is known from the states of Alabama, Arkansas, Delaware, Georgia, Kentucky, Massachusetts, Maryland, North Carolina, New Jersey, New York, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Virginia, and West Virginia. It may possibly occur in southern Indiana and Connecticut.
States/Provinces: AL AR CT DE GA IN? KY MA MD NC NJ NY OH OK PA RI SC TN VA WV
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Dc:CPP, 221Ea:CCC, 221Ef:CCP, 221Eg:CCP, 221Ha:CCC, 221Hc:CCP, 221Hd:CCP, 221He:CCC, 221Ja:CCP, 221Jb:CC?, 221Jc:CCP, 222Ab:CCC, 222Ag:CCC, 222An:CCC, 222Cb:CC?, 222Cc:CC?, 222Cd:CC?, 222Ce:CC?, 222Cf:CC?, 222Cg:CC?, 222Da:CCP, 222Db:CCP, 222Dc:CCP, 222Dd:CCP, 222De:CCP, 222Dg:CC?, 222Di:CC?,

222Dj:CC?, 222Ea:CCC, 222Eb:CCC, 222Ec:CC?, 222Ee:CCP, 222Ef:CCP, 222Eg:CCC, 222Eh:CCP, 222Ei:CCP, 222Ej:CCP, 222Ek:CCP, 222Em:CCP, 222En:CCP, 222Eo:CCP, 222F:CC, 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ag:CCC, 231Ah:CCC, 231Ai:CCC, 231Aj:CCC, 231Ak:CCP, 231Am:CCP, 231An:CCC, 231Ao:CCC, 231Ba:C??, 231Bb:C??, 231Be:C??, 231Bg:C??, 231Bh:C??, 231Bi:C??, 231Bk:C??, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCC, 231Db:CCC, 231Dc:CCC, 231Dd:CCC, 231Gb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCP, 232Bz:CCC, 232C:CC, 234Ab:PPP, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC
Federal Lands: COE (Falls Lake, Jordan Lake, Kerr Reservoir); DOD (Fort Benning); NPS (Buffalo, Guilford Courthouse, Mammoth Cave, Ninety Six, Rock Creek, Shiloh, Thomas Stone); TVA (Tellico); USFS (Bankhead, Chattahoochee, Cherokee?, Conecuh, Daniel Boone, Homochitto, Jefferson?, Land Between the Lakes, Ouachita, Ozark, Sumter, Talladega, Tuskegee, Uwharrie)
Synonymy: IA5g. Typic Mesic Piedmont Forest, in part (Allard 1990); Mixed Mesophytic Forest, in part (Foti 1994b); Piedmont Mesic Broad-leaved Deciduous Forest (Ambrose 1990a); Mesic Mixed Hardwood Forest, Piedmont Subtype (Schafale and Weakley 1990); Appalachian mesophytic forest, in part (Evans 1991); Beech RV. ? (Pyne 1994); T1B4aI1a. *Fagus grandifolia - Magnolia tripetala* (Foti et al. 1994); T1B4aI1b. *Fagus grandifolia - Acer saccharum - Quercus* spp. (*alba, muehlenbergii, rubra*) (Foti et al. 1994); Beech - Sugar Maple: 60, in part (Eyre 1980); Northern Red Oak: 55, in part (Eyre 1980); Maritime Oak - Holly Forest / Woodland (Swain and Kearsley 2001); Coastal Forest/Woodland (Swain and Kearsley 2001)
References: Allard 1990, Ambrose 1990a, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Golden 1979, Jones 1988a, Jones 1988b, Martin and Smith 1991, Pyne 1994, Schafale and Weakley 1990, Swain and Kearsley 2001, USFS 1990
Authors: D.J. ALLARD, MOD. A.S. WE, RW, Southeast **Identifier:** A.229

FAGUS GRANDIFOLIA - QUERCUS ALBA - LIRIODENDRON TULIPIFERA - CARYA SPP. FOREST
American Beech - White Oak - Tuliptree - Hickory species Forest
Northeastern Beech - White Oak Forest **G? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Acid Hardwood Slope Forests (307-10; n/a)

Concept: This forest of mesic to dry-mesic soils, found in the northern Piedmont and adjacent ecoregions, is characterized by a mixed canopy of *Quercus alba, Quercus falcata, Quercus rubra, Quercus coccinea, Fagus grandifolia, Carya glabra, Carya alba, Liriodendron tulipifera, Sassafras albidum*, and *Liquidambar styraciflua*. *Diospyros virginiana, Nyssa sylvatica, Fraxinus americana*, and *Ilex opaca* occur in the northern edge of the range. The subcanopy is characterized by *Carpinus caroliniana* and *Cornus florida*. The shrub layer is well-developed and can include *Viburnum acerifolium, Viburnum dentatum*, and *Euonymus americana*. Heath shrubs, such as *Vaccinium corymbosum* and *Vaccinium pallidum*, may be common, but not abundant. Vines are common, including *Parthenocissus quinquefolia, Smilax glauca*, and *Toxicodendron radicans*. The herb layer is comprised of *Polystichum acrostichoides, Uvularia perfoliata, Cypripedium acaule, Mitchella repens, Tipularia discolor, Goodyera pubescens, Eurybia divaricata (= Aster divaricatus), Chimaphila maculata, Carex swanii, Medeola virginiana, Athyrium filix-femina, Carex digitalis, Carex willdenowii, Epifagus virginiana, Maianthemum canadense, Desmodium nudiflorum*, and *Polygonatum biflorum*. *Podophyllum peltatum, Arisaema triphyllum*, and *Maianthemum racemosum (= Smilacina racemosa)* can occur in more northern examples.
Comments: "This type needs a little nomenclatural revision, but is basically a very robust 'mesic mixed hardwood' association. It occurs in the Chesapeake Bay Lowlands and Piedmont ecoregions, but NOT in the Mid-Atlantic Coastal Plain, as far as I know. It grades into other mesic mixed hardwood associations in the southern part of the CBL and the Piedmont" (G. Fleming pers. comm. 2003).
Range: Currently described from Virginia northward to New Jersey and southeastern Pennsylvania.
States/Provinces: DE:S5, MD:S?, NJ:S3, PA:S1, VA:S?
TNC Ecoregions: 52:C, 58:C, 61:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCP, 232Bz:CCC, 232C:C?
Federal Lands: NPS (Rock Creek)
Synonymy: Maritime forest (Rawinski 1984), Southern New England oak / pine forest on sandy / gravelly soils (Rawinski 1984). in part, CNE Mesic hardwood Forest on acidic bedrock / till (Rawinski 1984). in part, Mesic Coastal Plain mixed oak forest, mixed oak - beech forest subtype (Breden 1989). in part, *Quercus* spp. - *Carya* spp. / *Cornus florida - Ilex opaca* Mesic Forest (Clancy 1993b), Coastal Plain Forest (Smith 1983) B. in part, Mixed oak forest of the south Jersey mesic uplands (Robichaud and Buell 1973), *Fagus grandifolia - Liriodendron tulipifera - Quercus (alba, rubra) / Polystichum acrostichoides - Aster divaricatus* Forest (Fleming 2001), *Fagus*

grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / Ilex opaca var. opaca - (Asimina triloba) Forest (Patterson pers. comm.)
References: Berdine 1998, Bernard and Bernard 1971, Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1993b, Davis et al. 1992, Fleming 2001, Fleming et al. 2001, Fleming pers. comm., McCoy and Fleming 2000, Patterson pers. comm., Rawinski 1984, Robichaud and Buell 1973, Smith 1983
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006075

FAGUS GRANDIFOLIA - QUERCUS RUBRA / CORNUS FLORIDA / POLYSTICHUM ACROSTICHOIDES - HEXASTYLIS VIRGINICA FOREST

American Beech - Northern Red Oak / Flowering Dogwood / Christmas Fern - Virginia Heartleaf Forest
Piedmont Acidic Mesic Mixed Hardwood Forest **G3G4 (01-01-18)**
Ecological Group (SCS;MCS): Appalachian Highlands Mesic Acid Hardwood Forests (420-10; n/a)

Concept: This association represents the more typical mesic mixed hardwood forest of the Piedmont. The canopy of stands of this association is dominated by mesophytic trees such as *Fagus grandifolia, Quercus rubra, Liriodendron tulipifera, Acer rubrum*, and in the western Piedmont, *Tsuga canadensis*. Typical understory trees include *Cornus florida, Oxydendrum arboreum, Acer rubrum*, and *Ilex opaca*. Shrub species may include *Vaccinium stamineum, Viburnum rafinesquianum, Euonymus americana*, and sometimes *Kalmia latifolia*. The herb layer is often moderately dense and diverse, though it may be sparse under heavy shade. Herb species may include *Polystichum acrostichoides, Viola* spp., *Dichanthelium* spp. (= *Panicum* spp.), *Galium circaezans, Hexastylis arifolia, Hexastylis minor, Desmodium nudiflorum, Erythronium umbilicatum ssp. umbilicatum, Chamaelirium luteum, Epifagus virginiana, Tiarella cordifolia var. collina, Heuchera americana, Stellaria pubera, Podophyllum peltatum, Prenanthes serpentaria, Thalictrum thalictroides, Chrysogonum virginianum var. virginianum, Hepatica nobilis var. obtusa, Thelypteris noveboracensis*, and *Botrychium virginianum*. Exact composition varies locally with position on slope and nature of soil. Western Piedmont sites often have increasing importance of *Tsuga canadensis, Rhododendron* spp., and other species that are more typical of the Southern Blue Ridge.
Range: This association is found in the Piedmont of the southeastern United States.
States/Provinces: GA:S?, MD:S?, NC:S4, SC:S?, VA:S?
TNC Ecoregions: 52:C, 58:C
USFS Ecoregions: 231Aa:CCC, 231Ae:CCC
Federal Lands: COE (Falls Lake, Jordan Lake, Kerr Reservoir); NPS (Guilford Courthouse, Ninety Six, Thomas Stone); USFS (Uwharrie)
Synonymy: *Fagus grandifolia - Quercus (alba, rubra) - Liriodendron tulipifera / Ilex opaca var. opaca - (Asimina triloba)* Forest (Fleming pers. comm.), *Fagus grandifolia - Quercus rubra - Quercus alba / Carpinus caroliniana* Forest (Lea 2002a)
References: Fleming 2001, Fleming et al. 2001, Fleming pers. comm., LeGrand and Dalton 1987, Lea 2002a, Nehmeth 1968, Oosting 1942, Peet and Christensen 1980, Peet et al. 2002, Schafale and Weakley 1990, Skeen et al. 1980
Authors: M.P. Schafale, SCS **Confidence:** **Identifier:** CEGL008465

QUERCUS ALBA - FAGUS GRANDIFOLIA WESTERN ALLEGHENY PLATEAU FOREST

White Oak - American Beech Western Allegheny Plateau Forest
Western Allegheny Oak - Beech Forest **G? (97-12-31)**

Concept: This white oak - beech forest of the Western Allegheny Plateau occurs on deep, fine-textured soils of coves. *Quercus alba* is dominant, with associates including *Fagus grandifolia, Acer rubrum, Quercus rubra, Nyssa sylvatica*, and *Carya*. The subcanopy is characterized by *Fagus grandifolia, Acer rubrum, Acer saccharum*, and *Carya glabra*. The shrub layer is made up of *Cornus florida, Ostrya virginiana*, and *Castanea dentata*. The herbaceous layer is comprised of *Goodyera repens, Dioscorea quaternata, Polystichum acrostichoides, Ageratina altissima, Arisaema triphyllum, Actaea racemosa (= Cimicifuga racemosa), Carex blanda, Botrychium virginianum, Carex albursina, Polygonatum pubescens, Viola X palmata*, and *Prosartes lanuginosa (= Disporum lanuginosum)*.
Comments: See *Fagus grandifolia - Quercus alba / Cornus florida* Forest (CEGL007881), which may be synonymous with this type. Braun (1950, p. 63) describes a beech-white oak type, but noted that it overlaps considerably with the Beech-Maple Unglaciated Forest type, *Fagus grandifolia - Acer saccharum - Liriodendron*

tulipifera Unglaciated Forest (CEGL002411), in the Western Allegheny and Cumberland Plateau regions. It may be that CEGL002411 should be restricted primarily to Braun's Western Mesophytic Region (southern Illinois, southern Indiana, western Kentucky, western Tennessee) and this type primarily to the Mixed Mesophytic Region. However, Ohio ecologists (e.g., Gordon 1969, Anderson 1996) have generally recognized an unglaciated beech-maple-tuliptree type in the Western Allegheny region of southeastern Ohio, rather than a white oak-beech type. Fike (1999) also recognizes a "tuliptree-beech-maple" type for this region, but makes no mention of a white oak-beech type. The white oak-beech type may be more important southward. Braun's Beech-White Oak type from southwestern Ohio and southeastern Indiana, an Illinoisan till plain flatwoods type, *Fagus grandifolia - Quercus alba - (Quercus michauxii) - Acer rubrum* Flatwoods Forest (CEGL005015), should not be confused with this type [see Braun 1950, p. 133, Braun 1936].
Range: This forest community is found primarily on lower slopes of the Western Allegheny Plateau and Cumberland Mountains in the eastern U.S.
States/Provinces: MD?, OH:S?, WV:S?
TNC Ecoregions: 49:C
USFS Ecoregions: 221Ea:CCC, 221Ef:CCP, 221Eg:CCP
References: Anderson 1996, Braun 1936, Braun 1950, Gordon 1969, WVNHP n.d. (b)
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006144

I.B.2.N.a.24. LIRIODENDRON TULIPIFERA FOREST ALLIANCE
Tuliptree Forest Alliance

Concept: This alliance includes deciduous forests dominated by *Liriodendron tulipifera*, primarily in areas which were once clearcut, old fields, or cleared by fire or other natural disturbances. These non-wetland forests are also found along mesic stream terraces and on upland mountain benches. Forests in this alliance are abundant in the central and southern Appalachians, below 3000 feet (900 m) elevation, usually associated with disturbance and on the most productive sites, but also occur in the Coastal Plain, Piedmont, Ridge and Valley, and Cumberland Plateau. This alliance includes pure, often even-aged stands of *Liriodendron tulipifera* as well as forests with *Liriodendron tulipifera* associated with other species favored by canopy openings. Associated species vary with geographic location. Throughout most of the range of this alliance, *Acer rubrum, Robinia pseudoacacia, Betula lenta, Acer saccharum*, and *Acer negundo* are common components. In the Piedmont and Coastal Plain, *Liquidambar styraciflua* is a common associate. In the Appalachians, *Halesia tetraptera, Tsuga canadensis, Tilia americana var. heterophylla (= Tilia heterophylla), Prunus serotina var. serotina*, and *Magnolia fraseri* can be additional components. In the Ridge and Valley and Cumberland Plateau, additional species include *Quercus rubra, Magnolia acuminata, Carya alba, Carya glabra, Pinus virginiana, Sassafras albidum, Pinus strobus, Carpinus caroliniana, Asimina triloba*, and *Staphylea trifolia*. Herbaceous strata are not diverse and, in the southern Appalachians, this feature distinguishes these forests from rich cove forests in I.B.2.N.a *Liriodendron tulipifera - Tilia americana var. heterophylla - Aesculus flava - Acer saccharum* Forest Alliance (A.235). Vines can be abundant including *Vitis* spp., *Smilax* spp., *Aristolochia macrophylla*, and *Parthenocissus quinquefolia*. Forests in this alliance occur on middle to lower slopes, sheltered coves and gentle concave slopes, and river terraces over various soils and geologies. Vegetation of this alliance is uncommon in Louisiana.
Range: This alliance is found in Alabama, Georgia, Kentucky, Louisiana, Mississippi (?), North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia. Forests in this alliance are abundant in the central and southern Appalachians, below 3000 feet (900 m) elevation, but also occur in the Coastal Plain, Piedmont, Ridge and Valley, and Cumberland Plateau.
States/Provinces: AL GA KY MD NC PA SC TN VA WV
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 53:P, 58:C, 59:C
USFS Ecoregions: 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Jb:CCC, 222C:CC, 222D:CC, 222Eb:CCC, 222Ed:CCP, 222En:CCC, 222Eo:CCC, 231Aa:CCP, 231Ae:CCC, 231Bc:CCC, 231Cd:CCC, 231Dc:CCC, 232B:CC, 232D:CP, 234Ab:CCC, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC
Federal Lands: DOD (Arnold, Fort Benning); NPS (Blue Ridge Parkway, Cowpens, Great Smoky Mountains, Guilford Courthouse, Harpers Ferry, Kennesaw Mountain, Kings Mountain, Rock Creek, Shenandoah, Shiloh); TVA (Tellico); USFS (Apalachicola, Bankhead, Bienville, Chattahoochee, Cherokee, Conecuh, Daniel Boone, De Soto, George Washington, Holly Springs, Homochitto, Jefferson, Nantahala, Ocala, Oconee?, Osceola, Pisgah, St. Francis, Sumter, Talladega, Tombigbee, Tuskegee)
Synonymy: Yellow-Poplar: 57, in part (Eyre 1980)
References: Andreu and Tukman 1995, Eyre 1980, Gallyoun et al. 1996, Golden 1974, Horn 1980, McGee and

Hooper 1970, Phillips and Shure 1990, Schmalzer 1978, Thomas 1966
Authors: D.J. ALLARD, RW, Southeast **Identifier:** A.236

LIRIODENDRON TULIPIFERA - ACER (NEGUNDO, RUBRUM) / ASIMINA TRILOBA FOREST
Tuliptree - (Box-elder, Red Maple) / Common Pawpaw Forest
Successional Tuliptree / Pawpaw Forest **G4G5 (01-04-19)**
Ecological Group (SCS;MCS): Semi-natural Wooded Uplands (900-40; 8.0.0.1)

Concept: This association includes successional wet to mesic forests occurring in bottoms and on low slopes of the Appalachians and Interior Low Plateau with *Acer negundo* and *Liriodendron tulipifera* each contributing 25-75% of the total canopy cover. In some examples, *Acer rubrum* may also contribute to the canopy cover. *Asimina triloba* is present in the subcanopy or shrub strata where it makes up 5-50% of the total cover. *Liriodendron tulipifera* may share dominance with *Acer rubrum* in the canopy of some examples. The exotic grass *Microstegium vimineum* often dominates the herbaceous layer. These stands are apparently successional following intensive timber removal and also occur on old pastures. This vegetation is probably extensive in the Ridge and Valley, Interior Low Plateaus, and related provinces. Related vegetation is possible in the Chesapeake Bay region.
Comments: This element may actually represent a combination of temporarily flooded (stands with *Acer negundo*) and upland (stands with *Acer rubrum*) components. Described from Tellico Pilot Project (Ridge and Valley of northeastern Monroe County, Tennessee; 31 stands sampled), where this forest occurs along intermittent streams draining into Tellico Lake and on slopes of intermittent to ephemeral draws on the higher reaches of these streams (Andreu and Tukman 1995). Species composition was found to vary between these two topographic situations. This type represents mesic forest succession on areas cleared prior to Tellico Lake creation in 1979.
Range: This type is found in the Appalachians and Interior Low Plateau from Maryland and Pennsylvania west and south to Kentucky and Tennessee.
States/Provinces: KY?, MD:S?, PA:S?, TN:S?, VA:S?, WV:S?
TNC Ecoregions: 44:C, 50:C, 58:?, 59:C
USFS Ecoregions: 221Jb:CCC, 222Eb:CCC, 222Ed:CCP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221D:C?
Federal Lands: NPS (Harpers Ferry); TVA (Tellico); USFS (Cherokee?)
References: Andreu and Tukman 1995, Fike 1999, Vanderhorst 2000b
Authors: SCS **Confidence:** 3 **Identifier:** CEGL007184

LIRIODENDRON TULIPIFERA - QUERCUS RUBRA - MAGNOLIA ACUMINATA / CORNUS FLORIDA FOREST
Tuliptree - Northern Red Oak - Cucumber-tree / Flowering Dogwood Forest
Central Appalachian Rich Cove Forest (Tuliptree - Northern Red Oak - Cucumber-tree Type) **G5? (01-06-21)**
Ecological Group (SCS;MCS): Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)

Concept: This Central Appalachian community type occurs throughout the Blue Ridge and Ridge and Valley portion of the Virginia mountains north of the New River and may extend throughout the central Appalachian portions of West Virginia, Maryland, and Pennsylvania. Stands occupy mesic hollow sideslopes, ravines, and slope concavities at elevations from 240-800 m (800-2600 feet) and exceptionally to 1000 m (3300 feet). Underlying bedrock is variable and probably exerts less influence on vegetation than local soil conditions. Stands are associated both with sheltered sites on poor substrates, such as acidic sandstones, and with warmer, more exposed coves on fertile substrates. Vegetation consists largely of post-logging secondary forests with tall (>30 m), well-formed canopy trees. *Liriodendron tulipifera* is the characteristic, usually dominant canopy species in mixed stands with *Magnolia acuminata, Quercus rubra, Acer rubrum*, and *Carya ovalis*. *Quercus prinus (= Quercus montana), Fraxinus americana, Betula lenta, Tilia americana* (including both *var. americana* and *var. heterophylla*), *Carya glabra, Carya alba*, and *Quercus alba* are minor canopy associates. Understory tree layers are very open and contain young reproduction of the canopy species along with *Cornus florida* (often dominant) and *Ostrya virginiana*. *Cornus florida, Viburnum acerifolium*, and climbing or scrambling *Parthenocissus quinquefolia* are usually the most abundant species of a sparse shrub layer. The herb layer varies in density from open to moderately dense, but generally lacks the lush aspect of other communities in the Rich Cove and Slope Forests group.
Comments: Both in terms of floristics and soil fertility, this unit represents the least `rich' community type in the Rich Cove and Slope Forests group. Its classification and ecological interpretation are complicated by past

logging, which in most situations has greatly favored the reproduction of the shade-intolerant *Liriodendron tulipifera* and *Magnolia acuminata*. Yet, there does not seem to be a consistent or obvious successional pattern in most stands of the association. Potential successors might include several *Quercus* spp., *Carya* spp., and *Tilia americana*. Given the current dominance and longevity of *Liriodendron tulipifera* and its persistence even in mature cove hardwood stands, successional change in this association will be slow.

Old *Castanea dentata* stumps and wood debris were recorded in some plots of this type. Although most forests of this association were cut long ago because of their accessibility and fine timber, a few small patches of old growth persist on the steep, hollowed slopes of Peters Mountain in Alleghany County (Fleming and Moorhead 2000). Based on an examination of these old stands, it appears that the original forest canopies on Peters Mountain were mixed associations of *Quercus rubra, Quercus prinus (= Quercus montana), Castanea dentata*, and *Liriodendron tulipifera*. The latter was probably able to maintain a position in these mixed forests because of its rapid growth and superior ability to colonize light gaps caused by downfalls (Busing 1995, Fowells 1965).
Range: This community type occurs throughout the Blue Ridge and Ridge and Valley portion of the Virginia mountains north of the New River. Its potential range extends throughout the central Appalachian portions of West Virginia, Maryland, and Pennsylvania.
States/Provinces: MD?, PA?, VA:S?, WV?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Aa:CCC, M221Ab:CCP, M221Da:CCC, M221Db:CCP, M221Dc:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: *Liriodendron tulipifera - Quercus rubra - Magnolia acuminata / Cornus florida* Forest (Fleming and Coulling 2001) =, *Liriodendron tulipifera - Magnolia acuminata / Cornus florida / Osmunda claytoniana* Forest (Fleming and Moorhead 2000), *Liriodendron tulipifera / Cornus florida / Lindera benzoin / Cimicifuga racemosa* Association, *pro parte* (Rawinski et al. 1996), Yellow-poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) B, Yellow-poplar: 57 (Eyre 1980) B
References: Busing 1995, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Fowells 1965, Rawinski et al. 1996
Authors: G. Fleming, ECS **Confidence:** 2 **Identifier:** CEGL008510

I.B.2.N.a.27. QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE

White Oak - (Northern Red Oak, Hickory species) Forest Alliance

Concept: This alliance is widely distributed in the eastern United States and portions of adjacent Canada and includes dry mesic to mesic upland oak forests dominated by *Quercus alba* and/or *Quercus rubra*, with or without *Carya* species. Stands are 15-25 m tall, with a closed, deciduous canopy. The shrub and herbaceous strata are typically well-developed. *Quercus alba* usually dominates the stands, either alone or in combination with *Quercus rubra* (especially on moister sites) and sometimes *Quercus velutina* (especially on drier sites). Some associations in this alliance are dominated by *Quercus rubra*, although *Quercus alba* is usually also a canopy component. *Carya* species (particularly *Carya alba, Carya glabra* or *Carya ovata*) are typically common either in the canopy or subcanopy. In the southeastern United States, this alliance covers dry-mesic forests of the Piedmont, low Appalachian Mountains, and the Cumberland and Interior Low Plateau, and mesic oak-hickory forests of the Blue Ridge and the interior highlands of the Ozarks and Ouachita Mountains. Associated species include *Carya glabra, Carya ovata, Carya alba, Fraxinus americana, Acer rubrum, Acer leucoderme, Cornus florida, Nyssa sylvatica, Ostrya virginiana, Calycanthus floridus, Pyrularia pubera, Tilia americana var. caroliniana, Oxydendrum arboreum*, and others. This alliance is found throughout the midwestern United States on moderately rich, upland sites. Typical associates include *Fraxinus americana, Ulmus americana, Tilia americana, Acer saccharum, Acer rubrum*, and more locally, *Quercus macrocarpa* and *Quercus ellipsoidalis*.

Stands are found on gentle to moderately steep slopes on uplands and on steep valley sides. The soils are moderately deep to deep and vary from silts to clays and loams. The parent material ranges from glaciated till to limestone, shale, sandstone and other bedrock types. In the midwestern United States, many stands are succeeding to types dominated by *Acer saccharum, Tilia americana, Acer rubrum*, and other mesic tree associates. This succession may be delayed by fire and grazing. In the eastern and southeastern United States, *Liriodendron tulipifera, Fraxinus americana, Acer rubrum*, and other mesic associates often increase after disturbances, such as clearcutting or windstorms, especially in the absence of fire.
Range: This alliance ranges from Ontario, Canada, throughout the midwestern and eastern United States, south to the very northern edges of the Western and Eastern Gulf Coastal Plains.
States/Provinces: AL AR CT DE GA IA IL IN KS KY MA MD ME MI MN MO MS? NC NE NH NJ NY OH OK ON

PA RI SC TN VA VT WI WV
TNC Ecoregions: 32:P, 35:C, 36:C, 37:C, 38:C, 39:C, 40:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:?, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions: 212Fb:CCP, 212Fc:CCC, 212Fd:CC?, 212Ga:CC?, 212Gb:CC?, 212Ht:CPP, 212Hx:CPP, 212Jj:C??, 212Ka:CC?, 212Kb:CCC, 212Mb:C??, 212Na:CCP, 212Nb:CC?, 212Nc:CCC, 212Nd:CC?, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCP, 221Fc:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221Hd:CCC, 221He:CCC, 221Ja:CCP, 221Jb:CCC, 222Aa:CCC, 222Ab:CCC, 222Ac:CCC, 222Ad:CCC, 222Ae:CCC, 222Af:CCC, 222Ag:CCC, 222Ah:CCC, 222Aj:CCC, 222Ak:CCC, 222Al:CCP, 222Am:CCC, 222An:CCC, 222Ao:CCC, 222Ap:CCC, 222Aq:CCC, 222Cb:CCC, 222Cc:CCC, 222Cd:CCC, 222Ce:CCC, 222Cf:CCC, 222Cg:CCC, 222Ch:CCC, 222Da:CCP, 222Db:CCC, 222Dc:CCC, 222Dd:CCP, 222De:CCC, 222Df:CCC, 222Dg:CCP, 222Dh:CCC, 222Di:CCC, 222Dj:CCP, 222Ea:CCC, 222Eb:CCC, 222Ec:CCC, 222Ed:CCC, 222Ee:CCC, 222Ef:CCC, 222Eg:CCC, 222Eh:CCC, 222Ei:CCC, 222Ej:CCP, 222Ek:CCC, 222Em:CCC, 222En:CCC, 222Eo:CCC, 222Fa:CCP, 222Fb:CCC, 222Fd:CCC, 222Fe:CCC, 222Ff:CCC, 222Ga:CCC, 222Gb:CCC, 222Gc:CCC, 222Ha:CCC, 222Hb:CCC, 222Hf:CCC, 222Id:CCP, 222If:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ke:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 222Lb:CCC, 222Lc:CCC, 222Le:CCC, 222Lf:CCC, 222Ma:CCC, 222Mb:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 222Qb:CCC, 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ag:CCC, 231Ah:CCC, 231Ak:CCC, 231Al:CCC, 231Am:CCC, 231An:CCC, 231Ao:CCC, 231Ap:CCC, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCC, 231Bg:CCP, 231Bh:CCP, 231Bk:CCP, 231Ca:CCC, 231Cb:CCC, 231Cc:CCC, 231Cd:CCC, 231Cf:CCC, 231Da:CCC, 231Dc:CCC, 231Dd:CCC, 231De:CCC, 231E:CC, 231Gb:CCC, 232Aa:CCC, 232Ac:CCP, 232Ad:CCC, 232Bq:CCC, 232Br:CCC, 232Bt:CCC, 232Bv:CCC, 232Bx:CCC, 232Ca:CCC, 232Cb:CCC, 234Ac:PPP, 251Aa:CCC, 251Ba:CCC, 251Be:CCC, 251Ca:CC?, 251Cb:CCC, 251Cc:CCC, 251Cd:CCC, 251Ce:CCC, 251Cf:CCC, 251Cg:CCC, 251Ch:CCC, 251Cj:CCC, 251Ck:CCC, 251Cn:CC?, 251Co:CC?, 251Cp:CCC, 251Cq:CCC, 251Dc:CCC, 251Dd:CCC, 251De:CCC, 251Df:CCC, 251Dh:CCP, 251Ea:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CC?, M212Eb:CC?, M221Aa:CCC, M221Bd:C??, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: COE (Dale Hollow?); DOD (Arnold, Fort Benning); DOE (Oak Ridge); NPS (Carl Sandburg Home, Chickamauga-Chattanooga, Cowpens, Great Smoky Mountains, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Natchez Trace, Russell Cave, Shenandoah, Shiloh); TVA (Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Land Between the Lakes, Mark Twain, Nantahala, Oconee, Ouachita, Ozark, Pisgah, St. Francis, Shawnee, Sumter, Talladega, Tuskegee?, Uwharrie)
Synonymy: IA6j. Interior Calcareous Oak - Hickory Forest, in part (Allard 1990); Mesic Oak - Hickory Forest, in part (Foti 1994b); Submesic broadleaf deciduous forest, in part (Ambrose 1990a); Oak - Chestnut - Hickory Forest, in part (Ambrose 1990a); Acidic mesophytic forest, in part (Evans 1991); Calcareous mesophytic forest, in part (Evans 1991); Dry-Mesic Oak--Hickory Forest (Schafale and Weakley 1990); Basic Oak--Hickory Forest, Mafic Substrate Variant, in part (Schafale and Weakley 1990); Montane Oak--Hickory Forest, in part (Schafale and Weakley 1990); Basic Oak - Hickory Forest (Nelson 1986); Permesotrophic Forest, in part (Rawinski 1992); Oak--Hickory Forest, in part (Nelson 1986); T1B4aIII. *Quercus rubra* - *Quercus* spp. (Foti et al. 1994); White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980); White Oak: 53, in part (Eyre 1980); Oak - Hickory Forest (Swain and Kearsley 2001)
References: Allard 1990, Ambrose 1990a, Andreu and Tukman 1995, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Fountain and Sweeney 1985, Fralish 1988b, Fralish et al. 1991, Golden 1979, Hoagland 1997, Jones 1988a, Jones 1988b, McLeod 1988, Monk et al. 1990, Nelson 1986, Oakley et al. 1995, Oosting 1942, Rawinski 1992, Robertson et al. 1984, Schafale and Weakley 1990, Swain and Kearsley 2001, Wharton 1978
Authors: D.J. ALLARD/D. FABER-LANG, RW, Midwest **Identifier:** A.239

QUERCUS (ALBA, RUBRA, VELUTINA) / CORNUS FLORIDA / VIBURNUM ACERIFOLIUM FOREST
(White Oak, Northern Red Oak, Black Oak) / Flowering Dogwood / Mapleleaf Viburnum Forest
Dry Oak-Hickory Forest **G? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Acidic Upland Oak Forests (307-05; n/a)

Concept: This northeastern oak-hickory forest occurs on well-drained loamy sand of knolls and upper slopes.

This vegetation is ecologically transitional between dry-rich oak-hickory forests of relatively high diversity and dry, acidic oak species-poor forests. *Quercus alba* and *Quercus velutina* are prominent in the canopy, with *Quercus rubra* also important on the New Jersey Coastal Plain and in New England, and *Quercus prinus* and *Quercus coccinea* typical associates in the southern portion of the range. Typical hickory species include *Carya glabra, Carya ovata, Carya alba (= Carya tomentosa)*, and *Carya ovalis*. Other canopy associates may include *Acer rubrum, Sassafras albidum, Amelanchier arborea, Ostrya virginiana*, and *Fraxinus americana*. At the northern range limit of this type, *Pinus strobus* and *Betula lenta* also occur as minor associates. *Cornus florida* is a characteristic understory tree. The shrub layer is characterized by *Viburnum acerifolium*, with other frequent associates including *Hamamelis virginiana, Vaccinium corymbosum, Corylus cornuta*, and *Corylus americana*. A dwarf-shrub layer may be present, characterized by *Vaccinium pallidum* and *Gaylussacia baccata*, with *Vaccinium angustifolium* occurring more frequently to the north. The herbaceous layer is characterized by *Carex pensylvanica, Maianthemum racemosum (= Smilacina racemosa), Aralia nudicaulis, Hieracium venosum, Solidago bicolor, Desmodium glutinosum, Desmodium paniculatum, Melampyrum lineare, Chimaphila maculata, Eurybia divaricata (= Aster divaricatus), Danthonia spicata, Aureolaria* spp., and *Helianthemum canadense*.
Range: This association occurs from Maine to Virginia.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S3, NH:S?, NJ:S4S5, NY:S3, PA:S?, RI:S?, VA:S?, VT:S3
TNC Ecoregions: 60:C, 61:C, 62:C
USFS Ecoregions: 212Fb:CC?, 212Fc:CCC, 212Fd:CC?, 212Ga:CC?, 212Gb:CC?, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 232Aa:CCC, 232Ac:CCP, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CC?, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CC?, M212Eb:CC?
Synonymy: *Quercus montana - Quercus rubra - Carya (ovalis, glabra) / Viburnum acerifolium* Forest (Patterson pers. comm.), *Quercus montana - Quercus rubra - Carya (ovalis, glabra) / Viburnum acerifolium* Forest (Fleming pers. comm.), Mesic Coastal Plain mixed oak forest (Breden 1989). in part, SNE mesic central hardwood forest on acidic till (Rawinski 1984), Mesic Transition Hardwood Forest (Mesic Oak-Hickory-Northern Hardwood Forest) (Thompson 1996)
References: Berdine 1998, Breden 1989, Breden et al. 2001, Damman 1977, Edinger et al. 2002, Enser 1999, Fike 1999, Fleming et al. 2001, Fleming pers. comm., Gawler 2002, Hunt 1997, MENHP 1991, McCoy and Fleming 2000, Metzler and Barrett 2001, Patterson pers. comm., Rawinski 1984, Sperduto 1997b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006336

QUERCUS ALBA - QUERCUS (RUBRA, COCCINEA) - CARYA (ALBA, GLABRA) / VACCINIUM PALLIDUM PIEDMONT DRY-MESIC FOREST

White Oak - (Northern Red Oak, Scarlet Oak) - (Mockernut Hickory, Pignut Hickory) / Hillside Blueberry Piedmont Dry-Mesic Forest

Piedmont Dry-Mesic Oak - Hickory Forest **G5? (01-02-06)**

Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Oak Forests and Woodlands (401-13; 2.5.3.2)

Concept: This forest is found on submesic to dry-mesic to subxeric upland sites of mid- to upper-slope position with northerly or easterly aspects, or mid to lower slopes with more southerly aspects. In drier landscapes, this type could occupy habitats considered relatively mesic (e.g., concave slopes, lower slopes, shallow ravines). These sites are described as dry to intermediate in soil moisture. The soils are acidic and nutrient-poor, being weathered from felsic metamorphic and sedimentary rocks, or composed of unconsolidated sediments. Stands of this forest are closed to somewhat open, and are dominated by mixtures of oaks and hickories, with *Quercus alba* being most prevalent, along with *Quercus rubra, Quercus coccinea, Quercus velutina, Carya alba, Carya ovalis*, and *Carya glabra*. The *Carya* spp. are common in this type, but often most abundant in the understory. In Virginia examples, *Quercus prinus* is inconstant but sometimes important. In addition, *Pinus* spp., *Liriodendron tulipifera, Liquidambar styraciflua*, and *Acer rubrum* may be common. Understory species include *Acer rubrum, Cornus florida, Oxydendrum arboreum, Ilex opaca*, and *Nyssa sylvatica*. Shrubs include *Vaccinium stamineum, Vaccinium pallidum, Viburnum acerifolium, Viburnum rafinesquianum*, and *Euonymus americana*. In Virginia, *Vaccinium pallidum* is the principal ericad of patchy low-shrub layers, and stands may contain *Calycanthus floridus* (G. Fleming pers. comm. 2001). The woody vines *Vitis rotundifolia* and *Toxicodendron radicans* often are present. Herbs are fairly sparse, with *Hexastylis* spp., *Goodyera pubescens, Chimaphila maculata, Desmodium*

nudiflorum, Maianthemum racemosum, Polygonatum biflorum, Viola hastata, Tipularia discolor, and *Hieracium venosum* as some common components (Schafale and Weakley 1990). This association is less nutrient-rich than *Quercus rubra - Quercus alba - Carya glabra / Geranium maculatum* Forest (CEGL007237).
Range: This association is found in the Piedmont and northern Coastal Plain (Chesapeake Bay Lowlands Ecoregion) of Virginia, as well as south in the Piedmont to the Carolinas and possibly Georgia, as well as possibly in related areas of Maryland.
States/Provinces: GA?, MD?, NC:S5, SC:S?, VA:S?
TNC Ecoregions: 52:C, 58:C, 61:?
USFS Ecoregions: 221Db:CCC, 231Aa:CCC, 231Ae:CCC, 232Ad:CCC, 232Bt:CC?, 232Bx:CCC
Federal Lands: NPS (Guilford Courthouse)
Synonymy: Oak - Chestnut - Hickory Forest (Ambrose 1990a) B, White oak - northern red oak - false Solomon's seal (*Quercus alba - Quercus rubra - Smilacina racemosa*) community type (Jones 1988a), White oak - northern red oak - false Solomon's seal (*Quercus alba - Quercus rubra - Smilacina racemosa*) community type (Jones 1988b), IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) B. in part, *Quercus alba - Quercus coccinea - Carya (glabra, alba) / Vaccinium pallidum* Forest (Patterson pers. comm.)
References: Allard 1990, Ambrose 1990a, Fleming et al. 2001, Fleming pers. comm., Jones 1988a, Jones 1988b, Nelson 1986, Patterson pers. comm., Schafale and Weakley 1990, Skeen et al. 1980
Authors: M.P. Schafale/G.P. Fleming, SCS **Confidence:** 1 **Identifier:** CEGL008475

I.B.2.N.a.29. QUERCUS ALBA - QUERCUS (FALCATA, STELLATA) FOREST ALLIANCE

White Oak - (Southern Red Oak, Post Oak) Forest Alliance

Concept: This alliance contains vegetation that can be described as dry oak and oak-hickory forests. These are usually dominated by a mixture of *Quercus alba* and *Quercus falcata*; *Quercus stellata* may be dominant or codominant. In addition, *Quercus coccinea, Quercus velutina, Quercus marilandica, Carya alba, Carya glabra, Carya pallida, Carya carolinae-septentrionalis, Carya ovata*, and *Fraxinus americana* often are present. Common subcanopy and shrub species include *Oxydendrum arboreum, Acer rubrum, Ulmus alata, Juniperus virginiana var. virginiana, Vaccinium arboreum, Cornus florida, Sassafras albidum, Gaylussacia frondosa (= var. frondosa), Gaylussacia baccata, Vaccinium pallidum*, and *Vaccinium stamineum*. Herbaceous species that may be present include *Chimaphila maculata, Polystichum acrostichoides, Asplenium platyneuron, Hexastylis arifolia, Coreopsis major, Tephrosia virginiana, Sanicula canadensis, Desmodium nudiflorum, Desmodium nuttallii, Symphyotrichum urophyllum*? (= *Aster sagittifolius*?), *Symphyotrichum patens (= Aster patens), Solidago ulmifolia*, and *Hieracium venosum*. These often are successional forests following logging and/or agricultural cropping (and possibly also chestnut blight in the southern Appalachians). Some examples occur in upland flats and have been called xerohydric because they occasionally will have standing water in the winter due to a perched water table, but are droughty by the end of the growing season. Other occurrences are found on well-drained sandy loam or clay loam soils that are often, although not always, shallow. Karst topography can be found in areas where this alliance occurs. Soils are most often a well-drained sandy loam, although clay loams are not uncommon. Forests of this alliance may occupy narrow bands of dry-mesic habitat transitional between lower and midslope mesic communities and xeric ridgetops. This alliance is found in the Upper East Gulf Coastal Plain, Piedmont, low mountains (including Cumberlands, Ridge and Valley, and low parts of the Southern Blue Ridge), and Interior Low Plateau. Distribution in the Atlantic Coastal Plain, East Gulf Coastal Plain, and Upper West Gulf Coastal Plain needs assessment. In the Shawnee Hills, Knobs, Coastal Plain, and Appalachian Plateau regions of Kentucky, these forests form a common matrix vegetation over acid sandstone and shales. These Kentucky forests are dominated by *Quercus alba* with little or no *Quercus falcata* and occupy middle to upper slope positions. In the southern Illinois portion of the range, examples occur on south- to west-facing slopes where increased temperatures favor *Quercus falcata* over *Quercus rubra*.
Range: This alliance is found in southern Illinois, Indiana (?), Kentucky, Tennessee, Arkansas, Louisiana (?), Oklahoma (?), Texas (?), Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia, Delaware, Maryland, and New Jersey. This alliance is found in the Upper East Gulf Coastal Plain, Piedmont, low mountains, and Interior Low Plateau. Distribution in the Atlantic Coastal Plain, East Gulf Coastal Plain, and Upper West Gulf Coastal Plain needs assessment. In the Shawnee Hills, Knobs, Coastal Plain, and Appalachian Plateau regions of Kentucky, these forests form a common matrix vegetation over acid sandstone and shales.
States/Provinces: AL AR CT DE GA IL IN? KY LA? MA MD MS NC NJ NY OK? SC TN TX? VA
TNC Ecoregions: 32:P, 40:C, 41:P, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:P, 56:C, 57:P, 58:C, 59:P, 61:C,

62:C
USFS Ecoregions: 221Ad:CPP, 221Dc:C??, 221Ha:CCP, 221Hc:CCC, 221Hd:CCP, 221He:CCP, 221Jb:CCC, 222Ca:CCP, 222Cb:CCC, 222Cc:CCP, 222Cd:CCP, 222Ce:CCP, 222Cf:CC?, 222Cg:CC?, 222Ch:CC?, 222Da:CCC, 222Dc:CCP, 222Dd:CCP, 222De:CCC, 222Df:CCP, 222Dg:CCC, 222Dh:CCC, 222Di:CCP, 222Dj:CCC, 222Ea:CCC, 222Eb:CCC, 222Ec:CCP, 222Ee:CCC, 222Ef:CCC, 222Eg:CCC, 222Eh:CCC, 222Ei:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 231Aa:CCC, 231Ab:CCP, 231Ac:CCP, 231Ad:CCP, 231Ae:CCC, 231Af:CCC, 231Ag:CCC, 231Ah:CCP, 231Ai:CCC, 231Aj:CCP, 231Ak:CCC, 231Al:CCC, 231Am:CCC, 231An:CCC, 231Ao:CCC, 231Ap:CCC, 231Ba:CPP, 231Bc:CPP, 231Bd:CPP, 231Be:CP?, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cg:CCP, 231Da:CCC, 231Dc:CCC, 231De:CCC, 231Ea:CC?, 231Eb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bq:CCC, 232Br:CCC, 232Bt:CCC, 232Bv:CCP, 232Bx:CCP, 232Bz:CCP, 232Ca:CP?, 232Ch:CP?, 232Fa:CP?, 234Aa:CC?, 234Ab:CCC, 234Ac:CCP, 234Ae:CCC, 234Ag:CC?, 234Ah:CCP, M221Aa:CC?, M221Ab:CCC, M221Da:CCC, M221Dd:CCC
Federal Lands: DOD (Arnold, Fort Benning, Fort Gordon); DOE (Oak Ridge); NPS (Big South Fork, Chickamauga-Chattanooga, Cowpens, Fire Island, Great Smoky Mountains, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Ninety Six, Shiloh); TVA (Tellico); USFS (Bankhead, Chattahoochee?, Cherokee, Daniel Boone, Holly Springs?, Kisatchie?, Land Between the Lakes?, Oconee, Sabine NF?, St. Francis, Shawnee, Sumter, Talladega, Tombigbee?, Tuskegee?, Uwharrie); USFWS (Eufaula)
Synonymy: IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest, in part (Allard 1990); Acidic sub-xeric forest, in part (Evans 1991); Xerohydric flatwoods, in part (Evans 1991); Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990); Southern Red Oak RV (Pyne 1994); Post Oak-Black Hickory Series (Diamond 1993); Submesic Oak - Hickory Forest, in part (Foti 1994b); T1B4aIV. *Quercus falcata - Quercus* spp. (Foti et al. 1994); White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980); Maritime Oak - Holly Forest / Woodland (Swain and Kearsley 2001); Coastal Forest/Woodland (Swain and Kearsley 2001); Serpentine pitch pine - oak forest (Fike 1999); Eastern Serpentine Barren, in part (Smith 1991)
References: Allard 1990, Andreu and Tukman 1995, Braun 1950, Diamond 1993, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Fralish et al. 1991, Golden 1979, Oosting 1942, Peet and Christensen 1980, Pyne 1994, Robertson and Heikens 1994, Schafale and Weakley 1990, Smith 1991, Sneddon et al. 1996, Swain and Kearsley 2001, Voigt and Mohlenbrock 1964
Authors: M. PYNE/A.S. WEAKLEY 6-94, RW, Southeast **Identifier:** A.241

QUERCUS (FALCATA, ALBA, VELUTINA) / GAYLUSSACIA BACCATA - VACCINIUM PALLIDUM FOREST
(Southern Red Oak, White Oak, Black Oak) / Black Huckleberry - Hillside Blueberry Forest
G4G5 (97-12-01)
Ecological Group (SCS;MCS): North Atlantic Coastal Plain Mixed Oak - Heath Forests (307-03; n/a)

Concept: This oak forest of the unglaciated northeastern Coastal Plain occurs on well-drained acidic soils, generally sandy loam and silt/clay. The canopy is dominated by a mixture of oaks, such as *Quercus alba, Quercus falcata*, and *Quercus velutina*. Associates include *Sassafras albidum, Quercus coccinea, Quercus prinus, Quercus stellata, Liquidambar styraciflua, Nyssa sylvatica, Carya* spp., and *Pinus taeda*, with *Ilex opaca* and *Cornus florida* forming a subcanopy. The shrub layer is well-developed and dominated by ericaceous species such as *Gaylussacia baccata, Gaylussacia frondosa, Vaccinium pallidum*, and occasionally *Lyonia mariana*.
States/Provinces: DE:S?, MD:S?, NC?, NJ:S3S4, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Ac:CCC, 232Ad:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCP, 232Bz:CCP, 232Ch:CP?
Synonymy: Dry Oak-Pine Forest, mixed oak-pine forest subtype (Breden 1989), Pine - oak association (Shreve et al. 1910) B. in part, *Quercus alba - Quercus coccinea - Quercus velutina / Gaylussacia baccata - Vaccinium stamineum* Forest (Fleming pers. comm.)
References: Breden 1989, Breden et al. 2001, Fleming et al. 2001, Fleming pers. comm., Shreve et al. 1910, Sneddon et al. 1996
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006269

I.B.2.N.a.31. QUERCUS FALCATA FOREST ALLIANCE
Southern Red Oak Forest Alliance

Concept: Dry oak forests with canopies characteristically dominated by *Quercus falcata*, typically with some

combination of *Quercus stellata, Quercus velutina*, and *Quercus coccinea*. The relative dominance of these four species is variable between associations across the range of this alliance. *Quercus alba* may be present (although more likely in the understory than in the canopy), but it will rarely contribute to the dominance. Within its range, some examples have strong dominance by *Quercus coccinea*. In the Atlantic Coastal Plain, *Quercus nigra* may be the other oak sharing dominance with *Quercus falcata*. *Vaccinium* spp. are common in the understory of some stands (including successional ones on subxeric, intermediate sites). Some typical occurrences are found on well-drained sandy loam or clay loam soils that are often, although not always, shallow. Some other examples are found on sites with unusual soil conditions, such as hardpans with retarded drainage. These typically occur in upland flats and have been called xerohydric because they occasionally will have standing water in the winter due to a perched water table, but are droughty by the end of the growing season. The range of forests of this alliance is throughout the East Gulf Coastal Plain, West Gulf Coastal Plain, Upper West Gulf Coastal Plain, Piedmont, Carolina Sandhills, low mountains, and Cumberland and Interior Low plateaus. The overall distribution in the Atlantic Coastal Plain and Ouachita Mountains needs assessment.
Comments: This alliance is found in central and western Tennessee and Kentucky, rather than the montane portions of these states. There is a *Quercus coccinea*-dominated association in Tennessee (S. Major pers. comm.).
Range: This alliance is found from Oklahoma, Kentucky, and North Carolina, south to Louisiana, Mississippi, and South Carolina, in the East Gulf Coastal Plain, Upper West Gulf Coastal Plain, Piedmont, Cumberland Plateau, Carolina Sandhills, low mountains, Interior Low Plateau, Ozarks, and Ouachitas. Its distribution and extent in the Atlantic Coastal Plain needs assessment. It is also reported from the Chesapeake Bay Region and the Northern Piedmont.
States/Provinces: AL AR DE GA IN? KY LA MD MS NC NJ OK SC TN TX
TNC Ecoregions: 38:C, 39:C, 40:C, 41:C, 43:C, 44:C, 50:C, 52:P, 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 221Hc:CPP, 221Ja:CCP, 221Jb:CCC, 222Cb:CCC, 222Cc:CCP, 222Ce:CCP, 222Da:CCC, 222Dc:CC?, 222Dg:CCC, 222Eb:CCC, 222Ej:CCC, 222El:CCC, 231Aa:CCC, 231Ae:CC?, 231Cd:CCC, 231Ea:CCC, 232Ab:CCC, 232Ac:CCP, 232Ba:CCP, 232Bb:CCP, 232Bh:CCP, 232Bi:CC?, 232Bk:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCC, 232Br:CCP, 232Bt:CCC, 232Bu:CCP, 232Bv:CC?, 232Bx:CCC, 232Bz:CCP, 232Ca:CC?, 232Ce:CC?, 232Ci:CCC, 232Fa:CCP, 232Fb:CCP, 232Fe:CCC, 234Aa:CCP, 234Ab:CCC, 234Ac:CCC, 234Ae:CCC, 234Ag:CCP, 234Ah:CC?, 234Am:CC?, 234An:CCP, M222Ab:CCC, M231Aa:CCP, M231Ab:CCP, M231Ac:CCP, M231Ad:CCP
Federal Lands: DOD (Arnold, Fort Benning); NPS (Mammoth Cave, Shiloh); TVA (Tellico); USFS (Angelina, Bankhead, Bienville, Cherokee?, Conecuh, Davy Crockett, De Soto, Holly Springs, Homochitto, Kisatchie?, Ouachita, Sabine NF, St. Francis, Sam Houston, Talladega, Tombigbee, Tuskegee)
Synonymy: Acidic xeric forest, in part (Evans 1991); Xerohydric flatwoods, in part (Evans 1991); Dry Oak--Hickory Forest, Coastal Plain Sand Variant (Schafale and Weakley 1990); *Quercus falcata* forest alliance (Hoagland 1998a); Southern Red Oak RV (Pyne 1994); Post Oak-Black Hickory Series (Diamond 1993)
References: Andreu and Tukman 1995, Diamond 1993, Evans 1991, Hoagland 1998a, Major pers. comm., Pyne 1994, Schafale and Weakley 1990, Wharton 1945
Authors: M. PYNE/A.S. WEAKLEY 2-96, RW, Southeast **Identifier:** A.243

QUERCUS FALCATA - QUERCUS PHELLOS / ILEX OPACA FOREST
Southern Red Oak - Willow Oak / American Holly Forest
Mesic Coastal Plain Oak Forest **G? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Acid Hardwood Slope Forests (307-10; n/a)

Concept: This community is a mesic oak forest of the central Atlantic Coastal Plain. In general, this vegetation borders wetlands and occurs on sand in areas with a high water table. Canopy dominants include *Quercus falcata, Quercus phellos, Quercus alba, Quercus michauxii*, with *Liquidambar styraciflua* and *Acer rubrum* common associates. Pines may be present, including *Pinus rigida* or *Pinus echinata* in New Jersey, or *Pinus taeda* in Delaware and Maryland. A subcanopy is often present with *Ilex opaca, Vaccinium corymbosum*, and *Amelanchier canadensis*. *Gaylussacia frondosa* forms a patchy shrub layer draped with *Smilax rotundifolia*, and the herb layer is sparse with species like *Chasmanthium laxum, Osmunda regalis*, and *Mitchella repens*.
Comments: This association is currently attributed to Delaware although no occurrences have been documented there.
Range: Currently described from New Jersey to Maryland.
States/Provinces: DE:S?, MD:S?, NJ:S2S3
TNC Ecoregions: 58:C, 62:C

USFS Ecoregions: 232Ab:CCC, 232Ac:CCP, 232Bt:CCC, 232Bx:CCC, 232Bz:CC?
Synonymy: Oak - southern hardwood "peri-hydric" forest (Windisch pers. comm.), Cape May lowland swamp (Breden 1989). in part
References: Berdine 1998, Bowman 2000, Breden 1989, Breden et al. 2001, Windisch pers. comm.
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006390

I.B.2.N.a.101. QUERCUS MUEHLENBERGII - (ACER SACCHARUM) FOREST ALLIANCE

Chinquapin Oak - (Sugar Maple) Forest Alliance

Concept: This alliance includes a variety of dry, dry-mesic, and mesic forests, dominated by *Quercus muehlenbergii* and possibly *Acer saccharum*, the canopy often also including other hardwood species associated with high base substrates (e.g., limestone or dolomite) under a variety of moisture conditions. These include *Quercus alba, Quercus shumardii, Fraxinus americana, Fraxinus quadrangulata, Acer barbatum, Tilia americana, Carya* spp., *Juglans nigra*, and *Liriodendron tulipifera* (in the more interior portions of the alliance's distribution), and *Quercus sinuata var. sinuata* and *Carya myristiciformis* (in the southwestern, Coastal Plain portion of the alliance's distribution). The habitat of this alliance includes mesic and dry-mesic forests over limestones in the Nashville Basin of Tennessee, dry-mesic slopes associated with prairie openings in Louisiana, moist limestone slopes in the Edwards Plateau of Texas, blackland soils in the upper West Gulf Coastal Plain of Arkansas, lowlands and mesic slopes of Oklahoma and adjacent Arkansas, as well as related habitats in states farther east (e.g., Alleghenies and lower Cumberland Plateau escarpment). Forests in Kentucky and Tennessee have *Quercus shumardii* and *Frangula caroliniana* and occur over limestone on south-facing slopes. There are scattered occurrences on benches and clifftops on the Daniel Boone National Forest. In the Coastal Plain of Virginia, this alliance is represented by somewhat open canopy 'shell barren' forests dominated by *Quercus muehlenbergii* with *Acer barbatum*. On rare occurrences of limestone in the Southern Blue Ridge of North Carolina, *Quercus muehlenbergii* occurs with *Juglans nigra, Fraxinus americana*, and *Acer saccharum*. Understory species may include *Cornus florida, Cercis canadensis, Calycanthus floridus, Cornus alternifolia, Ostrya virginiana*, and *Hydrangea arborescens*. In the Northeast, the shrub layer is sparse and may contain *Hamamelis virginiana, Zanthoxylum americanum*, and *Cornus alternifolia*. In some more southerly examples, shrubs may include *Forestiera ligustrina, Frangula caroliniana*, and *Symphoricarpos orbiculatus*. The herbaceous layer may contain *Asclepias quadrifolia, Clematis occidentalis (= Clematis verticillaris)* (in northeastern examples), *Packera obovata (= Senecio obovatus), Phryma leptostachya, Saxifraga virginiensis, Arabis laevigata*, and *Triosteum aurantiacum*. Two unusual communities of this alliance are lowland forests from the Upper West Gulf Coastal Plain of Arkansas. In the Northeast, the habitat is characterized as upper slopes or summits of limestone or marble ridges with dry soil-moisture regimes. Limestone outcrops or boulders may be present, as well as Karst collapse features. In the Southeast, mesic to dry limestone-derived soils may occur as well on flatter landforms, as in the Nashville Basin of Tennessee. In the Southeast, this vegetation is known from the Ridge and Valley, lower Cumberland Plateau escarpment, Highland Rim escarpment, and Nashville Basin in Tennessee; the Highland Rim, Bluegrass and Dripping Springs escarpment in Kentucky; the Cumberland Plateau in Alabama; as well as rarely in the Southern Blue Ridge and Coastal Plain. Isolated occurrences are reported in northern Arkansas on moderately shallow soils, often on glade margins. It also occurs in the Arbuckle Mountains of Oklahoma and the Edwards Plateau of Texas. If this alliance occurs in the Upper East Gulf Coastal Plain, stands would contain *Acer barbatum* instead of *Acer saccharum*.
Comments: This alliance was created by the merger of the former *Acer saccharum - Quercus muehlenbergii* Forest Alliance and the former *Quercus muehlenbergii* Forest Alliance. MP 6-01: On the southern flank of the alliance's distribution, the sugar maple which is present is *Acer barbatum (= Acer saccharum var. floridanum)*, not *Acer saccharum var. saccharum*. Is this a problem?
Range: This alliance may be found in Alabama, Arkansas, Kentucky, Louisiana, North Carolina, Oklahoma, South Carolina (?), Tennessee, Texas, Connecticut, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, Virginia, West Virginia, Illinois, Indiana, Michigan (?), Missouri, Nebraska (?), and Ohio, and in Canada in Ontario. In the Southeast, this vegetation is known from the Ridge and Valley, lower Cumberland Plateau escarpment, Highland Rim escarpment, and Central Basin in Tennessee; the Highland Rim, Bluegrass and Dripping Springs escarpment in Kentucky; the Cumberland Plateau in Alabama; as well as rarely in the Southern Blue Ridge and coastal plain. Isolated occurrences are reported in northern Arkansas on moderately shallow soils, often on glade margins. It also occurs in the Arbuckle Mountains of Oklahoma and the Edwards Plateau of Texas.
States/Provinces: AL AR CT GA IL? IN KY LA MA MD MI? MS? NC NJ NY OH OK ON PA SC? TN TX VA VT WV

TNC Ecoregions: 29:C, 32:C, 33:C, 37:C, 38:C, 39:C, 40:C, 41:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 57:C, 58:C, 59:C, 60:?, 61:C, 63:C, 64:C
USFS Ecoregions: 212B:CC, 212E:CC, 212Fa:C??, 212Ga:C??, 212Gb:C??, 221A:CC, 221B:CC, 221Dc:CC?, 221Ea:CCC, 221Hb:CCC, 221Hc:CCC, 221Hd:CCP, 221Ja:CCC, 221Jb:CCC, 221Jc:CCP, 222An:CC?, 222Cg:CCC, 222Df:CCP, 222Dg:CCC, 222Ea:CC?, 222Eb:CCC, 222Ec:CCC, 222Ed:CCC, 222Ee:CCC, 222Ef:CCC, 222Eg:CCC, 222Eh:CCC, 222Ej:CCC, 222En:CCC, 222Eo:CCP, 222Fa:CCP, 222Fb:CCC, 222Fc:CC?, 222Fd:CCC, 222Fe:CCP, 222Ff:CCP, 222Ha:CCC, 222Hb:CCC, 222Hc:CCC, 222I:CC, 231Ba:CP?, 231Be:CP?, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Dc:CCP, 231De:CCC, 231Ea:CCP, 231Eb:CCC, 231Gc:CCC, 232Br:CCC, 232Ch:C??, 232Fa:CCC, 251Ea:P??, 251Eb:P??, 251Ec:P??, 251Ed:P??, 255Af:CCC, 311A:CC, 315D:CC, M212B:CC, M212C:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bd:CC?, M221Be:CCP, M221Ca:CC?, M221Cb:CCP, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CCC, M221Dd:CCC
Federal Lands: COE (J. Percy Priest?, Lake Millwood); NPS (Colonial, Cumberland Gap?, Great Smoky Mountains?, Russell Cave?, Shiloh, Stones River); TVA (Columbia, Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Kisatchie, Ozark, Pisgah); USFWS (Wichita Mountains)
Synonymy: IA6k. Sugar Maple - Oak - Hickory Forest, in part (Allard 1990); Sugar Maple - Oak - Hickory Forest, in part (Pyne 1994); IA6j. Interior Calcareous Oak - Hickory Forest. in part? (Allard 1990); Calcareous xeric forest, in part (Evans 1991); Calcareous sub-xeric forest, in part (Evans 1991); Calcareous mesophytic forest, in part (Evans 1991); Basic Mesic Forest, Montane Calcareous Subtype (Schafale and Weakley 1990); *Quercus muehlenbergii* forest alliance (Hoagland 1997); Bigtooth Maple-Oak Series, in part (Diamond 1993); Sugar Maple: 27, in part (Eyre 1980); Calcareous Talus Forest / Woodland (Swain and Kearsley 2001); Yellow Oak Dry Calcareous Forest (Swain and Kearsley 2001); Yellow oak - redbud woodland (Fike 1999); Dry-Mesic Calcareous Central Forest (Smith 1991)
References: Allard 1990, Andreu and Tukman 1995, Bowen et al. 1995, Campbell 1980, Crites and Clebsch 1986, Diamond 1993, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Fowells 1965, Hoagland 1997, Hoagland 1998a, Pyne 1994, Schafale and Weakley 1990, Smith 1991, Swain and Kearsley 2001, Ware and Ware 1992
Authors: D.J. ALLARD/D. FABER-LANG, MP, Southeast **Identifier:** A.1912

ACER SACCHARUM - QUERCUS MUEHLENBERGII / CERCIS CANADENSIS FOREST
Sugar Maple - Chinquapin Oak / Redbud Forest
Appalachian Sugar Maple - Chinquapin Oak Limestone Forest **G4? (00-10-19)**
Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Circumneutral Hardwood Forests and Woodlands (401-17; 2.5.3.z)

Concept: This circumneutral to basic maple - oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, ranging south and west to the Interior Low Plateau of Tennessee and the Cumberlands of Alabama. Stands occur in thin soils over calcareous substrates, sometimes in association with limestone glades. These are typically closed-canopy, rich, dry to dry-mesic forests; in some stands the canopy may vary from closed to somewhat open, particularly in Pennsylvania at the northern edge of the range. The stands are primarily composed of *Acer saccharum, Quercus muehlenbergii, Fraxinus americana*, and *Ostrya virginiana*. Associates include *Quercus alba, Tilia americana, Acer nigrum, Ulmus rubra, Celtis occidentalis, Carya ovalis*, and *Carya ovata*. *Quercus prinus* may also be present in some examples. A variable subcanopy and shrub layer contains *Cornus florida, Cercis canadensis, Hamamelis virginiana, Rosa carolina, Rhus aromatica, Viburnum prunifolium, Viburnum rafinesquianum, Viburnum rufidulum*, and *Zanthoxylum americanum*. The sparse to well-developed herb layer may contain *Danthonia spicata, Elymus hystrix, Bouteloua curtipendula, Ageratina altissima (= Eupatorium rugosum), Antennaria plantaginifolia, Aquilegia canadensis, Arabis laevigata, Asclepias quadrifolia, Clematis occidentalis* (to the north), *Houstonia longifolia (= Houstonia tenuifolia), Polygonum scandens, Sanicula canadensis, Saxifraga virginiensis*, and *Packera obovata (= Senecio obovatus)*. Some other herbs recorded in Virginia examples include *Agrimonia rostellata, Anemone virginiana var. virginiana, Symphyotrichum patens var. patens (= Aster patens var. patens), Bromus pubescens, Dichanthelium boscii, Erigeron pulchellus var. pulchellus, Galium circaezans, Sanicula canadensis, Scutellaria elliptica*, and *Solidago ulmifolia var. ulmifolia*. Some stands attributed to this type are mesic forests of steep slopes in the southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera, Carya* spp., and *Aesculus flava* in either the canopy or subcanopy. The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama.

Comments: The range of this type, which was initially described from "the High Alleghenies," has gradually extended south to at least the Interior Low Plateau. It may require subdivision. (This type was formerly attributed questionably to the Upper East Gulf Coastal Plain, it was dropped from ECO43 by REE based on input from MP and ASW). Some stands attributed to this type are mesic forests of steep slopes in the southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera, Carya* spp., and *Aesculus flava* in either the canopy or subcanopy (Andreu and Tukman 1995). The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama (Bowen et al. 1995). There has been discussion of the merits of subdividing this type, in effect re-splitting former *Acer saccharum - Quercus (alba, muehlenbergii) / Aesculus flava* Forest (CEGL006136) (or an equivalent) out of it again.

Two tentative, fully intergrading subtypes have been recognized in Virginia (Fleming 1999): The *Quercus muehlenbergii - Quercus alba / Cercis canadensis* Subtype occurs (with one exception) on limestone and occupies very steep, subxeric, middle to upper slopes with southwesterly aspects and considerable exposed mineral soil (mean = 28%). *Quercus alba, Cercis canadensis, Hamamelis virginiana, Muhlenbergia tenuiflora*, and *Desmodium glutinosum* are characteristic species of the subtype. The *Quercus muehlenbergii - Tilia americana / Muhlenbergia sobolifera* Subtype occurs without exception on dolomite and occupies less steep, more submesic, lower to middle slopes with more southerly aspects and high surface cover of bedrock and boulders. Soils have lower mean calcium levels and higher mean magnesium levels than those of the previous subtype. *Tilia americana, Juniperus virginiana, Dirca palustris*, and *Muhlenbergia sobolifera* are most important in this subtype.

Range: This maple - oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, including the Ridge and Valley and Western Allegheny Plateau regions, ranging from Pennsylvania southward to the Interior Low Plateau of Tennessee and the Ridge and Valley of Virginia.

States/Provinces: AL?, KY:S?, MD:S?, OH:S?, PA:S?, TN:S?, VA:S?, WV:S?

TNC Ecoregions: 44:C, 49:C, 50:C, 59:C, 60:?, 61:?

USFS Ecoregions: 212Fa:???, 212Ga:???, 212Gb:???, 221A:C?, 221D:C?, 221Ea:CCC, 221Hb:CCC, 221Hc:CCC, 221Jb:CCC, 222Ej:CPP, 222Fd:CCC, 231B:P?, 231Cc:PPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bd:CP?, M221Be:CPP, M221Ca:CC?, M221Cb:CC?, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CCC

Federal Lands: TVA (Tellico); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson)

Synonymy: *Acer saccharum - Quercus (alba, muehlenbergii)* Forest (Andreu and Tukman 1995), *Quercus muhlenbergii - Acer (nigrum, saccharum var. saccharum) / Ostrya virginiana / Senecio obovatus* Forest, Type 3.1 (Fleming 1999), *Quercus muehlenbergii / Juniperus virginiana / Hybanthus concolor* Association (Rawinski et al. 1996), Yellow oak - redbud woodland (Fike 1999), Yellow oak-sugar maple-red bud forest of calcareous upper slopes and summits (CAP pers. comm. 1998), *Quercus muehlenbergii - Acer (nigrum, saccharum) / Ostrya*

virginiana / Erigeron pulchellus - Packera obovata Forest (Fleming and Coulling 2001)
References: Andreu and Tukman 1995, Bartgis 1985a, Bartgis 1993, Bowen et al. 1995, CAP pers. comm. 1998, Fike 1999, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Rawinski et al. 1996
Authors: L.A. Sneddon, mod. M. Pyne after Fleming 1999, ECS **Confidence:** 2 **Identifier:** CEGL006017

QUERCUS MUEHLENBERGII / ERIGERON PULCHELLUS VAR. PULCHELLUS - DICHANTHELIUM BOSCII - (VERBESINA VIRGINICA VAR. VIRGINICA) FOREST
Chinquapin Oak / Robin's-plantain - Bosc's Witchgrass - (Common Frostweed) Forest
North Atlantic Coastal Plain Calcareous Forest **G2? (98-12-14)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Maritime Shell Barrens and Near-coastal Calcareous Hammocks (240-70; n/a)

Concept: This dry, open, calcareous forest of the Inner Coastal Plain of Virginia is restricted to subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits. These localized habitats are found on southeast- to southwest-facing, usually convex slopes of deep ravines or stream-fronting bluffs that have downcut into Tertiary shell deposits or limesands. Occurrences are small (typically <1 acre) and highly localized in dissected portions of the Inner Coastal Plain. *Quercus muehlenbergii* is a constant, codominant or dominant canopy tree, and is the most characteristic tree of this type. Some stands tend toward a woodland physiognomy, with low-statured, gnarled trees and a very open canopy. The understory includes *Juniperus virginiana var. virginiana* and *Cercis canadensis var. canadensis*. The herb layer is usually patchy, but contains a diversity of species, including several long-range mountain disjuncts. Particularly abundant or noteworthy herbaceous species include *Erigeron pulchellus var. pulchellus* and *Dichanthelium boscii*, which are the most constant and abundant herbs, each with mean cover >5% over all documented stands. Other important species are *Verbesina virginica var. virginica, Campanulastrum americanum, Smallanthus uvedalius, Silphium trifoliatum var. trifoliatum, Desmodium pauciflorum, Hexalectris spicata*, and *Piptochaetium avenaceum*.
Comments: This type is described by G. Fleming, Virginia Department of Conservation and Recreation, Division of Natural Heritage. It is based on analysis of plot data from 11 stands in James City, Stafford, Surry, and York counties (VA). Homoteneity = 0.653. Mean species richness = 70. According to Rod Simmons, vegetation similar to the stands of this type at Crow's Nest, Stafford County, VA, occurs across the Potomac River at Chapman's Landing, Maryland. It is likely that this community type is endemic to a narrow region of the Coastal Plain stretching from Charles County, MD, south to Surry County, VA. Further inventory is required to determine whether it is present in Isle of Wight County and City of Suffolk, VA. This is a small-patch community type, usually occurring in patches <1 acre. The total acreage of all known occurrences is <25 acres.
Range: This dry, open, calcareous forest occurs in the Inner Coastal Plain of Virginia.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Br:CCC
Federal Lands: NPS (Colonial)
Synonymy: *Quercus muhlenbergii / Erigeron pulchellus var. pulchellus - Dichanthelium boscii - (Verbesina virginica)* Forest (Patterson pers. comm.)
References: Fleming 2001, Fleming et al. 2001, Fleming unpubl. data, Patterson pers. comm., Ware and Ware 1992
Authors: G.P. Fleming, ECS **Confidence:** 2 **Identifier:** CEGL007748

I.B.2.N.a.36. QUERCUS PRINUS - (QUERCUS COCCINEA, QUERCUS VELUTINA) FOREST ALLIANCE

Rock Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance

Concept: This alliance includes xeric oak forests strongly dominated by *Quercus prinus* or *Quercus prinus* with admixtures of *Quercus coccinea* and/or *Quercus velutina*, occurring in the southern and central Appalachians, Ridge and Valley, Cumberland Plateau, Piedmont, Interior Low Plateau, and possibly in the northern Appalachians. In the Piedmont and Ridge and Valley, and in areas transitional to these provinces, *Quercus stellata* and *Quercus marilandica* may be canopy associates. Other canopy/subcanopy associates include *Acer rubrum, Amelanchier arborea, Carya alba, Carya glabra, Cornus florida, Hamamelis virginiana, Magnolia fraseri, Nyssa sylvatica, Oxydendrum arboreum, Pinus rigida, Pinus strobus, Quercus alba, Quercus rubra, Robinia pseudoacacia*, and *Sassafras albidum*. In the Appalachians, a dense ericaceous shrub layer is characteristic, with

species such as *Gaylussacia baccata, Gaylussacia ursina, Kalmia latifolia, Leucothoe recurva, Rhododendron maximum, Vaccinium pallidum*, and *Vaccinium stamineum*. In the upper Piedmont *Kalmia latifolia, Vaccinium arboreum*, and *Vaccinium pallidum* are common. In the montane distribution of this alliance, forests of this alliance have replaced forests formerly dominated or codominated by *Castanea dentata*, and chestnut sprouts are common in the understory. Other shrub species found in forests of this alliance include *Chionanthus virginicus, Diospyros virginiana, Robinia hispida, Sassafras albidum, Styrax grandifolius, Symplocos tinctoria, Viburnum acerifolium, Viburnum prunifolium*, and *Viburnum rufidulum*. Herbaceous cover is typically sparse in these dry, rocky forests and species vary with geographic location. Some typical herbaceous species include *Antennaria plantaginifolia, Aureolaria laevigata, Chamaelirium luteum, Chimaphila maculata, Danthonia spicata, Dichanthelium commutatum, Dichanthelium dichotomum, Dioscorea quaternata, Epigaea repens, Galax urceolata, Galium latifolium, Gaultheria procumbens, Goodyera pubescens, Hieracium venosum, Lysimachia quadrifolia, Medeola virginiana, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum, Stenanthium gramineum, Uvularia puberula*, and *Uvularia sessilifolia*. These forests occur on convex, upper slopes and ridgetops, south-facing slopes, over thin, rocky, infertile soils in the Appalachians, typically below 3500 feet (1066 m), where windthrow and ice damage are common natural disturbances. In the Piedmont these forests occur on low mountains and hills, on rocky, well-drained, acidic soils, sometimes associated with outcrops of quartzite, or other resistant rock.

Range: This alliance occurs in the southern and central Appalachians, Ridge and Valley, Cumberland Plateau, Piedmont, Interior Low Plateau, and possibly in the northern Appalachians. It is found in Illinois, Indiana, Ohio, Connecticut, Delaware, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, Alabama, Georgia, Kentucky, North Carolina, South Carolina, and Tennessee, and possibly Maine (?), Maryland (?), Mississippi (?), and West Virginia (?).

States/Provinces: AL CT DE GA IL IN KY MA MD ME NC NH NJ NY OH PA RI SC TN VA VT WV

TNC Ecoregions: 38:C, 43:P, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C, 63:C, 64:C

USFS Ecoregions: 212Ec:CCC, 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CC?, 221Ac:CCP, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCP, 221Aj:CCP, 221Ak:CCP, 221Al:CC?, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCP, 221Hc:CC?, 221I:CP, 221Ja:CCP, 221Jb:CCC, 221Jc:CCP, 222Aq:CCC, 222Cf:CCP, 222Cg:CCP, 222Da:CCP, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Dg:CCP, 222Dh:CCP, 222Dj:CCP, 222Eb:CCC, 222Eg:CCC, 222Ei:CCC, 222Ek:CCP, 222El:CCC, 222Em:CCC, 222Eo:CCC, 222Fd:CCC, 222Hb:CCC, 231Aa:CCP, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ag:CCC, 231Aj:CCC, 231Ak:CCC, 231Al:CCC, 231Am:CCP, 231An:CCP, 231Ao:CCP, 231Ap:CCP, 231Be:CPP, 231Cd:CCC, 231Dc:CCC, 232Aa:PPP, 232Ac:PPP, 232Ad:PPP, 232Ba:PP?, 232Bc:PP?, 232Bd:PPP, 232Br:PPP, 232Ch:PPP, M212Ba:CPP, M212Bb:CPP, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212De:CCC, M212Ea:CCC, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Cd:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: DOD (Fort Knox); NPS (Carl Sandburg Home, Chickamauga-Chattanooga, Great Smoky Mountains, Harpers Ferry, Kings Mountain, Rock Creek, Russell Cave); TVA (Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Land Between the Lakes, Nantahala, Oconee?, Pisgah, Sumter, Talladega?, Uwharrie)

Synonymy: IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990); IA7d. Piedmont Monadnock Forest (Allard 1990); Appalachian sub-xeric forest, in part (Evans 1991); Chestnut Oak Forest, in part (Schafale and Weakley 1990); Piedmont Monadnock Forests, in part (Schafale and Weakley 1990); Oligotrophic Forest, in part (Rawinski 1992); *Quercus prinus - Quercus velutina / Vaccinium stamineum* Association (Fleming and Moorhead 1996); Chestnut Oak: 44, in part (Eyre 1980); Mixed Oak Forest (Swain and Kearsley 2001); Ridgetop Chestnut Oak (Swain and Kearsley 2001); Dry oak - heath forest (Fike 1999); Xeric Central Hardwood Forest (Smith 1991)

References: Allard 1990, Arends 1981, Callaway et al. 1987, Cooper 1963, DuMond 1970, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Fleming and Moorhead 1996, Gibbon 1966, Golden 1974, Martin 1989, McLeod 1988, Mowbray 1966, Nelson 1986, Newell and Peet 1996a, Patterson 1994, Peet and Christensen 1980, Rawinski 1992, Rawinski et al. 1996, Schafale and Weakley 1990, Schmalzer 1978, Smith 1991, Swain and Kearsley 2001, Tobe et al. 1992, Wells 1974, Wheat 1986, Whittaker 1956

Authors: D. FABER-LANGENDOEN/D.J., RW, East **Identifier:** A.248

QUERCUS PRINUS - QUERCUS (RUBRA, VELUTINA) / GAYLUSSACIA BACCATA FOREST
Rock Chestnut Oak - (Northern Red Oak, Black Oak) / Black Huckleberry Forest
Northern Appalachian Dry Oak Forest **G5 (01-10-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Xeric Oak Forests and Woodlands (401-10; n/a)

Concept: This dry to xeric chestnut oak forest association of lower New England ranges to the northern Piedmont and central Appalachian Mountains. It occurs on upper slopes and ridgetops and is characterized by thin, nutrient-poor acidic soils. Windthrow, fire and ice damage are common natural disturbances. The tree canopy is closed to partially open and is dominated by *Quercus prinus*. *Quercus rubra, Quercus alba, Quercus velutina, Betula lenta*, and *Acer rubrum* are common associates, with other less frequent trees including *Quercus coccinea, Amelanchier arborea, Carya alba, Carya glabra, Pinus rigida, Pinus strobus, Quercus alba, Robinia pseudoacacia*, and *Sassafras albidum*. *Cornus florida* and *Nyssa sylvatica* are associates at the southern and western portions of the range. A tall-shrub layer is generally lacking, but when present may include *Viburnum acerifolium, Hamamelis virginiana*, and *Viburnum prunifolium*. The low-shrub layer is well developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*, or *Kalmia angustifolia*. The herbaceous layer is of sparse to moderate cover and may include *Carex pensylvanica, Antennaria plantaginifolia, Aralia nudicaulis, Aureolaria laevigata, Gaultheria procumbens, Chimaphila maculata, Carex rosea, Carex pensylvanica, Comandra umbellata, Cypripedium acaule, Deschampsia flexuosa, Danthonia spicata, Dioscorea quaternata, Epigaea repens, Galium latifolium, Goodyera pubescens, Hieracium venosum, Lysimachia quadrifolia, Medeola virginiana, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum, Uvularia puberula*, and *Uvularia sessilifolia*.
Comments: This community type is closely related to other oak / heath. It is distinguished by the presence of northern species such as *Pinus strobus* and *Vaccinium angustifolium*, and its general lack of southern Appalachian species such as *Gaylussacia ursina, Leucothoe recurva*, and *Galax urceolata*. In comparison to *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023), it lacks *Oxydendrum arboreum, Pinus echinata*, and *Pinus virginiana*. It occupies poorer sites and has a more abundant ericaceous shrub component than *Quercus prinus - Quercus rubra - Carya (glabra, alba) / Gaylussacia baccata* Forest (CEGL006057) and *Quercus prinus - Quercus velutina / Oxydendrum arboreum - Cornus florida* Forest (CEGL008522). The Chestnut Oak / Low-Elevation Subtype of Virginia intergrades with the more southern *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) throughout west-central Virginia. A well-developed Piedmont example of the Chestnut Oak / Low-Elevation Subtype is described by Allard and Leonard (1943). The Chestnut Oak - Northern Red Oak / High-Elevation Subtype of Virginia is similar to *Quercus rubra - (Quercus prinus, Quercus velutina) / Rhododendron periclymenoides / Lysimachia quadrifolia - Hieracium paniculatum* Forest (CEGL008523) of high-elevation granitic terrain on the Northern Blue Ridge, but lacks *Quercus velutina, Rhododendron periclymenoides*, and the suite of low-cover herbaceous species characteristic of mineral soil microhabitats in that unit.

The recognition of global subtypes equivalent to two distinct state community types is well supported by quantitative analysis of compositional and environmental data. Further study may support the elevation of these subtypes to full association-level status in the USNVC.
Range: This community ranges from southern Maine to Virginia and West Virginia through the Central Appalachians, and north more locally in the Piedmont. The Chestnut Oak / Low-Elevation Subtype occurs throughout this range, while the Chestnut Oak - Northern Red Oak / High-Elevation Subtype is confined to the higher ridges of west-central and northwestern Virginia.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S?, NH:S?, NJ:S3S4, NY:S4, PA:S?, RI:S?, VA:S?, VT:S3, WV:S?
TNC Ecoregions: 52:C, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212Ec:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 231Ak:CCP, 231Al:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCP, M221Bf:CCC, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Harpers Ferry, Rock Creek); USFS (George Washington, Jefferson)
Synonymy: Chestnut Oak Forest (Breden 1989) =, *Quercus velutina - (Quercus prinus)* Forest (Metzler and Barrett 1996), Chestnut oak forest (NAP pers. comm. 1998), Chestnut oak-black oak/ericad forest: (matrix) xeric, S- & SW-facing slopes (CAP pers. comm. 1998), Black gum ridgetop forest (Fike 1999), *Quercus montana / Kalmia latifolia / Gaylussacia baccata* Forest (Fleming and Moorhead 2000), *Quercus prinus - Quercus rubra / Acer pensylvanicum* Association: *Betula lenta / Ilex montana* Subassociation and *Quercus prinus / Smilax*

rotundifolia - Polypodium virginianum Subassociation (Fleming and Moorhead 1996), *Populus grandidentata* Association (Fleming and Moorhead 1996). a post-fire successional variant., *Quercus prinus / Kalmia latifolia - Rhododendron periclymenoides* Forest (Fleming and Coulling 2001) F. VA Srank = S5, *Quercus prinus - Quercus rubra / Kalmia latifolia / Vaccinium angustifolium - Gaultheria procumbens* Forest (Fleming and Coulling 2001) F. VA Srank = S4, *Quercus montana / Kalmia latifolia / Vaccinium pallidum* Association, *pro parte* (Rawinski et al. 1996), *Quercus montana / Kalmia latifolia / Gaultheria procumbens* Association (Rawinski et al. 1994), Chestnut Oak: 44 (Eyre 1980) B. typical variant and chestnut oak - northern red oak variant., SNE mesic oak/pine forest on acidic bedrock or till (Rawinski 1984), CNE dry hardwood forest on acidic bedrock or till (Rawinski 1984), SNE dry oak/pine forests on acidic bedrock or till (Rawinski 1984) B. in part, Dry Oak Woodland (Thompson 1996) B. closed-canopy occurrences on deeper soils, Dry Oak-Hickory Hophornbeam Forest (Thompson 1996) B
References: Allard and Leonard 1943, Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Collins and Anderson 1994, Edinger et al. 2002, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming et al. 2001, Gawler 2002, Metzler and Barrett 1996, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Rawinski et al. 1994, Rawinski et al. 1996, Shreve et al. 1910, Sperduto 1996, Thompson 1996, Thompson and Sorensen 2000, Vanderhorst 2000b
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006282

I.B.2.N.a.37. QUERCUS PRINUS - QUERCUS (ALBA, FALCATA, RUBRA, VELUTINA) FOREST ALLIANCE

Rock Chestnut Oak - (White Oak, Southern Red Oak, Northern Red Oak, Black Oak) Forest Alliance

Concept: Dry-mesic to mesic forests dominated by *Quercus prinus* occurring in admixture with other *Quercus* species, in the Blue Ridge, Piedmont, Ridge and Valley, Cumberland Plateau, and the Interior Low Plateau. *Quercus prinus* is the leading dominant in these forests, but other common canopy species can include *Quercus alba, Quercus coccinea, Quercus falcata, Quercus rubra, Quercus velutina, Acer rubrum, Carya alba, Carya glabra, Carya ovalis, Carya ovata, Carya pallida, Fagus grandifolia, Liriodendron tulipifera, Nyssa sylvatica*, and *Pinus strobus*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. Drier examples can contain *Juniperus virginiana var. virginiana*. Other common species in the subcanopy/shrub stratum include *Acer rubrum, Carya glabra, Cercis canadensis, Hamamelis virginiana, Kalmia latifolia, Nyssa sylvatica, Rhododendron calendulaceum, Rhododendron maximum, Robinia pseudoacacia, Stewartia ovata, Symplocos tinctoria, Vaccinium stamineum*, and *Viburnum acerifolium*. The ground flora varies depending on available light, moisture, and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. Herbaceous species characteristic of these dry-mesic to mesic oak - hickory forests include *Symphyotrichum cordifolium (= Aster cordifolius), Symphyotrichum retroflexum (= Aster curtisii), Eurybia macrophylla (= Aster macrophyllus), Symphyotrichum undulatum (= Aster undulatus), Botrychium virginianum, Carex nigromarginata, Chimaphila maculata, Actaea racemosa (= Cimicifuga racemosa), Collinsonia canadensis, Coreopsis major, Cypripedium parviflorum var. pubescens (= Cypripedium pubescens), Danthonia compressa, Danthonia spicata, Dioscorea villosa, Epigaea repens, Eupatorium album, Eupatorium purpureum, Galax urceolata, Galium triflorum, Houstonia purpurea (= Hedyotis purpurea), Hieracium venosum, Iris cristata, Maianthemum racemosum, Medeola virginiana, Melanthium parviflorum, Polystichum acrostichoides, Prenanthes altissima, Pycnanthemum incanum, Scutellaria ovata, Tephrosia virginiana, Uvularia perfoliata*, and *Uvularia puberula*. Vines are common and species that may be present include *Parthenocissus quinquefolia, Smilax* spp., and *Toxicodendron radicans*. In the Cumberland Plateau, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory. Forests in this alliance are known from moderately sheltered low ridges, flats, and valleys at lower elevations (762-1036 m; 2500-3400 feet) in the Blue Ridge and from upper slopes, draws, and gorge slopes in the Cumberland Plateau, and from upper to middle, dry-mesic slopes in the Piedmont. This alliance provisionally includes forests over limestone in the lower portions of the Ridge and Valley.
Range: This alliance is found in Alabama, Georgia (?), Kentucky, Mississippi (?), North Carolina, South Carolina, Tennessee, New Jersey, New York, Virginia, West Virginia, and Ohio. Forests in this alliance occur in the Blue Ridge, Piedmont, Ridge and Valley, Cumberland Plateau, and the Interior Low Plateau.
States/Provinces: AL CT GA? KY MD? MS? NC NJ NY SC TN VA WV?
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 59:C, 61:C, 62:C
USFS Ecoregions: 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221Hd:CCP, 221He:CCP, 221Jb:CCC, 222Cc:CCP, 222Ce:CCP, 222Cf:CCP, 222Cg:CCP, 222Eb:CCC, 222Ec:CCC, 222Eg:CCC, 222Eo:CCC, 222Fd:CCC, 231Aa:CCP, 231Ac:CCP, 231Af:CCC, 231Ah:CCP, 231Ai:CCC, 231Bc:CCC, 231Bd:CCC, 231Be:CCC,

231Bk:CCC, 231Db:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, M221Aa:CCC, M221Ab:CCC, M221Ca:CCP, M221Cb:CCP, M221Cc:CCC, M221Cd:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

Federal Lands: DOE (Oak Ridge); NPS (Chickamauga-Chattanooga, Kennesaw Mountain, Kings Mountain); TVA (Tellico); USFS (Cherokee, Daniel Boone, George Washington, , Holly Springs?, Jefferson, Land Between the Lakes?, Nantahala, Oconee?, Pisgah, Sumter, Talladega, Uwharrie)

Synonymy: Chestnut Oak Slope and Ridge Forest (Wieland 1994b); Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990); Mixed Oak, Yellow Poplar, Hickory (McLeod 1988); Mesic Oak-Hickory Forest (Patterson 1994); Oak-Hickory Cover Type (Thomas 1966); Mixed Oak Cover Type (Thomas 1966); Chestnut Oak: 44, in part (Eyre 1980); White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980)

References: Andreu and Tukman 1995, Eyre 1980, Fralish and Crooks 1989, Franklin et al. 1993, Golden 1979, Martin 1971, McLeod 1988, Nowacki and Abrams 1992, Patterson 1994, Schafale and Weakley 1990, Schmalzer 1978, Schmalzer and DeSelm 1982, Thomas 1966, Wells 1970c, Wells 1974, Wieland 1994b

Authors: M.P. SCHAFALE/A.S. WEAKLE, RW, Southeast **Identifier:** A.249

QUERCUS ALBA - QUERCUS PRINUS - CARYA GLABRA / CORNUS FLORIDA / VACCINIUM PALLIDUM / CAREX PENSYLVANICA FOREST

White Oak - Rock Chestnut Oak - Pignut Hickory / Flowering Dogwood / Hillside Blueberry / Pennsylvania Sedge Forest

Central Appalachian Acidic Oak - Hickory Forest **G4? (01-09-21)**

Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Oak Forests and Woodlands (401-13; 2.5.3.2)

Concept: This community type is associated with substrates weathered from shale and similar metasedimentary rocks in the central Appalachian region. It appears to be widespread at low elevations of the Ridge and Valley province in Virginia, south at least to the New River, and more local on the western flank of the northern Blue Ridge, and may extend into the Ridge and Valley of West Virginia and/or Maryland. Sites in the Ridge and Valley are distributed on low shale knobs and ridges, or at the base of higher sandstone ridges, where local shale strata have been exposed by stream incision. On the Blue Ridge, stands are confined to a belt of metasedimentary rocks that overlie the plutonic basement complex on the western side of the anticlinorium. Habitats encompass dry, most east- to south-facing slopes, hollows, and broad, sub-level ridge crests at low elevations (<600 m or 2000 feet). Slope shape is generally convex in at least one direction. The characteristic vegetation of this unit is an open oak-hickory or oak-hickory-pine forest dominated by *Quercus prinus* and *Quercus alba*, with high cover of *Carya* spp., especially *Carya glabra*. *Quercus velutina* and *Quercus rubra* are less frequent, but locally codominant trees. Total canopy cover is usually in the 60-80% range, and dominant canopy trees typically do not much exceed, and in some situations do not reach, 20 m in height. Minor canopy associates include *Carya alba, Carya ovalis, Pinus echinata, Pinus strobus, Pinus virginiana, Quercus coccinea*, and *Quercus stellata*. Young representatives of most canopy species are common in the understory, along with *Cornus florida* and *Amelanchier arborea*. Generally, there is a moderate to sparse representation of ericaceous (heath family) shrubs in this community type. However, on gentle ridge crests, where litter and humus tend to accumulate, *Vaccinium pallidum* may dominate the herb layer in low colonies. On the more extensive steep, convex slopes, where litter accumulations are thin and patchy, ericads are sparse and herbaceous richness tends to be moderately high, although total herb cover is usually quite sparse.

Comments: The global range and status of this community type need further investigation. It may occur on a wider variety of substrates, and cover a much larger geographic area, than current documentation indicates.

Increment cores taken from old trees in the Peters Mountain area of Alleghany County (James River Ranger District) - e.g., a 44 cm (17 in.) dbh *Quercus alba* ca. 225 years old, a 49 cm (19 in.) dbh *Quercus alba* ca. 155 years old, and a 46 cm (18 in.) dbh coppice sprout of *Quercus prinus* ca. 175 years old - indicate slow growth rates in stands of this type (Fleming and Moorhead 2000). Data collected from throughout the Peters Mountain study area also indicate that *Castanea dentata* was much less important in pre-blight forests on shale compared to those on the area's sandstone ridges (Fleming and Moorhead 2000).

Range: This community type is associated with substrates weathered from shale and similar metasedimentary rocks (e.g., metasiltstone) in the central Appalachian region. It appears to be widespread at low elevations of the Ridge and Valley province in Virginia, south at least to the New River, and more local on the western flank of the northern Blue Ridge. Although not documented in either West Virginia or Maryland, its occurrence in the Ridge and Valley portions of these states seems probable. Within its known distribution, this unit is a matrix community type in localities of optimal habitat.

States/Provinces: MD?, VA:S?, WV?
TNC Ecoregions: 50:C, 59:C
USFS Ecoregions: M221Aa:CCC, M221Ab:CCC, M221Da:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: *Quercus alba - Quercus prinus - Carya glabra / Cornus florida / Vaccinium pallidum / Carex pensylvanica* Forest (Fleming and Coulling 2001) =, *Quercus alba - Quercus montana - Carya glabra / Carex pensylvanica* Forest (Fleming and Moorhead 2000), *Quercus prinus - Quercus rubra - Carya ovalis / Cornus florida / Desmodium nudiflorum* Association: *Helianthus divaricatus - Carex pensylvanica - Dichanthelium boscii - Arabis laevigata* Subassociation, *pro parte* (Rawinski et al. 1996). see CEGL008516., White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) B
References: Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Rawinski et al. 1996
Authors: G. Fleming and P. Coulling, ECS **Confidence:** **Identifier:** CEGL008515

I.B.2.N.a.38. QUERCUS PRINUS - QUERCUS RUBRA FOREST ALLIANCE

Rock Chestnut Oak - Northern Red Oak Forest Alliance

Concept: This alliance includes dry-mesic oak forests, codominated by *Quercus prinus* and *Quercus rubra*, at moderate elevations in the Blue Ridge, Ridge and Valley, and High Alleghenies of Virginia, western North Carolina, eastern Tennessee, South Carolina, and Georgia. It also includes transitional oak - hickory forests of Lower New England and the Northern Piedmont. This alliance may possibly range into the upper Piedmont and into the eastern fringes of the Cumberland Mountains and Appalachian Plateau of Kentucky, but no associations have been defined for these regions. The majority of the forests in this alliance occur in areas previously dominated by *Castanea dentata*, and chestnut sprouts are common in the understory. The canopy of forests in this alliance tend to be dominated by *Quercus rubra* and/or *Quercus prinus*, although other mesic hardwood species can codominate or be present in the canopy and subcanopy. Typical tree associates include *Liriodendron tulipifera, Acer rubrum, Hamamelis virginiana, Acer pensylvanicum*, and *Oxydendrum arboreum*. In the Appalachian Mountains, shrub layers are often dense and dominated by ericaceous species, *Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus, Kalmia latifolia, Gaylussacia* spp., and *Vaccinium* spp. Herbaceous coverage tends to be inversely proportional to the shrub coverage. *Galax urceolata* and *Gaultheria procumbens* are components in sparse herb strata. Other herbs typical of these forests include *Solidago curtisii, Lysimachia quadrifolia, Thelypteris noveboracensis, Gentiana decora, Sanicula trifoliata, Prenanthes altissima, Dichanthelium* spp. (*Dichanthelium boscii, Dichanthelium commutatum, Dichanthelium dichotomum), Carex pensylvanica, Polystichum acrostichoides, Chimaphila maculata, Desmodium nudiflorum, Galium latifolium, Houstonia purpurea*, and *Maianthemum racemosum ssp. racemosum*. In montane landscapes, these forest occur on intermediate positions of elevation and aspect, on protected, often rocky slopes. Forests in this alliance are also found on sandstone boulderfields and outcrops in Virginia's Ridge and Valley.
Range: This alliance ranges from the southern Blue Ridge, north through the Ridge and Valley, and High Alleghenies of Virginia, and into some areas of Lower New England and the Northern Piedmont. This alliance may possibly range into the upper Piedmont and into the eastern fringes of the Cumberland Mountains and Appalachian Plateau of Kentucky, but no associations have been defined for these regions.
States/Provinces: GA MD? NC NJ? PA SC TN VA WV
TNC Ecoregions: 49:?, 50:P, 51:C, 52:C, 59:C, 61:C
USFS Ecoregions: 212G:P?, 221Am:CCP, 221Da:CCP, 221Db:CCP, 221Eb:C??, 221F:C?, 221H:C?, 221J:C?, 231Aa:PPP, 231Ag:PP?, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Bf:CCC, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??, M221Ce:C??, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Carl Sandburg Home, Great Smoky Mountains, Harpers Ferry, Kings Mountain); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter)
Synonymy: Appalachian sub-xeric forest, in part (Evans 1991); Chestnut Oak Forest, in part (Schafale and Weakley 1990); Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990); Oak - Chestnut - Hickory Forest (Ambrose 1990a); Oak--Hickory Forest, in part (Nelson 1986); *Quercus prinus - Quercus rubra / Acer pensylvanicum* Association (Fleming and Moorhead 1996); Chestnut Oak: 44, in part (Eyre 1980)
References: Ambrose 1990a, Evans 1991, Eyre 1980, Fleming and Moorhead 1996, Golden 1981, Livingston and Mitchell 1976, McLeod 1988, Mowbray 1966, Nelson 1986, Nowacki and Abrams 1992, Rheinhardt 1981, Schafale and Weakley 1990
Authors: D.J. ALLARD 6-94, MOD. S., RW, Southeast **Identifier:** A.250

QUERCUS PRINUS - QUERCUS RUBRA - CARYA (GLABRA, ALBA) / GAYLUSSACIA BACCATA FOREST
Rock Chestnut Oak - Northern Red Oak - (Pignut Hickory, Mockernut Hickory) / Black Huckleberry Forest
Central Appalachian Rocky Dry-Mesic Oak Forest **G5 (01-10-01)**
Ecological Group (SCS;MCS): Appalachian Montane Oak-Hickory Forests (410-40; n/a)

Concept: This closed-canopy, dry-mesic oak forest of the central Appalachian Mountains is a montane forest of protected, rocky slopes. The canopy is codominated by *Quercus prinus* and *Quercus rubra*. Associated canopy species include *Liriodendron tulipifera, Acer rubrum, Carya glabra*, and *Carya alba*. The tall-shrub layer, when present, is characterized by *Hamamelis virginiana* and *Acer pensylvanicum*. The lower shrub layer is dense and ericaceous, characterized by *Rhododendron maximum, Kalmia latifolia, Gaylussacia* spp., and *Vaccinium* spp. The herbaceous layer is usually sparse but may include *Gaultheria procumbens, Lysimachia quadrifolia, Thelypteris noveboracensis, Sanicula trifoliata, Prenanthes altissima, Dichanthelium boscii, Dichanthelium commutatum, Dichanthelium dichotomum, Carex pensylvanica, Polystichum acrostichoides, Chimaphila maculata, Desmodium nudiflorum, Galium latifolium, Houstonia purpurea*, and *Maianthemum racemosum*. This association is intermediate in elevation and aspect in relation to *Quercus prinus - Quercus coccinea* forests and *Quercus rubra* forests.
Comments: The Ecological Group placement of this vegetation type is somewhat arbitrary, since it has atypically fertile soils and a sparse ericaceous shrub component compared to other members of the Mixed Oak / Heath and Chestnut Oak Forests group. Although it has some affinities to the Montane Oak - Hickory Forests and the Low-Elevation Boulderfield Forests, placement in either of these groups would be just as imperfect. Therefore, we have followed the results of cluster analysis, which placed the cluster of plots forming this type in a larger group with other oak / heath forests.

Wind and ice damage to tree crowns, damage to *Cornus florida* from dogwood anthracnose (*Discula destructiva*), and a few small fire scars were disturbances noted in plots. Although *Castanea dentata* logs and wood were not abundant in plots, frequent sprouts indicate that *Castanea dentata* was at least an associate tree in this unit prior to the arrival of chestnut blight. The northwest slopes of Peters Mountain in Alleghany County contains old-growth examples of the type with large, widely spaced canopy trees in the 43-72 cm (17-28 in.) dbh range. Representative old-age trees include a 59 cm (23 in.) dbh *Quercus prinus* >220 years old; a 63 cm (25 in.) dbh *Quercus prinus* ca. 179 years old; a 67 cm (26 in.) dbh *Quercus prinus* 265 years old; and a 71 cm (28 in.) dbh *Quercus rubra* >247 years old (Fleming and Moorhead 2000).
Range: This association occurs throughout the Central Appalachian region of Virginia, West Virginia, Maryland, Pennsylvania, and possibly further north. In Virginia, it is a large-patch to matrix community type in both the Northern Blue Ridge and Ridge and Valley provinces.
States/Provinces: MD?, NJ?, PA:S?, VA:S?, WV:S?
TNC Ecoregions: 59:C, 61:?
USFS Ecoregions: 212G:P?, 221Am:CCP, 221Da:CCP, 221Db:CCP, 221E:C?, 221F:C?, 231A:??, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bf:CCC, M221C:C?, M221Da:CCC
Federal Lands: NPS (Harpers Ferry); USFS (George Washington, Jefferson)
Synonymy: Chestnut oak-red oak/ericad forest: (matrix) N slopes (CAP pers. comm. 1998), *Quercus montana - Quercus rubra / Acer pensylvanicum - Hamamelis virginiana* Forest (Fleming and Moorhead 2000), *Quercus rubra - Magnolia acuminata* Association (Fleming and Moorhead 1996), *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (Fleming and Coulling 2001), *Magnolia acuminata - Betula lenta - Tilia americana / Parthenocissus quinquefolia* Association (Rawinski et al. 1994), *Quercus montana - Robinia pseudoacacia / Ribes rotundifolium* Association (Rawinski et al. 1994), *Quercus rubra - Quercus prinus - Liriodendron tulipifera / Parthenocissus quinquefolia - Dryopteris marginalis* Association (Rawinski et al. 1996), Red Oak - Chestnut Oak Community Type (Stephenson and Adams 1991), Chestnut Oak: 44 (Eyre 1980) B. chestnut oak - northern red oak variant
References: Breden et al. 2001, CAP pers. comm. 1998, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming et al. 2001, Rawinski et al. 1994, Rawinski et al. 1996, Stephenson and Adams 1991, Vanderhorst 2000b
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 3 **Identifier:** CEGL006057

I.B.2.N.a.100. QUERCUS VELUTINA - QUERCUS ALBA - (QUERCUS COCCINEA) FOREST ALLIANCE

Black Oak - White Oak - (Scarlet Oak) Forest Alliance

Concept: Forests in this alliance represent the drier end of the white oak - red oak - black oak cover type and are difficult to identify easily. This alliance is distributed in the Ozark Highlands, Ouachita Mountains, Arkansas Valley, the Interior Highlands, Piedmont, Inner Coastal Plain, and Blue Ridge. Stands are codominated by some combination of *Quercus alba, Quercus coccinea, Quercus velutina*, and/or *Quercus rubra*. In addition, *Quercus stellata, Quercus prinus, Carya alba, Carya glabra, Carya ovata, Pinus virginiana*, and *Pinus echinata* are common associates. Other common associates can include *Nyssa sylvatica, Acer rubrum var. rubrum, Sassafras albidum, Quercus falcata, Quercus macrocarpa* (within its range), and *Prunus serotina var. serotina*. Typical shrubs and small trees include *Cornus florida, Corylus americana, Ostrya virginiana, Oxydendrum arboreum, Sassafras albidum, Kalmia latifolia, Rhododendron calendulaceum, Gaylussacia ursina, Vaccinium* spp., *Viburnum acerifolium*, and *Hamamelis virginiana*. The herbaceous composition varies considerably over the wide range of this alliance. Some common herbs include *Agrimonia rostellata, Amphicarpaea bracteata, Botrychium virginianum, Carex blanda, Danthonia spicata, Antennaria plantaginifolia, Desmodium nudiflorum, Thelypteris noveboracensis, Prenanthes altissima, Galium* spp., *Dioscorea villosa, Conopholis americana, Polygonatum biflorum, Medeola virginiana*, and *Maianthemum racemosum*. Stands can be found on mid to upper slopes and terraces where dry-mesic conditions persist and where soils are more sandy and/or rocky. Bedrock is sandstone, siltstone, chert, or shale. Disturbance in the form of wind and logging tends to favor *Quercus velutina* in these forests. These forests generally occur on slopes and sheltered ridgetops. One example from the Interior Low Plateau of Tennessee occurs on high, ancient, elevated terraces adjacent to river floodplains.
Comments: It is not clear (2001-08-19) what the Piedmont manifestations of this alliance are. It is attributed to Kings Mountain NMP, Sumter NF, etc. but no association captures these attributes. Is a "provisional" justified? A new association will be added from the Arkansas Field Office Ouachita Inventory. This alliance is also present in Virginia, at least in the Ridge and Valley; a new association is likely needed. Stands previously placed in this alliance that occur in what are called inland maritime situations in older mature stands in the Outer Coastal Plain of South Carolina (C. Aulbach-Smith pers. comm.) need to be accommodated elsewhere. In Kentucky, these forests lack *Quercus rubra* as a dominant and occur in the Shawnee Hills and on upper slopes and ridgetops in the Appalachian Plateaus, and are abundant in the Interior Low Plateau.
Range: This alliance is distributed in the Ozark Highlands, Ouachita Mountains, Arkansas Valley, the Interior Highlands, Piedmont, upper Coastal Plain, and Blue Ridge. It is found in Arkansas, Georgia, North Carolina, Tennessee, Connecticut, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, Pennsylvania, Rhode Island, Virginia, West Virginia, Iowa, Illinois, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin, and in Ontario, Canada, and possibly in Alabama (?), Delaware (?), Kentucky (?), Mississippi (?), Oklahoma (?), and South Carolina (?).
States/Provinces: AL? AR CT DE? GA IA IL IN KY? MA MD MI MN MO MS? NC NH NJ NY OH ON PA RI SC? TN VA WI WV
TNC Ecoregions: 36:C, 38:C, 39:C, 43:C, 44:C, 45:C, 46:C, 48:C, 50:C, 51:C, 52:C, 53:C, 56:P, 58:C, 59:C, 60:C, 61:C, 62:C
USFS Ecoregions: 212Fa:CCP, 212Fb:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Ht:CPP, 212Hu:CPP, 212Hw:CP?, 212Hx:CPP, 221Ab:CCP, 221Ac:CCP, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ai:CCP, 221Ak:CCC, 221Bd:CCP, 221Dc:CPP, 221E:CP, 221F:CP, 221Jb:CCC, 222Aa:CCC, 222Ab:CCP, 222Ad:CCP, 222Ae:CCP, 222Af:CCP, 222Ag:CCP, 222Aj:CCP, 222Am:CCP, 222Ca:CCC, 222Cf:CCP, 222Cg:CCP, 222De:CCC, 222Df:CCC, 222Dh:CCP, 222Di:CCP, 222Eb:CCC, 222Eg:CCP, 222Eh:CCP, 222Ek:CCC, 222Em:CCC, 222Fe:CCC, 222Ga:CCC, 222Gb:CCC, 222Gd:CCC, 222Ha:CCC, 222Hb:CCP, 222Hf:CCP, 222Ig:CCC, 222Ja:CC?, 222Jb:CCP, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 222Kg:CCP, 222Kj:CCC, 222Lc:CCC, 222Lf:CCC, 222Md:CCC, 222Me:CCC, 231A:CP, 231Bd:CPP, 231Gb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCP, 232Bq:CCC, 232Br:CCC, 232Bt:CCP, 232Ch:CCC, 251Cf:CCC, 251Ci:CCC, 251Cj:CCC, 251Ck:CCC, 251Dc:CCC, 251Dd:CCC, 251Df:CCC, 251Dg:CCC, 251Dh:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221C:CP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: DOD (Arnold, Fort Benning); NPS (Buffalo, Fire Island, Great Smoky Mountains, Kings Mountain, Russell Cave, Shiloh?); TVA (Tellico); USFS (Cherokee?, Daniel Boone?, George Washington, Holly Springs?, Jefferson, Manistee-Huron?, Nantahala, Ouachita, Ozark, Pisgah, Sumter, Talladega, Tuskegee, Uwharrie)
Synonymy: Submesic Oak - Hickory Forest (Foti 1994b); Acidic sub-xeric forest, in part (Evans 1991); Montane

Oak--Hickory Forest, in part (Schafale and Weakley 1990); T1B4aII4c. *Quercus alba - Quercus velutina - Quercus falcata* (Foti et al. 1994); White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980); Coastal Forest/Woodland (Swain and Kearsley 2001); Black Oak - Scarlet Oak Forest / Woodland (Swain and Kearsley 2001)
References: Aulbach-Smith pers. comm., Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Jones 1988a, Jones 1988b, Schafale and Weakley 1990, Swain and Kearsley 2001
Authors: D. FABER-LANGENDOEN/L.A., MP, Southeast **Identifier:** A.1911

QUERCUS (VELUTINA, ALBA) / VACCINIUM PALLIDUM HIGH ALLEGHENY PLATEAU, WESTERN ALLEGHENY PLATEAU FOREST

(Black Oak, White Oak) / Hillside Blueberry High Allegheny Plateau, Western Allegheny Plateau Forest
G? (97-12-01)
Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Oak Forests and Woodlands (401-13; 2.5.3.2)

Concept: Acidic, nutrient-poor oak forest of High Alleghenies (HAL) and Lower Allegheny Plateau (LAP) ecoregions.
Comments: Compare with *Quercus velutina - Quercus alba / Vaccinium (angustifolium, pallidum) / Carex pensylvanica* Forest (CEGL005030); range may include some midwestern states.
States/Provinces: MD:S?, NY:S4, PA:S?, WV:S?
TNC Ecoregions: 59:C, 60:C, 61:P
USFS Ecoregions: 212Fa:CCP, 212Fb:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Bd:CCP, 221D:CP, 221E:CP, 221F:CP, 231A:CP, M221Aa:CCC, M221Ac:CCC, M221Bb:CCC, M221Bf:CCC, M221C:CP, M221D:CP
Synonymy: Black oak-white oak-hickory/dogwood forest: (matrix) dry, dry-mesic, low elevation (CAP pers. comm. 1998)
References: CAP pers. comm. 1998, Fike 1999
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006018

QUERCUS COCCINEA - QUERCUS VELUTINA - QUERCUS ALBA / AMELANCHIER ARBOREA / GAYLUSSACIA BACCATA FOREST

Scarlet Oak - Black Oak - White Oak / Downy Serviceberry / Black Huckleberry Forest
Mixed Oak / Heath Forest (Low-Elevation White Oak - Scarlet Oak - Black Oak Type) **G3G4 (01-09-21)**
Ecological Group (SCS;MCS): Appalachian Highlands Xeric Oak Forests and Woodlands (401-10; n/a)

Concept: This community is currently known from low-elevation landscapes in the northern Blue Ridge and Ridge and Valley provinces of Virginia but probably also occurs at similar sites in West Virginia, Maryland, and Pennsylvania. Stands are located between 360 and 700 m (1200-2300 feet) elevation on relatively level sites of mountain valleys and lower slope benches. Most documented occurrences are located on ancient alluvial fan deposits, which are especially extensive along the western foot of the Blue Ridge. The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by *Quercus coccinea, Quercus velutina, Quercus alba*, and *Quercus prinus*. *Pinus rigida* is a frequent canopy associate but has been much reduced over the past decade by infestations of the southern pine beetle (*Dendroctonus frontalis*). *Quercus falcata, Quercus stellata*, and *Carya alba* are infrequent canopy trees. *Nyssa sylvatica, Amelanchier arborea* and, in the southern part of the range, *Oxydendrum arboreum* attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* and *Sassafras albidum* are other common understory trees. The shrub layer is dominated by ericaceous species but is fairly diverse. Despite high shrub densities, a number of low-cover herbs and subshrubs occur in the type.
Comments: This unit is distinct among Virginia oak / heath forests in its occurrence on low-elevation, relatively level, non-rocky terrain. *Quercus prinus* and *Kalmia latifolia*, although present and occasionally abundant, are not as important in this unit as it is in most related vegetation types. *Quercus alba*, normally a minor tree in montane oak / heath forests, is usually a codominant, while the low-elevation oaks *Quercus falcata* and *Quercus stellata* further distinguish the type. In many respects, this forest's distinctive environmental and floristic features resemble characteristics of Piedmont vegetation, and the relationship of this community to similar oak / heath forests of the Virginia Piedmont needs further scrutiny. Additional data collection and analysis may warrant a broader conceptual interpretation that includes both montane and Piedmont stands.

Range: This community is currently known from low-elevation landscapes in the northern Blue Ridge and Ridge and Valley provinces of Virginia. Its full geographic distribution is likely to be more extensive than documentation indicates and probably includes similar sites in West Virginia, Maryland, and Pennsylvania.
States/Provinces: MD?, PA?, VA:S?, WV?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Aa:CCC, M221Ab:CCC, M221Da:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: *Quercus coccinea - Quercus velutina - Quercus alba / Amelanchier arborea / Gaylussacia baccata* Forest (Fleming and Coulling 2001), *Quercus alba - Quercus falcata - Carya tomentosa / Cornus florida* Association (Rawinski et al. 1996), White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) B. black oak - scarlet oak variant
References: Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Harbor 1996, Rawinski et al. 1996
Authors: G. Fleming and P. Coulling, ECS **Confidence:** **Identifier:** CEGL008521

I.B.2.N.d. Temporarily flooded cold-deciduous forest

I.B.2.N.d.3. ACER NEGUNDO TEMPORARILY FLOODED FOREST ALLIANCE

Box-elder Temporarily Flooded Forest Alliance

Concept: Temporarily flooded, early successional forests dominated by *Acer negundo*. This alliance is widespread but sporadic in the southeastern United States, and occurs at scattered locations in the Western Great Plains, lower montane Rocky Mountains, and Intermountain West. Characteristic species include *Platanus occidentalis, Acer rubrum, Liquidambar styraciflua, Acer saccharinum, Ulmus alata, Celtis laevigata*, and *Populus deltoides*. These forests are common on large rivers in the active floodplain and on sandbars. The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. Forests dominated by *Carya illinoinensis* often succeed these forests within the range of the species. Pure stands occur on the Mississippi River batture on second ridges with heavy vine cover of *Berchemia scandens* and *Vitis* spp. These forests also occur in the Arkansas River Valley, with marginal examples on larger rivers in the Ouachita Mountains, and the Mississippi River Alluvial Plain, and also in the Nashville Basin of Tennessee and the Bluegrass Basin of Kentucky. Forests dominated by *Acer negundo* occur from near sea level in the Southeast to over 2300 m in elevation in western Colorado. The presence of this alliance in the Southeastern Coastal Plains is apparently somewhat sporadic. It would be expected on the Apalachicola River in Florida and adjacent Georgia.
Comments: Forests dominated by *Carya illinoinensis* often succeed these forests. The rangewide occurrence of this type is complicated by the 'weedy' nature of *Acer negundo*. For example, disturbed stands in the I.B.2.N.d *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286) often become dominated by *Acer negundo*.
Range: This alliance is widespread across the southeastern United States and occurs at scattered locations in the Western Great Plains, lower montane Rocky Mountains, and the Intermountain West. It ranges from Maryland and Virginia sporadically south through Kentucky, South Carolina, Alabama, and Georgia, and west into Arkansas, Missouri, and Oklahoma. These forests also occur in the Arkansas River Valley, with marginal examples on larger rivers in the Ouachita Mountains, the Mississippi River Alluvial Plain, the Nashville Basin of Tennessee, and the Bluegrass Basin of Kentucky. Its presence in the Southeastern Coastal Plains is apparently somewhat sporadic. It would be expected on the Apalachicola River in Florida and adjacent Georgia, and the lower Chattahoochee River (Alabama/Georgia stateline). It is also reported from Colorado, Utah, Idaho, Montana, South Dakota, Wyoming, and possibly Arizona.
States/Provinces: AL AR CO GA IA ID KY LA MD MO MS MT OK SC SD TN TX? UT VA WV WY
TNC Ecoregions: 10:C, 18:C, 19:C, 20:C, 25:C, 26:C, 31:?, 32:P, 36:C, 39:C, 40:C, 41:P, 42:C, 43:C, 44:C, 50:C, 53:C, 56:?, 57:?, 58:?, 59:P, 6:C, 9:C
USFS Ecoregions: 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221Hd:CC?, 221He:CCC, 221Ja:CP?, 221Jb:CP?, 221Jc:CP?, 222Ca:CC?, 222Cb:CC?, 222Cc:CCC, 222Cd:CC?, 222Ce:CC?, 222Cf:CC?, 222Cg:CCC, 222Ch:CC?, 222Ea:CCP, 222Eb:CCC, 222Ec:CCP, 222Ed:CCP, 222Ee:CCP, 222Ef:CCP, 222Eg:CCP, 222Eh:CCP, 222Ei:CCP, 222Ej:CCC, 222Ek:CCP, 222En:CCC, 222Eo:CCC, 222Fa:CP?, 222Fb:CP?, 222Fc:CP?, 222Fd:CP?, 222Ff:CP?, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCC, 231Be:CCP, 231Bf:CCP, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP,

231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CC?, 231Eb:CCP, 231Ec:CC?, 231Ed:CCP, 231Ee:CCP, 231Ef:CCP, 231Eg:CCP, 231Eh:CCP, 231Ei:CCP, 231Ej:CCP, 231Ek:CCP, 231El:CCP, 231Em:CCP, 231En:CCP, 231Fa:C??, 231Fb:C??, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Bj:CP?, 232Bs:CPP, 232Dc:CP?, 234Aa:CCC, 234Ab:CCC, 234Ac:CCC, 234Ad:CCC, 234Ae:CCC, 234Af:CCC, 234Ag:CCC, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 331D:CC, 331G:CC, 341B:CC, 342A:CC, 342B:CC, 342G:CC, M221Cd:CCC, M231A:CC, M331B:CC, M331D:CC, M331G:CC, M331H:CC, M334A:CC, M341B:CC

Federal Lands: COE (Arkansas River); NPS (Jewel Cave, Russell Cave, Shiloh, Wind Cave); USFS (Black Hills, Daniel Boone, St. Francis, Tuskegee); USFWS (Holla Bend, Little River)

Synonymy: Riverfront Forest, in part (Foti 1994b); Alluvial forest, in part (Evans 1991); *Acer saccharinum* forest alliance. ? (Hoagland 1998a); R1B3cI1a. *Acer negundo - Carya illinoiensis - Populus deltoides* (Foti et al. 1994); Boxelder (*Acer negundo*) Dominance Type, in part (Jones and Walford 1995); *Acer negundo* Community Type, in part (Szaro 1989); *Acer negundo*-Mixed Deciduous Community Type, in part (Szaro 1989)

References: Evans 1991, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hoagland 1997, Hoagland 1998a, Jones and Walford 1995, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Padgett et al. 1989, Richard et al. 1996, Szaro 1989, Youngblood et al. 1985a

Authors: D.J. ALLARD, MOD. D. CULV, MP, Southeast **Identifier:** A.278

ACER NEGUNDO FOREST

Box-elder Forest

Box-elder Floodplain Forest **G4G5 (97-08-15)**

Ecological Group (SCS;MCS): Southeastern Coastal Plain Large River Bottomland Hardwood Forests (385-20; 1.6.4.2)

Concept: This box-elder floodplain forest is found on floodplains in the southern, eastern, and midwestern United States. Stands occur on large rivers in the active floodplain and on sandbars, and may form farther from the riverfront following disturbance. They are typically temporarily flooded in the spring. These early successional forests are dominated by *Acer negundo*. Other characteristic species include *Platanus occidentalis, Celtis laevigata, Acer rubrum, Liquidambar styraciflua, Acer saccharinum, Ulmus alata, Ulmus rubra, Carpinus caroliniana, Morus rubra*, and *Populus deltoides*. The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. The range, dynamics, and variability of this type is complicated by the 'weedy' nature of *Acer negundo*. For example, disturbed stands in the *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286) often become dominated by *Acer negundo*. In Kentucky, *Acer negundo* may also dominate in old fields, with *Dichanthelium clandestinum* and *Carex* spp. in the ground layer.

Comments: The range, dynamics, and variability of this type is complicated by the 'weedy' nature of *Acer negundo*. For example, disturbed stands in the *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286) often become dominated by *Acer negundo*. And in the upper Midwest *Acer negundo*-dominated stands are treated as part of the *Fraxinus pennsylvanica - (Ulmus americana) / Symphoricarpos occidentalis* Forest (CEGL002088). Thus, some consistency is needed in the application of this type across its range. In Arkansas, these forests can be pure *Acer negundo* or have *Acer rubrum* and *Platanus occidentalis* as associates (T. Foti pers. comm. 1999). Composition is variable. In central Kentucky, a simple strip of *Acer negundo* and *Platanus occidentalis*, plus *Ulmus americana*, etc., is common along all medium-sized streams, with almost no *Acer saccharinum* or *Populus deltoides* (J. Campbell pers. comm. 1999). This type occurs along the Arkansas River in Arkansas (D. Zollner pers. comm. 1999). In Missouri, stands would probably be combined with *Betula nigra - Platanus occidentalis* Forest (CEGL002086) (M. Leahy pers. comm. 1999). In Kentucky, this may be found at the Licking River impoundment (Cave Run Lake).

Range: This *Acer negundo* floodplain forest is found sporadically on floodplains in the southern, eastern, and midwestern United States, ranging from Maryland west to Iowa, south to Louisiana and possibly Texas, and east to Georgia.

States/Provinces: AL:S?, AR:S?, GA:S?, IA:SW, KY:S3, LA:S4, MD:S?, MO:S?, MS:S?, OK:S?, SC:S?, TN:S?, TX?, VA:S?, WV:S?

TNC Ecoregions: 31:?, 32:P, 39:C, 40:C, 41:P, 42:C, 43:C, 44:C, 50:C, 53:P, 56:?, 57:?, 58:?, 59:P

USFS Ecoregions: 221Ha:CC?, 221Hb:CCC, 221Hc:CC?, 221Hd:CC?, 221He:CC?, 221Ja:CP?, 221Jb:CP?, 221Jc:CP?, 222Ca:CC?, 222Cb:CC?, 222Cd:CC?, 222Ce:CC?, 222Cf:CC?, 222Cg:CCC, 222Ch:CC?,

222Ea:CCP, 222Eb:CCP, 222Ec:CCP, 222Ed:CCP, 222Ee:CCP, 222Ef:CCP, 222Eg:CCP, 222Eh:CCP, 222Ei:CCP, 222Ej:CCP, 222Ek:CCP, 222En:CCP, 222Eo:CCC, 222Fa:CP?, 222Fb:CP?, 222Fc:CP?, 222Fd:CP?, 222Ff:CP?, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCP, 231Bf:CCP, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCC, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CC?, 231Eb:CCP, 231Ec:CC?, 231Ed:CCP, 231Ee:CCP, 231Ef:CCP, 231Eg:CCP, 231Eh:CCP, 231Ei:CCP, 231Ej:CCP, 231Ek:CCP, 231El:CCP, 231Em:CCP, 231En:CCP, 231Fa:C??, 231Fb:C??, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 234Aa:CCC, 234Ab:CCC, 234Ac:CCC, 234Ad:CCC, 234Ae:CCC, 234Af:CCC, 234Ag:CCC, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC
Federal Lands: NPS (Shiloh); USFS (Daniel Boone, St. Francis); USFWS (Little River)
References: Blair 1938, Campbell pers. comm., Fleming et al. 2001, Foti pers. comm., Hoagland 2000, Leahy pers. comm., Patterson and DeSelm 1989, Zollner pers. comm.
Authors: SCS **Confidence:** 2 **Identifier:** CEGL005033

I.B.2.N.d.4. ACER SACCHARINUM TEMPORARILY FLOODED FOREST ALLIANCE

Silver Maple Temporarily Flooded Forest Alliance

Concept: This alliance contains floodplain forests of major rivers in the eastern United States where *Acer saccharinum* is generally dominant. Other tree associates include *Platanus occidentalis, Celtis laevigata, Carya illinoinensis, Ulmus americana, Acer negundo, Fraxinus pennsylvanica, Ulmus rubra, Salix nigra, Betula nigra*, and *Populus deltoides*. Common shrub species include *Lindera benzoin, Ilex decidua, Asimina triloba, Cephalanthus occidentalis, Alnus serrulata*, and *Forestiera acuminata* (in the Southeast). Characteristic herbs include nettles and ferns, such as *Boehmeria cylindrica, Urtica dioica, Laportea canadensis, Onoclea sensibilis*, and *Matteuccia struthiopteris*, and in the South, *Leersia lenticularis, Pilea pumila, Carex grayi, Impatiens capensis*, and others.

Forests in this alliance generally occur on well-drained, sandy soils, on infrequently flooded bottomlands, on levees, and on deep silts on stabilized sites along larger rivers. They also may occur along smaller rivers but are most common along bigger rivers where there is more scour and more silt deposition. This alliance is common in the Interior Low Plateau and in the Upper West Gulf Coastal Plain particularly along the White and Arkansas rivers north to the Ozarks, and then in the central Midwest to Wisconsin and Minnesota, and the East Coast to Maine. It is sparingly distributed in the Piedmont and is known from the South Atlantic Coastal Plain in South Carolina.
Comments: There appears to be some conceptual overlap between A.279 and A.288 which should be clarified.
Range: This alliance is common in the Interior Low Plateau and in the Upper West Gulf Coastal Plain particularly along the White and Arkansas rivers north to the Ozarks, and then in the central Midwest to Wisconsin and Minnesota, and the East Coast to Maine. It is sparingly distributed in the Piedmont and is known from the South Atlantic Coastal Plain in South Carolina. Pure forests of *Acer saccharinum* occur along larger rivers throughout Kentucky, but primarily in the eastern portion of the state (M. Evans pers. comm.). States of occurrence in the Southeast are Arkansas, Kentucky, Mississippi (?), Oklahoma (?), South Carolina, and Tennessee (but not Louisiana); in the East are Connecticut, Maryland (?), Massachusetts, Maine, New Hampshire, New York, Pennsylvania (?), Vermont, and Virginia; in the Midwest are Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin; and, in Canada, Ontario and probably Quebec.
States/Provinces: AR CT IA IL IN KY MA MD ME MI MN MO MS? NB NH NY OH OK? ON PA SC TN VA VT WI WV
TNC Ecoregions: 35:C, 36:C, 37:C, 38:C, 39:C, 40:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:P, 52:C, 57:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Da:CCC, 212E:CP, 212Fa:CCC, 212Fb:CCC, 212Ga:CCC, 212Hb:CCC, 212He:CCC, 212Hm:CCC, 212Ht:CCP, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ja:CCC, 212Jb:CCP, 212Jc:CCP, 212Je:CCC, 212Jf:CCC, 212Jj:CC?, 212Jl:CCC, 212Jm:CCP, 212Js:CCC, 212Ka:CC?, 212Kb:CCC, 212Lc:CPP, 212Ld:CPP, 212Mb:CPP, 212Na:CC?, 212Nb:CCP, 212Nc:CCC, 212Nd:CCC, 221Ak:CCC, 221B:CP, 221D:CC, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Fa:CCC, 221Ha:CCP, 221Hc:CCP, 221He:CCP, 222Ab:CCC, 222Ad:CCP, 222Ae:CCP, 222Ag:CCC, 222Ah:CCC, 222Aj:CCC, 222An:CCC, 222Ao:CCC, 222Ap:CCC, 222Aq:CCC, 222Cg:CCC, 222Ch:CCC, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Df:CCP, 222Ei:CPP, 222Ek:CPP, 222El:CPP, 222Em:CPP, 222Fa:CCP, 222Fb:CCC, 222Fc:CCP, 222Fd:CCP, 222Fe:CCP,

222Ff:CCP, 222Ga:CCC, 222Gb:CCC, 222Gc:CCC, 222Gd:CCP, 222Ge:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCC, 222Hf:CCC, 222If:CCC, 222Jb:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ka:CCC, 222Kb:CCC, 222Kd:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCP, 222Lc:CCC, 222Ld:CCC, 222Lf:CCC, 222Ma:CCC, 222Mb:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, 231Ea:CCC, 231Ec:CCP, 231Ej:CCC, 231Ga:CCC, 232A:CP, 232Bs:CCC, 234Aa:CC?, 234Am:CCC, 234An:CCC, 251Ba:CCC, 251Be:CCC, 251Cc:CCC, 251Cd:CCC, 251Cf:CCC, 251Dd:CCP, 251De:CCC, 251Df:CCC, 251Dg:CCC, 251Dh:CCC, 251Eb:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212E:CP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Da:CCC, M222Aa:CCC, M222Ab:CCC

Federal Lands: COE (Arkansas River); NPS (Congaree Swamp, Harpers Ferry, Shiloh?); USFS (George Washington, Ozark); USFWS (Holla Bend, Little River)

Synonymy: Silver Maple - American Elm: 62, in part (Eyre 1980); Cottonwood: 63, in part (Eyre 1980); Riverfront Forest, in part (Foti 1994b); Bottomland hardwood forest, in part (Evans 1991); R1B3cII5a. *Acer saccharinum - Ulmus americana*, in part (Foti et al. 1994); *Acer saccharinum* forest alliance. ? (Hoagland 1998a); *Acer saccharinum - Populus deltoides / Aster* community. New Haven, Illinois (Voigt and Mohlenbrock 1964); Southern Wet Forest. Wisconsin (Curtis 1959); *Populus - Acer saccharinum, Eupatorium - Acer saccharinum, Onoclea - Acer saccharinum* community. Connecticut (Metzler and Damman 1985); *Boehmeria - Acer saccharinum* community. Connecticut (Metzler and Damman 1985); Major-River Floodplain Forest (Swain and Kearsley 2001); Silver maple floodplain forest (Fike 1999); Floodplain Forest, in part (Smith 1991)

References: Curtis 1959, Evans 1991, Evans, M., pers. comm., Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Fralish et al. 1991, Hoagland 1997, Hoagland 1998a, Metzler and Damman 1985, Smith 1991, Swain and Kearsley 2001, Voigt and Mohlenbrock 1964

Authors: D.J. ALLARD/D. FABER-LANG, MP, Midwest **Identifier:** A.279

ACER SACCHARINUM - ULMUS AMERICANA - (POPULUS DELTOIDES) FOREST

Silver Maple - American Elm - (Eastern Cottonwood) Forest

Silver Maple - Elm - (Cottonwood) Forest **G4? (96-10-03)**

Ecological Group (SCS;MCS): Midwestern Riverfront Floodplain Forests (459-30; 1.6.2.3)

Concept: This silver maple - elm - cottonwood forest community is found throughout the midwestern United States and parts of the eastern United States. Stands occur on large, regularly flooded floodplains. Canopy cover is more-or-less closed and dominated by *Acer saccharinum*. Codominants may include *Populus deltoides, Platanus occidentalis, Ulmus americana, Ulmus rubra, Salix nigra, Acer negundo, Betula nigra, Celtis occidentalis*, and *Fraxinus pennsylvanica*. The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus canadensis* or *Lindera benzoin*. Woody and herbaceous vines can be prominent, including, among the woody vines, *Parthenocissus quinquefolia* and *Vitis riparia*. Herbaceous vines species include *Apios americana, Amphicarpaea bracteata*, and *Echinocystis lobata*. Herbaceous grasses, forbs, and ferns dominate the ground layer, including *Symphyotrichum lateriflorum (= Aster lateriflorus), Boehmeria cylindrica, Elymus virginicus, Impatiens pallida, Laportea canadensis, Matteuccia struthiopteris, Onoclea sensibilis, Pilea pumila, Urtica dioica*, and others. A variety of exotics may be present, including *Lysimachia* spp., *Microstegium vimineum*, and *Lonicera japonica*.

Comments: This type includes stands where *Acer saccharinum* represents the majority of trees (>50% cover or basal area?). This type is most clearly expressed on larger rivers. To some degree this type is more northern, separable from the more southern type *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Forest (CEGL002431), but this distinction is not yet well resolved. In the southern parts of its range, this type may overlap with *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334), but that type is generally a higher terrace, small stream type. Compare this type with SAF cover type 62 (Eyre 1980). In Minnesota stands with less than either 50% cottonwood or silver maple and not in northwestern Minnesota tend to occur here (i.e., a mixed floodplain forest), as do silver maple stands with a supercanopy of cottonwoods. In southwestern Minnesota, stands with only some swamp white oak go here. If swamp white oak is dominant the stands probably belong with either an association in the *Quercus palustris - (Quercus bicolor)* Seasonally Flooded Forest Alliance (A.329), or *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* spp. Forest (CEGL002098), at least in the Midwest. *Fraxinus pennsylvanica* is a typical codominant in this type. In Wisconsin, this type may better be named *Acer saccharinum - Fraxinus pennsylvanica - Betula nigra* Forest (E. Epstein pers. comm. 1999).

Range: This association is found throughout the midwestern United States and parts of the eastern United

States, ranging from Pennsylvania west to Minnesota, south to Arkansas, and east to Virginia. It is a major, large-river floodplain forest community along the Potomac, Shenandoah, Rappahannock, and James rivers in Virginia.
States/Provinces: AR:S?, IA:SU, IL:S?, IN:S?, KY:S?, MD:S?, MI:S?, MN:S?, MO:S?, OH:S?, ON:S?, PA:S?, TN:S?, VA:S?, WI:S3, WV:S?
TNC Ecoregions: 35:C, 36:C, 37:C, 38:C, 40:?, 42:C, 43:P, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:P, 52:C, 59:C
USFS Ecoregions: 212Hb:CCC, 212He:CCC, 212Hm:CCC, 212Ht:CCP, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ja:CCC, 212Je:CCC, 212Jf:CCC, 212Jj:CC?, 212Jl:CCC, 212Js:CCC, 212Ka:CC?, 212Kb:CCC, 212Mb:CPP, 212Na:CC?, 212Nb:CCP, 212Nc:CCC, 212Nd:CCC, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Fa:CCC, 222Aj:CCC, 222Ap:CCC, 222Aq:CCC, 222Ch:CCC, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Df:CCP, 222Ei:CPP, 222Ek:CPP, 222El:CPP, 222Em:CPP, 222Fa:CCP, 222Fb:CCC, 222Fc:CCP, 222Fd:CCP, 222Fe:CCP, 222Ff:CCP, 222Ga:CCC, 222Gb:CCC, 222Gc:CCC, 222Gd:CCP, 222Ge:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCC, 222Hf:CCC, 222If:CCC, 222Jb:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ka:CCC, 222Kb:CCC, 222Kd:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCP, 222Lc:CCC, 222Ld:CCC, 222Lf:CCC, 222Ma:CCC, 222Mb:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, 234Aa:CC?, 234Am:CCC, 234An:CCC, 251Ba:CCC, 251Be:CCC, 251Cc:CCC, 251Cd:CCC, 251Cf:CCC, 251Dd:CCP, 251De:CCC, 251Df:CCC, 251Dg:CCC, 251Dh:CCC, 251Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Da:CCC
Federal Lands: NPS (Harpers Ferry, Shiloh?); USFS (George Washington, Ozark?)
Synonymy: Silver Maple - Mixed Hardwood Floodplain Forest. [common name], Silver maple-American elm-cottonwood floodplain forest (CAP pers. comm. 1998), Silver Maple - American Elm: 62 (Eyre 1980) B, *Acer saccharinum - Acer negundo / Elymus virginicus - Laportea canadensis* Forest (Fleming and Coulling 2001)
References: Anderson 1996, CAP pers. comm. 1998, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming et al. 2001, MNNHP 1993, Vanderhorst 2000b
Authors: D. Faber-Langendoen, mod. G. Fleming and P. Coulling, MCS **Confidence:** 2 **Identifier:** CEGL002586

I.B.2.N.d.27. ACER SACCHARUM - CARYA CORDIFORMIS TEMPORARILY FLOODED FOREST ALLIANCE

Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance

Concept: Forests in this alliance are dominated by *Acer saccharum* and *Carya cordiformis*. The subcanopy may contain a variety of species including *Ulmus americana, Ulmus rubra, Morus rubra*, and *Prunus serotina var. serotina*. The shrub layer is often quite dense with *Asimina triloba, Toxicodendron radicans*, and *Vitis* spp. dominating, but *Lindera benzoin, Aralia spinosa, Corylus americana*, and *Cornus florida* are also common. Where dense shrubs exist, light penetrating to the forest floor is diminished, and herbaceous density is reduced. *Campanulastrum americanum* and *Fleischmannia incarnata (= Eupatorium incarnatum)* are common herbs. Stands of this alliance occur on level to gently sloping ridges, terraces, natural levees, or higher elevations which border river floodplains or streams. They are found on moist, well-drained to moderately drained soils, primarily on northern aspects. In general, soils are medium-textured silt and colluvial, deep, clay loams derived mainly from sandstone and shales. Mesic moisture conditions are maintained throughout most of the growing season, but some flooding does occur. Damage from flooding during periods of heavy precipitation, wind, or storms can have dramatic effects on species composition. Although stands in this alliance tend to be late successional floodplain forest, the stresses of seasonal flooding create canopy openings which are quickly colonized by early and mid-successional species.
Range: This alliance is found in southern Illinois, southern Indiana, Kentucky, Tennessee, West Virginia, Virginia, Maryland, Pennsylvania, New Jersey, New York, Connecticut, New Hampshire, Massachusetts, Vermont, and Maine.
States/Provinces: AR CT IL IN? KY MA MD ME MO NB NH NJ NY OH? OK TN VT
TNC Ecoregions: 32:?, 36:C, 38:C, 39:C, 42:C, 43:C, 44:C, 45:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Cb:CPP, 212Da:CCC, 212Dc:CCP, 212Ea:CPP, 212Eb:CPP, 212Ec:CPP, 212Ed:CP?, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Ga:CPP, 212Gb:CPP, 221Aa:CC?, 221Ad:CCP, 221Ae:CCP, 221Af:CCP, 221Ag:CCP, 221Ah:CC?, 221Ai:CCP, 221Aj:CC?, 221Ak:CCC, 221Al:CCP, 221Ba:CCP, 221Bb:CCP, 221Bc:CCP, 221Bd:CCP, 221Db:CPP, 221Ea:CPP, 221Eb:CPP, 221Fa:CPP, 222Aa:CCC, 222Af:CCC, 222Ag:CCC, 222Aj:CCP, 222Ak:CCP, 222Al:CCC, 222An:CCC, 222Ao:CCP, 222Aq:CCP, 222Ca:CP?, 222Cb:CP?, 222Ch:CP?,

222Dh:CCC, 222Di:CCC, 222Gb:CCC, 222Hb:CCC, 222Ia:CPP, 222Ib:CPP, 222Ic:CPP, 222Id:CPP, 222Ie:CPP, 222If:CPP, 231Ae:PPP, 231Ak:PPP, 231Al:PPP, 231An:PPP, 231Ap:PPP, 232Ad:PPP, 232Br:PPP, 251Cj:CCC, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCP, M212Bc:CCC, M212Ca:CCC, M212Cc:CCP, M212Cd:CCC, M212Da:CPP, M212Db:CPP, M212Dc:CPP, M212Ea:CP?, M212Eb:CPP, M212Fa:CP?, M212Fb:CPP, M221Aa:PPP, M221Ab:PPP, M221Bb:PPP, M221Bd:PPP, M221Be:PPP, M221Bf:PP?, M221Ca:PPP, M221Cb:PPP, M221Cd:PP?, M221Da:P??, M222:C, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC
Federal Lands: NPS (Mammoth Cave); TVA (Shawnee Steam Plant, West Kentucky)
Synonymy: Sugar Maple: 27, in part (Eyre 1980)
References: Eyre 1980, Faber-Langendoen et al. 1996, Nelson 1985, Steyermark 1940
Authors: D.J. ALLARD/D. FABER-LANG, MP, East **Identifier:** A.302

ACER SACCHARUM - FRAXINUS SPP. - TILIA AMERICANA / MATTEUCCIA STRUTHIOPTERIS - AGERATINA ALTISSIMA FOREST

Sugar Maple - Ash species - American Basswood / Ostrich Fern - White Snakeroot Forest
Terrace Hardwood Floodplain Forest **G? (97-12-01)**

Concept: These rich floodplain forests are found on slightly elevated alluvial terraces of larger rivers throughout the glaciated Northeast. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well entrenched, and may even be on sloping banks along some river reaches. The alluvial soils are coarse and less regularly inundated than the soils supporting silver maple floodplain forests. Many of our examples occur on circumneutral to slightly calcareous soils. The canopy is closed to somewhat open, and unlike lower-elevation floodplain forests, a subcanopy is often present. Shrubs are occasional, but do not form high cover. The herb layer is well-developed and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids, and forbs. Bryoids are very minor. The canopy dominants can vary from site to site, but are usually some combination of *Acer saccharum, Tilia americana, Quercus rubra, Ulmus americana, Fraxinus americana, Fraxinus pennsylvanica*, and *Prunus serotina*. Minor canopy associates include *Acer saccharinum, Juglans cinerea, Fraxinus nigra*, and *Acer rubrum*. Shrubs include *Corylus americana, Viburnum lentago*, and *Prunus virginiana*; vines such as *Toxicodendron radicans, Parthenocissus* spp., or *Vitis* spp. may be locally common. The herb layer usually features *Matteuccia struthiopteris* and a mixture of other ferns, forbs, and graminoids. Characteristic species include *Ageratina altissima (= Eupatorium rugosum), Allium tricoccum, Allium canadense, Athyrium filix-femina, Caulophyllum thalictroides, Carex gracillima, Carex intumescens, Carex sprengelii, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Elymus wiegandii (= Elymus canadensis var. wiegandii), Onoclea sensibilis, Sanguinaria canadensis, Solidago flexicaulis, Solidago rugosa*, and *Solidago gigantea*. Exotic species, such as *Lysimachia nummularia, Glechoma hederacea*, and *Hesperis matronalis*, may be abundant, especially in disturbed areas. These terrace forests are distinguished from lower-floodplain forests by the reduced importance of *Acer saccharinum*; they differ from enriched northern hardwood forests, e.g., *Acer saccharum - Fraxinus americana - Tilia americana / Acer spicatum / Allium tricoccum - Caulophyllum thalictroides* Forest (CEGL005008), in their alluvial soils and flooding regime; also, *Matteuccia struthiopteris* is generally not found in enriched northern hardwood forests.
Comments: Drastically reduced from original extent, as most make excellent fertile farmland. Originally probably a large patch type; now small patch.
States/Provinces: CT:S?, MA:S2, MD:S?, ME:S2, NB:S?, NH:S?, NJ:S2S3, NY:S3, VT:S2
TNC Ecoregions: 60:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CCC, 212Bb:CCC, 212Ca:CPP, 212Da:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 221Ak:CCC, 221Bd:CCP, 221D:C?, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Ca:CCC, M212Cd:CCC
Synonymy: Sugar Maple - Basswood: 26 (Eyre 1980) B, Riverine Floodplain Forest (Thompson 1996), Floodplain Forest (Breden 1989) B, Riverine floodplain forest: terraces (NAP pers. comm. 1998), SNE Riverside/streamside mesic, deciduous forest (Rawinski 1984), Palustrine Broad-leaved Deciduous Forested Wetland, Seasonally Flooded (PFO1C) (Cowardin et al. 1979), *Acer saccharum-Acer saccharinum-Fraxinus americana* variant, Type 5 (Sperduto and Crowley 2002a)
References: Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Edinger et al. 2002, Eyre 1980, Gawler 2002, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Sperduto 2000b, Sperduto and Crowley 2002a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: S.C. Gawler, ECS **Confidence:** 2 **Identifier:** CEGL006114

I.B.2.N.d.5. BETULA NIGRA - (PLATANUS OCCIDENTALIS) TEMPORARILY FLOODED FOREST ALLIANCE

River Birch - (Sycamore) Temporarily Flooded Forest Alliance

Concept: Forests in this alliance occur on riverfronts in areas with repeated, frequent, natural disturbance in the form of flooding. In addition to the codominants *Betula nigra* and *Platanus occidentalis*, a variety of canopy species occur in these forests, including *Acer negundo, Populus deltoides, Acer saccharinum, Salix nigra, Celtis laevigata, Quercus laurifolia, Liriodendron tulipifera*, and *Liquidambar styraciflua*. The subcanopy or tall-shrub strata may include *Cornus florida* and *Carpinus caroliniana*, along with *Acer rubrum, Ilex opaca, Ulmus alata, Prunus serotina*, and *Carya* spp. The shrub layer is often sparse with such species as *Asimina triloba, Lindera benzoin, Crataegus marshallii*, and *Crataegus viridis* present. The herbaceous and vine components may be lush and diverse, and species of these strata include *Boehmeria cylindrica, Campsis radicans, Elymus hystrix, Stellaria pubera, Impatiens capensis, Pilea pumila, Bignonia capreolata, Toxicodendron radicans, Berchemia scandens, Campsis radicans, Parthenocissus quinquefolia, Vitis rotundifolia, Chasmanthium latifolium (= Uniola latifolia), Arundinaria gigantea*, and *Podophyllum peltatum*. These forests occur more frequently on sandy soils than on heavier soils and their most characteristic location is on levees. The soils are deep and well-drained with low organic matter content and are most commonly of the Orders Inceptisol and Entisol. This is a wide ranging alliance that occurs throughout most of the southeastern and midwestern United States.
Comments: In the Ouachita Mountains of Arkansas and Oklahoma, these forests occur along larger streams and rivers, especially those with a sandy substrate.
Range: This is a wide-ranging alliance that occurs throughout most of the southeastern and midwestern United States. This alliance is found in eastern Iowa, Missouri, Illinois, Indiana, Ohio, Virginia, West Virginia, Florida, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas. It may be found in Canada in southern Ontario (?).
States/Provinces: AL AR DE FL GA IA IL IN KY LA MD MO MS NC NJ? NY OH OK ON? PA SC TN TX VA WV
TNC Ecoregions: 32:P, 36:C, 37:P, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 55:C, 56:C, 57:C, 58:P, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Bd:CCC, 221Db:CCP, 221Ea:CCC, 221Eb:CCP, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fc:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCP, 221Jb:CCP, 222Ab:CCC, 222Ad:CCP, 222Ae:CCP, 222Af:CCC, 222Ca:CCP, 222Cb:CCP, 222Cc:CCP, 222Cd:CCP, 222Ce:CCP, 222Cf:CCC, 222Cg:CCC, 222Ch:CCP, 222En:CCC, 222Eo:CCC, 222Ga:CCC, 222Ha:CCC, 222If:CCC, 231Aa:CCP, 231Ab:CCP, 231Ac:CCP, 231Ad:CCP, 231Ae:CCP, 231Af:CCP, 231Ag:CCP, 231Ah:CCP, 231Ai:CCP, 231Aj:CCP, 231Ak:CCP, 231Al:CCP, 231Am:CCP, 231An:CCP, 231Ao:CCP, 231Ap:CCP, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCP, 231Bf:CCP, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCP, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CCC, 231Eb:CCP, 231Ec:CCP, 231Ed:CCP, 231Ee:CCP, 231Ef:CCP, 231Eg:CCC, 231Eh:CCP, 231Ei:CCP, 231Ej:CCP, 231Ek:CCP, 231El:CCP, 231Em:CCP, 231En:CCP, 231Fa:CCP, 231Fb:CCP, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ba:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Be:CCP, 232Bf:CCC, 232Bg:CCP, 232Bh:CC?, 232Bi:CCC, 232Bj:CCC, 232Bk:CCP, 232Bl:CCC, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCP, 232Br:CCP, 232Bs:CCP, 232Bt:CCP, 232Bu:CCP, 232Bv:CCP, 232Bx:CCP, 232Bz:CCP, 232Ca:CCP, 232Cb:CCP, 232Cc:CCP, 232Cd:CCP, 232Ce:CCP, 232Cf:CCP, 232Cg:CCP, 232Ch:CCP, 232Ci:CCP, 232Cj:CCP, 232Dc:CCC, 232Fa:CCC, 232Fb:CCP, 232Fc:CCP, 232Fd:CCP, 232Fe:CCC, 234:P, 251Ea:CCP, 251Ec:CCP, 251Ed:CCP, 251Fb:CCP, 251Fc:CCP, 255:C, M212Eb:CCC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Be:CCC, M221Bf:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M222Aa:CCP, M222Ab:CCP, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Fort Benning); NPS (Mammoth Cave, Shiloh); USFS (Angelina, Apalachicola, Bankhead?, Bienville, Chattahoochee, Conecuh, Croatan?, Daniel Boone, Davy Crockett, Delta, De Soto, Francis Marion?, Holly Springs, Kisatchie, Oconee, Osceola?, Ouachita, Ozark, Sabine NF, Sam Houston, St. Francis, Sumter, Talladega, Tombigbee, Tuskegee); USFWS (Felsenthal?, Hatchie?, Little River, Overflow?, Pond Creek)
Synonymy: IIA7b. River Birch - Sycamore Riverfront Forest (Allard 1990); Riverfront Forest, in part (Foti 1994b); Riparian forest, in part (Evans 1991); *Betula nigra* forest alliance (Hoagland 1998a); R1B3cII4a. *Betula nigra - Platanus occidentalis* (Foti et al. 1994); River Birch - Sycamore: 61, in part (Eyre 1980); Sycamore - (river birch) - box-elder floodplain forest. ? (Fike 1999); Floodplain Forest. ?, in part (Smith 1991)
References: Allard 1990, Burns and Honkala 1990a, Campbell 1988, Campbell 1989b, Evans 1991, Eyre 1980,

Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Fowells 1965, Gettman 1974, Hoagland 1998a, Klimas et al. 1981, Smith 1991, Wharton 1978, Wharton et al. 1982
Authors: D.J. ALLARD, MP, Southeast **Identifier:** A.280

BETULA NIGRA - PLATANUS OCCIDENTALIS / IMPATIENS PALLIDA FOREST
River Birch - Sycamore / Yellow Jewelweed Forest

G? (97-12-01)

Ecological Group (SCS;MCS): Appalachian Highlands Riverfront and Levee Forests and Shrublands (422-30; 1.6.3.4)

Concept: This Mid-Atlantic floodplain forest of large and moderately large rivers occurs on sandy, gravelly, well-drained soils of levees, gravel bars, braided channels and other areas of frequent flooding. The tree canopy is well-developed and dominated by *Betula nigra* and *Platanus occidentalis*, with associates including *Acer negundo, Populus deltoides*, and *Acer saccharinum*. The shrub layer includes *Cornus amomum, Salix sericea, Asimina triloba*, and *Lindera benzoin*. The vine and herb layers are lush and diverse, and may include *Boehmeria cylindrica, Elymus hystrix, Stellaria pubera, Impatiens capensis, Impatiens pallida, Laportea canadensis, Pilea pumila, Toxicodendron radicans, Parthenocissus quinquefolia, Vitis rotundifolia, Chasmanthium latifolium (= Uniola latifolia), Podophyllum peltatum, Polygonum virginianum, Apocynum cannabinum*, and *Urtica* sp. Exotic species are typical and may include *Lysimachia* sp., *Microstegium vimineum, Lonicera japonica, Lonicera morrowii, Polygonum cuspidatum*, and *Alliaria petiolata*.
States/Provinces: DE:S3S4?, MD:S?, NJ?, NY:S2S3, PA:S?, WV?
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Bd:CCC, M212Eb:CCC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC
Synonymy: Sycamore-river birch-jewelweed floodplain forest (CAP pers. comm. 1998)
References: Bowman 2000, CAP pers. comm. 1998, Edinger et al. 2002, Fike 1999, Thompson et al. 1999
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006184

I.B.2.N.d.9. FAGUS GRANDIFOLIA TEMPORARILY FLOODED FOREST ALLIANCE
American Beech Temporarily Flooded Forest Alliance

Concept: This alliance contains vegetation that occurs along small streams and along levees and terraces in somewhat larger alluvial systems. Stand are dominated by *Fagus grandifolia*. Other canopy species may include *Quercus alba, Quercus rubra var. rubra, Quercus laurifolia, Acer barbatum, Quercus shumardii var. shumardii, Liquidambar styraciflua, Magnolia grandiflora* (within its range), *Quercus michauxii, Fraxinus pennsylvanica*, and *Acer rubrum var. rubrum*. The subcanopy and shrub layers often contain *Aesculus pavia, Aesculus sylvatica, Arundinaria gigantea, Asimina triloba, Ilex opaca var. opaca, Cornus florida, Cornus foemina, Magnolia acuminata, Carpinus caroliniana ssp. caroliniana, Hamamelis virginiana, Ostrya virginiana var. virginiana, Oxydendrum arboreum, Alnus serrulata, Calycanthus floridus var. floridus, Rhododendron arborescens*, and *Vaccinium elliottii*; and fairly dense coverage by *Cyrilla racemiflora* over *Kalmia latifolia* is present in an occurrence in the Piedmont of North Carolina. Herbaceous species common to forests in this alliance include *Carex glaucescens, Carex intumescens, Chasmanthium latifolium, Anemone quinquefolia var. quinquefolia, Anemone virginiana var. virginiana, Carex blanda, Carex laxiflora var. laxiflora, Carex striatula, Chamaelirium luteum, Chrysogonum virginianum, Dioscorea quaternata, Dichanthelium* spp., *Gelsemium sempervirens, Polystichum acrostichoides var. acrostichoides, Heuchera americana, Mitchella repens, Hexastylis minor, Hexastylis arifolia var. arifolia*, and *Xanthorhiza simplicissima* among others. The distribution of this alliance is incomplete, but it is known from at least the Piedmont of North Carolina, Virginia, and South Carolina, the West Gulf Coastal Plain, southern Indiana, Pennsylvania, and possibly southern Ontario in Canada.
Comments: This alliance needs review. Although these forests experience flooding, perhaps even annually, the vegetation does not appear to be influenced by these disturbances (i.e., *Fagus grandifolia* is dominant), so these associations might be better placed in an upland alliance. Mixed beech-other species forests occur in Texas, but these lack enough *Fagus* to be included here. Work is needed to determine alliance placement. The so-called 'beechy bottoms' of Kentucky and southern Illinois, which are high terraces with beech dominant, could be included here. This alliance is present along the Notaway and Meherrin rivers in Virginia (G. Fleming pers. comm.).
Range: The distribution of this alliance is incomplete, but it is known from at least the Piedmont of North Carolina, Virginia, and South Carolina, the West Gulf Coastal Plain of Louisiana and Texas, southern Indiana,

Pennsylvania, and possibly southern Ontario in Canada. This alliance is also found in Georgia and Mississippi, and may possibly occur in Kentucky (?) and Tennessee (?).
States/Provinces: AL GA IN KY LA MD MS NC OH? ON PA? SC TN TX
TNC Ecoregions: 40:?, 41:C, 43:P, 44:C, 45:C, 48:C, 49:C, 50:C, 52:C, 53:C, 56:C, 57:P, 58:P
USFS Ecoregions: 221Eg:CCC, 221Fa:CCC, 221Ha:CCC, 221Hb:CCC, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Df:CCP, 222Ei:CCP, 222Ek:CCC, 222El:CCP, 222Em:CCP, 222Fc:CCP, 222Fd:CCP, 222Fe:CCC, 222Ff:CCC, 222Gc:CPP, 222Gd:CPP, 222Ge:CPP, 222Ha:CCC, 222Hb:CCC, 222Hf:CCC, 222If:CCC, 222Jh:CCP, 222Ji:CCC, 222Jj:CCP, 231Aa:CCP, 231Ac:CCC, 231Ae:CCC, 231Af:CCC, 231Ao:CCC, 231Bc:CPP, 231Bd:CPP, 231Db:CCC, 231Dd:CCC, 231Ea:CCC, 232Ba:CCC, 232Bb:CC?, 232Bc:CC?, 232Bd:CC?, 232Be:CC?, 232Bf:CC?, 232Bg:CC?, 232Bh:CC?, 232Bi:CC?, 232Bj:CCC, 232Bk:CC?, 232Bl:CC?, 232Bm:CC?, 232Bn:CCP, 232Bo:CC?, 232Bp:CC?, 232Bq:CCC, 232Br:CCP, 232Bs:CCP, 232Bt:CC?, 232Bu:CCP, 232Bv:CCP, 232Bx:CC?, 232Bz:CC?, 232Cg:CPP, 232Fa:CCC, 232Fc:CCP, 234Ab:???, 234An:???
Federal Lands: COE (Jordan Lake); DOD (Fort Benning, Fort Gordon); NPS (Kings Mountain, Shiloh?); USFS (Angelina, Daniel Boone, Kisatchie, Sabine NF?, Sam Houston?, Talladega, Uwharrie)
Synonymy: American Beech-Southern Magnolia Series, in part (Diamond 1993); American Beech Cover Type (Jackson 1979)
References: Diamond 1993, Faber-Langendoen et al. 1996, Fleming pers. comm., Jackson 1979, Martin and Smith 1991
Authors: J.E. MOHAN, MP, Southeast **Identifier:** A.284

FAGUS GRANDIFOLIA - QUERCUS SPP. - ACER RUBRUM - JUGLANS NIGRA FOREST
American Beech - Oak species - Red Maple - Black Walnut Forest
Beech - Mixed Hardwood Floodplain Forest **G2G3 (98-06-22)**
Ecological Group (SCS;MCS): Interior Highlands Small Stream Floodplain / Terrace Forests (427-10; 1.6.3.5)

Concept: This beech - hardwoods floodplain forest community is found in the central United States and adjacent Canada. Stands occur on high terraces of small stream floodplains. Soils are well-drained and at least partially alluvial in origin, flooding only occasionally. The closed, deciduous tree canopy has a mixed set of species, with few dominants. Typical constants include *Acer saccharum, Carya cordiformis, Celtis occidentalis, Fagus grandifolia, Fraxinus americana, Juglans nigra, Liriodendron tulipifera, Quercus rubra, Tilia americana, Ulmus americana*, and *Ulmus rubra* among the more typical upland species, and *Acer negundo, Acer rubrum, Acer saccharinum, Fraxinus pennsylvanica*, and *Platanus occidentalis* among the more typical bottomland species. Perhaps the more dominant include *Acer saccharum, Fagus grandifolia, Liriodendron tulipifera, Platanus occidentalis*, and *Ulmus americana*. The tall shrubs, subcanopy trees, and vine species include *Carpinus caroliniana, Hamamelis virginiana, Lindera benzoin, Parthenocissus quinquefolia*, and *Toxicodendron radicans*. A wide variety of herbaceous species are found.
Comments: This type can be difficult to distinguish from upland beech - maple forests or lower terrace floodplain forests. Vegetation will probably need to be linked to physical site characteristics in order to accurately identify the type, including features such as small stream terraces, presence of occasional, though not annual, flooding, and some alluvial material (Anderson 1996). Disturbed sites may often be more dominated by the wetter and more rapidly colonizing floodplain species, such as *Acer saccharinum* or *Populus deltoides* (Anderson 1996). A related mesic hardwood floodplain type with dominance of *Acer* and *Carya* rather than *Fagus* is the *Acer saccharum - Carya cordiformis / Asimina triloba* Floodplain Forest (CEGL005035). Attribution of Ontario to this type may be stretching this type too far north. Ontario crosswalk may better fit with *Acer saccharum - Fraxinus americana - Tilia americana / Acer spicatum / Allium tricoccum - Caulophyllum thalictroides* Forest (CEGL005008). The distribution in central Indiana and western Ohio should be reviewed.
Range: This beech - hardwoods floodplain forest community is found in the central United States and adjacent Canada, ranging from Tennessee, Kentucky, Indiana and Ontario, east to Maryland and possibly Pennsylvania.
States/Provinces: IN:S1, KY:S?, MD:S?, OH?, ON:S?, PA?, TN?
TNC Ecoregions: 44:C, 45:C, 48:C, 49:C, 50:C
USFS Ecoregions: 221Eg:CCC, 221Fa:CCC, 221Ha:CCC, 221Hb:CCC, 222Db:CCC, 222Dc:CCP, 222De:CCC, 222Df:CCP, 222Ei:CCP, 222Ek:CCC, 222El:CCP, 222Em:CCP, 222Fc:CCP, 222Fd:CCP, 222Fe:CCC, 222Ff:CCC, 222Gc:CPP, 222Gd:CPP, 222Ge:CPP, 222Ha:CCC, 222Hb:CCC, 222Hf:CCC, 222If:CCC, 222Jh:CCP, 222Ji:CCC, 222Jj:CCP
Federal Lands: USFS (Daniel Boone)
Synonymy: Mixed Floodplain Forests (Anderson 1996) =

References: Anderson 1996
Authors: D. Faber-Langendoen, MCS **Confidence:** 2 **Identifier:** CEGL005014

I.B.2.N.d.12. LIQUIDAMBAR STYRACIFLUA - (LIRIODENDRON TULIPIFERA, ACER RUBRUM) TEMPORARILY FLOODED FOREST ALLIANCE

Sweetgum - (Tuliptree, Red Maple) Temporarily Flooded Forest Alliance

Concept: This alliance includes a variety of bottomland communities of moderately wet floodplains of the lower Piedmont, Interior Low Plateau, Coastal Plain, and possibly the Cumberland Plateau, ranging into the Ouachita Mountains and Ozarks, and dominated by *Liquidambar styraciflua* with or without some combination of *Liriodendron tulipifera* and *Acer rubrum* as codominants. Canopy and subcanopy associates vary with geography and substrate, but may include *Acer barbatum, Ilex opaca var. opaca, Aesculus sylvatica, Quercus nigra, Carya cordiformis, Platanus occidentalis, Betula nigra, Carpinus caroliniana ssp. caroliniana, Cornus florida, Crataegus flava, Fagus grandifolia, Juglans nigra, Morus rubra var. rubra, Ostrya virginiana var. virginiana, Oxydendrum arboreum, Pinus echinata, Prunus serotina var. serotina, Quercus alba, Quercus rubra var. rubra, Ulmus rubra, Ulmus americana, Ulmus alata, Juniperus virginiana var. virginiana, Nyssa sylvatica, Fraxinus americana*, and *Fraxinus pennsylvanica*. The shrub layer often is well-developed and species include *Euonymus americana, Lindera benzoin var. benzoin, Corylus americana, Viburnum acerifolium, Viburnum nudum var. nudum, Viburnum prunifolium, Viburnum rufidulum, Hamamelis virginiana, Asimina triloba*, and *Ilex decidua* among others. Vines are prominent and species include *Vitis rotundifolia, Apios americana, Campsis radicans, Aristolochia serpentaria, Bignonia capreolata, Dioscorea quaternata, Gelsemium sempervirens, Parthenocissus quinquefolia (= var. quinquefolia), Campsis radicans, Passiflora lutea, Smilax bona-nox, Smilax glauca (= var. glauca), Smilax hugeri, Smilax rotundifolia*, and *Toxicodendron radicans ssp. radicans*. The herbaceous layer can be species-rich and often has good sedge development. Common species in this layer include *Thalictrum thalictroides, Trillium cuneatum, Arisaema triphyllum ssp. triphyllum, Asplenium platyneuron var. platyneuron, Botrychium virginianum, Carex* spp., *Carex impressinervia, Carex striatula, Galium circaezans, Geum canadense, Polystichum acrostichoides*, and *Scutellaria integrifolia* among many others. Soils are relatively acid. The exotics *Microstegium vimineum, Ligustrum sinense*, and *Lonicera japonica* may be common in examples of this alliance. This alliance is fairly common in the lower Piedmont of Georgia, as well as on small stream floodplains and bottoms in all of the Interior Low Plateau of Kentucky (except the Bluegrass region) where it is somewhat successional. *Liriodendron tulipifera* is dominant on disturbed areas of Kentucky and is common on well-drained floodplains of Kentucky without *Liquidambar styraciflua*. Conversely, *Liriodendron tulipifera* is absent in Ouachita - Ozark examples.
Comments: Need association that is one version of a small stream swamp forest with the nominals (J. Ambrose pers. comm.).
Range: This alliance is fairly common in the lower Piedmont of Georgia (J. Ambrose pers. comm.), as well as on small stream floodplains and bottoms in all of the Interior Low Plateau of Kentucky (except the Bluegrass region) where it is somewhat successional (L. McKinney pers. comm.). *Liriodendron tulipifera* is dominant on disturbed areas of Kentucky and is common on well-drained floodplains of Kentucky without *Liquidambar styraciflua*. Conversely, *Liriodendron tulipifera* is absent in Ouachita - Ozark examples. This alliance is found in Alabama, Arkansas, Georgia, Kentucky, Mississippi, North Carolina, Oklahoma, South Carolina, and Tennessee, Maryland, Virginia, and possibly in Florida (?), but not in Texas.
States/Provinces: AL AR FL? GA KY MD MS NC OK SC TN VA
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 50:C, 52:C, 53:?, 56:C, 57:C, 58:C
USFS Ecoregions: 221Hc:CCC, 222Ab:CCC, 222Ag:CCC, 222An:CCC, 222Cb:CCP, 222Cc:CCP, 222Cd:CCP, 222Ce:CCP, 222Cf:CCP, 222Cg:CCC, 222Da:CCP, 222Db:CCP, 222Dc:CCP, 222Dd:CCP, 222De:CCP, 222Dg:CCP, 222Di:CCP, 222Ea:CC?, 222Eb:CCC, 222Ec:CC?, 222Ed:CC?, 222Ee:CC?, 222Ef:CC?, 222Eg:CCP, 222Eh:CC?, 222Ei:CC?, 222Ej:CC?, 222Ek:CC?, 222En:CC?, 222Eo:CC?, 231Aa:CCC, 231Ab:CC?, 231Ac:CCC, 231Ad:CC?, 231Ae:CCC, 231Af:CCC, 231Ag:CC?, 231Ah:CC?, 231Ai:CC?, 231Aj:CC?, 231Ak:CC?, 231Al:CC?, 231Am:CC?, 231An:CC?, 231Ao:CC?, 231Ap:CC?, 231Ba:CP?, 231Bb:CP?, 231Bc:CP?, 231Bd:CP?, 231Be:CP?, 231Bf:CP?, 231Bg:CP?, 231Bh:CP?, 231Bi:CP?, 231Bj:CP?, 231Bk:CP?, 231Bl:CP?, 231Ca:CP?, 231Cb:CP?, 231Cc:CP?, 231Cd:CPP, 231Ce:CP?, 231Cf:CP?, 231Cg:CP?, 231Da:CC?, 231Db:CC?, 231Dc:CC?, 231Dd:CC?, 231De:CC?, 231Ga:CCP, 231Gb:CCP, 231Gc:CCC, 232Ad:CCC, 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Be:CCP, 232Bf:CCP, 232Bg:CCP, 232Bh:CCP, 232Bi:CCP, 232Bj:CCP, 232Bk:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCC, 232Br:CCC, 232Bs:CCC, 232Bt:CCP, 232Bu:CCP, 232Bv:CCP, 232Bx:CCP, 232Bz:CCP, 234Ab:PP?, 234An:PPP, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC,

M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Arnold, Fort Benning, Fort Gordon); DOE (Oak Ridge?, Savannah River Site); NPS (Carl Sandburg Home, Cowpens, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Ninety Six, Shiloh?); USFS (Bankhead?, Bienville, Croatan?, Daniel Boone, Delta, De Soto, Francis Marion?, Holly Springs, Homochitto, Oconee, Ouachita, Ozark, Sumter, Talladega, Tombigbee, Tuskegee, Uwharrie)
Synonymy: Lowland Oak - Sweetgum Forest, in part (Foti 1994b); Piedmont/Low Mountain Alluvial Forest, in part (Schafale and Weakley 1990)
References: Ambrose pers. comm., Foti 1994a, Foti 1994b, Jones et al. 1981b, McKinney pers. comm., Schafale and Weakley 1990
Authors: D.J. ALLARD, MP, Southeast **Identifier:** A.287

LIQUIDAMBAR STYRACIFLUA - QUERCUS PALUSTRIS / CARPINUS CAROLINIANA / CAREX INTUMESCENS FOREST

Sweetgum - Pin Oak / Ironwood / Bladder Sedge Forest
Coastal Plain Floodplain Forest **G? (00-03-21)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Large River Bottomland Hardwood Forests (385-20; 1.6.4.2)

Concept: This bottomland forest of the Coastal Plain of the Chesapeake Bay region occurs along braided stream channels. Soils are moderately well-drained to very poorly drained sandy, silty or clay loams. The canopy is diverse, characterized by *Liquidambar styraciflua, Acer rubrum, Quercus palustris, Fraxinus pennsylvanica, Quercus pagoda, Quercus michauxii*, and *Quercus phellos*. The well-developed understory is usually dominated by *Carpinus caroliniana*, with other associates including *Ilex opaca var. opaca, Lindera benzoin*, and *Asimina triloba*. Occasional shrubs may include *Ilex verticillata, Viburnum dentatum*, and *Ilex decidua*. The herbaceous layer is dense and is characterized by *Cinna arundinacea, Carex intumescens, Carex debilis, Onoclea sensibilis, Arisaema triphyllum*, and *Solidago rugosa*.
Range: This bottomland forest is found in the Coastal Plain of the Chesapeake Bay region.
States/Provinces: MD:S?, VA?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ad:CCC
References: Fleming et al. 2001, Meininger 1998
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006602

LIRIODENDRON TULIPIFERA - ACER RUBRUM - LIQUIDAMBAR STYRACIFLUA / MEDEOLA VIRGINIANA FOREST

Tuliptree - Red Maple - Sweetgum / Indian Cucumber-root Forest
Coastal Plain Bottomland / Tributary Forest **G? (00-04-12)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Small Stream Forests (365-10; 1.6.3.9)

Concept: This bottomland forest community occurs on the Inner Coastal Plain of the Chesapeake Bay region. It occurs along small streams and on adjacent low slopes on somewhat poorly drained sandy loams or sandy clay loams. The tree canopy is dominated by *Liriodendron tulipifera* and *Acer rubrum*, with *Liquidambar styraciflua* at lower abundance. Other canopy associates may include *Nyssa sylvatica, Fagus grandifolia* and *Quercus rubra*. The understory is made up of the same species as the canopy dominants, with *Ilex opaca*. The shrub layer is dominated by *Asimina triloba, Lindera benzoin*, and *Ilex opaca*, with less frequent associates including *Clethra alnifolia, Vaccinium corymbosum, Magnolia virginiana*, and *Viburnum* spp. The herbaceous layer is characterized by *Thelypteris noveboracensis, Mitchella repens, Euonymus americana*, and *Medeola virginiana*.
Range: This bottomland forest community occurs on the Inner Coastal Plain of the Chesapeake Bay region.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232A:CC, 232B:CC
References: Fleming et al. 2001
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006601

I.B.2.N.d.13. PLATANUS OCCIDENTALIS - (FRAXINUS PENNSYLVANICA, CELTIS LAEVIGATA, ACER SACCHARINUM) TEMPORARILY FLOODED FOREST ALLIANCE

Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance

Concept: Forests in this alliance occur on the fronts, terraces, and levees of small, medium and large rivers of the Atlantic Coastal Plain, Southern Ridge and Valley, Interior Low Plateau, Ozark Highlands, Ouachita Mountains, Arkansas Valley, East and West Gulf coastal plains, Mississippi River Alluvial Plain, Cumberland Plateau, Southern Blue Ridge, and lower Piedmont. These forests are dominated by *Platanus occidentalis* or a mixture of it with *Fraxinus pennsylvanica, Celtis laevigata*, and *Acer saccharinum*, as well as *Acer negundo, Ulmus americana, Liquidambar styraciflua, Ulmus alata, Planera aquatica, Juglans nigra, Celtis occidentalis, Carya illinoinensis, Quercus nigra, Salix nigra, Carya cordiformis, Quercus pagoda*, and *Carya aquatica*. The understory may be dense and typically contains *Asimina triloba, Crataegus viridis, Crataegus spathulata*, and *Lindera benzoin*. Herbaceous species that may be present include *Elymus virginicus, Carex grayi, Carex lupulina, Carex abscondita, Chasmanthium latifolium, Boehmeria cylindrica, Polygonum virginianum, Elymus virginicus, Pilea pumila, Leersia lenticularis*, and others. Vines may be abundant and species include *Bignonia capreolata, Toxicodendron radicans*, and *Smilax tamnoides (= Smilax hispida)*. This alliance does not include typical alluvial forests of the upper Piedmont and Blue Ridge, but forests in this alliance may occur in these areas in restricted calcareous situations. In Arkansas, these forests occur during point bar succession as intermediates between forests dominated by *Salix* and *Populus*, and those dominated by *Carya illinoinensis*. In Kentucky and Arkansas, *Fraxinus americana, Fraxinus pennsylvanica, Ulmus rubra*, and *Ulmus americana* are common in these forests. According to K. Ribbeck (pers. comm.) 'Sycamore - River Birch - Silver Maple' forests of the Pearl River in Louisiana are included here.

Comments: The relationship between this alliance and the I.B.2.N.d *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286) needs to be defined more clearly. It appears that this alliance (A.288) may be more northern in distribution and more often located closer to the river and in areas of more active deposition, but further research is needed. In Texas, where *Acer saccharinum* is absent, these forests occur on the Sabine and Neches rivers. In Arkansas, forests in this alliance that are dominated by *Celtis laevigata, Platanus occidentalis*, and *Carya illinoinensis* occur in areas with flowing water, active deposition, and lots of meandering; still water and lesser deposition are needed for succession to oaks (T. Foti pers. comm.).

Range: Forests in this alliance occur on the fronts, terraces, and levees of small, medium and large rivers of the Atlantic Coastal Plain, Southern Ridge and Valley, Cumberland Plateau, Interior Low Plateau, Ozark Highlands, Ouachita Mountains, Arkansas Valley, East and West Gulf coastal plains, Mississippi River Alluvial Plain, and lower Piedmont. It also ranges into the southern midwestern United States. This alliance does not include typical alluvial forests of the upper Piedmont and Blue Ridge, but forests in this alliance may occur in these areas in restricted calcareous situations.

States/Provinces: AL AR CT GA IN KY LA MA MD MO MS NC NH NY OH? PA RI SC TN TX VA VT? WV

TNC Ecoregions: 24:C, 29:C, 31:C, 32:?, 37:C, 38:C, 39:P, 40:P, 41:C, 42:C, 43:C, 44:C, 45:C, 49:C, 50:C, 51:C, 52:C, 53:P, 56:P, 57:C, 58:P, 59:C, 60:C, 61:C, 63:C

USFS Ecoregions: 212E:C?, 212Fb:CCP, 212Fc:CCC, 221A:CC, 221Bd:CCC, 221D:CC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Eg:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Ab:CCC, 222Ac:CCC, 222Ad:CCC, 222Ae:CCC, 222Af:CCC, 222Ag:CCC, 222Ah:CCC, 222Aj:CCC, 222Ak:CCC, 222Am:CCC, 222An:CCC, 222Cb:CCP, 222Cd:CCP, 222Ce:CCP, 222Cg:CCC, 222De:CCP, 222Eb:CCC, 222Ec:CCC, 222Ed:CCP, 222Eh:CCP, 222Em:CCP, 222En:CCC, 222Eo:CCC, 222Fa:CCC, 222Fb:CCC, 222Fc:CCC, 222Fd:CCC, 222Hb:CCC, 222Hf:CCC, 222I:C?, 222O:C?, 231Aa:CCC, 231Ae:CCC, 231Af:CCC, 231Ak:CCP, 231Al:CCC, 231Ap:CCC, 231Ba:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCC, 231Bg:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Cd:CCC, 231Da:CCP, 231Dc:CCC, 231Ef:CCC, 231Eg:CCP, 231Eh:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ad:CCC, 232Bj:CCC, 232Bk:CCP, 232Bl:CCP, 232Bq:CCP, 232Br:CCP, 232Bs:CCC, 232Bu:CCP, 232Bv:CCP, 232Ca:CPP, 232Fa:CCP, 232Fb:CCP, 232Fc:CCP, 232Fd:CCP, 234Aa:CCP, 234Ab:CC?, 234Ac:CCC, 234Ae:CCP, 234Ag:CCC, 234Ah:CC?, 234Am:CCC, 234An:CCC, 251Cd:CPP, 251Eb:CCC, 255Da:CCP, 255Db:CCC, 315:C, M212B:??, M221Aa:CCC, M221Ab:CCC, M221Cd:CCC, M221Da:CCC, M221Db:CCP, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231:P

Federal Lands: DOD (Arnold, Fort Benning); NPS (Congaree Swamp, Great Smoky Mountains, Harpers Ferry, Kennesaw Mountain, Ninety Six, Rock Creek, Shiloh); USFS (Angelina, Bankhead, Bienville, Chattahoochee, Daniel Boone, Davy Crockett, De Soto, Delta?, Holly Springs?, Homochitto, Jefferson, Kisatchie, Oconee, Ozark, Pisgah?, Sabine NF, St. Francis?, Sam Houston, Tombigbee?, Tuskegee); USFWS (San Bernard?)

Synonymy: IIA7g. Sycamore - Sweetgum - American Elm Riverfront Forest, in part (Allard 1990); Riparian forest, in part (Evans 1991); Alluvial forest, in part (Evans 1991); Sycamore-Willow Series, in part (Diamond 1993); Sycamore - Sweetgum - American Elm: 94, in part (Eyre 1980)
References: Allard 1990, Diamond 1993, Evans 1991, Eyre 1980, Foti pers. comm., Ribbeck pers. comm.
Authors: D.J. ALLARD, MOD., MP, Southeast **Identifier:** A.288

PLATANUS OCCIDENTALIS - ACER SACCHARINUM - JUGLANS NIGRA - ULMUS RUBRA FOREST
Sycamore - Silver Maple - Black Walnut - Slippery Elm Forest
Sycamore - Silver Maple Calcareous Floodplain Forest **G4 (01-01-04)**
Ecological Group (SCS;MCS): Interior Highlands Large River Floodplain Forests and Shrublands (426-35; 1.6.3.8)

Concept: This sycamore - silver maple floodplain forest occurs along riverfronts in calcareous areas of the east-central United States. Stands are dominated by *Platanus occidentalis*, with a mixture of other species, including *Acer negundo, Acer saccharinum, Fraxinus americana, Fraxinus pennsylvanica, Juglans nigra, Ulmus americana*, and *Ulmus rubra*. Shrubs include *Asimina triloba* and *Lindera benzoin*. Vines may be abundant, including *Parthenocissus quinquefolia* and *Toxicodendron radicans*. Herbaceous species include *Arisaema triphyllum, Asarum canadense, Boehmeria cylindrica, Elymus virginicus, Pilea pumila, Polygonum virginianum*, and others.
Comments: This type could be in Illinois and Missouri. It is not well characterized yet and may be difficult to distinguish from other floodplain forests where *Platanus* is conspicuous without being dominant. For example, see *Acer saccharinum - Ulmus americana - (Populus deltoides)* Forest (CEGL002586), *Fraxinus pennsylvanica - Celtis* spp. - *Quercus* spp. - *Platanus occidentalis* Bottomland Forest (CEGL002410), *Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua* Forest (CEGL002427), and *Fraxinus pennsylvanica - Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014). It is possible that CEGL002410 could be merged with this type, depending on level of dominance required for *Platanus*.

This community type co-occurs with *Acer saccharinum - Ulmus americana - (Populus deltoides)* Forest (CEGL002586) in several regions of Virginia and transitional stands may be difficult to classify. Separation of the two types may relate more to a soil texture gradient than to soil fertility, which is similar across most plot samples of both types. CEGL002586 and Acer saccharinum appear to be strongly associated with sandy soils, while this unit appears to occupy heavier-textured, silt or clay-loam soils that are favorable for the development of a mixed canopy, abundant Asimina understory, and a very lush herbaceous flora.
Range: This association occurs in river and large stream floodplains in calcareous areas of the east-central United States from Indiana and Kentucky east to West Virginia, Virginia and North Carolina, and possibly Ohio. In Virginia, the type definitely occurs in the Potomac / Shenandoah River drainage, the James River drainage, and the Clinch River drainage. It is probable along the Rappahannock and Roanoke rivers, the New River, and other rivers of the Tennessee drainage in southwestern Virginia.
States/Provinces: IN:S?, KY:S?, MD:S?, OH?, TN:S?, VA:S?, WV:S?
TNC Ecoregions: 43:, 44:C, 45:C, 49:C, 50:C, 51:C, 59:C, 61:?
USFS Ecoregions: 221D:CC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Eg:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Cg:CCC, 222De:CCP, 222Eb:CCC, 222Em:CCP, 222En:CCC, 222Eo:CCC, 222Fa:CCC, 222Fb:CCC, 222Fc:CCC, 222Fd:CCC, 222Hb:CCC, 222Hf:CCC, 231Aa:CCP, 231Ae:CCP, 231Ak:CCP, 231Al:CCC, 231Ap:CCC, 232Ad:CCC, M221Aa:CCC, M221Ab:CCC, M221Cd:CCC, M221Da:CCC, M221Db:CCP
Federal Lands: NPS (Harpers Ferry, Shiloh); USFS (Daniel Boone, Jefferson)
Synonymy: Sycamore-green ash floodplain forest (CAP pers. comm. 1998), IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) B. in part, ELTP 61: *Platanus / Asarum*, Wet-mesic Bottomlands (Van Kley et al. 1995) =, Silver Maple - Sycamore Forest on Base-rich Alluvium (Palmer-Ball et al. 1988) =, *Platanus occidentalis - Acer negundo / Asimina triloba - Lindera benzoin / Mertensia virginica - Asarum canadense* Forest (Fleming and Coulling 2001), *Acer saccharinum - Acer negundo / Mertensia virginica* Association (Rawinski et al. 1996)
References: Allard 1990, CAP pers. comm. 1998, Fleming and Coulling 2001, Fleming et al. 2001, Palmer-Ball et al. 1988, Rawinski et al. 1996, Schafale and Weakley 1990, Van Kley et al. 1995, Vanderhorst 2000b, Weakley et al. 1998
Authors: D. Faber-Langendoen, mod. G. Fleming and P. Coulling, SCS **Confidence:** 2 **Identifier:** CEGL007334

I.B.2.N.d.14. PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) TEMPORARILY FLOODED FOREST ALLIANCE

Sycamore - (Sweetgum, Tuliptree) Temporarily Flooded Forest Alliance

Concept: Forests in this alliance typically are dominated by *Platanus occidentalis* with *Liquidambar styraciflua* and/or *Liriodendron tulipifera*, and typically occur on rocky streambeds and alluvial deposits on relatively high-gradient rivers. The alliance is distributed in the upper Piedmont, Appalachian Mountains, Interior Low Plateau, Cumberland Mountains, and Cumberland Plateau regions. In the eastern part of the Interior Low Plateau, vegetation of this alliance may be in lower gradient situations. Other canopy and understory species that may be present include *Aesculus sylvatica* (within its range), *Asimina triloba, Cornus florida, Alnus serrulata, Fraxinus americana, Acer rubrum, Carpinus caroliniana, Ulmus americana*, and *Fagus grandifolia* in the non-montane part of the distribution. Species present in the montane occurrences include *Platanus occidentalis, Liriodendron tulipifera, Betula alleghaniensis*, and *Betula lenta*, with *Carpinus caroliniana, Hamamelis virginiana, Liquidambar styraciflua, Betula nigra, Fraxinus americana, Acer rubrum, Pinus virginiana, Pinus strobus*, and *Tsuga canadensis*. *Euonymus americana* is a typical shrub species in the lower elevation occurrences, while *Rhododendron maximum* and *Leucothoe fontanesiana* are common at higher elevations. Herbaceous species vary as well by geography and elevation, and may include *Arisaema triphyllum, Sanicula canadensis, Saururus cernuus, Campanula divaricata, Dichanthelium dichotomum var. dichotomum, Amphicarpaea bracteata, Actaea racemosa (= Cimicifuga racemosa), Polystichum acrostichoides, Eurybia divaricata (= Aster divaricatus), Viola sororia*, and *Viola blanda*. *Carex* species may be common (e.g., *Carex appalachica, Carex austrocaroliniana, Carex blanda, Carex crinita, Carex digitalis, Carex plantaginea, Carex swanii*, and/or *Carex torta*).
Comments: Vegetation of the Interior Low Plateau, where there is a distribution overlap of related alliances, may also be classified in the I.B.2.N.d *Platanus occidentalis - (Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum)* Temporarily Flooded Forest Alliance (A.288). Consider a new alliance for montane alluvial vegetation called *Liriodendron tulipifera - Fraxinus americana / Carpinus caroliniana* Temporarily Flooded Forest Alliance [see North Carolina Vegetation Survey Nantahala Data].
Range: The alliance is distributed in the upper Piedmont, Appalachian Mountains, Interior Low Plateau, Cumberland Mountains, Cumberland Plateau, and Chesapeake Bay regions. In the eastern part of the Interior Low Plateau, vegetation of this alliance may be in lower gradient situations. This alliance is found in Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Maryland, Delaware, and Virginia, and possibly in Alabama (?) and Mississippi (?).
States/Provinces: AL? DE GA KY MD MS? NC SC TN VA
TNC Ecoregions: 43:C, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C
USFS Ecoregions: 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CP?, 221Jb:CP?, 221Jc:CP?, 222C:CP, 222D:CP, 222Eb:CCC, 222Ec:CCP, 222Ed:CC?, 222Eg:CC?, 222Eh:CCP, 222En:CCC, 222Eo:CCC, 231Aa:CCP, 231Ae:CCC, 231Ag:CCC, 231Aj:CCC, 231Al:CCC, 231Be:C??, 231Ca:CPP, 231Cb:CPP, 231Cc:CPP, 231Cd:CP?, 231Cf:CPP, 231Da:CCP, 231Db:CCP, 231Dd:CCC, 232Ad:CCC, 232Br:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: DOD (Arnold); NPS (Great Smoky Mountains, Kings Mountain); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)
Synonymy: IIA7g. Sycamore - Sweetgum - American Elm Riverfront Forest, in part (Allard 1990); Piedmont/Low Mountain Alluvial Forest, in part (Schafale and Weakley 1990); Rocky Bar and Shore, in part (Schafale and Weakley 1990); Alluvial forest, in part (Evans 1991); Eutrophic Seasonally Flooded Forest, in part (Rawinski 1992); Sycamore - Sweetgum - American Elm: 94, in part (Eyre 1980)
References: Allard 1990, Evans 1991, Eyre 1980, Flinchum 1977, McLeod 1988, Newell and Peet 1995, Rawinski 1992, Schafale and Weakley 1990
Authors: S. SIMON/G. KAUFFMAN/D.M., MP, Southeast **Identifier:** A.289

PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) / ASIMINA TRILOBA FOREST

Sycamore - (Sweetgum, Tuliptree) / Common Pawpaw Forest
Coastal Plain Streamside Forest **G3G4 (00-03-21)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Riverfront and Levee Forests and Shrublands (385-30; 1.6.4.4)

Concept: This Inner Coastal Plain streamside forest of the Chesapeake Bay region occurs along braided and intermittent streams on active and former stream channels. Flooding frequency is annual, and soils are alluvial

clay loams or sandy clay loams. The tree canopy is dominated by *Platanus occidentalis, Liquidambar styraciflua, Betula nigra, Liriodendron tulipifera*, and *Acer rubrum*. Less frequent associates may include *Quercus michauxii, Ulmus americana*, and *Quercus phellos*. The subcanopy is of variable cover and is characterized by *Asimina triloba, Carpinus caroliniana, Lindera benzoin*, and *Ilex opaca*, with *Cornus florida* found less frequently. Typical vines include *Toxicodendron radicans, Parthenocissus quinquefolia*, and *Smilax rotundifolia*. The most abundant herbs are *Boehmeria cylindrica* and *Arisaema triphyllum*. Other herbaceous associates include *Geum virginianum, Carex debilis, Lycopus virginicus, Impatiens capensis, Pilea pumila, Claytonia virginica, Ranunculus abortivus*, and *Cardamine concatenata*. The vine *Campsis radicans* may also be present.
Range: This forest is found in the Inner Coastal Plain of the Chesapeake Bay region.
States/Provinces: DE:S?, MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ad:CCC, 232Br:CCC
References: Fleming et al. 2001, Thompson et al. 1999
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006603

I.B.2.N.d.26. QUERCUS PALUSTRIS - ACER RUBRUM TEMPORARILY FLOODED FOREST ALLIANCE

Pin Oak - Red Maple Temporarily Flooded Forest Alliance

Concept: Floodplain forest of smaller rivers and headwaters.
Range: This alliance is found in Massachusetts, Maine, Rhode Island, New Hampshire, Connecticut, Maryland, and possibly Virginia (?).
States/Provinces: CT MA MD NJ? NY PA? RI VA
TNC Ecoregions: 52:C, 58:C, 60:?, 61:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ae:CCC, 221Af:CCC, 221D:CP, 231Ap:CCC, 232Ad:CCC
References:
Authors: ECS, East **Identifier:** A.301

QUERCUS (PALUSTRIS, PHELLOS) - ACER RUBRUM / CINNA ARUNDINACEA FOREST

(Pin Oak, Willow Oak) - Red Maple / Stout Woodreed Forest

G? (00-03-27)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Large River Bottomland Hardwood Forests (385-20; 1.6.4.2)

Concept: This floodplain swamp community of the Chesapeake Bay region and environs occurs in topographic depressions within alluvial floodplains. The tree canopy is dominated by *Quercus palustris, Quercus phellos, Acer rubrum*, and *Liquidambar styraciflua*. The shrub layer is of relatively low cover and comprised of *Viburnum dentatum, Viburnum prunifolium*, and *Ilex verticillata*. *Vaccinium corymbosum* is a less frequent shrub layer associate. Typical vines include *Toxicodendron radicans, Parthenocissus quinquefolia*, and *Smilax rotundifolia*. The herb layer is characterized by *Cinna arundinacea, Boehmeria cylindrica, Symphyotrichum lateriflorum var. lateriflorum (= Aster vimineus)*, and *Carex* spp., with less frequent associates including *Arisaema triphyllum, Eurybia divaricata (= Aster divaricatus), Lycopus virginicus, Ranunculus abortivus, Euonymus americana, Chasmanthium laxum*, and *Glyceria striata*.
Range: This community is found in the Chesapeake Bay region.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 52:C, 58:C
USFS Ecoregions: 231Ap:CCC, 232Ad:CCC
Synonymy: *Acer rubrum - Liquidambar styraciflua - Quercus (palustris, phellos)* Seasonally Flooded Forest (Patterson pers. comm.)
References: Fleming et al. 2001, Patterson pers. comm., Thompson et al. 1999
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006605

I.B.2.N.e. Seasonally flooded cold-deciduous forest

I.B.2.N.e.1. ACER RUBRUM - FRAXINUS PENNSYLVANICA SEASONALLY FLOODED FOREST ALLIANCE

Red Maple - Green Ash Seasonally Flooded Forest Alliance

Concept: This alliance is widely distributed in the eastern United States. Stands are dominated by broad-leaved deciduous trees and well-developed shrub and herbaceous strata. They are characterized by dense growth and a great diversity of species. Basal area can reach 40-42 m2/ha. *Acer rubrum* and *Fraxinus pennsylvanica* are consistently abundant overstory species, but *Fraxinus profunda* (in the southern parts of this alliance's range), *Liquidambar styraciflua, Quercus lyrata, Quercus bicolor*, and *Ulmus americana* occur almost as frequently, and *Nyssa aquatica* and *Taxodium distichum* occur sporadically in the southern parts of this alliance's range. *Acer saccharinum* may dominate in parts of the range. The shrub layer can include a diverse mixture including *Carpinus caroliniana, Cephalanthus occidentalis, Forestiera acuminata*, and *Ilex decidua*, but *Itea virginica* is characteristic of southern stands of this alliance. Even with dense shading, the herbaceous layer is usually well-developed, displaying a preponderance of *Boehmeria cylindrica, Carex* spp., *Glyceria* spp., *Juncus* spp., *Laportea canadensis, Leersia* spp., and *Pilea pumila*. *Vitis* spp. are characteristic vines of this community, but *Toxicodendron radicans* and *Campsis radicans* are also prominent.

Sites which support stands of this alliance have level or nearly level soils that formed in water-deposited clayey or loamy sediments on floodplains of the Mississippi and other rivers and large perennial streams in the Coastal Plain. These soils are flooded or saturated for a significant portion of the growing season, and water may be ponded for most of the year in shallow depressions. Flooding can reach 1 m. Flooding occurs during the winter and spring and often extends into the growing season.

Comments: Stands of this alliance support a diverse assemblage of bottomland hardwoods. Perhaps the most diagnostic is the mixture of bottomland hardwoods found there. Species typical of wetter and drier sites are commonly encountered, but the diagnostic environmental feature is shallow standing water or soil saturation for a significant portion of the growing season. Slight ridges within these flooded zones provide drier habitat for less flood-tolerant species.

Range: This alliance is widely distributed in the eastern United States in southern Michigan, Ohio, Indiana, Illinois, Wisconsin, southeastern Missouri, eastern Arkansas (?), Georgia, Kentucky, Louisiana, Mississippi, Oklahoma, Tennessee (?), Texas, South Carolina (?), North Carolina, central-western New York and the Lake Erie Plain of Pennsylvania, West Virginia, Maryland, New Jersey, and Virginia; and in Canada in southern Ontario.

States/Provinces: AR CT DE IL IN KY LA MA MD ME MI MO NB NC NH NJ NY OH ON PA QC? RI SC TN TX VA VT WI

TNC Ecoregions: 31:C, 36:C, 38:C, 40:P, 42:C, 43:C, 44:C, 45:C, 46:C, 47:P, 48:C, 49:C, 50:C, 51:C, 52:C, 53:P, 56:P, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C

USFS Ecoregions: 212Cb:CCC, 212Da:C??, 212Ea:CP?, 212Eb:CPP, 212Ec:CPP, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CPP, 212Gb:CPP, 212Hb:CCP, 212Hd:CCC, 212He:CCC, 212Je:CPP, 212Ka:CPP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCP, 221Dc:CCC, 221Ea:CCP, 221Eb:CCP, 221Ed:CC?, 221Ef:CCC, 221Fa:CCC, 221Fb:CCC, 222Ao:CPP, 222Ca:CCP, 222Cb:CCP, 222Cc:CCP, 222Cd:CCP, 222Ce:CCP, 222Cf:CCP, 222Cg:CCP, 222Ch:CCP, 222Db:CCC, 222Df:CCC, 222Eg:CCP, 222Ek:CCC, 222Ga:CCC, 222Ha:CCC, 222Hb:CCC, 222Ia:CCC, 222Ic:CCP, 222Id:CCP, 222Ie:CC?, 222If:CCC, 222Ig:CCC, 222Ja:CC?, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ke:CCC, 222Kf:CCC, 231Aa:CCC, 231Ae:CCP, 231Af:CCP, 231Ak:CCP, 231Al:CCP, 231Am:CCP, 231An:CCP, 231Ao:CCP, 231Ap:CCP, 231Gb:CCC, 231Gc:CCC, 232Aa:CCP, 232Ad:CCC, 232Ba:CCP, 232Bb:CC?, 232Bc:CCP, 232Bd:CC?, 232Be:CC?, 232Bf:CC?, 232Bg:CC?, 232Bh:CC?, 232Bi:CC?, 232Bj:CC?, 232Bk:CC?, 232Bl:CC?, 232Bm:CC?, 232Bn:CC?, 232Bo:CC?, 232Bp:CC?, 232Bq:CC?, 232Br:CCC, 232Bs:CCC, 232Bt:CCC, 232Bu:CC?, 232Bv:CC?, 232Bx:CCC, 232Bz:CC?, 232Ca:CC?, 232Cb:CC?, 232Cd:CC?, 232Ce:CC?, 232Cf:CC?, 232Cg:CC?, 232Ch:CCC, 232Ci:CC?, 232Cj:CC?, 232Dc:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCP, 234Ae:CCP, 234Af:CCC, 234Ag:CCP, 234Ah:CCC, 234Ai:CC?, 234Aj:CCP, 234Ak:CCP, 234Al:CCP, 234Am:CCP, 234An:CCP, 251Dg:CCC, 255Db:CCC, M212Ad:CP?, M212Bb:CCP, M212Bc:CCC, M212Bd:CCC, M212Ca:CC?, M212Cb:CCC, M212Cc:CCC, M212Cd:CC?, M212D:CP, M221Aa:CCP, M221Ab:CCC, M221Bb:CCP, M221Bd:CCP, M221Be:CCC, M221Ca:CP?, M221Cb:CPP, M221Da:CCP, M221Dc:CCC,

M222A:??, M231A:??
Federal Lands: NPS (Acadia, Congaree Swamp, Great Smoky Mountains); USFS (Daniel Boone?, Ouachita?, Ozark?); USFWS (Little River, Reelfoot?, San Bernard)
Synonymy: *Acer rubrum* forest alliance (Hoagland 1998a); *Acer rubrum - Nyssa aquatica* forest (Robertson et al. 1984); Red maple-green ash. ? (Wharton et al. 1982); Spruce-Fir Boreal Swamp (Swain and Kearsley 2001); Alluvial Red Maple Swamp (Swain and Kearsley 2001); Black Ash Swamp (Swain and Kearsley 2001); Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp (Swain and Kearsley 2001)
References: Faber-Langendoen et al. 1996, Golet et al. 1993, Hoagland 1998a, Robertson et al. 1984, Swain and Kearsley 2001, Wharton et al. 1982
Authors: ECS, MP, Midwest **Identifier:** A.316

ACER RUBRUM - FRAXINUS (PENNSYLVANICA, AMERICANA) / LINDERA BENZOIN / SYMPLOCARPUS FOETIDUS FOREST

Red Maple - (Green Ash, White Ash) / Northern Spicebush / Skunk-cabbage Forest
Southern New England Red Maple Seepage Swamp **G4G5 (98-06-25)**
Ecological Group (SCS;MCS): Northern Coastal Plain Acid Seepage Swamp Forests (360-15; n/a)

Concept: Acidic seepage swamp of southern New England and adjacent areas dominated by *Acer rubrum*. These generally occur in seasonally saturated situations on slightly sloping hillsides, along small streams, or in basins that receive overland flooding in addition to groundwater influence. In general, these swamps are acidic and have some seepage indicators, but are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils. *Acer rubrum* dominates the canopy; *Fraxinus pennsylvanica* or *Fraxinus americana* are usually also found in the canopy. *Fraxinus nigra* is not generally associated with this type, and if present occurs only as scattered individuals. Conifers, like *Tsuga canadensis* or *Pinus strobus*, are generally absent or occur in very low abundance. The shrub layer may be fairly open to quite dense, depending on the amount of canopy closure. Shrub species commonly include *Ilex verticillata, Rhododendron viscosum, Clethra alnifolia, Lindera benzoin*, and less commonly *Vaccinium corymbosum, Lyonia ligustrina, Toxicodendron vernix, Viburnum dentatum*, and *Viburnum nudum var. cassinoides (= Viburnum cassinoides)*. The herbaceous layer is variable in cover, and *Symplocarpus foetidus* and *Osmunda cinnamomea* are nearly always present. Other herbaceous species include *Impatiens capensis, Carex stricta, Veratrum viride, Osmunda regalis, Onoclea sensibilis, Thelypteris palustris*, and *Glyceria* spp. Microtopography is generally pronounced, resulting from tip ups. Tree seedlings and *Sphagnum* mosses are common on hummocks, but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum (= Mnium cuspidatum)* and *Calliergon* spp.
States/Provinces: CT:S?, MA:S3, MD:S?, NH:S?, NJ:S3S5, NY:S4S5, RI:S?, VT:S2
TNC Ecoregions: 60:C, 61:C, 62:C
USFS Ecoregions: 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bd:CCP, 221Da:CCC, 221Dc:CCC, 232Aa:CCP
Synonymy: Inland Red Maple Swamp (Breden 1989) B, Southern New England acidic seepage swamp B, Southern New England stream bottom forest (Rawinski 1984), Red or Silver Maple-Green Ash Swamp (Thompson 1996), Palustrine Broad-leaved Deciduous Forested Wetlands (PFO1) (Cowardin et al. 1979)
References: Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Edinger et al. 2002, Enser 1993, Golet et al. 1993, MENHP 1991, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006406

ACER RUBRUM - FRAXINUS PENNSYLVANICA / SAURURUS CERNUUS FOREST

Red Maple - Green Ash / Lizard's-tail Forest
Chesapeake Red Maple Swamp **G? (00-03-21)**
Ecological Group (SCS;MCS): Northern Coastal Plain Swamp Forests (490-12; n/a)

Concept: This red maple swamp community of the Coastal Plain of the Chesapeake Bay region occurs on poorly drained to very poorly drained, base-rich, alluvial soils that are seasonally to semipermanently flooded. A thin organic horizon overlies sandy or silt clay loam soils. This swamp has pronounced hummock-and-hollow microtopography. The tree canopy is closed to partially open and dominated by *Acer rubrum, Fraxinus pennsylvanica*, and *Quercus lyrata*. Associated canopy species may include *Nyssa sylvatica, Quercus phellos*,

and *Populus heterophylla*. The shrub layer includes *Lindera benzoin, Leucothoe racemosa, Ilex verticillata, Viburnum* spp., and *Fraxinus pennsylvanica* saplings. The herbaceous layer is characterized by *Saururus cernuus, Peltandra virginica, Boehmeria cylindrica, Triadenum walteri, Cinna arundinacea, Pilea pumila, Impatiens capensis, Osmunda cinnamomea, Osmunda regalis, Leersia oryzoides, Leersia virginica, Glyceria striata, Commelina virginica, Rumex verticillatus, Carex* spp., and *Polygonum arifolium*.
Range: This red maple swamp community occurs in the Coastal Plain of the Chesapeake Bay region.
States/Provinces: DE:S?, MD:S?, NJ:S?, VA:S?
TNC Ecoregions: 52:C, 58:C, 62:C
USFS Ecoregions: 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC
References: Bowman 2000, Breden et al. 2001, Fleming 2001, Meininger 1998, Thompson et al. 1999
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006606

I.B.2.N.e.6. LIQUIDAMBAR STYRACIFLUA - (ACER RUBRUM) SEASONALLY FLOODED FOREST ALLIANCE

Sweetgum - (Red Maple) Seasonally Flooded Forest Alliance

Concept: Forests dominated by *Liquidambar styraciflua* with seasonally flooded hydrology. Some stands may be dominated or codominated by *Acer rubrum*. Other woody species that may be present include *Planera aquatica, Salix nigra, Quercus palustris, Quercus lyrata, Fraxinus pennsylvanica, Quercus phellos*, and *Cornus foemina*. Shrubs that may be present include *Ilex opaca, Magnolia virginiana, Cephalanthus occidentalis, Clethra alnifolia, Leucothoe racemosa*, and *Vaccinium corymbosum*. *Sphagnum* spp. are common in the herbaceous layer. Known examples occur in seasonally flooded depressions and not on floodplains.
Comments: There is a *Liquidambar styraciflua*-dominated type in ponded areas and shallow sloughs in Pond Creek Bottoms in southwestern Arkansas, Sevier and Little River counties (J. Campbell pers. comm., D. Zollner pers. comm. cited in Weakley et al. 1996). Other woody species include *Salix nigra, Planera aquatica, Quercus lyrata, Cephalanthus occidentalis, Cornus foemina, Styrax americanus, Brunnichia ovata*, and *Cardiospermum halicacabum*. Herbs include *Carex joorii, Cyperus erythrorhizos, Hydrocotyle verticillata, Triadenum walteri, Limnobium spongia, Lycopus rubellus, Mikania scandens, Polygonum hydropiperoides, Proserpinaca palustris, Rhynchospora corniculata*, and *Saururus cernuus*. See *Liquidambar styraciflua - (Acer rubrum)* Seasonally Flooded Forest [Provisional] (CEGL007387).
Range: This alliance is found in Alabama, Arkansas, Georgia, North Carolina, Tennessee, Delaware, Maryland, New Jersey, New York, Pennsylvania (?), Virginia, West Virginia, and elsewhere.
States/Provinces: AL DE GA MD NC NJ NY PA? SC TN VA
TNC Ecoregions: 32:P, 40:C, 49:C, 50:C, 51:C, 52:C, 53:P, 56:C, 57:?, 58:C, 59:C, 61:C, 62:C
USFS Ecoregions: 221Ae:CCC, 221Dc:CCC, 221Eb:C??, 221F:C?, 231Ad:CCC, 231Af:CCC, 231Cd:CCC, 231E:CC, 231Ga:CC?, 231Gb:CC?, 231Gc:CC?, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bj:CCC, 232Bq:CCC, 232Bt:CCC, 232Cb:CCC, 232Ce:CCC, 232F:CC, 234Ac:PPP, 234An:PPP, 255A:PP, M221B:C?, M221C:C?, M221Dd:CCC
Federal Lands: DOD (Fort Gordon); NPS (Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Uwharrie)
Synonymy: Red maple - magnolia Coastal Plain palustrine forest. ? (Fike 1999); Coastal Plain Forest. ?, in part (Smith 1991)
References: Campbell et al. 1996, Fike 1999, Smith 1991, Weakley et al. 1996
Authors: A.S. WEAKLEY/K.D. PATTERS, MP, Southeast **Identifier:** A.321

LIQUIDAMBAR STYRACIFLUA - ACER RUBRUM - NYSSA BIFLORA / CAREX JOORII FOREST
Sweetgum - Red Maple - Swamp Blackgum / Cypress Swamp Sedge Forest
Central Coastal Plain Basin Swamp **G1G2 (97-11-20)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Upland Depression Forested Ponds (340-10; n/a)

Concept: This seasonally flooded hardwood forest community occurs in groundwater basins on the Coastal Plain of Maryland and Virginia. The canopy is of variable closure and is dominated by *Liquidambar styraciflua, Acer rubrum*, and *Nyssa biflora*. Associated canopy species include *Quercus lyrata, Quercus laurifolia* and *Diospyros virginiana*. The shrub layer is comprised of *Leucothoe racemosa* and scattered *Cephalanthus occidentalis*. The herbaceous layer is characterized by *Carex joorii, Carex striata, Panicum verrucosum, Fimbristylis autumnalis*, and others.
Range: This community is limited to small seasonally flooded depressions of the Coastal Plain of Maryland and Virginia.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 57:?, 58:C
USFS Ecoregions: 232A:CC, 232B:CC, 232C:C?
References: Fleming et al. 2001, Rawinski 1997, Sneddon et al. 1996
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006223

LIQUIDAMBAR STYRACIFLUA - ACER RUBRUM - QUERCUS PHELLOS / LEUCOTHOE RACEMOSA FOREST
Sweetgum - Red Maple - Willow Oak / Swamp Doghobble Forest
Red Maple - Sweetgum Swamp **G? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Upland Depression Forested Ponds (340-10; n/a)

Concept: This association is a seasonally flooded forest of shallow basins and other depressions of the Coastal Plain of the Chesapeake Bay region. The substrate is characterized by mineral soils, generally acidic, gleyed to mottled, sandy or clay loams. Characteristic tree species include *Acer rubrum, Liquidambar styraciflua*, and *Nyssa sylvatica*, which are nearly constant in the canopy. Associates include *Ilex opaca, Magnolia virginiana, Nyssa biflora, Sassafras albidum, Quercus palustris, Pinus taeda*, and *Quercus phellos*, and occasionally *Quercus lyrata* or *Betula nigra*. The shrub layer is characterized by *Leucothoe racemosa, Vaccinium corymbosum, Clethra alnifolia, Lindera benzoin, Ilex verticillata*, and *Rhododendron viscosum*. *Smilax rotundifolia* is a particularly characteristic vine. The herbaceous layer is generally sparse but may include *Mitchella repens, Osmunda cinnamomea, Woodwardia areolata, Onoclea sensibilis, Carex albolutescens, Scirpus cyperinus*, and *Polygonum* spp.
Comments: Delaware examples contain *Quercus* spp. and *Magnolia virginiana*. In Maryland, *Clethra* is more prominent than *Leucothoe, Quercus phellos* less characteristic than *Nyssa sylvatica*.
Range: This association is a seasonally flooded forest of shallow basins and other depressions of the Coastal Plain of the Chesapeake Bay region.
States/Provinces: DE:S?, MD:S?, NJ:S3, NY:S1S2, PA?, VA:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221Ae:CCC, 221Dc:CCC, 231A:??, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bt:CCC
Synonymy: *Leucothoe racemosa* communities (Tyndall et al. 1990). are likely synonymous with this community, *Liquidambar-Acer* hardwood swamp (Breden 1989)
References: Bowman 2000, Breden 1989, Breden et al. 2001, Brush et al. 1980, Clancy 1996, Edinger et al. 2002, Fleming et al. 2001, Hunt 1998, Sneddon and Anderson 1994, Sneddon et al. 1996, Thompson et al. 1999, Tyndall et al. 1990
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006110

I.B.2.N.e.8. NYSSA (AQUATICA, BIFLORA, OGECHE) FLOODPLAIN SEASONALLY FLOODED FOREST ALLIANCE

(Water Tupelo, Swamp Blackgum, Ogeechee Tupelo) Floodplain Seasonally Flooded Forest Alliance

Concept: This alliance includes forests dominated by some combination of *Nyssa aquatica, Nyssa biflora*, or *Nyssa ogeche* without substantial *Taxodium distichum*, that occur in seasonally flooded floodplains, sloughs, and backswamps. *Acer rubrum var. rubrum, Quercus laurifolia, Quercus lyrata, Ulmus americana*, and *Liquidambar styraciflua* are characteristic canopy species. The canopy layer in these forests often is dense, but strata below are sparse to very sparse. *Fraxinus caroliniana, Itea virginica*, and *Sebastiania fruticosa* are common understory species. Common herbaceous species of forests in this alliance include *Carex gigantea, Phanopyrum*

gymnocarpon (= Panicum gymnocarpon), Pluchea sp., *Carex bromoides, Rhynchospora corniculata, Leersia lenticularis, Proserpinaca pectinata*, and *Pleopeltis polypodioides*.
Comments: This alliance includes both blackwater and brownwater small stream swamp forests dominated by *Nyssa ogeche* within its range of the Coastal Plain of Georgia, northern Florida, and southeastern South Carolina. This alliance is attributed to Congaree Swamp (NPS), but not to any association; alliance was not noted in TNC 1998b.
Range: Distribution of this alliance is the Atlantic Coastal Plain from southern Virginia to Florida, and the Gulf Coastal Plain to eastern Texas. This alliance is found in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Virginia, and possibly Texas (?).
States/Provinces: AL AR FL GA LA MD MS NC SC TX VA
TNC Ecoregions: 31:C, 38:P, 40:P, 41:C, 42:C, 43:P, 44:P, 52:P, 53:C, 55:P, 56:C, 57:C, 58:P
USFS Ecoregions: 222Cb:CCP, 222Cc:CCP, 222Ce:CCP, 222Cf:CCP, 222Cg:CCP, 222Ch:CCP, 222Eb:CCC, 222Ef:CC?, 231Aa:CC?, 231Ae:CC?, 231Af:CCC, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Bf:CC?, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bl:CCP, 231Fa:CCC, 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Be:CCP, 232Bf:CCP, 232Bg:CCC, 232Bh:CCP, 232Bi:CCP, 232Bj:CCP, 232Bk:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCC, 232Br:CCC, 232Bs:CCC, 232Bt:CCP, 232Bu:CCP, 232Bv:CCC, 232Bx:CCP, 232Bz:CCP, 232Ca:CCC, 232Cb:CCC, 232Cc:CCP, 232Cd:CCP, 232Ce:CCC, 232Cf:CCC, 232Cg:CCP, 232Ch:CCC, 232Ci:CCC, 232Cj:CCP, 232Dc:CCC, 232Fa:CCP, 232Fb:CCP, 232Fc:CCP, 232Fd:CCP, 232Fe:CCP, 234Aa:CCP, 234Ac:CCC, 234Ad:CCC, 234Ae:CCC, 234Af:CCP, 234Ag:CCP, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CC?, 234Am:CCC, 234An:CCC
Federal Lands: DOD (Fort Benning, Fort Gordon, Fort Stewart); DOE (Savannah River Site); NPS (Congaree Swamp); USFS (Apalachicola, Kisatchie, Uwharrie)
Synonymy: IIA4d. Tupelo Swamp, in part (Allard 1990); Basin Swamp, in part (FNAI 1992a); Basin Swamp, Blackgum Swamp subtype (FNAI 1992b); Water Tupelo - Swamp Tupelo: 103, in part (Eyre 1980); Coastal Plain Bottomland Hardwoods, Blackwater Subtype, in part (Schafale and Weakley 1990)
References: Allard 1990, Eyre 1980, FNAI 1992a, FNAI 1992b, Schafale and Weakley 1990, Wharton 1978, Whipple et al. 1981
Authors: A.S. WEAKLEY, MP, Southeast **Identifier:** A.323

NYSSA BIFLORA - (LIQUIDAMBAR STYRACIFLUA) / ITEA VIRGINICA / SAURURUS CERNUUS FOREST
Swamp Blackgum - (Sweetgum) / Virginia-willow / Lizard's-tail Forest
Small Blackwater Stream Swamp **G4? (98-12-29)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Backswamp/Slough Floodplain Forests (385-10; 1.6.4.3)

Concept: This community occurs in seasonally flooded low areas (stream channels) along small streams with intermittent flow in regions of very subdued topographic relief in the Outer Coastal Plain of South Carolina, Virginia, Maryland, and likely North Carolina and Georgia. The canopy consists of *Nyssa biflora*, sometimes with admixture of *Liquidambar styraciflua*. Herbs and shrubs are few, and these strata are poorly developed. *Itea virginica, Leucothoe racemosa*, and *Clethra alnifolia* are characteristic of the shrub layer. *Saururus cernuus* can be a common herb.
Comments: Examples occur at Nemours Plantation (Beaufort County, South Carolina) and from the Blackwater Ecological Preserve (Isle of Wight County, Virginia).
Range: This community occurs in the Outer Coastal Plain of South Carolina, Virginia, Maryland, and likely North Carolina and Georgia.
States/Provinces: GA?, MD:S?, NC?, SC:S?, VA?
TNC Ecoregions: 56:C, 57:C
USFS Ecoregions: 232Br:CCC, 232Cb:CCC, 232Ce:CCC
Synonymy: CT-D. *Nyssa sylvatica biflora / Acer rubrum / Clethra alnifolia* (Blackgum Swamp) (Frost and Musselman 1987), Swamp black gum dominance type (Tiner 1995)
References: Frost and Musselman 1987, Peet et al. 2002, Tiner 1995
Authors: SCS **Confidence:** 2 **Identifier:** CEGL007847

I.B.2.N.e.15. QUERCUS PHELLOS SEASONALLY FLOODED FOREST ALLIANCE
Willow Oak Seasonally Flooded Forest Alliance

Concept: Forests in this alliance have seasonally flooded hydrology and are typically dominated or codominated by *Quercus phellos*. Other canopy species that frequently occur in these forests are *Quercus lyrata, Quercus nigra, Quercus laurifolia* (within its range), *Quercus similis* (within its range), *Quercus texana* (within its range), *Quercus bicolor* (within its range), *Nyssa biflora, Liquidambar styraciflua, Ulmus americana*, and in the northern extension of its range, *Celtis laevigata var. laevigata* and *Fraxinus pennsylvanica*. The subcanopy and shrub layers are poorly developed. Common species of these strata are *Acer rubrum, Ilex decidua, Fraxinus caroliniana, Salix nigra*, and *Viburnum nudum var. nudum*. Some other characteristic herbs of these forests include *Boehmeria cylindrica, Saururus cernuus, Onoclea sensibilis, Carex joorii, Carex striata, Carex intumescens, Saccharum baldwinii, Juncus coriaceus, Trachelospermum difformе, Cinna arundinacea, Chasmanthium sessiliflorum, Rhynchospora glomerata*, and *Osmunda cinnamomea*. *Sphagnum* spp. may be common, especially *Sphagnum lescurii*. This alliance occurs in upland depressions and swales in flatwoods that do not receive overbank flooding. In addition, some associations in this alliance are described from depressions in floodplains, but these may more appropriately placed in the related alliance, *Quercus (laurifolia, phellos)* Seasonally Flooded Forest Alliance (A.327). The flooding is seasonal in all these environments, but the hydroperiod may be longer or shorter depending on the situation. Some examples typically have longer hydroperiods than *Quercus phellos*-dominated communities in floodplain terraces. This alliance is found in the central and southeastern United States. Its component associations are distributed from the West Gulf Coastal Plain of Arkansas and Texas through the Gulf Coastal Plain, and north in the Atlantic Coastal Plain and Piedmont to Virginia. They also occur in the Interior Low Plateau of Tennessee and Kentucky, the Cumberland Plateau of northern Alabama, and the Mississippi River Alluvial Plain north to southern Illinois.
Comments: Consider splitting this alliance (T. Foti pers. comm.). There are types associated with a variety of environments. These include upland depressions, ponds, flatwoods, and depressions in floodplains.
Range: This alliance is found in southern Illinois, southeastern Missouri, Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Delaware, Maryland, and Virginia.
States/Provinces: AL AR GA IL KY LA MD? MO? MS? NC OK? SC TN TX VA
TNC Ecoregions: 38:C, 39:P, 40:C, 41:C, 42:C, 43:?, 44:C, 50:C, 52:C, 53:C, 56:P, 57:C, 58:C, 62:P
USFS Ecoregions: 221Hc:CCC, 221He:CCC, 222Af:CCC, 222Cb:CCC, 222Da:CCC, 222Eb:CCC, 222Eh:CCC, 231Aa:CCC, 231Ae:CCC, 231Ah:CC?, 231Ai:CC?, 231Aj:CC?, 231Ak:CC?, 231Ao:CCC, 231Ap:CCC, 231Ba:CC?, 231Bc:CC?, 231Bd:CC?, 231Bj:CCC, 231Bl:CC?, 231Cd:CCC, 231Cf:CCC, 231Da:CCC, 231Dc:CCC, 231Ea:CCC, 231Eb:CC?, 231Ec:CC?, 231Ed:CC?, 231Ee:CC?, 231Ef:CCC, 231Eg:CC?, 231Eh:CCC, 231Ei:CCC, 231Ej:CCC, 231Ek:CC?, 231El:CC?, 231Em:CC?, 231En:CC?, 231Ga:CCC, 231Gb:CC?, 231Gc:CCC, 232A:CP, 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Bh:CCP, 232Bj:CCP, 232Bk:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCP, 232Br:CCP, 232Bs:CCC, 232Bt:CCP, 232Bu:CCP, 232Bv:CCP, 232Bx:CCP, 232Bz:CCC, 232Ca:CCP, 232Cb:CCP, 232Cc:CCP, 232Cf:CCP, 232Cg:CCP, 232Ch:CCP, 232Cj:CCP, 232Fa:CC?, 232Fb:CC?, 232Fc:CC?, 232Fd:CCC, 232Fe:CCC, 234Aa:CCC, 234Ab:CCP, 234Ac:CCC, 234Ad:CCC, 234Ae:CCP, 234Af:CCP, 234Ag:CCC, 234Ah:CCC, 234Ai:CCP, 234Aj:CCP, 234Ak:CCP, 234Al:CCP, 234Am:CCC, 234An:CCP, 255:C, M221Cd:CCC, M231Aa:CCC, M231Ac:CCC
Federal Lands: COE (Bayou Bodcau); DOD (Arnold, Barksdale, Louisiana Army Ammunition Plant); NPS (Chickamauga-Chattanooga, Congaree Swamp, Shiloh?); USFS (Angelina, Bankhead, Bienville?, Chattahoochee, Daniel Boone, Davy Crockett, Delta?, De Soto?, Holly Springs?, Homochitto?, Kisatchie, Oconee, Ouachita, Ozark, Sabine NF, Sam Houston, St. Francis?, Tombigbee?, Tuskegee?, Uwharrie); USFWS (Big Lake?, Cossatot River?, Eufaula, Felsenthal?, Holla Bend?, Little River, Overflow?, Pond Creek?, Upper Ouachita?, White River NWR?)
Synonymy: IIA10d. Upland Depression Swamp, in part (Allard 1990); Willow Oak Forest (Foti 1994b); Sagpond Forest (Ambrose 1990a); Xerohydric flatwoods, in part (Evans 1991); Depression swamp. ? in part (Evans 1991); Nonriverine Willow Oak Flatwoods (Smith 1996a); Upland Depression Swamp Forest (Schafale and Weakley 1990); P1B3cVII. *Quercus phellos* (Foti et al. 1994); Flatwood Depression Forest (Smith 1996b); Willow Oak - Water Oak - Diamondleaf (Laurel) Oak: 88, in part (Eyre 1980); Sweetgum - Willow Oak: 92 (Eyre 1980); Willow Oak - Laurel Oak / *Bignonia* Loamy/Clayey Seasonally Flooded River Floodplains, in part (Turner et al. 1999)
References: Allard 1990, Ambrose 1990a, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Foti pers. comm., Klimas 1988b, Nelson 1985, Schafale and Weakley 1990, Smith 1996a, Smith 1996b, Turner et al. 1999, Voigt and Mohlenbrock 1964, Wharton et al. 1982, White and Madany 1978
Authors: A.S. WEAKLEY, MP, Southeast **Identifier:** A.330

QUERCUS PHELLOS / CAREX STRIATA VAR. BREVIS FOREST
Willow Oak / Northern Peatland Sedge Forest
Delmarva Upland Oak Pool **G2? (97-08-15)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Upland Depression Forested Ponds (340-10; n/a)

Concept: This association is found in isolated, extensive upland depressions, in Delmarva bays in Accomack County, Virginia. The vegetation is characterized by mixed canopies of *Quercus phellos, Quercus michauxii, Quercus pagoda, Quercus palustris*, and/or *Quercus alba*. In addition, *Acer rubrum, Nyssa sylvatica, Liquidambar styraciflua*, and *Pinus taeda* are minor or understory trees. Shrubs (sparse to open) include *Morella cerifera (= Myrica cerifera), Cephalanthus occidentalis, Itea virginica, Clethra alnifolia, Rhododendron viscosum, Lyonia ligustrina var. foliosiflora, Leucothoe racemosa, Smilax rotundifolia, Vaccinium corymbosum*, and *Vaccinium formosum*. In the herbaceous layer, *Carex striata var. brevis* is the overwhelming herbaceous dominant (25-75% cover), with *Carex bullata* also abundant (25-50% cover) in some examples. Minor herbaceous associates include *Woodwardia virginica, Woodwardia areolata, Euthamia graminifolia, Pluchea foetida, Scirpus cyperinus*, and *Rhexia mariana*. The stands apparently cover many hectares and are associated with slight depressions with drainage impeded by an impermeable clay layer about half a meter below the soil surface. The habitat apparently has a seasonally high water table but ponds water only intermittently or for short periods.
Comments: This vegetation has been documented by Bill Moorhead (VANHP), who investigated several of the large, elliptical depressions that dot the flat landscape in Accomack County. There are three plots that document this vegetation, at two sites: "Dahl Swamp" and "The Lake" (G. Fleming pers. comm.). The stands apparently cover many hectares and are associated with slight depressions with drainage impeded by an impermeable clay layer about half a meter below the soil surface. The habitat apparently has a seasonally high water table but ponds water only intermittently or for short periods. Most of the areas seen by Bill Moorhead had been logged some decades ago and had a very open (woodland-like) physiognomy due to poor restocking of canopy trees. However, he also obtained information from local people that one of the areas was known historically as "savanna land," suggesting that fire and hydrology maintained a woodland physiognomy in the depressions (G. Fleming pers. comm.).
Range: This association is restricted to isolated upland pools in Delmarva bays in Accomack County, Virginia.
States/Provinces: MD?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bz:CCC
References: Fleming et al. 2001, Fleming pers. comm.
Authors: SCS **Confidence:** 2 **Identifier:** CEGL004644

I.B.2.N.e.22. TAXODIUM DISTICHUM - NYSSA (AQUATICA, BIFLORA, OGECHE) SEASONALLY FLOODED FOREST ALLIANCE

Bald-cypress - (Water Tupelo, Swamp Blackgum, Ogeechee Tupelo) Seasonally Flooded Forest Alliance

Concept: Floodplain forests, with seasonally flooded hydrology, dominated by *Taxodium distichum* and usually one or more of the following: *Nyssa aquatica, Nyssa biflora*, and/or *Nyssa ogeche*. Characteristic woody species include *Quercus lyrata, Carya aquatica, Acer rubrum, Planera aquatica, Fraxinus caroliniana, Liquidambar styraciflua, Quercus laurifolia, Populus heterophylla, Ilex decidua*, and others. The subcanopy, shrub and herbaceous layers of these communities range from sparse to moderate. Herbaceous and vine species that may be present include *Leersia lenticularis, Justicia ovata, Carex intumescens, Boehmeria cylindrica, Onoclea sensibilis, Commelina communis, Hydrocotyle verticillata, Ludwigia palustris, Carex bromoides, Saururus cernuus, Pilea pumila, Phanopyrum gymnocarpon (= Panicum gymnocarpon), Campsis radicans, Smilax tamnoides (= Smilax hispida), Ampelopsis arborea, Mikania scandens*, and others. Forests in this alliance occur in the Coastal Plain from Virginia south tp Florida, west to eastern Texas, and in the Mississippi River alluvial basin north to southern Illinois.
Comments: Compare to alliances in I.B.2.N.f with semipermanently flooded hydrology where surface water persists through the growing season in most years. This alliance with seasonal flooding has flooding of long duration, but the water level is below the surface by the end of the growing season. Several communities in Louisiana contain *Taxodium distichum* with various hardwoods (*Quercus nigra* and *Magnolia virginiana*; *Celtis laevigata* and *Acer rubrum* or *Acer negundo*). Assessment is needed regarding their alliance placement.
Range: Forests in this alliance occur in the Coastal Plain from Delaware south to Florida and west to eastern

Texas and in the Mississippi River alluvial basin north to Kentucky.
States/Provinces: AL AR DE FL GA? KY LA MD MS NC SC TN TX VA
TNC Ecoregions: 40:P, 41:C, 42:C, 43:?, 53:C, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231B:C?, 231E:CP, 231Gc:CCC, 232Ac:CCC, 232Ad:CCC, 232Ba:CCC, 232Bb:CCC, 232Bc:CCC, 232Bd:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bk:CCC, 232Bl:CCC, 232Bm:CCC, 232Bn:CCC, 232Bo:CCC, 232Bp:CCC, 232Bq:CCC, 232Br:CCC, 232Bs:CCC, 232Bt:CCC, 232Bu:CCC, 232Bv:CCC, 232Bx:CCC, 232Bz:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Cd:CCC, 232Cf:CCC, 232Cg:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232Dc:CCC, 232Fa:CCC, 232Fb:CCC, 232Fc:CCC, 232Fd:CCC, 232Fe:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Ae:CCC, 234Af:CCC, 234Ag:CCC, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC
Federal Lands: DOD (Camp Lejeune, Camp MacKall); DOE (Savannah River Site); NPS (Congaree Swamp); USFS (Angelina, Apalachicola, Davy Crockett, De Soto, Delta, Kisatchie, Ocala, Osceola, Sabine NF, Sam Houston, Tuskegee); USFWS (Okefenokee?)
Synonymy: IIA4b. Bald Cypress - Water Tupelo Swamp, in part (Allard 1990); Cypress - Tupelo Swamp (Foti 1994b); Cypress swamp, in part (Evans 1991); Floodplain swamp, in part (FNAI 1992a); Cypress/Cypress-Tupelo Swamp, in part (Smith 1996a); Bald Cypress - Water Tupelo Swamp (Wieland 1994b); Palustrine *Taxodium distichum-Nyssa spp*. Series, in part (Pyne 1994); Baldcypress-Water Tupelo Series, in part (Diamond 1993); P1B3dI1b. *Taxodium distichum - Nyssa aquatica* (Foti et al. 1994); Baldcypress - Tupelo: 102, in part (Eyre 1980); Baldcypress / *Ceratophyllum* Semi-Permanently Flooded Swamps, in part (Turner et al. 1999)
References: Allard 1990, Conner and Day 1976, Conner et al. 1981, Diamond 1993, Evans 1991, Eyre 1980, FNAI 1992a, Foti 1994b, Foti et al. 1994, Jones et al. 1981b, Martin and Smith 1991, Pyne 1994, Schafale and Weakley 1990, Schneider et al. 1989, Smith 1996a, Turner et al. 1999, Wharton 1978, Wharton et al. 1982, Whipple et al. 1981, Wieland 1994b
Authors: A.S. WEAKLEY 6-95, MOD. A, MP, Southeast **Identifier:** A.337

TAXODIUM DISTICHUM - NYSSA BIFLORA CHESAPEAKE BAY FOREST
Bald-cypress - Swamp Blackgum Chesapeake Bay Forest

G? (97-12-01)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Backswamp/Slough Floodplain Forests (385-10; 1.6.4.3)

Concept: These forests comprise cypress - swamp blackgum in channels of blackwater rivers in the Chesapeake Bay region, characterized by a canopy dominated by *Taxodium distichum* and *Nyssa biflora*, in association with *Fraxinus pennsylvanica* or *Fraxinus profunda*. Shrubs tend to be sparse, but common species include *Clethra alnifolia, Viburnum dentatum, Cornus amomum, Itea virginica, Cephalanthus occidentalis*, and *Rhododendron viscosum*. The herb layer of these forests is variable, supporting such species as *Saururus cernuus, Osmunda cinnamomea, Woodwardia areolata, Boehmeria cylindrica, Dulichium arundinaceum, Lobelia cardinalis, Impatiens capensis, Polygonum hydropiperoides, Carex folliculata, Carex atlantica, Carex crinita, Carex intumescens, Carex lonchocarpa, Carex seorsa*, and other *Carex* spp., *Orontium aquaticum*, and *Peltandra virginica*. Soils of this community are generally organic, and waters usually acidic. This vegetation may be tidally influenced and is occasionally affected by storm tides in Delaware and Maryland. In Virginia, this vegetation is almost exclusively tidal.
States/Provinces: DE:S?, MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CC?, 232C:CC
References: Beaven and Oosting 1939, Dennis 1986, Fleming 1978, Fleming et al. 2001, McAvoy and Clancy 1993, Stalter 1981
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006214

I.B.2.N.g. Saturated cold-deciduous forest

I.B.2.N.g.2. ACER RUBRUM - NYSSA SYLVATICA SATURATED FOREST ALLIANCE
Red Maple - Blackgum Saturated Forest Alliance

Concept: This alliance covers deciduous forested acid seeps, saturated swamp forests, and "basin swamps" of

the eastern and southeastern United States. Forests in this alliance have variable canopy composition, but *Acer rubrum* and *Nyssa sylvatica* are common components. Canopy composition differs from the surrounding upland and varies with geography. Typical canopy species across the range of this alliance include *Acer rubrum var. trilobum, Nyssa sylvatica*, and *Liquidambar styraciflua*. Understory and shrub species include *Alnus serrulata, Ilex opaca var. opaca, Photinia pyrifolia (= Aronia arbutifolia)*, and *Ilex verticillata*. Characteristic herbaceous species are *Osmunda cinnamomea* and *Osmunda regalis*. *Sphagnum* spp. are typical. These wetland forests occur where surface water is seldom present, but the substrate is saturated to the surface for extended periods during the growing season, and include forested acid seeps on hillsides or streamheads, on edges of floodplains, and other poorly drained depressions. Individual occurrences of these forests tend to be small in extent, and can provide habitat for rare plant species.

Comments: This alliance may only cover a portion of the variation in wooded seeps in Arkansas, where a calcareous shale and a sandstone seep type need to be defined (D. Zollner pers. comm.).

Range: This alliance is known from the Cumberland Plateau of Alabama, Kentucky and Tennessee, the Allegheny Plateau of Kentucky, the upper East Gulf Coastal Plain of Kentucky and Tennessee, the Piedmont of North Carolina, South Carolina, and Virginia, the Arkansas River Valley, and the Coastal Plain of North Carolina, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. It may also be found in Georgia (?), Oklahoma, Connecticut, Massachusetts, Maine, New Hampshire, New York, Vermont, West Virginia, and Illinois (?).

States/Provinces: AL AR CT DE GA IL? KY MA MD ME NC NH NJ NY OK PA RI SC TN VA VT WV

TNC Ecoregions: 32:P, 38:P, 39:C, 40:C, 41:C, 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 53:P, 56:P, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C

USFS Ecoregions: 212Aa:CCP, 212Ab:CCP, 212Ba:CCP, 212Bb:CCP, 212Ca:CCP, 212Cb:CCP, 212Da:CCP, 212Db:CCP, 212Dc:CCP, 212Ec:CPP, 212Ed:CP?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCC, 221Ab:CCP, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Aj:CCP, 221Ak:CCP, 221Al:CCC, 221Am:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCC, 221Ea:CCP, 221Eb:CCP, 221Fa:CPP, 221Fb:CPP, 221Hc:CCC, 221He:CCC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Ca:CC?, 222Cb:CCC, 222Ce:CCC, 222Cg:CCC, 222Dc:CCP, 222Dg:CCP, 222Eg:CC?, 222Eo:CCC, 222G:CC, 222Ia:CPP, 231Aa:CCC, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ak:CC?, 231Al:CCC, 231An:CCP, 231Ao:CCP, 231Bc:CCC, 231Ca:CCC, 231Cd:CCC, 231Db:CCC, 231Dc:CCC, 231De:CCC, 231Ec:CCC, 231F:CC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Aa:CCP, 232Ab:CCC, 232Ac:CCP, 232Ad:CCP, 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Bq:CCC, 232Br:CCC, 232Bt:CCC, 232Bz:CCC, 232Ch:CP?, M212Aa:CC?, M212Ab:CC?, M212Ac:CCP, M212Ad:CCP, M212Bb:CCC, M212Bc:CCP, M212Bd:CCC, M212Cb:CCC, M212Cc:CCP, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCP, M221Bb:CCP, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221Bf:CCP, M221Ca:CP?, M221Cb:CPP, M221Cc:CP?, M221Ce:CP?, M221Da:CCC, M221Db:CC?, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

Federal Lands: DOD (Fort Jackson, Pine Bluff Arsenal); NPS (Assateague Island, Big South Fork, Shiloh?); USFS (Angelina, Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Kisatchie?, Ouachita, Ozark, Sabine NF, Talladega, Uwharrie); USFWS (Felsenthal?, Mountain Longleaf, Overflow?, Pond Creek?)

Synonymy: IIA9a. Forested Mountain Seep, in part (Allard 1990); Wooded Seep, in part (Foti 1994b); Appalachian acid seep, in part (Evans 1991); Cretaceous Hills forested acid seep (Evans 1991); Low Elevation Seep (Schafale and Weakley 1990); Boggy Streamside Seep (Schafale pers. comm.); Red Maple Swamp (Swain and Kearsley 2001); Black Gum Swamp (Swain and Kearsley 2001); Red maple - black gum palustrine forest (Fike 1999); Acidic Broadleaf Swamp. subtypes a and d (Smith 1991); Circumneutral Broadleaf Swamp, in part (Smith 1991)

References: Allard 1990, Breden 1989, Campbell 1989b, Evans 1991, Fike 1999, Foti 1994b, Funk 1975, Funk and Fuller 1978, Harvill 1967, Heckscher 1994, Schafale and Weakley 1990, Schafale pers. comm., Smith 1991, Swain and Kearsley 2001

Authors: K.D. PATTERSON/J. CAMPBEL, RW, East **Identifier:** A.348

ACER RUBRUM - NYSSA SYLVATICA - BETULA ALLEGHANIENSIS / SPHAGNUM SPP. FOREST

Red Maple - Blackgum - Yellow Birch / Peatmoss species Forest

Red Maple - Black Gum Basin Swamp **G? (97-12-01)**

Concept: This blackgum basin swamp of the northeastern United States is found from the central Appalachians north to central New England, at the northern range limit for *Nyssa sylvatica*. It occupies saturated or seasonally

wet basins, typically perched basins in small watersheds within upland forests. In most settings, the mineral soil is overlain with a shallow to deep peat layer. Conditions are highly acidic and nutrient-poor. The tree canopy varies from an open woodland to nearly complete. Shrubs are well represented and may be locally dense. Herbs are likewise patchy, and the herb layer is usually dominated by only a few species. The bryoid layer varies, but is often extensive. Hummock-and-hollow topography is often pronounced, with bryophytes common on the hummocks and in those hollows where water does not stand for long periods. The canopy is dominated by *Acer rubrum* and *Nyssa sylvatica*; however, even where red maple is more abundant, the longevity and stature of the black gum trees give them a strong impact. *Betula alleghaniensis, Picea rubens, Pinus strobus*, and *Tsuga canadensis* may be minor canopy associates. The most abundant shrubs are *Ilex verticillata* and *Vaccinium corymbosum*; associated shrub species include *Viburnum nudum var. cassinoides, Nemopanthus mucronatus, Kalmia angustifolia, Lyonia ligustrina*, and *Cephalanthus occidentalis*. *Osmunda cinnamomea* is the characteristic dominant in the herb layer, with associates including *Osmunda regalis, Thelypteris palustris, Woodwardia virginica, Glyceria canadensis, Coptis trifolia, Carex trisperma, Carex intumescens, Triadenum virginicum*, and *Symplocarpus foetidus*. Mosses are primarily *Sphagnum* spp., including *Sphagnum palustre* and *Sphagnum magellanicum*. These swamps are distinguished from other basin swamps in the Northern Appalachians by the presence of *Nyssa sylvatica*. They are distinguished from black gum swamps further south by the absence of more central-Appalachian species such as *Liquidambar styraciflua, Rhododendron maximum, Rhododendron viscosum*, and *Magnolia virginiana*.
States/Provinces: CT:S?, MA:S2, MD?, ME:S2, NH:S1S2, NJ:S?, NY:S?, PA:S?, VT:S?
TNC Ecoregions: 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212A:CC, 212B:CC, 212C:CC, 212D:CC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCC, 221Ae:CCC, 221Af:CCP, 221Ag:CCP, 221Ah:CCC, 221Ai:CCC, 221Ak:CCP, 221Al:CCC, 221Bb:CCC, 221Bd:CCP, M212A:CC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCC, M212Cb:CCP, M212Cc:CCP, M212Eb:CCP
Synonymy: Black gum-red maple swamp (NAP pers. comm. 1998), Southern New England acidic seepage swamp, black gum swamp (Rawinski 1984), Southern New England basin swamp, black gum association (Rawinski 1984), Red Maple-Black Gum Swamp (Thompson 1996), Palustrine Broad-leaved Deciduous Saturated Forested Wetland (PFO1B) (Cowardin et al. 1979)
References: Cain and Penfound 1938, Cowardin et al. 1979, Edinger et al. 2002, Fike 1999, Gawler 2002, Golet et al. 1993, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Sperduto 2000b, Sperduto et al. 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000, Vogelmann 1976, Windisch 1995c, Zebryk 1990
Authors: S.C. Gawler, ECS **Confidence:** 2 **Identifier:** CEGL006014

ACER RUBRUM - NYSSA SYLVATICA - LIQUIDAMBAR STYRACIFLUA - POPULUS HETEROPHYLLA FOREST
Red Maple - Blackgum - Sweetgum - Swamp Cottonwood Forest
Cape May Lowland Swamp **G1 (97-11-18)**
Ecological Group (SCS;MCS): Northern Coastal Plain Acid Seepage Swamp Forests (360-15; n/a)

Concept: Typically this community occupies the headwaters of streams where occurrences probably receive groundwater discharge. Topography is gently rolling with a series of wet depressions alternating with drier islands. Stands generally have high diversity, one occurrence was found to contain 20-25 species of trees and 40 species of shrubs. Typical canopy species include *Acer rubrum, Liquidambar styraciflua, Fraxinus profunda*, and *Nyssa sylvatica*. *Magnolia virginiana* and *Ilex opaca* are frequent subcanopy trees. Characteristic shrubs include *Clethra alnifolia, Rhododendron viscosum, Lindera benzoin*, and *Itea virginica*. In addition to these generally 'acid-loving' species a number of typical calcicoles occur in this community including *Cirsium muticum, Euphorbia purpurea, Platanthera flava var. flava*. Several species with a more southern distribution are also found in this community including *Quercus michauxii, Quercus phellos, Quercus nigra, Triadenum walteri*, and *Populus heterophylla*.
Range: This community is apparently restricted to the Cape May portion of New Jersey's Outer Coastal Plain.
States/Provinces: MD?, NJ:S1
TNC Ecoregions: 58:P, 62:C
USFS Ecoregions: 232Ab:CCC
Synonymy: Cape May Lowland Swamp (Breden 1989) B
References: Bernard 1963, Breden 1989, Breden et al. 2001, Stone 1911
Authors: M. Anderson, ECS **Confidence:** 2 **Identifier:** CEGL006013

ACER RUBRUM - NYSSA SYLVATICA - MAGNOLIA VIRGINIANA FOREST
Red Maple - Blackgum - Sweetbay Forest
Southern Red Maple - Black Gum Swamp Forest **G3? (97-12-01)**
Ecological Group (SCS;MCS): Northern Coastal Plain Acid Seepage Swamp Forests (360-15; n/a)

Concept: This acidic red maple swamp forest community of the eastern middle-latitude states is a nutrient-poor wetland forest occurring in poorly drained depressions. Soils are typically moderately deep to deep muck over mineral soil, with pools of standing water at the surface. Acidic waters originate from groundwater-fed seepage, with little to no overland seasonal flooding. This community is characterized by *Acer rubrum* and *Nyssa sylvatica* in the canopy, which may be quite open in some examples. Canopy associates include *Magnolia virginiana, Liquidambar styraciflua*, and *Persea palustris* plus occasional incidental *Liriodendron tulipifera* or *Pinus taeda*. Upland trees may occur on drier hummocks. The shrub layer is characterized by *Vaccinium corymbosum*, as well as *Clethra alnifolia, Ilex verticillata, Ilex opaca, Viburnum nudum, Lindera benzoin*, and *Rhododendron viscosum*. The herbaceous layer is generally poorly developed but diverse and may include *Symplocarpus foetidus, Triadenum virginicum, Lythrum lineare, Osmunda regalis var. spectabilis, Woodwardia areolata, Carex folliculata, Carex lonchocarpa, Carex collinsii, Carex atlantica, Bartonia paniculata, Parnassia asarifolia, Helonias bullata, Chelone glabra, Oxypolis rigidior*, and *Osmunda cinnamomea*. *Sphagnum* spp. and other mosses are common.
States/Provinces: DE:S?, MD:S?, NJ:S4S5, NY:S4S5, PA:S?, VA:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221Da:CCC, 221Db:CCC, 232Aa:CCP, 232Ab:CCC, 232Ac:CC?, 232Br:CCC, 232Bt:CCC, 232Bz:CCC, 232Ch:CP?
Federal Lands: NPS (Assateague Island)
Synonymy: Cape May lowland swamp (Breden 1989) B. in part, Inland red maple swamp (Breden 1989), Pine barrens hardwood swamp (Breden 1989) B. in part, *Acer rubrum - Quercus nigra - Nyssa sylvatica* swamp (Harvill 1967). Virginia portion of Assateague Island., Broadleaf swamp forest (Heckscher 1994). described from Cumberland County, New Jersey., Woodland fresh marsh community (Hill 1986), *Acer rubrum - Nyssa sylvatica / Magnolia virginiana / Woodwardia areolata - Symplocarpus foetidus* Saturated Forest (Patterson pers. comm.)
References: Breden 1989, Breden et al. 2001, Edinger et al. 2002, Ehrenfeld and Gulick 1981, Fike 1999, Fleming et al. 2001, Harvill 1967, Heckscher 1994, Hill 1986, McCormick 1979, Patterson pers. comm., Robichaud and Buell 1973, Sipple and Klockner 1984, Windisch 1995b
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006238

ACER RUBRUM - NYSSA SYLVATICA HIGH ALLEGHENY PLATEAU, CENTRAL APPALACHIAN FOREST
Red Maple - Blackgum High Allegheny Plateau, Central Appalachian Forest
Central Appalachian Forested Acid Seep **G? (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Forested Acid Seeps (470-20; 1.3.3.1)

Concept: This acidic deciduous swamp occurs in the central Appalachian Mountains north of the Cumberland drainage. Characteristic trees are *Acer rubrum* and *Nyssa sylvatica*, with other associates including *Tsuga canadensis* and *Betula alleghaniensis*. The shrub stratum includes *Alnus serrulata, Photinia pyrifolia (= Aronia arbutifolia), Ilex verticillata, Vaccinium corymbosum, Rhododendron maximum*, and *Rubus hispidus*. Characteristic herbs include *Osmunda cinnamomea, Osmunda regalis, Carex folliculata, Carex trisperma, Carex intumescens, Carex stricta*, and *Poa trivialis*. *Sphagnum* spp. are typical. This community occurs on substrates which are saturated for extended periods during the growing season but which rarely have standing water, including forested seeps, hillsides, streamheads, floodplain edges, and poorly drained depressions. Occurrences tend to be small.
States/Provinces: KY:S?, MD:S?, PA:S?, VA?, WV:S?
TNC Ecoregions: 49:C, 50:C, 59:C, 60:C
USFS Ecoregions: 212F:PP, 212G:PP, 221Eb:CCP, 221He:CCC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCP, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221Bf:CCP
Synonymy: Red maple-black gum swamp (CAP pers. comm. 1998)
References: Anderson et al. 1998, CAP pers. comm. 1998, Fike 1999
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006132

I.B.2.N.g.1. FRAXINUS NIGRA - ACER RUBRUM SATURATED FOREST ALLIANCE
Black Ash - Red Maple Saturated Forest Alliance

Concept: This alliance, found in the upper midwestern and eastern regions of the United States as well as parts of adjacent Canada, contains communities known as 'calcareous seepage swamps,' 'hardwood swamps,' and 'red maple - black ash swamps' in which *Acer rubrum* and *Fraxinus nigra* are dominant or prominent canopy members. Total canopy cover ranges from nearly closed to open. Where the tree canopy is open, the understory vegetation is patchy, ranging from shrub-dominated patches to minerotrophic sedge meadows. Associated canopy trees are *Betula alleghaniensis, Ulmus rubra, Ulmus americana*, and *Pinus strobus*. In the northern parts of the range, *Larix laricina, Thuja occidentalis*, and *Abies balsamea* are sometimes present. *Lindera benzoin* (east), *Toxicodendron vernix, Alnus incana* (north), *Salix* spp., and *Rhamnus alnifolia* often occur in the shrub layer. The herbaceous layer is often quite diverse, supporting such species as *Carex leptalea, Carex bromoides ssp. bromoides, Caltha palustris, Veratrum viride, Platanthera grandiflora, Geum rivale* (north), *Symplocarpus foetidus, Trollius laxus* (north), *Cypripedium reginae, Cypripedium parviflorum (= Cypripedium calceolus), Osmunda cinnamomea, Impatiens capensis, Cardamine bulbosa, Saxifraga pensylvanica, Dryopteris cristata*, and *Carex lacustris*.

Stands are typically found in poorly drained depressions (sometimes as narrow zones or small inclusions in wetland complexes, sometimes as large swamps), and occasionally in seepage zones at the base of river terraces or draws. Soils are generally muck and, although *Sphagnum* spp. may occur, there is generally not substantial peat development. Stands often occur in areas where there is influence by calcareous bedrock, and soil pH is generally higher than that of other alliances containing *Acer rubrum*.
Range: This alliance is found in Connecticut, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Indiana, Illinois, Michigan, Minnesota, Missouri, North Dakota, and Wisconsin; and in Canada in Manitoba and Ontario. Present in Garrett County, Maryland.
States/Provinces: CT IL IN? MA MB MD MI MN MO ND NH NJ NY ON PA RI VA VT WI WV
TNC Ecoregions: 35:C, 36:C, 38:C, 45:P, 46:C, 47:C, 48:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Ea:CPP, 212Eb:CPP, 212Ec:CPP, 212Ed:CP?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CPP, 212Gb:CP?, 212Ha:CCP, 212Hb:CCP, 212Hd:CCC, 212He:CCP, 212Hh:CCP, 212Hi:CCP, 212Hj:CCP, 212Hk:CCP, 212Hl:CCP, 212Hm:CCC, 212Hn:CCP, 212Ho:CCP, 212Hp:CCP, 212Hq:CCP, 212Hr:CCP, 212Hs:CCP, 212Ht:CCP, 212Hu:CCP, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCP, 212Ib:CCC, 212Ja:CCP, 212Jb:CCC, 212Jc:CCC, 212Jd:CCC, 212Je:CCP, 212Jf:CCP, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCC, 212Jn:CCP, 212Jo:CCP, 212Jr:CCP, 212Ka:CCC, 212Kb:CCC, 212La:CCC, 212Lb:CCP, 212Lc:CCP, 212Ld:CCP, 212Ma:CCP, 212Mb:CCC, 212Na:CCC, 212Nb:CCP, 212Nc:CCC, 212Nd:CCP, 212Oa:CCC, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Al:CCP, 221Am:CCP, 221Ba:CCC, 221Bb:CCP, 221Bc:CCP, 221Bd:CCC, 221Da:CPP, 221Db:CPP, 221Dc:CPP, 221Ea:CP?, 221Eb:CP?, 221Fa:CCP, 222Aa:CCC, 222Ad:CC?, 222Ae:CC?, 222Af:CCC, 222Al:CCC, 222Ia:CPP, 222Ib:CPP, 222Ic:CPP, 222Id:CPP, 222Ie:CPP, 222If:CPP, 222Jc:CCC, 222Jg:CCC, 222Ke:CCC, 222Kf:CCC, 222Kg:CCC, 222Lc:CCC, 222Ld:CCC, 222Lf:CCC, 222Mc:CCC, 222Md:CCC, 222Na:CCC, 232A:CC, 232Br:CCC, 251Aa:CCC, 251Dc:CCC, M212Ad:CP?, M212Ba:CCC, M212Bb:CCP, M212Bc:CCP, M212Bd:CCP, M212Ca:CCP, M212Cb:CCP, M212Cc:CCP, M212Cd:CCP, M212Da:CPP, M212Db:CPP, M212Dc:CPP, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CC?, M221Be:CC?, M221C:CP, M221Da:CCC
Federal Lands: NPS (Colonial, Isle Royale, Voyageurs); USFS (George Washington, Jefferson, Huron-Manistee)
Synonymy: Black Ash - American Elm - Red Maple: 39, in part (Eyre 1980); *Ulmus - Fraxinus* wetland forest (No. 25), in part (Vankat 1990); Black Ash-Red Maple-Tamarack Calcareous Seepage Swamp (Swain and Kearsley 2001); Red maple - black ash palustrine forest (Fike 1999); Red maple - mixed shrub palustrine woodland (Fike 1999); Eastern Calcareous Seepage Swamp (Smith 1991); Circumneutral Shrub Swamp, in part (Smith 1991)
References: Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, MNNHP 1993, Smith 1991, Swain and Kearsley 2001, Vankat 1990
Authors: ECS, RW, Midwest **Identifier:** A.347

ACER RUBRUM - FRAXINUS PENNSYLVANICA / BIDENS LAEVIS - PILEA FONTANA FOREST
Red Maple - Green Ash / Smooth Beggarticks - Lesser Clearweed Forest
Coastal Plain Calcareous Seepage Swamp **G? (00-11-15)**
Ecological Group (SCS;MCS): Northern Coastal Plain Calcareous Seepage Swamp Forests (360-17; n/a)

Concept: This calcareous seepage swamp occurs on the Virginia Coastal Plain on groundwater-saturated stream bottoms in ravines that have cut into Tertiary shell deposits or limesands. Braided streams and hummock-and-hollow microtopography are characteristic of the environmental setting. The tree canopy is characterized by *Fraxinus pennsylvanica, Acer rubrum, Liquidambar styraciflua*, and others. The shrub layer is comprised of *Lindera benzoin, Morella cerifera (= Myrica cerifera)* and *Cornus foemina*. Vines are abundant, characterized by *Decumaria barbara*. The herbaceous layer is characterized by *Caltha palustris, Carex bromoides, Packera aurea (= Senecio aureus), Scirpus lineatus, Thelypteris palustris, Pedicularis lanceolata, Carex tetanica, Liparis loeselii*, and *Carex granularis* on drier hummocks, and *Saururus cernuus, Bidens laevis, Pilea fontana, Glyceria striata*, and *Impatiens capensis* in wetter hollows and seepage rivulets.
Comments: Although *Fraxinus pennsylvanica* rather than *Fraxinus nigra* characterizes the canopy of this type, it is placed in the *Fraxinus nigra - Acer rubrum* Saturated Forest Alliance (A.347) because of the calcareous environmental setting and presence of calciphitic species.
Range: This calcareous seepage swamp occurs on the Virginia Coastal Plain.
States/Provinces: MD?, VA:S?
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Br:CCC
Federal Lands: NPS (Colonial)
Synonymy: *Acer rubrum - Fraxinus pennsylvanica / Bidens laevis - Pilea fontana - (Scirpus lineatus)* Saturated Forest [Provisional] (Fleming 2001)
References: Fleming 2001, Fleming et al. 2001
Authors: Chesapeake Bay Ecology Group, mod. L.A. Sneddon, ECS **Confidence:** 3 **Identifier:** CEGL006413

FRAXINUS NIGRA - ACER RUBRUM / CAREX LEPTALEA SATURATED FOREST

Black Ash - Red Maple / Little Bog Sedge Saturated Forest
Red Maple - Black Ash Swamp **G? (97-12-01)**
Ecological Group (SCS;MCS): Northern Swamp Forests (490-16; n/a)

Concept: Closed-canopy deciduous swamp forest of poorly drained depressions or seepage zones in the unglaciated portions of Lower New England/Northern Piedmont, High Allegheny Plateau, and Central Appalachians. This forest can occur as narrow zones to small inclusions to large swamps. Soils are generally mucky and without substantial peat development. It often occurs in areas of calcareous bedrock. The canopy is codominated by *Acer rubrum* and *Fraxinus nigra* with associates such as *Betula alleghaniensis, Ulmus rubra, Ulmus americana*, and *Pinus strobus*. The understory is patchy, ranging from shrub-dominated to sedge-dominated. Shrubs include *Lindera benzoin, Toxicodendron vernix, Alnus incana, Salix* spp., and *Rhamnus alnifolia*. The herb layer is diverse with *Carex leptalea, Carex bromoides, Caltha palustris, Veratrum viride, Platanthera grandiflora, Geum rivale, Symplocarpus foetidus, Cypripedium reginae, Trollius laxus, Osmunda cinnamomea, Impatiens capensis, Cardamine bulbosa, Saxifraga pensylvanica, Dryopteris cristata, Carex lacustris*, and *Symplocarpus foetidus*.
States/Provinces: MD:S?, NY:S4S5, PA:S?, WV:S?
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions: 212Fb:CCC, 212Fd:CCC, 221E:CP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Da:CCC
Synonymy: Red maple-black ash swamp (CAP pers. comm. 1998)
References: CAP pers. comm. 1998, Edinger et al. 2002, Fike 1999
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL007441

FRAXINUS NIGRA - LIRIODENDRON TULIPIFERA - ACER RUBRUM / CALTHA PALUSTRIS - CAREX BROMOIDES FOREST

Black Ash - Tuliptree - Red Maple / Yellow Marsh-marigold - Brome-like Sedge Forest
Montane Black Ash Seepage Swamp **G3 (00-04-17)**
Ecological Group (SCS;MCS): Appalachian Highlands Forested Fens and Calcareous Seeps (470-50; n/a)

Concept: This community type occupies groundwater-saturated stream headwaters, large spring seeps and runs, and lateral areas in ravine and stream bottoms where groundwater emerges at the base of slopes.

Overstory composition is mixed, with *Liriodendron tulipifera, Acer rubrum*, and *Fraxinus americana* the most abundant species. Frequent associates are *Fraxinus nigra, Betula lenta*, and *Tilia americana*. *Fraxinus* nigra is more abundant and sometimes dominant in the understory, along with *Acer rubrum* and *Fraxinus americana*. Canopy closure is often incomplete (mean stratum cover = 60-80%), most evidently because of blowdowns. Very wet microhabitats that impede the establishment and firm rooting of trees may also contribute to a somewhat open canopy. Shrub stratum diversity is moderately high; *Lindera benzoin* is usually the most abundant species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring true shrubs are *Alnus serrulata, Carpinus caroliniana, Hamamelis virginiana, Ilex verticillata*, and *Sambucus canadensis*. Except in local areas where shrubs are dense, herbaceous cover is high (mean stratum cover = 90%). One or both of the early-maturing forbs, *Symplocarpus foetidus* and *Veratrum viride*, are usually dominant over substantial areas. Because of microtopographic diversity (see below), herbaceous patch-mosaics are typical in this vegetation. More-or-less constant (50% constancy), sometimes locally abundant species include *Eurybia schreberi (= Aster schreberi), Caltha palustris, Carex bromoides, Carex gynandra, Carex prasina, Chelone glabra, Chrysosplenium americanum, Cinna arundinacea, Dryopteris carthusiana, Dryopteris goldiana, Glyceria striata, Impatiens capensis, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Ranunculus recurvatus, Saxifraga pensylvanica, Packera aurea (= Senecio aureus), Sphenopholis pensylvanica, Thalictrum pubescens*, and *Viola cucullata*. Moss cover is often significant, but only rarely includes *Sphagnum* spp. (not recorded in the plots analyzed here). Typical upland mesophytes commonly occur in well-drained hummock microhabitats and contribute to relatively high species richness values for this type of wetland.

Comments: This type needs additional resolution relative to *Fraxinus nigra - Acer rubrum / Carex leptalea* Saturated Forest (CEGL007441). *Liriodendron tulipifera* was added to the name to help distinguish this type from more northern and boreal associations in the alliance. Environmentally, this community type is distinguished from other montane wetlands by its saturated or seasonally saturated habitats that are influenced by more-or-less calcareous substrates. Floristically, it is distinguished from calcareous fens and seeps by its forest physiognomy and the absence or scarcity of light-demanding plants. This unit is most similar to forested, acidic seepage wetlands that are situated on soils derived from acidic sandstones, quartzites, and other oligotrophic substrates. These environmentally disparate swamps share a surprising number of prominent species including *Acer rubrum, Symplocarpus foetidus, Veratrum viride, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Carex leptalea*, etc. Mean species richness of stands analyzed in this study (n=52.2), however, is much higher than that of 23 acidic swamps in Augusta County, Virginia (n=27.7; DCR-DNH unpublished data). Distinct floristic features of calcareous seepage swamps include the prevalence of *Fraxinus* spp. (especially *Fraxinus nigra*), and nutrient-demanding species, among the most diagnostic of which are *Caltha palustris, Carex bromoides, Carex laevivaginata, Pilea fontana, Poa paludigena, Ranunculus hispidus var. caricetorum, Saxifraga pensylvanica*, and *Trillium cernuum*. These communities lack the *Sphagnum* mosses that characterize acidic groundwater wetlands. Moreover, many vascular plants that are common in or diagnostic of acidic seepage swamps are absent or unimportant, e.g., *Pinus rigida, Nyssa sylvatica, Viburnum nudum var. nudum, Parnassia asarifolia, Platanthera ciliaris, Platanthera clavellata, Rubus hispidus, Lycopodium obscurum, Carex debilis var. debilis*, and *Carex folliculata* (Fleming and Van Alstine 1999). Observations suggest, however, that the sharp distinctions that can now be drawn from limited existing data may be somewhat illusory, as the two putative "types" of seepage swamp are most likely confluent along a continuum of pH and trophic gradients.

Range: The probable range of this community type encompasses the Central Appalachian region of Pennsylvania, Maryland, Virginia, and West Virginia. In Virginia it is found primarily in the northern half of the mountains, apparently reaching its southern limits in Giles County. The majority of occurrences are on the Northern Blue Ridge, but the type is also scattered in suitable habitats of the Ridge and Valley province.

States/Provinces: MD?, VA:S?, WV?

TNC Ecoregions: 58:C, 59:C

USFS Ecoregions: M221Aa:CCC, M221Ab:CCC, M221Bd:C??, M221Da:CCC

Federal Lands: USFS (George Washington, Jefferson)

Synonymy: *Acer rubrum - Fraxinus nigra / Caltha palustris - Carex bromoides* Forest (Fleming 1999), *Acer rubrum - Fraxinus americana - Fraxinus nigra / Carex bromoides - Carex prasina - (Caltha palustris)* Forest (Fleming and Coulling 2001), Black Ash - American Elm - Red Maple: 39 (Eyre 1980) B

References: Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming and Van Alstine 1999, Fleming et al. 2001, Golet et al. 1993, Ludwig et al. 1993

Authors: G.P. Fleming, SCS **Confidence:** 2 **Identifier:** CEGL008416

I.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous forest

I.C.3.N.a.4. PICEA RUBENS - BETULA ALLEGHANIENSIS FOREST ALLIANCE

Red Spruce - Yellow Birch Forest Alliance

Concept: Forests with mixed deciduous/evergreen canopies, dominated by *Picea rubens* and *Betula alleghaniensis*, occurring from the maritime provinces of Canada, through northern New England and eastern New York, south to the High Alleghenies, and high elevations in the northern Ridge and Valley and Southern Blue Ridge. This alliance includes forests transitional between northern hardwoods and spruce - fir forests, as well as successional forests resulting from the death of *Abies fraseri* due to the Balsam Woolly Adelgid. *Picea rubens* is usually the most abundant conifer, with lesser amounts of *Abies balsamea*, in the north, and *Abies fraseri*, in the southern portion of the range. *Betula alleghaniensis* is usually the most abundant deciduous tree, although other deciduous species, such as *Fagus grandifolia* and, in the southern Appalachians, *Aesculus flava*, can be prominent constituents. Associated species vary with geography, but include *Acer spicatum, Acer pensylvanicum, Acer saccharum, Oclemena acuminata (= Aster acuminatus), Clintonia borealis, Dryopteris carthusiana (= Dryopteris spinulosa), Dryopteris intermedia, Dryopteris campyloptera, Ilex montana, Menziesia pilosa, Oxalis montana, Rugelia nudicaulis, Rhododendron catawbiense, Sambucus racemosa var. racemosa (= Sambucus racemosa var. pubens), Solidago glomerata, Trillium undulatum, Vaccinium erythrocarpum*, and *Viburnum lantanoides (= Viburnum alnifolium)*. Forests of this alliance generally occur on midslopes, with soils ranging from somewhat poorly drained to well-drained. Forests of this alliance in the White Mountains and Green Mountains in New England were noted to occur on soils derived from compact till and ablational till consisting of metamorphic schist and gneiss. Forests in this alliance tend to be on moister sites than deciduous forests dominated by northern hardwood species.
Range: This alliance is found in North Carolina, Tennessee, Massachusetts, Maine, New Hampshire, New York, Pennsylvania (?), Vermont, Virginia, and West Virginia.
States/Provinces: MA MD ME NB NC NH NS NY PA? QC? TN VA? VT WV
TNC Ecoregions: 51:C, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Eb:CCC, 212Ed:CCC, 221Ah:CCC, 221Al:CCC, 221Bc:CCC, 222Ob:CCC, 232C:CC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Fa:CCC, M212Fb:CCC, M221Aa:CCC, M221Ba:CCC, M221Bc:CCC, M221Cb:CP?, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Acadia, Great Smoky Mountains); USFS (Cherokee?, Jefferson?, Nantahala?, Pisgah)
Synonymy: Red Spruce--Fraser Fir Forest, in part (Schafale and Weakley 1990); Red Spruce - Yellow Birch: 30, in part (Eyre 1980); Spruce - Fir - Northern Hardwoods Forest (Swain and Kearsley 2001)
References: Eyre 1980, Fincher 1991, Golden 1974, Golden 1981, Schafale and Weakley 1990, Swain and Kearsley 2001
Authors: D.J. ALLARD, RW, East **Identifier:** A.384

PICEA RUBENS - BETULA ALLEGHANIENSIS - PRUNUS SEROTINA FOREST

Red Spruce - Yellow Birch - Black Cherry Forest

G? (97-12-01)

Concept: Transitional hardwood - spruce forest of Central Appalachians (CAP). These are closed-canopy mixed forests dominated by *Picea rubens* and *Betula alleghaniensis*. Associates include *Prunus serotina, Fagus grandifolia, Acer spicatum, Acer pensylvanicum, Acer saccharum*. The variable shrub layer may contain *Rhododendron maximum, Sambucus racemosa, Ilex montana, Vaccinium erythrocarpum, Viburnum lantanoides*. The variable herb layer includes *Oclemena acuminata (= Aster acuminatus), Clintonia borealis, Dryopteris carthusiana (= Dryopteris spinulosa), Dryopteris intermedia, Dryopteris campyloptera, Menziesia pilosa, Oxalis montana, Trillium undulatum*. These communities are found on midslopes with well-drained to somewhat poorly drained acidic soils. This type includes forests transitional between northern hardwoods and spruce-fir forests.
States/Provinces: MD:S?, PA?, WV:S?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Ba:CCC, M221Bc:CCC
Synonymy: Red spruce-yellow birch-black cherry forest (CAP pers. comm. 1998)
References: CAP pers. comm. 1998

Authors: ECS **Confidence:** 3 **Identifier:** CEGL006029

I.C.3.N.a.21. PINUS STROBUS - QUERCUS (ALBA, RUBRA, VELUTINA) FOREST ALLIANCE

Eastern White Pine - (White Oak, Northern Red Oak, Black Oak) Forest Alliance

Concept: This alliance occurs from the western Great Lakes to the northeastern United States and south to the southern Appalachian Mountains. The overstory is a mix of evergreen and deciduous trees which form a moderately closed to closed canopy. *Pinus strobus* is a consistent constituent of the canopy and usually occurs as supercanopy trees, as well. *Quercus alba, Quercus rubra*, and *Quercus velutina* are also important canopy trees along with minor amounts of *Acer rubrum, Carya alba, Liriodendron tulipifera, Pinus resinosa, Pinus banksiana* (in Wisconsin), *Populus tremuloides* (in the northern parts of this alliance's range), *Quercus ellipsoidalis* (in the northwest), and *Tsuga canadensis*, and *Quercus prinus* (in the southeast). Subcanopy trees can include *Carpinus caroliniana, Cornus florida, Hamamelis virginiana, Halesia tetraptera, Oxydendrum arboreum*, and *Nyssa sylvatica*. The shrub layer is often well-developed with *Gaylussacia* spp., *Kalmia latifolia, Rubus* spp., and *Vaccinium* spp. most commonly dominant. Other shrubs can include *Corylus americana, Gaultheria procumbens, Rhododendron maximum*, and *Sassafras albidum*, and in the Ridge and Valley, *Viburnum rafinesquianum* and *Viburnum prunifolium*. The herb stratum is sparse to moderate, but can be quite species rich, especially in the Southern Blue Ridge and Ridge and Valley, where typical species include *Ageratina altissima, Amphicarpaea bracteata, Brachyelytrum erectum, Carex communis, Carex platyphylla, Carex woodii, Carex pensylvanica, Chimaphila maculata, Desmodium nudiflorum, Eupatorium purpureum, Galax urceolata, Galium latifolium, Galium circaezans, Geranium maculatum, Goodyera pubescens, Hexastylis shuttleworthii, Hieracium venosum, Houstonia purpurea, Maianthemum racemosum, Maianthemum canadense, Medeola virginiana, Mitchella repens, Monotropa uniflora, Poa cuspidata, Polygonatum biflorum, Polystichum acrostichoides, Trillium catesbaei*, and *Viola hastata*. Stands of this alliance are dry-mesic to mesic forests found on acidic, relatively nutrient-poor, sandy loam to sandy soil on a variety of topographic positions. In the upper Midwest, most stands are on flat to rolling topography on outwash plains or moraines. In the Southern Blue Ridge, they occur on mid to lower slopes in the lower elevations (below 3000 feet) on protected ridges, and in disturbed bottoms. In the Ridge and Valley of Virginia, these forests are found on protected ravines, with rocky soils developed over shale, sandstone, or other sedimentary rock.
Comments: In the Appalachians, these forests are typically transitional between the more mesic, protected cove forests and the more xeric, exposed pine - oak forests with *Quercus prinus* and *Quercus coccinea*. Stands of this alliance are mid-successional but long-lasting and require repeated disturbances to regenerate (MNNHP 1993). Isolated stands of *Pinus strobus* with *Quercus alba* and *Quercus velutina* and scattered *Fagus grandifolia* over *Kalmia latifolia* are found on steep slopes of the Western Highland Rim of (Cheatham and Dickson counties; Chester 1980). Similar isolated stands with *Pinus strobus* are found in the vicinity of Clifty, Kentucky. Their status is unclear as well. These occur on sandstones of the Dripping Springs escarpment (Logan, Muhlenburg, Todd counties). "These are along Clifty Creek Gorge and Rocky Creek/Lake Malone State Park area; no botanical person has reported from here for a long time. The environment is not necessarily more xeric." (Julian Campbell, TNC-KYFO).
Range: This alliance is found in northern Minnesota, Wisconsin, Michigan, northern Illinois, Indiana, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, West Virginia, northern Georgia, western North Carolina, western South Carolina, and eastern Tennessee (?). It is also found in Canada.
States/Provinces: CT GA IL? IN? MA MD ME MI MN NC NH NJ? NY ON PA QC? RI SC TN? VA? VT WI WV
TNC Ecoregions: 44:P, 46:C, 47:C, 48:C, 49:C, 50:P, 51:C, 52:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CPP, 212Bb:CPP, 212Ca:CCP, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Eb:CCC, 212Ec:CCP, 212Ed:CCP, 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 212Hb:CCP, 212He:CCC, 212Hi:CCP, 212Hj:CCC, 212Hl:CCC, 212Hm:CCP, 212Ho:CCC, 212Hp:CCC, 212Hq:CCC, 212Hr:CCP, 212Hs:CCP, 212Ht:CCP, 212Hu:CCC, 212Hv:CCC, 212Hw:CCC, 212Hx:CCP, 212Hy:CCC, 212Ja:CCP, 212Jb:CCC, 212Jc:CCP, 212Jf:CCP, 212Jj:CCP, 212Jl:CCP, 212Jm:CCC, 212Jn:CCP, 212Jr:CCC, 212Ka:CCP, 212Kb:CCC, 212La:CPP, 212Lb:CP?, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 212Oa:CCC, 212Oc:CCC, 221Aa:CCC, 221Ab:CCP, 221Ac:CCC, 221Ae:CCC, 221Af:CCP, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Aj:CCP, 221Ak:CCC, 221Al:CCC, 221Am:CCP, 221Ba:CCC, 221Bb:CCP, 221Bc:CCC, 221Bd:CCC, 221Db:CPP, 221Ea:CCC, 221Ec:CCC, 221Fa:CCC, 222Eg:CCC, 222Ic:CCP, 222Id:CCP, 222If:CCP, 222Ja:CCC,

222Jc:CCC, 222Jd:CCC, 222Je:CCC, 222Jg:CCC, 222Jj:CCC, 222Ka:CCC, 222Kh:CCC, 222Lc:CCC, 222Lf:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 232Aa:CCC, M212Ac:CC?, M212Ad:CCC, M212Ae:CCP, M212Ag:CCC, M212Ba:CCP, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCP, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212Db:CCP, M212Dc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CC?, M221Bb:CCC, M221Bc:CC?, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Ca:CC?, M221Cb:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: NPS (Acadia, Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, George Washington, Nantahala, Pisgah, Sumter)

Synonymy: Hardwood - White Pine Forest, in part (Ambrose 1990a); Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990); Eastern White Pine: 21, in part (Eyre 1980); White Pine - Chestnut Oak: 51, in part (Eyre 1980); White Pine - Northern Red Oak - Red Maple: 20 (Eyre 1980); *Pinus strobus - Pinus resinosa* forest (No. 36), in part (Vankat 1990); Northern Dry-mesic Forest, in part (Curtis 1959); Coastal Forest/Woodland (Swain and Kearsley 2001); Dry white pine (hemlock) - oak forest (Fike 1999); Dry - Mesic Acidic Central Forest (Smith 1991)

References: Ambrose 1990a, Chester and Scott 1980, Curtis 1959, Eyre 1980, Faber-Langendoen et al. 1996, Fike 1999, MNNHP 1993, Rawinski et al. 1996, Schafale and Weakley 1990, Smith 1991, Swain and Kearsley 2001, Vankat 1990

Authors: S. SIMON 8-94, MOD. A.S., RW, East **Identifier:** A.401

PINUS STROBUS - QUERCUS RUBRA - LIRIODENDRON TULIPIFERA FOREST

Eastern White Pine - Northern Red Oak - Tuliptree Forest

G? (97-12-01)

Ecological Group (SCS;MCS): Northeastern Dry Pine Forests and Woodlands (490-10; n/a)

Concept: This mixed white pine - oak forest occurs in the southern portion of the central Appalachian region. The forest is dry to mesic and occurs on acidic and nutrient-poor sand or sandy loam. It occurs at lower elevations, generally below 3000 feet, on middle to lower slopes and in ravines or on sheltered ridges of shale, sandstone or other sedimentary rock. The canopy is dominated by *Pinus strobus*, which may also form a distinct emergent tree layer. Other dominant trees are *Quercus alba, Quercus rubra*, and *Quercus velutina*. Less abundant canopy associates include *Acer rubrum, Carya alba, Liriodendron tulipifera, Populus tremuloides, Tsuga canadensis, Quercus prinus*. The subcanopy is of variable cover and may include *Carpinus caroliniana, Cornus florida, Hamamelis virginiana, Halesia tetraptera, Oxydendrum arboreum*, or *Nyssa sylvatica*. The shrub layer is well developed, often characterized by ericaceous species such as *Gaylussacia* spp., *Kalmia latifolia*, and *Vaccinium* spp., as well as other shrubs such as *Rubus* spp., *Corylus americana, Gaultheria procumbens, Sassafras albidum, Viburnum rafinesquianum*, and *Viburnum prunifolium*. The herbaceous layer is of sparse to moderately dense cover and is characterized by *Ageratina altissima, Amphicarpaea bracteata, Brachyelytrum erectum, Carex communis, Carex platyphylla, Carex woodii, Carex pensylvanica, Chimaphila maculata, Desmodium nudiflorum, Eupatorium purpureum, Galax urceolata, Galium latifolium, Galium circaezans, Geranium maculatum, Goodyera pubescens, Hexastylis shuttleworthii, Hieracium venosum, Houstonia purpurea, Maianthemum racemosum, Maianthemum canadense, Medeola virginiana, Mitchella repens, Monotropa uniflora, Poa cuspidata, Polygonatum biflorum, Polystichum acrostichoides, Trillium catesbaei*, and *Viola hastata*. This association is differentiated from a related type that ranges from the central Appalachians to New England by the presence of the following species *Liriodendron tulipifera, Halesia tetraptera, Viburnum rafinesquianum, Eupatorium purpureum, Galax urceolata, Galium circaezans, Geranium maculatum, Hexastylis shuttleworthii*, and *Trillium catesbaei*.

States/Provinces: MD:S?, VA?, WV:S?

TNC Ecoregions: 59:C

USFS Ecoregions: M221Aa:CCC, M221Bd:CCC, M221Be:CCC, M221C:CC, M221Da:C??

Synonymy: White pine-oak-tuliptree dry forest (CAP pers. comm. 1998)

References: CAP pers. comm. 1998

Authors: ECS **Confidence:** 2 **Identifier:** CEGL006304

I.C.3.N.a.24. PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

Loblolly Pine - (White Oak, Southern Red Oak, Post Oak) Forest Alliance

Concept: This alliance encompasses loblolly pine - oak forests of the Coastal Plain and some adjacent provinces of the eastern United States. The canopy is dominated by *Pinus taeda* with some combination of the nominal oaks. More mesic examples tend to be codominated by *Quercus alba*, while dry to dry-mesic examples are usually codominated by *Quercus falcata*. Associated species vary by geography, substrate, and exposure. Described members of this alliance are found sporadically, ranging from the North Atlantic Coast of Delaware, through the Chesapeake Lowlands of Maryland and Virginia to the West Gulf and Upper West Gulf coastal plains of eastern Texas and Arkansas where they are most common. These forests are apparently absent from the Mid-Atlantic Coastal Plain of North and South Carolina, but are documented in the South Atlantic Coastal Plain of Georgia. Successional and/or semi-natural examples are known from the East Gulf and Upper East Gulf coastal plains. Within the longleaf pine belt, these forests can occur naturally on fire-protected areas such as topographically isolated hilltops, mid to lower slopes, protected ravines, broad flats and second bottoms. In some cases, they are successional forests on broad uplands following clearing or alteration of natural forests, especially those historically dominated by *Pinus palustris* A broad range of associated species may be present in this type, including *Carya alba, Carya texana, Nyssa sylvatica, Liquidambar styraciflua, Carya cordiformis, Magnolia grandiflora, Fagus grandifolia, Quercus velutina, Quercus michauxii, Quercus pagoda*, and *Acer rubrum*. The subcanopy can include canopy species, as well as *Ilex opaca var. opaca, Ostrya virginiana, Carpinus caroliniana, Cornus florida*, and others. *Callicarpa americana, Symplocos tinctoria, Morella cerifera (= Myrica cerifera), Vaccinium elliottii, Viburnum dentatum*, and *Viburnum acerifolium* are common shrub species. Herbaceous species that may be present include *Polystichum acrostichoides, Athyrium filix-femina ssp. asplenioides, Phegopteris hexagonoptera, Prenanthes altissima, Spigelia marilandica, Mitchella repens, Podophyllum peltatum, Phlox divaricata, Tipularia discolor, Arisaema triphyllum, Erigeron pulchellus, Lilium michauxii, Chasmanthium laxum, Chasmanthium sessiliflorum*, and *Melica mutica*.

Range: This alliance encompasses pine - oak forests of the coastal plain and some adjacent provinces from Virginia to Texas. This includes the mesic to dry-mesic loblolly - oak - hickory forests of Arkansas, Louisiana, and Texas; dry forests on flats in the Piedmont of, at least, North Carolina and South Carolina that are dominated by *Pinus taeda* with a combination of the nominal oaks; and related vegetation in the East Gulf and Atlantic coastal plains.

States/Provinces: AL AR DE GA LA MD MS OK TX VA

TNC Ecoregions: 31:C, 40:C, 41:C, 43:P, 44:P, 50:?, 52:P, 53:C, 56:C, 57:?, 58:C, 62:C

USFS Ecoregions: 231Aa:CCC, 231Ac:CCC, 231Ae:CCC, 231Af:CCC, 231Ah:CCP, 231Ba:CCP, 231Bc:CCP, 231Bd:CCC, 231Be:CCC, 231Bg:CCP, 231Bh:CCP, 231Bi:CCC, 231C:CC, 231Ea:CCC, 231Ee:CCC, 231Ef:CCC, 231Eg:CCC, 231Eh:CCC, 231Ei:CCC, 231Ej:CCC, 231En:CCC, 231Fa:CCC, 232Ac:CCC, 232Ad:CCC, 232Ba:CCC, 232Bb:CCC, 232Bi:CCP, 232Bj:CCP, 232Bk:CCP, 232Bl:CCC, 232Bm:CCP, 232Bn:CCC, 232Bo:CCP, 232Bq:CCC, 232Br:CCC, 232Bt:CCC, 232Bu:CCC, 232Bv:CCC, 232Bx:CCC, 232Bz:CCC, 232Ca:CCC, 232E:C?, 232Fa:CCC, 232Fb:CCC, 232Fe:CCC, 234Ab:PP?, 234Ac:PPP, 234Ah:PPP, 255:?

Federal Lands: DOD (Fort Benning); NPS (Chickamauga-Chattanooga, Kennesaw Mountain, Rock Creek); USFS (Angelina, Apalachicola?, Bienville, Conecuh, Croatan?, Davy Crockett, De Soto, Holly Springs, Homochitto, Kisatchie, Oconee, Sabine NF, Sam Houston, St. Francis, Sumter?, Talladega, Tombigbee, Tuskegee, Uwharrie?); USFWS (Eufaula)

Synonymy: IA6e. Loblolly Pine - Shortleaf Pine - Oak Forest, in part (Allard 1990); Lowland Pine - Oak Forest (Foti 1994b); Calcareous Forest, in part (Smith 1996a); Mixed Hardwood-Loblolly Pine Forest, in part (Smith 1996a); Dry-Mesic Mixed Oak - Pine Forest (Wieland 1994b); Loblolly Pine-Oak Series (Diamond 1993); T1B3aIII4a. *Pinus echinata - Pinus taeda - Quercus* spp. (*stellata, alba, falcata*) (Foti et al. 1994); Loblolly Pine - Hardwood: 82 (Eyre 1980); White Oak - Loblolly Pine/*Callicarpa* Loamy Mesic Lower Slopes and Terraces, in part (Turner et al. 1999)

References: Allard 1990, Baker and Langdon 1990, Clarke et al. 2000, Diamond 1993, Eyre 1980, Foti 1994b, Foti et al. 1994, Golden 1979, Martin and Smith 1991, Martin and Smith 1993, Smith 1996a, Smith pers. comm., Turner et al. 1999, Wieland 1994b

Authors: D.J. ALLARD, MOD. R.E. EV, RW, Southeast **Identifier:** A.404

(PINUS TAEDA) - QUERCUS FALCATA / GAYLUSSACIA FRONDOSA FOREST
(Loblolly Pine) - Southern Red Oak / Dangleberry Forest

G5 (97-12-01)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Loblolly/Shortleaf Upland Pine and Pine-Hardwood Forests (307-09; n/a)

Concept: This mixed loblolly pine-oak forest of the northern Atlantic Coastal Plain occurs on dry to somewhat mesic, sandy or sandy loam soils on gently rolling to flat topography. The canopy is dominated by a mixture of *Pinus taeda* and oaks, of which *Quercus falcata* and *Quercus alba* are the most characteristic. Other canopy associates include *Acer rubrum, Quercus velutina, Quercus coccinea, Sassafras albidum, Nyssa sylvatica, Carya glabra*, and *Ilex opaca*. The ericaceous shrub layer is characterized by *Gaylussacia frondosa (= var. frondosa), Gaylussacia baccata, Vaccinium stamineum, Vaccinium pallidum, Vaccinium corymbosum*, and *Kalmia latifolia*. The herbaceous layer is generally sparse and characterized by *Pteridium aquilinum, Cypripedium acaule, Chimaphila maculata*, and *Gaultheria procumbens*.
Comments: The relative cover of *Pinus taeda* is likely related to disturbance history, with higher pine cover suggesting more recent disturbance.
States/Provinces: DE:S?, MD:S?, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232C:CP
Synonymy: *Quercus alba - Quercus falcata - Pinus taeda / Gaylussacia frondosa* Forest (Patterson pers. comm.)
References: Bowman 2000, Clancy 1996, Fleming 2001, Fleming et al. 2001, Lea 2002b, Patterson pers. comm., Shreve et al. 1910
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006169

I.C.3.N.a.27. PINUS VIRGINIANA - QUERCUS (ALBA, STELLATA, FALCATA, VELUTINA) FOREST ALLIANCE

Virginia Pine - (White Oak, Post Oak, Southern Red Oak, Black Oak) Forest Alliance

Concept: This alliance includes forests with mixed evergreen/deciduous canopies composed primarily of *Pinus virginiana*, with various admixtures of the nominal *Quercus* spp. (*Quercus alba, Quercus stellata, Quercus falcata, Quercus velutina*). The application of this alliance is currently restricted to the pine barrens of New Jersey, Delaware and Maryland.
Comments: Communities of the southeastern United States formerly attributed to this alliance are now covered in *Pinus virginiana* Forest Alliance (A.131) and other deciduous alliances. Further review is needed to ascertain whether or not this alliance is applicable to vegetation of the Piedmont, Shawnee Hills of Kentucky (J. Campbell pers. comm.), and possibly other parts of the Interior Low Plateau.
Range: Vegetation of this alliance is found in Delaware, Maryland, and New Jersey. Its attribution to Virginia and West Virginia is unclear.
States/Provinces: DE MD NJ VA
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Ac:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC
Synonymy: Virginia Pine - Oak: 78, in part (Eyre 1980); Serpentine Virginia pine - oak forest (Fike 1999); Virginia pine - mixed hardwood forest (Fike 1999); Eastern Serpentine Barren, in part (Smith 1991); Xeric Central Hardwood - Conifer Forest (Smith 1991)
References: Chapman 1957, Eyre 1980, Fike 1999, Schmalzer and DeSelm 1982, Smith 1991
Authors: ECS, East **Identifier:** A.407

PINUS VIRGINIANA - QUERCUS FALCATA - CARYA PALLIDA FOREST
Virginia Pine - Southern Red Oak - Sand Hickory Forest
Inland Dune Ridge Forest **G? (97-12-01)**

Ecological Group (SCS;MCS): Southeastern Coastal Plain Maritime Stable Dune Forests and Woodlands (240-50; n/a)

Concept: This xeric pine forest of the central Atlantic Coastal Plain occurs on inland sand dune ridges. *Pinus virginiana* is codominant with a variety of oak species, including *Quercus falcata, Quercus nigra, Quercus alba,*

Quercus stellata, and *Quercus velutina*. *Carya pallida* and *Carya alba (= Carya tomentosa)* can also occur. Other canopy and subcanopy associates may include *Sassafras albidum, Pinus taeda, Quercus prinus, Quercus marilandica, Prunus serotina, Cornus florida, Nyssa sylvatica*, and *Diospyros virginiana*. The shrub layer may include *Gaylussacia frondosa, Ilex opaca, Vaccinium pallidum (= Vaccinium vacillans), Gaylussacia baccata, Kalmia angustifolia, Comptonia peregrina*, and *Vaccinium stamineum*. The herbaceous layer is generally sparse, but is more abundant in openings. Characteristic herbs may include *Cypripedium acaule, Carex tonsa, Carex nigromarginata, Carex albicans, Carex albicans var. emmonsii (= Carex emmonsii), Tephrosia virginiana, Tephrosia spicata, Dichanthelium commutatum, Dichanthelium ovale, Chimaphila maculata, Melampyrum lineare*, and *Mitchella repens*. Less frequent species may include *Euphorbia ipecacuanhae, Baptisia tinctoria, Lupinus perennis, Pteridium aquilinum, Chimaphila umbellata, Monotropa uniflora*, and *Desmodium strictum*. Lichens of the genera *Cladonia* and *Cladina* are common. Vines such as *Smilax glauca, Smilax rotundifolia, Parthenocissus quinquefolia*, and *Vitis rotundifolia* are common at low cover.
Comments: The origin of this type in New Jersey was suspected to be post-agricultural (Breden 1989), but this should be further explored, because of the recent identification of *Carya pallida* on the New Jersey Coastal Plain (A. Windisch pers. comm.). The ancient xeric dunes in Maryland may also be this type.
Range: Currently described from Delaware, Maryland, and New Jersey.
States/Provinces: DE:S?, MD:S?, NJ:S?, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Ac:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC
Synonymy: Virginia pine - oak forest (Breden 1989)
References: Berdine 1998, Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1996, Fleming et al. 2001, Windisch pers. comm.
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006354

I.C.3.N.a.32. TSUGA CANADENSIS - BETULA ALLEGHANIENSIS FOREST ALLIANCE
Eastern Hemlock - Yellow Birch Forest Alliance

Concept: This alliance is found in the Great Lakes region and the northeastern United States and can range as far south as the Southern Blue Ridge of North Carolina and Tennessee, where it can occur in high-elevation areas. Forests in this alliance are late successional upland forests, dominated by coniferous and deciduous trees. *Tsuga canadensis* and some combination of *Acer saccharum, Betula alleghaniensis*, and *Fagus grandifolia* are typically the dominant trees. *Fagus grandifolia* is not found in stands west of eastern Wisconsin. Associated trees include *Acer rubrum, Betula lenta* (in the eastern portion of this alliance's range), *Carya* spp. (in the south), *Liriodendron tulipifera* (in the south), *Pinus strobus, Prunus serotina var. serotina* (in the Allegheny Mountains), *Quercus alba, Quercus rubra*, and *Ulmus americana*. *Picea rubens* can be found in northern New England. The small tree *Ostrya virginiana* is often present in the subcanopy. In the northern portions of this alliance's range, the shade from the canopy and dense stands of *Acer saccharum* saplings and seedlings inhibits the growth of many other species. These stands often have depauperate ground layer strata. Where the shade is not as complete, shrubs such as *Corylus cornuta, Diervilla lonicera, Hamamelis virginiana, Sambucus racemosa var. racemosa (= Sambucus pubens)*, and *Viburnum lantanoides (= Viburnum alnifolium)* may be found along with saplings of *Abies balsamea* and *Picea glauca*. In the southern portion of this alliance's range, ericaceous shrubs are common. Among these *Kalmia latifolia, Rhododendron maximum*, and *Vaccinium pallidum* are typically the most abundant. The herbaceous layer consists of species such as *Anemone quinquefolia, Cornus canadensis* (in the north), *Dryopteris carthusiana* (in the north), *Epigaea repens, Maianthemum canadense, Medeola virginiana, Mitchella repens, Oxalis montana* (in the east), *Trientalis borealis* (in the north), *Trillium grandiflorum* (in the north), and *Viola* spp. Stands of this alliance tend to be on dry-mesic to mesic loam and sand soils. The soil is sometimes acidic, especially in the southern portion of this alliance's range. The parent material is glacial till in the north and sandstone in the unglaciated southern part. Stands can be on flat to moderately steep slopes of any aspect.
Range: This alliance occurs in Michigan and northern and southeastern Wisconsin. It is widespread in the eastern United States in Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. It is also found in Canada from southern Ontario east to Nova Scotia, and in the Southeast in Tennessee and possibly North Carolina (?).
States/Provinces: CT MA MD ME MI NB NC? NH NJ NS NY ON PA RI TN VA VT WI WV
TNC Ecoregions: 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 58:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CCP, 212Ab:CCP, 212Ba:CCP, 212Bb:CCP, 212Ca:CCP, 212Cb:CCP, 212Da:CCP, 212Db:CCP, 212Dc:CCP, 212Ea:CCP, 212Ec:CCP, 212Ed:CCP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC,

212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Ha:CCC, 212Hb:CCC, 212Hd:CCC, 212He:CCC, 212Hi:CCP, 212Hj:CCC, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCC, 212Hp:CCP, 212Hq:CCP, 212Hr:CCP, 212Hs:CCC, 212Ht:CCP, 212Hv:CCC, 212Hw:CCC, 212Hx:CCC, 212Ia:CCC, 212Ib:CCP, 212Ja:CCP, 212Jb:CCC, 212Jc:CCC, 212Je:CCP, 212Jf:CCP, 212Jj:CCC, 212Jk:CC?, 212Jl:CCC, 212Jm:CCC, 212Jn:CCC, 212Jo:CCP, 212Jr:CCC, 212Js:CCC, 212Lb:CCC, 212Oa:CCC, 212Oc:CCC, 212Pa:CCC, 221Aa:CCP, 221Ac:CC?, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCP, 221Ak:CCC, 221Al:CCP, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Dc:CCP, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, 221Ja:C??, 222De:C??, 222Ek:CCC, 222Em:CCC, 222Hb:CCC, 222Hf:CCC, 222Ia:CCC, 222Ib:CCP, 222Ic:CCP, 222Id:CCP, 222Ie:CCP, 222If:CCP, 222Ja:CCC, 222Je:CCC, 222Jj:CCC, 222Ka:CCC, 222Lb:CCC, 222Lc:CCC, 222Ld:CCC, 231Aa:???, 231Ae:???, 231Ak:???, 231Ap:???, 232Ac:PPP, 232Ad:PP?, 232Ba:P??, M212Aa:CC?, M212Ab:CC?, M212Ac:CCP, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCP, M212Ca:CCC, M212Cb:CCC, M212Cc:CCC, M212Cd:CCC, M212Da:CCC, M212Db:CCC, M212Dc:CCC, M212Dd:CCC, M212De:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fa:CCC, M212Fb:CCC, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CC?, M221Bf:CCP, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??, M221Da:CCC, M221Db:CC?, M221Dc:CCC, M221Dd:CCC

Federal Lands: NPS (Acadia, Great Smoky Mountains, Shenandoah); USFS (Cherokee, George Washington, Jefferson, Pisgah)

Synonymy: Hemlock - Yellow Birch: 24 (Eyre 1980); Hemlock (Braun 1950); Hemlock-Hardwood Forests (Braun 1950); Beech-Hemlock Association (Braun 1928); *Tsuga canadensis-Betula alleghaniensis/Rhododendron maximum* Forest (Newell et al. 1997); Oak - Hemlock - White Pine Forest (Swain and Kearsley 2001); Hemlock Ravine Community (Swain and Kearsley 2001); Northern Hardwoods - Hemlock - White Pine Forest (Swain and Kearsley 2001); Red Oak - Sugar Maple Transition Forest (Swain and Kearsley 2001); Spruce - Fir - Northern Hardwoods Forest (Swain and Kearsley 2001)

References: Braun 1928, Braun 1950, Eyre 1980, Faber-Langendoen et al. 1996, Kotar et al. 1988, Newell et al. 1997, Swain and Kearsley 2001

Authors: ECS/MCS, RW, East **Identifier:** A.412

TSUGA CANADENSIS - BETULA ALLEGHANIENSIS - PRUNUS SEROTINA / RHODODENDRON MAXIMUM FOREST

Eastern Hemlock - Yellow Birch - Black Cherry / Great Rhododendron Forest

Central Appalachian Hemlock - Northern Hardwood Forest **G? (97-12-31)**

Ecological Group (SCS;MCS): Appalachian Highlands High Elevation Northern Hardwood Forests (410-20; n/a)

Concept: This hemlock forest of the Central Appalachian Mountains and High Allegheny Plateau occurs on acidic, mesic, sandy loams and sands of glacial till or sandstone in rocky ravines to occasionally flats or moderately steep slopes of any aspect. This is a closed-canopy, late-successional, mixed forest dominated by *Tsuga canadensis* with associated canopy species including *Acer saccharum, Prunus serotina, Betula alleghaniensis*, and *Fagus grandifolia*. Other associates include *Acer rubrum, Betula lenta, Carya* spp., *Pinus strobus, Quercus alba, Quercus rubra, Ulmus americana*, and *Ostrya virginiana*. The variable shrub layer consists of *Corylus cornuta, Diervilla lonicera, Hamamelis virginiana, Viburnum lantanoides*, and ericaceous species *Kalmia latifolia, Rhododendron maximum*, and *Vaccinium pallidum*. The herbaceous layer may include *Anemone quinquefolia, Cornus canadensis, Dryopteris carthusiana, Maianthemum canadense, Medeola virginiana, Mitchella repens, Oxalis montana, Trientalis borealis, Trillium grandiflorum, Trillium erectum*, and *Viola* spp. *Rhododendron maximum, Sambucus racemosa (= Sambucus pubens)*, and the abundance of *Prunus serotina* in the canopy differentiate this from other associations of this alliance.

States/Provinces: MD?, NJ:S1S2, NY:S4, PA:S?, TN:S?, VA?, WV:S?

TNC Ecoregions: 59:C, 60:C, 61:C

USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCP, 221Am:CCP, 221Ba:CCP, 221Bd:CCC, 221Dc:CCP, 221E:C?, M212Eb:CCP, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221C:C?, M221Da:C??

Synonymy: Eastern hemlock-yellow birch-black cherry forest (CAP pers. comm. 1998)

References: Breden et al. 2001, CAP pers. comm. 1998, Fike 1999

Authors: ECS **Confidence:** 2 **Identifier:** CEGL006206

TSUGA CANADENSIS - BETULA ALLEGHANIENSIS LOWER NEW ENGLAND / NORTHERN PIEDMONT FOREST
Eastern Hemlock - Yellow Birch Lower New England / Northern Piedmont Forest
Hemlock - Northern Hardwood Forest **G4? (97-12-31)**

Concept: Mixed hemlock - northern hardwood forests of Lower New England / Northern Piedmont. *Tsuga canadensis* forms at least 50% of the canopy, and associated hardwoods usually include *Betula alleghaniensis, Fagus grandifolia, Acer saccharum*. This forest is usually described as mesic, but on drier sites, *Fagus grandifolia* and oaks may also be present in quantity, particularly *Quercus rubra*. The shrub layer may be dense to fairly open, and often includes *Viburnum acerifolium, Acer pensylvanicum*. Herbs may be sparse, particularly in dense shade, but often include *Medeola virginiana, Oxalis montana, Mitchella repens, Maianthemum canadense, Trientalis borealis, Huperzia lucidula (= Lycopodium lucidulum)*, and *Thelypteris noveboracensis*. A bryophyte layer may be well-developed, often characterized by the liverwort *Bazzania trilobata*. Soils of this community are dry-mesic to mesic and acidic.
Comments: Many stands of this vegetation type in the national forests and Shenandoah National Park have been devastated during the past decade by adelgid-caused tree mortality. In some cases, 100% of the canopy hemlocks have been killed, littering the forest floor with downed wood and stimulating massive increases in understory growth, particularly of *Betula* spp. and *Acer pensylvanicum*. Since there is no practical treatment for the adelgid on a landscape level, one can only hope that natural pathogens will emerge to keep the adelgid in check before all of our examples of this community are severely degraded or lost.
Range: This community is generally distributed in large patches from New Hampshire south through New England, becoming more local in the north Atlantic Piedmont and restricted to local patches at higher elevations of the Central Appalachians in Maryland, West Virginia, and Virginia.
States/Provinces: CT:S?, MA:S5, MD:S?, ME:S4, NH:S4, NJ:S3, NY:S4, RI:S?, VA:S?, VT:S4, WV?
TNC Ecoregions: 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ak:CCC, 221Am:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Dc:CCP, 222Id:CCP, 232Ad:???, M212Bb:CCC, M212Bc:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CC?, M221Ba:CCP, M221Bd:CCC, M221Da:CCC
Federal Lands: NPS (Shenandoah); USFS (George Washington)
Synonymy: Mesic Hemlock-Hardwood Forest (Breden 1989) B, CNE mesic hardwood forest on acidic bedrock/till (Rawinski 1984) B. in part, CNE mesic conifer [transition] forest on acidic bedrock/till (Rawinski 1984) B. in part, CNE dry transitional forest on sandy / gravelly soils (Rawinski 1984), *Tsuga canadensis - Betula (alleghaniensis, lenta) / Dryopteris intermedia* Forest (Fleming and Coulling 2001), *Tsuga canadensis-Betula(all,lenta)-Quercus rubra* (NAP pers. comm. 1998), *Betula alleghaniensis - Tsuga canadensis / Dryopteris intermedia - Huperzia lucidula* Forest (Coulling and Rawinski 1999), *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Association (Fleming and Moorhead 1996), *Tsuga canadensis / Dryopteris intermedia / Bazzania trilobata* Association (Rawinski et al. 1994), *Liriodendron tulipifera - Betula alleghaniensis / Acer pensylvanicum* Association (Rawinski et al. 1994), Eastern Hemlock: 23 (Eyre 1980) B. *pro parte*, Hemlock - Yellow Birch: 24 (Eyre 1980) B. *pro parte*, Hemlock Forest (Thompson 1996) B
References: Breden 1989, Breden et al. 2001, Coulling and Rawinski 1999, Edinger et al. 2002, Enser 1993, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Gawler 2002, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Rawinski et al. 1994, Smith 1983, Sperduto 2000a, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006109

I.C.3.N.a.33. TSUGA CANADENSIS - LIRIODENDRON TULIPIFERA FOREST ALLIANCE
Eastern Hemlock - Tuliptree Forest Alliance

Concept: Forests in this alliance are dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Liriodendron tulipifera, Tilia americana var. heterophylla, Magnolia acuminata, Quercus rubra, Fraxinus americana, Betula lenta, Fagus grandifolia, Halesia tetraptera*, and others. Common shrubs are *Rhododendron maximum, Kalmia latifolia*, and *Leucothoe fontanesiana*. Herbaceous cover is typically sparse and includes acid-loving species such as *Polystichum acrostichoides, Goodyera pubescens, Thelypteris noveboracensis, Galax urceolata, Hexastylis* sp., and *Tiarella cordifolia*. These forests occur in deep coves, moist flats, and ravines, but are occasionally found along larger stream bottoms, typically at elevations below 1060 m (3500 feet). Forests in this alliance include acidic cove forests and mesic successional forests, mostly of the

southern and central Appalachians, but also occurring in the Cumberland Plateau and Cumberland Mountains of Kentucky, Tennessee, and Alabama, the Allegheny Plateau of West Virginia, and isolated occurrences in the Interior Low Plateau of Indiana and Tennessee.
Comments: Occurrences are threatened by the Hemlock Woolly Adelgid (*Adelges tsugae*), an exotic insect pest.
Range: Forests in this alliance include acidic cove forests and mesic successional forests, mostly of the southern and central Appalachians, but also occurring in the Cumberland Plateau and Cumberland Mountains of Kentucky, Tennessee, and Alabama, the Allegheny Plateau of West Virginia, and isolated occurrences in the Interior Low Plateau of Indiana and Tennessee. This alliance is found in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, Indiana, Ohio, and West Virginia.
States/Provinces: AL GA IN KY MD NC OH PA SC TN VA WV
TNC Ecoregions: 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C
USFS Ecoregions: 212:C, 221Db:CPP, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, 221Fc:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222De:C??, 222Eb:CCC, 222Ek:CCC, 222Em:CCC, 222Eo:CCC, 222Hb:CCC, 222Hf:CCC, 231Aa:CCC, 231Ap:CCP, 231Ca:CCC, 231Cc:CCP, 231Cd:CCC, 232Ad:CCC, 232Bt:CCC, M221Aa:CCC, M221Ab:CCC, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC, M231Ad:CCC
Federal Lands: NPS (Carl Sandburg Home, Great Smoky Mountains, Mammoth Cave); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)
Synonymy: Acidic Cove Forest, in part (Schafale and Weakley 1990); Hemlock-Mixed Mesophytic HR (Pyne 1994); Yellow-Poplar - Eastern Hemlock: 58, in part (Eyre 1980)
References: Cooper and Hardin 1970, Eyre 1980, Fike 1999, Gettman 1974, Golden 1974, Malter 1977, McLeod 1988, Newell and Peet 1995, Newell et al. 1997, Patterson 1994, Pyne 1994, Schafale and Weakley 1990, Winstead and Nicely 1976
Authors: D. TAYLOR, RW, Southeast **Identifier:** A.413

TSUGA CANADENSIS - FAGUS GRANDIFOLIA - ACER SACCHARUM / (HAMAMELIS VIRGINIANA, KALMIA LATIFOLIA) FOREST

Eastern Hemlock - American Beech - Sugar Maple / (Witch-hazel, Mountain Laurel) Forest
East-central Hemlock Hardwood Forest **G3? (96-10-03)**
Ecological Group (SCS;MCS): Appalachian Highlands Hemlock-Hardwood Forests (420-25; 2.5.3.4)

Concept: This community is found in parts of the Interior Low Plateau and the Western Allegheny Plateau and possibly the Central Appalachians of Virginia in the northeastern and east-central United States. Stands occur on dry-mesic to mesic slopes, sometimes in steep-sloped valleys. Soils are typically acid, silty to sandy loams, with a sandstone or shale parent material. The overstory is dominated by *Tsuga canadensis, Acer saccharum, Acer rubrum*, and *Fagus grandifolia*. Rarely does any one of these comprise more than 50% of the mature trees in a stand. Other trees are common in the canopy, among them *Betula alleghaniensis, Betula lenta, Carya* spp., *Liriodendron tulipifera, Nyssa sylvatica, Pinus strobus, Prunus serotina, Quercus alba, Quercus rubra*, and *Tilia americana*. The shrub layer, occasionally sparse, contains *Hamamelis virginiana, Lindera benzoin*, and *Viburnum acerifolium*, as well as ericaceous shrubs, including *Kalmia latifolia* (except in the northern portion of the Western Allegheny Plateau) and *Rhododendron maximum*. The ground layer contains the ferns *Botrychium virginianum, Dryopteris intermedia, Dryopteris marginalis, Polystichum acrostichoides*, and the herbs *Arisaema triphyllum, Maianthemum canadense, Mitchella repens, Podophyllum peltatum, Viola blanda*, and *Viola rotundifolia*, among others. Three subtypes are possible: (1) steep-walled sandstone gorges and talus, where *Hydrangea arborescens, Kalmia latifolia*, and *Dryopteris marginalis* may be indicative; (2) more gently sloped valleys, with shrubs such as *Hamamelis virginiana, Viburnum acerifolium*; and (3) rolling lakeplain ridges. The Kentucky examples, which are mesic rather than dry-mesic, may lack *Acer saccharum, Maianthemum canadense*, and several other species, and may contain *Magnolia* spp., (e.g., *Magnolia tripetala, Magnolia acuminata*, and *Magnolia macrophylla*) (J. Campbell pers. comm. 2000). In addition, *Betula lenta* (widespread on Appalachian Plateaus) is replaced by *Betula alleghaniensis (var. macrolepis*?) in western Kentucky and southern Indiana.
Comments: This type appears to vary from pure evergreen to mixed evergreen-deciduous. Black and Mack (1976) suggest that this type contains more temperate species, such as several *Dryopteris* spp. (*Dryopteris intermedia, Dryopteris marginalis*) and *Viburnum acerifolium* when compared to more northern/boreal types, such as *Tsuga canadensis - Fagus grandifolia - (Acer saccharum)* Great Lakes Forest (CEGL005042), which contains *Clintonia borealis, Coptis trifolia*, and *Cornus canadensis*. One of their subtypes, the steep-walled sandstone gorges and talus, where *Hydrangea arborescens, Kalmia latifolia*, and *Dryopteris marginalis* may be indicative,

has some conceptual and environmental overlap with *Tsuga canadensis - (Fagus grandifolia, Tilia americana var. heterophylla) / Magnolia tripetala* Forest (CEGL008407) of the southern Cumberland Plateau and Central Appalachians.
Range: This community is found in parts of the Interior Low Plateau and the Western Allegheny Plateau of the northeastern and east-central United States, ranging from Pennsylvania and Ohio, south to Maryland and West Virginia, and westward to a few stands in Indiana, and possibly Kentucky. Stands in Indiana are not part of the continuous range of *Tsuga canadensis*.
States/Provinces: IN:S?, KY:S?, MD:S?, OH:S3,S?, PA:S?, VA?, WV:S?
TNC Ecoregions: 44:C, 45:C, 48:C, 49:C, 50:?, 59:?
USFS Ecoregions: 212:C, 221Ea:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CCC, 221Fc:CCC, 222De:C??, 222Ek:CCC, 222Em:CCC, 222Hb:CCC, 222Hf:CCC
Federal Lands: NPS (Mammoth Cave)
References: Anderson 1982, Black and Mack 1976, Campbell pers. comm., Fike 1999, Fleming pers. comm., Homoya pers. comm.
Authors: D. Faber-Langendoen, ECS **Confidence:** 2 **Identifier:** CEGL005043

TSUGA CANADENSIS / ILEX OPACA / HIERACIUM VENOSUM FOREST
Eastern Hemlock / American Holly / Rattlesnake-weed Forest
Coastal Plain Eastern Hemlock Forest **G? (00-04-12)**

Concept: This Coastal Plain hemlock ravine forest is known from the Wicomoco terrace of the eastern shore of Maryland and on the western shore in Calvert County. It occurs in shallow ravines with *Tsuga canadensis* occurring with *Fagus grandifolia, Liriodendron tulipifera, Quercus prinus, Quercus velutina*, and *Quercus alba*. The shrub layer is characterized by *Ilex opaca, Lindera benzoin, Aralia spinosa, Kalmia latifolia, Viburnum acerifolium*, and *Vaccinium pallidum*. The herbaceous layer is comprised of *Mitchella repens, Uvularia sessilifolia, Epigaea repens, Gaultheria procumbens, Hieracium venosum, Polystichum acrostichoides, Botrychium virginianum, Lycopodium complanatum*, and *Lycopodium obscurum*.
Range: This Coastal Plain hemlock ravine forest is known from the Wicomoco terrace of the eastern shore of Maryland and on the western shore in Calvert County.
States/Provinces: MD:S?
TNC Ecoregions: 52:P, 61:P
USFS Ecoregions: 221Db:PPP, 231Ap:PPP
Synonymy: Eastern Hemlock: 23 (Eyre 1980) B. in part
References: Eyre 1980, Shreve et al. 1910, Waggoner 1973
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006600

I.C.3.N.d. Saturated mixed needle-leaved evergreen - cold-deciduous forest

I.C.3.N.d.8. CHAMAECYPARIS THYOIDES - ACER RUBRUM SATURATED FOREST ALLIANCE

Atlantic White-cedar - Red Maple Saturated Forest Alliance

Concept: This alliance is characterized by a canopy of abundant *Chamaecyparis thyoides*, but because other hardwoods are often present in quantity, this vegetation is placed within a mixed alliance. Nearly pure stands do occur, but their floristic composition is similar enough to warrant their placement within this alliance. Associated canopy trees include *Acer rubrum, Magnolia virginiana, Betula alleghaniensis, Pinus strobus, Pinus rigida, Pinus serotina*, and *Nyssa sylvatica*. Common shrubs include *Vaccinium corymbosum, Ilex glabra, Leucothoe racemosa, Lyonia lucida, Rhododendron viscosum, Clethra alnifolia*, and *Gaylussacia frondosa*. Common herbaceous species of this alliance include *Osmunda cinnamomea, Woodwardia virginica, Smilax rotundifolia, Smilax laurifolia, Trientalis borealis, Arundinaria gigantea, Maianthemum canadense*, and *Aralia nudicaulis*. *Sphagnum* hummocks are usually characteristic of this vegetation. *Schizaea pusilla* is apparently restricted to this vegetation, where it grows at the bases of cedar trees. Other species found in this alliance on the Delmarva peninsula include *Orontium aquaticum* and *Alnus maritima*. Communities of this alliance are commonly associated with pine barrens vegetation in New Jersey; Long Island, New York; and Cape Cod, Massachusetts. Isolated communities also occur in poorly drained depressions inland of the coastal plain in Massachusetts, New York and New Jersey. Waters are generally acidic, and soils are usually thick peat deposits in basin wetlands, or

mucks overlying mineral soils along water courses. Atlantic white-cedar grows in basins and along streams in the pine barrens; it is much more common in this habitat in Delaware than it is in basins not influenced by stream flooding or seepage. White-cedar reaches its greatest abundance on artificial habitats in Delaware, headwaters of dammed mill ponds (Clancy 1993b). As a commercially important species, Atlantic white-cedar has been cut extensively throughout its range, and very few virgin or old-growth stands are known. Classification of this vegetation is complicated by this fact, although much research has been done on the impacts of fire in this vegetation. Although Atlantic white-cedar trees are fire-sensitive, many stands were initiated following fire. Low-intensity fires that did not burn the forest floor foster the growth of dense seedlings. Seedling mortality is high, but even mature stands initiated in this way are quite dense (McCormick 1979.)
Comments: White-cedar swamps of the New Jersey Pine Barrens are described by Little (1951), who lists *Pogonia ophioglossoides, Sarracenia purpurea, Bartonia paniculata*, and *Drosera rotundifolia* as more characteristic of cedar swamps than of hardwood swamps in the pine barrens. Harshberger (1916) describes the "cedar swamp formation" of the New Jersey Pine Barrens and lists essentially the same species. Other orchid species apparently confined to cedar swamps in the pine barrens noted by Harshberger include *Arethusa bulbosa, Platanthera blephariglottis*, and *Platanthera clavellata*. Other associates include *Carex collinsii, Kalmia angustifolia, Chamaedaphne calyculata*, and *Helonias bullata*. Olsson (1979) describes similar white cedar vegetation. This alliance is also described from Cape May, New Jersey, by Bernard (1963) as the "*Chamaecyparis thyoides - Acer rubrum* type."
Range: This alliance occurs in southern New England, New York, New Jersey, Maryland, Delaware, and Virginia. It also occurs in the Southeastern Region. The range of this alliance is essentially coincident with the range of *Chamaecyparis thyoides*, from southern Maine along the coastal plain to northern South Carolina. This alliance also occurs in small areas inland in New York, Massachusetts and New Jersey. *Chamaecyparis thyoides* also occurs along the coastal plain of the Gulf of Mexico, but these forests may be better placed in a separate alliance.
States/Provinces: DE MD NJ
TNC Ecoregions: 61:C, 62:C
USFS Ecoregions: 212Dc:PPP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Af:CCP, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Aj:CCP, 221Ak:CCC, 221Al:CCP, 221Am:CCP, 221Bc:CPP, 221Bd:CPP, 232Aa:CCC, 232Ac:CCC, 232Ba:CPP, 232Bc:CPP, 232Br:CPP, 232Bt:CPP, 232Ch:CPP, M212Bb:PPP
Synonymy: Atlantic White-Cedar: 97 (Eyre 1980); *Chamaecyparis thyoides - Acer rubrum* type. described from Cape May, New Jersey (Bernard 1963)
References: Bernard 1963, Clancy 1993b, Eyre 1980, Laderman 1989, McCormick 1979, Motzkin 1990
Authors: ECS, East **Identifier:** A.448

CHAMAECYPARIS THYOIDES - ACER RUBRUM - MAGNOLIA VIRGINIANA FOREST
Atlantic White-cedar - Red Maple - Sweetbay Forest
Coastal Plain Atlantic White-cedar - Red Maple Swamp **G? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Peatland Atlantic White-cedar Forests (370-20; n/a)

Concept: Mixed Atlantic white-cedar - red maple swamp of New Jersey, Delaware, and Maryland. In addition to *Chamaecyparis thyoides* and *Acer rubrum*, other canopy associates include *Nyssa sylvatica, Magnolia virginiana*. The shrub layer is characterized by *Vaccinium corymbosum* or *Vaccinium formosum, Clethra alnifolia, Ilex glabra, Gaylussacia frondosa, Rhododendron viscosum*. The herbaceous layer may be sparse to moderate cover and includes species such as *Mitchella repens, Sarracenia purpurea, Triadenum virginicum, Pogonia ophioglossoides*. In canopy openings, *Peltandra virginica, Orontium aquaticum, Iris versicolor* may also occur. Sphagnum mosses form a moderately dense to dense bryophyte layer; species include *Sphagnum magellanicum, Sphagnum pulchrum, Sphagnum flavicomans, Sphagnum recurvum*, and *Sphagnum fallax*.
Range: This association is found in New Jersey, Delaware, and Maryland.
States/Provinces: DE:S?, MD:S?, NJ:S4
TNC Ecoregions: 61:?, 62:C
USFS Ecoregions: 232Ac:CCC, 232Bt:CPP, 232C:CP
Synonymy: Coastal Plain Atlantic White Cedar Swamp (Breden 1989) B
References: Breden 1989, Breden et al. 2001, Clancy 1996, Karlin 1988, Olsson 1979
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006078

I.C.3.N.e. Tidal mixed needle-leaved evergreen - cold-deciduous forest

I.C.3.N.e.100. PINUS TAEDA - NYSSA BIFLORA - TAXODIUM DISTICHUM TIDAL FOREST ALLIANCE

Loblolly Pine - Swamp Blackgum - Bald-cypress Tidal Forest Alliance

Concept: Freshwater lunar-tidal or wind-tidal forests, associated with tidal marshes of the Atlantic Coastal Plain. The canopy consists of *Pinus taeda, Nyssa biflora, Taxodium distichum, Acer rubrum*, and *Liquidambar styraciflua*. *Acer rubrum* and *Liquidambar styraciflua* may also be important, especially in the subcanopy stratum. *Morella cerifera (= Myrica cerifera var. cerifera)* is characteristically dominant in the shrub layer, sometimes reaching subcanopy heights (6-10 m). Other small tree and shrub components include *Persea palustris, Itea virginica, Clethra alnifolia, Vaccinium formosum, Rosa palustris, Magnolia virginiana, Rhododendron viscosum, Leucothoe racemosa, Lyonia ligustrina var. foliosiflora, Photinia pyrifolia (= Aronia arbutifolia)*, and, in more open transitional zones, *Salix caroliniana*. *Smilax laurifolia* and *Smilax rotundifolia* are common vines, and *Toxicodendron radicans ssp. radicans* and *Berchemia scandens* also occur. *Osmunda regalis var. spectabilis* is often the strong dominant of the herbaceous stratum, but also occurs in a more mixed condition with *Carex stricta, Carex atlantica ssp. capillacea, Hydrocotyle verticillata, Chasmanthium laxum, Woodwardia areolata, Osmunda cinnamomea, Juncus* spp., and *Rhynchospora caduca*. This alliance is found on relatively firm, poorly decomposed, fibrous and root-rich peat, which usually overlies soupy, well-decomposed peat at depths of about 0.5-1.0 m. Microtopography frequently exhibits a strong hummock-and-hollow pattern, with hollows retaining standing water through much of the year. Flooding by wind tides is frequent, and habitats may be inundated to depths of 0.5 m or more by occasional powerful wind-tide events. This alliance may have complex long-term dynamics, related to inlet closing and opening.
Range: This alliance is found in the Atlantic Coastal Plain of Virginia may possibly be found in North Carolina (?).
States/Provinces: DE MD? VA
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Bx:CCC, 232Ch:CCC
Synonymy: Baldcypress - Tupelo: 102, in part (Eyre 1980)
References: Eyre 1980, Fleming 1998
Authors: G.P. FLEMING/A.S. WEAKLEY, MP, Southeast **Identifier:** A.1886

PINUS TAEDA - NYSSA BIFLORA - TAXODIUM DISTICHUM / MORELLA CERIFERA / OSMUNDA REGALIS VAR. SPECTABILIS FOREST

Loblolly Pine - Swamp Blackgum - Bald-cypress / Wax-myrtle / Royal Fern Forest

G2? (97-06-20)

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Tidal Hardwood Swamp Forests (202-90; n/a)

Concept: This community occurs on relatively firm, poorly decomposed, fibrous and root-rich peat, which usually overlies soupy, well-decomposed peat at depths of about 0.5-1.0 m. Microtopography frequently exhibits a strong hummock-and-hollow pattern, with hollows retaining standing water through much of the year. Flooding by wind tides is frequent, and habitats may be inundated to depths of 0.5 m or more by occasional powerful wind tide events. This community may have complex long term dynamics, related to inlet closing and opening. *Nyssa biflora* and *Taxodium distichum* dominate the canopy in variable proportions. *Pinus taeda* is also present and is diagnostic of this type in Virginia. *Acer rubrum* and *Liquidambar styraciflua* may also be important, especially in the subcanopy stratum. *Morella cerifera (= Myrica cerifera var. cerifera)* is characteristically dominant in the shrub layer, sometimes reaching subcanopy heights (6-10 m). Other small tree and shrub components include *Persea palustris, Itea virginica, Clethra alnifolia, Vaccinium corymbosum, Rosa palustris*, and *Magnolia virginiana*. *Smilax laurifolia* and *Smilax rotundifolia* are common vines, and *Toxicodendron radicans ssp. radicans* also occurs. *Osmunda regalis var. spectabilis* is often the strong dominant of the herbaceous stratum, but also occurs in a more mixed condition with *Carex* spp., *Osmunda cinnamomea, Polygonum* spp., and *Thelypteris palustris var. pubescens*. In some areas, *Carex hyalinolepis* forms dense swards in this community.
Comments: Excellent and large examples occur along the Northwest River and North Landing River in southeastern Virginia and may occur as well in northeastern North Carolina. An additional occurrence is also known from the Pocomoke River in Delaware.
States/Provinces: DE:S?, MD?, VA:S?
TNC Ecoregions: 57:C, 58:C

USFS Ecoregions: 232Bx:CCC, 232Ch:CCC
Synonymy: *Taxodium distichum - Nyssa biflora - Pinus taeda / Myrica cerifera / Osmunda regalis var. spectabilis* Tidally Flooded Forest (Fleming and Moorhead 1998)
References: Bowman 1999, Fleming 1998, Fleming and Moorhead 1998, Fleming et al. 2001
Authors: SCS **Confidence:** 2 **Identifier:** CEGL004651

II. WOODLAND

II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

II.A.4.N.a.23. PINUS PUNGENS - (PINUS RIGIDA) WOODLAND ALLIANCE

Table Mountain Pine - (Pitch Pine) Woodland Alliance

Concept: This alliance includes woodland vegetation in the southern and central Appalachians, dominated or codominated by *Pinus pungens*, with or without some admixture of *Pinus rigida* and/or *Pinus virginiana*. This alliance also includes woodlands dominated by *Pinus rigida* that occur within the geographic area where *Pinus pungens* occurs as a canopy dominant. Common canopy and subcanopy associates include *Quercus prinus, Quercus coccinea, Castanea dentata, Nyssa sylvatica, Acer rubrum*, and *Oxydendrum arboreum*. Typical shrubs include *Gaylussacia baccata, Vaccinium pallidum, Vaccinium stamineum, Vaccinium corymbosum, Vaccinium simulatum, Gaylussacia ursina, Rhododendron maximum, Kalmia latifolia, Rhododendron carolinianum, Rhododendron catawbiense, Leucothoe recurva*, and *Leiophyllum buxifolium*. In the central Appalachians and in the Virginia portion of the Southern Blue Ridge, *Quercus ilicifolia* is a characteristic shrub. Herbaceous species composition will vary within the range of this alliance. Species commonly found in the sparse herb stratum include *Galax urceolata, Pteridium aquilinum var. latiusculum, Xerophyllum asphodeloides, Fothergilla major, Comptonia peregrina*, and the subshrubs *Gaultheria procumbens*, and *Epigaea repens*. These woodlands typically occur at elevations from 760-1220 m (2500-4000 feet), on xeric ridges and exposed, steep side-slopes over thin, excessively drained, nutrient-poor soils and are often associated with rock outcroppings. Without periodic fire, these woodlands will gradually succeed into forests dominated by *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating. The primary range of associations in this alliance is the Appalachian Mountains (within the range of *Pinus pungens*), although the nominal species, *Pinus pungens*, has insular occurrences in the Upper Piedmont.
Comments: Associations in this alliance generally have a woodland structure (open canopy), although locally vegetation may vary to a denser canopy.
Range: The primary range of associations in this alliance is the Appalachian Mountains (within the range of *Pinus pungens*), although the nominal species, *Pinus pungens*, has insular occurrences in the Upper Piedmont. This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia.
States/Provinces: GA MD NC PA SC TN VA WV
TNC Ecoregions: 51:C, 52:C, 59:C, 61:C
USFS Ecoregions: 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ce:C??, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Carl Sandburg Home, Great Smoky Mountains, Shenandoah); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter)
Synonymy: IA7b. Xeric Pitch Pine/Table Mountain Pine Ridge Forest, in part (Allard 1990); Pine--Oak/Heath, in part (Schafale and Weakley 1990); Pine--Oak/Heath, in part (Nelson 1986); *Pinus pungens/Pinus rigida* (Pyne 1994)
References: Allard 1990, Barden 1977, Golden 1981, McLeod 1988, Nelson 1986, Newell and Peet 1995, Pyne 1994, Racine 1966, Rawinski et al. 1996, Schafale and Weakley 1990, Sutherland et al. 1993, Thomas 1966, Turrill and Buckner 1995, Wharton 1978, Whittaker 1956, Williams 1991, Williams and Johnson 1990, Williams and Johnson 1992, Williams et al. 1990a, Zobel 1969
Authors: A.S. WEAKLEY, RW, Southeast **Identifier:** A.521

PINUS (PUNGENS, RIGIDA) / QUERCUS ILICIFOLIA / GAYLUSSACIA BACCATA WOODLAND
(Table Mountain Pine, Pitch Pine) / Bear Oak / Black Huckleberry Woodland
Central Appalachian Table Mountain Pine - Pitch Pine - Heath Woodland **G4 (01-10-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Pitch and Table Mountain Pine Woodlands (401-80; n/a)

Concept: This association represents predominantly evergreen woodlands occupying xeric, convex, often rocky

south- and west-facing slopes, ridge spurs, crests, and clifftops in the central Appalachians and peripherally in the Southern Blue Ridge. Stands occur at elevations from 450-1200 m (1500-4000 feet) on various substrates, but most commonly on acidic, sedimentary and metasedimentary substrates (e.g. quartzites, sandstones, and shales). Soils are very infertile, shallow, and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, create a strongly fire-prone habitat. *Pinus pungens* and *Pinus rigida*, individually or together, dominate the canopy, which can approach forest physiognomy in some situations as a result of fire suppression. Scattered canopy and subcanopy associates may include *Quercus prinus, Quercus coccinea, Quercus rubra, Quercus marilandica, Pinus virginiana, Castanea dentata, Acer rubrum, Sassafras albidum, Nyssa sylvatica*, and *Amelanchier arborea*. *Quercus ilicifolia* dominates a moderately open to very dense tall-shrub layer, while variable combinations of *Kalmia latifolia, Gaylussacia baccata, Vaccinium pallidum, Vaccinium angustifolium, Vaccinium stamineum, Pieris floribunda, Rhododendron catawbiense*, and other ericads form a generally dense low-shrub layer. *Smilax rotundifolia* and *Smilax glauca* may be prominent climbers among the shrubs. Herbaceous species, often very sparse, are rooted in small openings among the shrubs, on rocks, and in disturbed areas where mineral soil is exposed. Typical herbs and subshrubs include *Epigaea repens, Gaultheria procumbens, Xerophyllum asphodeloides, Iris verna, Pteridium aquilinum var. latiusculum, Melampyrum lineare var. latifolium, Stenanthium gramineum var. micranthum, Uvularia puberula, Lycopodium tristachyum, Aralia hispida* (usually on outcrops), and *Carex tonsa*. Periodic fire is an important ecological process which provides opportunities for the regeneration of both canopy pines and less competitive herbaceous species, while setting back successional encroachment of xeric oaks. On many sites (e.g. clifftops, quartzite ledges), the vegetation is self-perpetuating due to extreme edaphic conditions.

Comments: This community type is closely related to other associations classified in the II.A.4.N.a *Pinus pungens - (Pinus rigida)* Woodland Alliance (A.521). It is thought to differ in the shrub layer dominance of *Quercus ilicifolia*, a northern species which is absent in similar communities south of Virginia, as well as the absence of a number of characteristic southern species such as *Gaylussacia ursina, Rhododendron carolinianum, Rhododendron minus, Leiophyllum buxifolium*, and *Fothergilla major*. Long-term, widespread fire suppression is an ongoing problem which may be causing some stands to succeed to closed, mixed oak - pine forest. However, on many sites occupied by this community, edaphic conditions are so stressful that tree oaks are not or marginally competitive, and even long fire-return intervals (e.g., >25 years) are sufficient to maintain pine-dominated vegetation. Within the past ten years, much of this vegetation in Virginia has been devastated by infestations of Southern Pine Beetle (*Dendroctonus frontalis*). These outbreaks have resulted in extensive mortality of the dominant pines and changed physiognomies, at least temporarily, to a shrubland condition.

The recognition of global subtypes equivalent to two distinct state community types is well supported by quantitative analysis of compositional and environmental data. Further study may support the elevation of these subtypes to full association-level status in the USNVC.

Range: This community occurs in the Central Appalachian region of Virginia, West Virginia, Maryland, and Pennsylvania, with very local outliers in the western Piedmont of Virginia and Maryland (e.g., Sugarloaf Mountain). In Virginia, the type as a whole ranges through the Blue Ridge and Ridge and Valley provinces north of the New River. Outliers occur on Bull Run Mountain (Fauquier County), Willis Mountain (Buckingham County), and other Piedmont foothills. The Table-Mountain Subtype occurs throughout this range, while the Pitch Pine Subtype is more confined to the northern two-thirds of the state's mountain region.

States/Provinces: MD:S?, PA:S?, VA:S?, WV:S?

TNC Ecoregions: 51:C, 52:C, 59:C, 61:?

USFS Ecoregions: 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:C??, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: NPS (Shenandoah); USFS (George Washington, Jefferson)

Synonymy: *Pinus pungens / Quercus ilicifolia / Gaylussacia baccata - Pteridium aquilinum* Woodland (Fleming and Moorhead 2000), *Pinus pungens - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association (Rawinski et al. 1996), *Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association (Rawinski et al. 1994), Chestnut Oak: 44 (Eyre 1980) B. chestnut oak - pitch pine variant, *pro parte*., Pitch Pine: 45 (Eyre 1980) B. pitch pine - chestnut oak variant, *pro parte*., *Pinus pungens - Quercus prinus - (Quercus coccinea) / Kalmia latifolia - Gaylussacia baccata* Woodland (Fleming and Coulling 2001) F. VA Srank = S4, *Quercus prinus - Pinus rigida / Quercus ilicifolia - Kalmia latifolia - Gaylussacia baccata / Gaultheria procumbens* Woodland (Fleming and Coulling 2001) F. VA Srank = S3

References: Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Fleming pers. comm., Rawinski et al. 1994, Rawinski et al. 1996

Authors: G. Fleming and P. Coulling, SCS **Confidence:** 1 **Identifier:** CEGL004996

II.A.4.N.a.28. PINUS TAEDA WOODLAND ALLIANCE

Loblolly Pine Woodland Alliance

Concept: Woodlands of the Atlantic and Gulf coastal plains dominated by *Pinus taeda*. In the Atlantic Coastal Plain, natural examples of this alliance include maritime woodlands of barrier islands that occur on foredunes. Trees in these maritime woodlands often have multiple trunks and spreading branches. Herbaceous cover is usually low. Canopy associates include *Quercus phellos, Quercus falcata*, and *Quercus virginiana*. One rare community in this alliance occurs on swamp islands protected from fire in the Mid-Atlantic Coastal Plain. Associated species include *Quercus hemisphaerica, Osmanthus americanus var. americanus, Ilex glabra, Ilex opaca var. opaca, Persea palustris*, and *Quercus nigra*. Other associations, including some vegetation of Louisiana, result from thinning of plantations, or disturbance by fire of *Pinus taeda* forests. One other semi-natural example occurs on military reservations and is at least in part the result of fires set by military training. It may occur both within or outside of the natural range of *Pinus palustris*. In the former case, it is present where *Pinus palustris* has failed to regenerate.
Range: This alliance is found in Alabama, Florida, Georgia, Louisiana, North Carolina, Texas, Maryland, and Virginia, and possibly Oklahoma (?), South Carolina (?), Delaware (?), and elsewhere.
States/Provinces: AL DE FL GA MD NC SC VA
TNC Ecoregions: 40:P, 41:C, 43:P, 52:C, 53:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231B:PP, 231Ef:PP?, 231Eg:PP?, 231Ei:PP?, 232Ac:CCC, 232Ba:CCC, 232Br:CCC, 232Bt:CCC, 232Bz:CCC, 232Ch:CCC, 232Dc:CCC, 232Fa:CCC, 234Ah:???
Federal Lands: DOD (Fort A.P. Hill, Fort Benning, Fort Pickett); NPS (Assateague Island); USFS (Angelina, Apalachicola, Davy Crockett, Kisatchie, Sabine NF, Sam Houston, Tuskegee?); USFWS (St. Marks?)
Synonymy: Loblolly Pine: 81, in part (Eyre 1980)
References: Eyre 1980
Authors: D.J. ALLARD, RW, Southeast **Identifier:** A.526

PINUS TAEDA / HUDSONIA TOMENTOSA WOODLAND

Loblolly Pine / Woolly Beach-heather Woodland

G1G2 (98-12-02)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Maritime Stable Dune Forests and Woodlands (240-50; n/a)

Concept: This maritime woodland occurs on sand dunes of barrier islands in Delaware, Maryland, and Virginia. Soils in this community are sandy and rapidly drained. This community often occurs directly adjacent to actively shifting foredunes and is exposed to salt spray, winds, and storms. The community also occurs on unstable sands of protected backdunes. In the denser woodlands, more pine duff accumulates, and herb diversity and cover are generally higher. Where woodlands are more open and trees sparse, growing conditions are harsh, less duff accumulates, and vast areas of exposed white sand are characteristic. Trees are generally characterized by low spreading branches and multiple trunks. A shrub layer is lacking; herbaceous cover is usually low. *Pinus taeda* dominates the canopy, but hardwoods such as *Quercus falcata, Quercus phellos*, and *Ilex opaca* are frequent. Younger, smaller pines make up a sparse subcanopy. Tall shrubs are also sparse, although an occasional *Morella cerifera (= Myrica cerifera), Pinus taeda* sapling, or *Vaccinium corymbosum* can be found. Sparse low shrubs of *Hudsonia tomentosa* are more common. *Smilax glauca, Smilax rotundifolia*, and *Toxicodendron radicans* are typical vines. Herbs are sparse, yet much varied. *Andropogon virginicus* is commonly present. The typical pattern of herb distribution is on dry open sand, in direct sunlight. Here, small patches of *Dichanthelium acuminatum, Dichanthelium scoparium, Andropogon virginicus, Eupatorium rotundifolium, Erigeron* sp., *Euthamia caroliniana (= Euthamia tenuifolia), Solidago sempervirens, Aristida tuberculosa, Polygonella articulata*, and *Pseudognaphalium obtusifolium (= Gnaphalium obtusifolium)* are typically mixed with scattered *Hudsonia tomentosa* and *Smilax rotundifolia*. This community ranges from Delaware south along the coast to Virginia.
Comments: This community gained greater extent in some areas of Virginia and North Carolina barrier beaches following logging (Schafale and Weakley 1990, Higgins et al. 1971, Bratton and Davison 1987).
Range: This maritime woodland occurs on sand dunes of barrier islands in Delaware, Maryland, and Virginia.
States/Provinces: DE:S1?, MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ac:CCP, 232Bt:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Pine woodland (Higgins et al. 1971) B. Assateague Island., Woodland community (Hill 1986) B.

Assateague Island.
References: Berdine 1998, Bowman 2000, Bratton and Davison 1987, Clampitt 1991, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990, TNC 1995c
Authors: A. Berdine, ECS **Confidence:** 1 **Identifier:** CEGL006052

II.A.4.N.b. Conical-crowned temperate or subpolar needle-leaved evergreen woodland

II.A.4.N.b.2. JUNIPERUS VIRGINIANA WOODLAND ALLIANCE

Eastern Red-cedar Woodland Alliance

Concept: This alliance, found in the central, eastern, and southeastern United States, contains rocky woodlands dominated by *Juniperus virginiana*. Associated woody species include *Quercus muehlenbergii, Quercus stellata, Celtis tenuifolia, Ulmus alata, Cercis canadensis*, and *Fraxinus quadrangulata* on calcareous or circumneutral sites; and *Liquidambar styraciflua* and others on old fields. Some examples occur as shale woodlands in the Ouachita Mountains, rimrock glades and cliffs, and as fire-suppressed glades and prairies. Some examples occur on rich granitic substrates in the Piedmont. In Louisiana, this community is found on calcareous clays of the Jackson Formation. This alliance occurs in the Piedmont, Interior Low Plateau, West Gulf Coastal Plain, Ozark Plateau, Ouachita Mountains, and Arkansas Valley. More information is needed on the range of variability and the exact distribution of this alliance.

Note that *Juniperus virginiana var. virginiana*-dominated communities occurring in old pastures, cleared calcareous areas, and so forth are placed in the I.A.8.N.c *Juniperus virginiana* Forest Alliance (A.137), whether the canopy is closed or open.
Comments: In Louisiana, this alliance is found on calcareous clays of the Jackson Formation. Some examples occur on rich granitic substrates in the Piedmont.
Range: This alliance is found in southern Indiana, southern Missouri, Alabama (?), Arkansas, Georgia, Kentucky (?), Louisiana, North Carolina, Tennessee, Maryland, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia (?), and in Ontario, Canada.
States/Provinces: AL? AR CT DE GA KY LA MA MD MO NC NH? NJ NY ON RI SC? TN VA VT WV
TNC Ecoregions: 32:C, 33:C, 37:C, 38:C, 39:C, 40:C, 41:C, 43:?, 44:C, 48:C, 50:C, 52:C, 58:C, 60:C, 61:C, 62:C, 64:C
USFS Ecoregions: 212A:CC, 212B:CC, 212Ee:CC?, 212Fc:CCP, 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Af:CCC, 221Bd:CCC, 221Dc:CCC, 221Hc:C??, 221Jb:CCC, 222Ad:CC?, 222Ae:CC?, 222Af:CCP, 222Ag:CCP, 222Am:CC?, 222Ca:CCC, 222Cb:CCC, 222Cg:CCC, 222Da:CCC, 222Db:CCC, 222Dc:CCC, 222Dj:CCC, 222Ea:CCC, 222Eb:CCC, 222Ec:CCC, 222Ed:CCC, 222Eg:CCC, 222Ej:CCC, 222Ek:CCC, 222En:CCC, 222Eo:CCC, 222Fc:CCC, 222Fd:CCC, 222I:CC, 231Ad:CCC, 231Af:CCC, 231Ba:CCC, 231Be:CC?, 231Cc:CC?, 231Cd:CC?, 231Cf:CCC, 231Da:CCC, 231E:CC, 231Ga:CCP, 231Gb:CCC, 232Aa:CCC, 232Ab:CC?, 232Ac:CCC, 232Bj:CCC, 232Bz:CCC, 232Fa:CCC, 234Ab:???, 234Ac:???, 251E:CC, 251F:CC, 255Ad:CCC, 311A:CC, 332E:CC, M221:C, M222A:CC, M231A:CC
Federal Lands: DOD (Arnold); NPS (Chickasaw NRA, New River Gorge); USFS (Chattahoochee, Daniel Boone?, Ouachita, Ozark, Uwharrie)
Synonymy: Juniper - Hardwood Woodland, in part (Foti 1994b); Piedmont Acidic Cliff, in part (Schafale and Weakley 1990); Granitic Flatrock, in part (Schafale and Weakley 1990); *Juniperus virginiana* woodland alliance (Hoagland 1998a); T2A2bI. *Juniperus virginiana - Quercus* spp., in part (Foti et al. 1994); Eastern Redcedar: 46, in part (Eyre 1980); Circumneutral Rocky Summit/Rock Outcrop (Swain and Kearsley 2001); Calcareous Rocky Summit/Rock Outcrop (Swain and Kearsley 2001); Maritime Juniper Woodland/Shrubland (Swain and Kearsley 2001)
References: Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994a, Foti 1994b, Foti et al. 1994, Hoagland 1998a, Schafale and Weakley 1990, Swain and Kearsley 2001
Authors: D.J. ALLARD, RW, Midwest **Identifier:** A.545

JUNIPERUS VIRGINIANA VAR. VIRGINIANA / MORELLA PENSYLVANICA WOODLAND
Eastern Red-cedar / Northern Bayberry Woodland
Maritime Red-cedar Woodland **G2 (97-11-18)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Maritime Stable Dune Forests and Woodlands (240-50; n/a)

Concept: This maritime woodland community dominated by *Juniperus virginiana* occurs on sand dunes, upper edges of salt marshes, and less commonly on rocky headlands of the northern and mid-Atlantic coast. The physiognomy of this association is variable, ranging from dense tall-shrub thickets to open woodlands; trees are generally shorter than 4 m. Canopy trees are stunted and salt-pruned. *Juniperus virginiana* may form pure stands, but more often grows in association with *Pinus rigida, Quercus stellata, Prunus serotina, Amelanchier canadensis, Ilex opaca*, or *Quercus velutina*, which tend to have low percent cover. In the southern portion of the range *Pinus taeda, Quercus falcata, Diospyros virginiana*, and *Quercus phellos* can be infrequent canopy associates. A shrub layer may be well-developed where the canopy is more open and include *Morella pensylvanica (= Myrica pensylvanica), Morella cerifera (= Myrica cerifera)* (at the southern end of the range), *Juniperus communis, Baccharis halimifolia, Iva frutescens*, or *Vaccinium corymbosum*. Vines can be dense in the shrub layer and extend into the canopy; species include *Toxicodendron radicans, Smilax rotundifolia, Smilax glauca*, and *Parthenocissus quinquefolia*. Herbs are usually patchily distributed in openings and include many species from the surrounding dune associations among others. They include *Opuntia humifusa, Dichanthelium ovale, Schizachyrium scoparium, Deschampsia flexuosa, Cyperus grayi, Polygonella articulata, Hieracium gronovii, Panicum amarum var. amarulum, Solidago sempervirens, Panicum virgatum, Spartina patens*, and *Lechea intermedia*.
Range: This association occurs along the North Atlantic coast from Delaware to Massachusetts.
States/Provinces: DE:S1, MA:S1, MD:S?, NJ:S1, NY:S1, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 221Aa:CC?, 221Ab:CCC, 232Aa:CCC, 232Ab:CC?, 232Ac:CCC, 232Bz:CCC
Synonymy: Coastal dune woodland (Breden 1989), High red cedar thicket, Red cedar woodland, Red cedar-pine woodland (Martin 1959b), Red Cedar Maritime Forest (Greller 1977), Maritime Forest on Dunes: Maritime Red Cedar Forest/Woodland Variant (Lundgren 2000), SNE Maritime Forest on Dunes/Maritime Juniper Forest (Rawinski 1984)
References: Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1996, Edinger et al. 2002, Fleming et al. 2001, Greller 1977, Lundgren 2000, Martin 1959b, Rawinski 1984, Reschke 1990, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006212

II.A.4.N.b.1. THUJA OCCIDENTALIS WOODLAND ALLIANCE
Northern White-cedar Woodland Alliance

Concept: This alliance contains woodlands (with variable canopy closure) of calcareous bedrock outcrops and limestone cliffs on which *Thuja occidentalis* is the dominant canopy tree, although associations can include admixtures of deciduous species. The growth form is generally single-stemmed, but trees may be quite stunted. Associated canopy species can include *Pinus resinosa, Ostrya virginiana, Quercus rubra, Pinus strobus, Abies balsamea, Betula alleghaniensis, Betula papyrifera, Picea mariana, Picea glauca, Acer saccharum, Fraxinus americana, Tsuga canadensis, Celtis occidentalis, Ulmus rubra, Quercus alba*, and *Quercus muehlenbergii*. Herbaceous species vary with geography but can include *Zigadenus elegans ssp. glaucus, Carex eburnea, Cystopteris bulbifera, Pellaea atropurpurea, Pinguicula vulgaris, Primula laurentiana, Saxifraga oppositifolia, Waldsteinia fragarioides, Oligoneuron album (= Solidago ptarmicoides)*, and *Carex pensylvanica*, among others. This alliance occurs in Canada, the Great Lakes region, northern New England, New York, and discontinuously in Maryland, West Virginia, Virginia, Kentucky, and Tennessee. In the Southeast it is known mostly from the Ridge and Valley Province, but occurrences are known from the periphery of the Tennessee Blue Ridge.
Comments: This alliance occurs in Maryland, where it lacks *Pinguicula, Saxifraga*, and *Waldsteinia* but has *Pellaea* and *Ostrya*; it occurs in association with rich forests. It may occur in New York in the Champlain valley and may be in association with alvar communities. Above cliffs of Ohio communities, mixed stands grade into oak or oak-maple stands at short distances from the cliffs. In a comparison of two *Thuja occidentalis* forests, Kangas (1989) found that a southern glacial relict site in Ohio, which belongs in this alliance, had a stable population of *Thuja occidentalis*, which was not being replaced by the only subdominant, *Ulmus americana*.
Range: This alliance is found in Kentucky, Tennessee, Maryland, New Hampshire (?), New York, Pennsylvania, Vermont, Virginia, West Virginia, Michigan, Minnesota, Ohio, Minnesota, and Wisconsin (?), and in Canada, in

Ontario.
States/Provinces: KY MD ME MI MN NB NH NY OH ON PA QC? TN VA VT WI WV
TNC Ecoregions: 44:C, 45:C, 46:C, 47:?, 48:C, 50:C, 51:C, 52:C, 59:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Ec:CCP, 212Ee:CCC, 212Ha:CCP, 212Hj:CCP, 212Hl:CCP, 212Ja:CP?, 212Jb:CP?, 212Jc:CP?, 212Jl:CPP, 212Jn:CPP, 212Jo:CPP, 212Jr:CPP, 221Al:C??, 221Ba:CPP, 221Db:C??, 222Ea:CCC, 222Eb:CCC, 222Ej:CCC, 222Fd:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCP, 222Ib:CCP, 222Ic:CCP, 222Ie:CCP, 222If:CCP, 222Lc:CCC, 231Ak:CCC, 231Al:CCP, 231Ap:CCP, M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ba:CCC, M212Ca:CCP, M212Cd:CCP, M212Da:CCP, M212Db:CC?, M212Dc:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCP, M221Bd:CCP, M221Be:CCC, M221Dd:CCC
Federal Lands: NPS (Acadia); USFS (Cherokee, George Washington)
Synonymy: Northern White-Cedar: 37 (Eyre 1980)
References: Braun 1928, Eyre 1980, Faber-Langendoen et al. 1996, Kangas 1989, Walker 1987
Authors: D.J. ALLARD, RW, East **Identifier:** A.544

THUJA OCCIDENTALIS / CAREX EBURNEA - PELLAEA ATROPURPUREA WOODLAND
Northern White-cedar / Bristleleaf Sedge - Purple Cliffbrake Woodland
Appalachian Cliff White-cedar Woodland **G2G3 (98-08-04)**
Ecological Group (SCS;MCS): Eastern Dry Alkaline Cliffs (430-50; 2.4.3.1)

Concept: This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau region of the United States. The type extends to near the southern limit of *Thuja occidentalis*, in the southeastern Highland Rim of Kentucky and Tennessee, where it tends to increase its distinctiveness from more northern communities. Stands occur on north-facing bluffs or cliffs of dolomite or limestone, where dip slopes provide slight seepage and maintain humidity higher than the regional average, or provide a cooler-than-normal microclimate. In Ohio it occurs as pure isolated patches on steep calcareous cliffs. It is also found as mixed stands on the uplands above the cliffs. Stands are dominated by coniferous trees but can have a significant amount of deciduous species. The structure of this association can vary from a stunted, very open canopy of *Thuja* to a mixed conifer-deciduous woodland approaching a forest structure. Canopy species other than *Thuja occidentalis* vary with geography. The most abundant tree species are *Thuja occidentalis, Acer saccharum, Tsuga canadensis, Juniperus virginiana, Quercus alba, Quercus muehlenbergii*, and *Quercus rubra*. Other associates include *Celtis occidentalis* and *Ulmus rubra* in more northern stands. Shrub and small tree species include *Cercis canadensis, Cornus florida, Hydrangea arborescens, Ostrya virginiana*, and *Rhus aromatica*. Closed-canopy stands have very few vascular species in the lower strata, while stands with broken canopies contain scattered shrubs and a substantial number of herbaceous species. Composition of the herbaceous and shrub strata can also vary due to seepage influence. Composition is quite variable, but some of the most constant herbaceous plants include *Asarum canadense, Carex eburnea, Cystopteris bulbifera*, and *Hepatica nobilis var. acuta (= Hepatica acutiloba)*. In Kentucky, sites are small (0.1-1 acre), with scattered *Thuja occidentalis* codominating with *Acer saccharum, Fraxinus americana, Ostrya virginiana*, and *Philadelphus hirsutus*. Other associated species include *Juniperus virginiana var. virginiana, Cercis canadensis var. canadensis, Pachysandra procumbens, Hamamelis virginiana, Parthenocissus quinquefolia, Solidago flexicaulis, Solidago sphacelata, Symphyotrichum cordifolium (= Aster cordifolius)*, and *Dioscorea quaternata*.
Comments: This type is simply defined by the presence of white-cedar or mixed white-cedar - hardwoods, and either forest or woodland canopy; hence all four physiognomic categories fall under this one type. Small-scale occurrences are worth documenting. The relationship between this type and *Thuja occidentalis / Carex eburnea* Forest (CEGL006021) should be examined and clarified. Stands on lower slopes often grade into swamps, especially those dominated by *Thuja occidentalis*. There are also many similarities between this vegetation and that in the I.C.3.N.a *Thuja occidentalis - Betula alleghaniensis* Forest Alliance (A.417). In the Ridge and Valley of Virginia, *Thuja occidentalis* communities occur in two situations: on rocky bluffs with admixtures of hardwood species and on mesic slopes with *Tsuga canadensis* and *Pinus strobus* (G. Fleming pers. comm. 1999). Southern *Thuja* stands are more genetically diverse than northern populations (Walker 1987). One Tennessee site is a proposed State Natural Area, Window Cliffs. This association is peripheral in the Southern Blue Ridge of Tennessee.
Range: This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau region of the United States.
States/Provinces: KY:S?, MD:S?, OH:S2, PA:S?, TN:S?, VA:S?, WV:S?
TNC Ecoregions: 44:C, 45:C, 50:C, 51:C, 52:C, 59:C

USFS Ecoregions: 222Ea:CCC, 222Eb:CCC, 222Ej:CCC, 222Fd:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCP, 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CC?, M221Be:CCC, M221Dd:CCC
Federal Lands: USFS (Cherokee, George Washington)
Synonymy: Arbor vitae forest (Braun 1928) =, *Thuja occidentalis / Carex eburnea - Sedum glaucophyllum* Shrubland (Fleming 1999), *Thuja occidentalis / Carex eburnea - Sedum glaucophyllum* Woodland (Fleming and Coulling 2001)
References: Anderson 1996, Braun 1928, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Fleming pers. comm., Kangas 1989, Palmer-Ball et al. 1988, Walker 1987
Authors: J. Drake, mod. M. Pyne, mod. G. Fleming and P. Coulling, MCS **Confidence:** 2 **Identifier:** CEGL002596

II.A.4.N.e. Seasonally flooded temperate or subpolar needle-leaved evergreen woodland

II.A.4.N.e.3. CHAMAECYPARIS THYOIDES SEASONALLY FLOODED WOODLAND ALLIANCE

Atlantic White-cedar Seasonally Flooded Woodland Alliance

Concept: This open-canopy Atlantic white-cedar swamp occurs along streams of the Delmarva peninsula. It is also found in artificial mill ponds. The substrate is peat and muck characterized by hummock-and-hollow microtopography. The tree canopy is characterized by low-stature *Chamaecyparis thyoides* in association with *Pinus taeda*. The herbaceous layer is comprised of *Peltandra virginica, Nymphaea odorata, Carex exilis, Dichanthelium dichotomum, Oxypolis rigidior, Triadenum virginicum, Dulichium arundinaceum, Glyceria obtusa, Rhynchospora alba, Carex atlantica, Selaginella apoda, Drosera rotundifolia, Juncus militaris, Vaccinium macrocarpon, Calopogon tuberosus*, and *Eriocaulon decangulare*. Floating mats within mill ponds have unique species assemblages.
Range: This alliance is found in New York, New Jersey, Massachusetts, Delaware, and Maryland (?).
States/Provinces: DE MD
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Aa:CCP, 232Ac:CC?, 232Ba:CC?, 232Bb:CC?, 232Bc:CC?, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC
References:
Authors: ECS, MOD. S.L. NEID, East **Identifier:** A.571

CHAMAECYPARIS THYOIDES / ALNUS MARITIMA WOODLAND
Atlantic White-cedar / Seaside Alder Woodland

G? (00-04-17)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Peatland Atlantic White-cedar Forests (370-20; n/a)

Concept: This open-canopy Atlantic white-cedar swamp occurs along streams of the Delmarva peninsula. It is also found in artificial mill ponds. The substrate is peat and muck characterized by hummock-and-hollow microtopography. The tree canopy is characterized by low-stature *Chamaecyparis thyoides* in association with *Pinus taeda*. Other woody associates include *Alnus maritima, Morella cerifera (= Myrica cerifera), Ilex glabra*, and *Clethra alnifolia*. The herbaceous layer is comprised of *Decodon verticillatus, Peltandra virginica, Nymphaea odorata, Carex exilis, Dichanthelium dichotomum, Oxypolis rigidior, Triadenum virginicum, Dulichium arundinaceum, Glyceria obtusa, Rhynchospora alba, Carex atlantica, Selaginella apoda, Drosera rotundifolia, Juncus militaris, Vaccinium macrocarpon, Calopogon tuberosus*, and *Eriocaulon decangulare*. Floating mats within mill ponds have a unique species assemblage including *Xyris difformis, Fuirena* spp., *Hypericum mutilum, Juncus pelocarpus, Juncus canadensis, Fimbristylis* sp., and *Rhynchospora macrostachya*.
Range: This swamp type occurs along streams of the Delmarva peninsula.
States/Provinces: DE:S?, MD:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bt:CCC, 232Bx:CCC, 232Bz:CCC
References:
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006307

II.B.2.N.a. Cold-deciduous woodland

II.B.2.N.a.4. FRAXINUS AMERICANA - CARYA GLABRA - (JUNIPERUS VIRGINIANA) WOODLAND ALLIANCE

White Ash - Pignut Hickory - (Eastern Red-cedar) Woodland Alliance

Concept: Woodlands in this alliance have *Fraxinus americana* and *Carya glabra* as typical canopy dominants, although *Juniperus virginiana, Quercus prinus*, or other *Carya* spp. may have significant coverage in some associations. Some associations have a nearly closed or locally closed canopy, and could in some cases as readily be considered as forests, while others have an edaphically maintained woodland physiognomy. Other minor canopy species vary with geography, but may include *Quercus rubra var. rubra, Pinus virginiana, Ulmus alata, Quercus stellata, Carya ovata*, and *Carya pallida*. Subcanopy and shrub species are variable between associations, but can include *Amelanchier sanguinea, Ceanothus americanus, Celtis tenuifolia, Cercis canadensis, Chionanthus virginicus, Crataegus* sp., *Hypericum prolificum, Juniperus virginiana var. virginiana, Lonicera flava, Ostrya virginiana, Philadelphus hirsutus, Physocarpus opulifolius, Ptelea trifoliata, Rhus aromatica var. aromatica, Rhus typhina, Rosa carolina, Spiraea betulifolia var. corymbosa, Symphoricarpos orbiculatus, Toxicodendron radicans, Vaccinium arboreum, Vaccinium pallidum, Vaccinium stamineum, Viburnum rafinesquianum (= var. rafinesquianum)*, and *Viburnum rufidulum*. Herbaceous species vary among associations, but species known from these woodlands include *Allium cuthbertii, Andropogon gerardii, Andropogon gyrans, Andropogon ternarius, Anemone berlandieri, Anemone virginiana, Antennaria virginica, Aquilegia canadensis, Arabis canadensis, Arabis hirsuta var. pycnocarpa (= Arabis hirsuta var. adpressipilis), Arabis laevigata, Aristida purpurascens, Aristolochia serpentaria, Asclepias quadrifolia, Asplenium platyneuron, Symphyotrichum oblongifolium (= Aster oblongifolius), Symphyotrichum patens var. patens (= Aster patens var. patens), Campanula divaricata, Cardamine parviflora var. arenicola, Carex pensylvanica, Cheilanthes lanosa, Claytonia virginica, Coreopsis major, Coreopsis pubescens, Cunila origanoides, Danthonia compressa, Danthonia sericea, Danthonia spicata, Desmodium rotundifolium, Dichanthelium boscii, Dichanthelium scoparium, Dodecatheon meadia, Draba ramosissima, Elymus hystrix, Erigeron pulchellus, Helianthus divaricatus, Helianthus microcephalus, Houstonia longifolia, Hypericum gentianoides, Hypericum punctatum, Melica mutica, Muhlenbergia tenuiflora, Phacelia dubia, Phlox nivalis ssp. hentzii, Piptochaetium avenaceum, Polygala paucifolia, Polygonum tenue, Pycnanthemum incanum, Pycnanthemum montanum, Saxifraga michauxii, Schizachyrium scoparium, Sedum glaucophyllum, Selaginella rupestris, Packera millefolia (= Senecio millefolium), Packera obovata (= Senecio obovatus), Solidago arguta var. harrisii (= Solidago harrisii), Solidago juncea, Solidago nemoralis, Sorghastrum nutans, Tradescantia ohiensis, Verbesina occidentalis, Woodsia ilvensis*, and *Woodsia obtusa*. These woodlands are often a physiognomic complex of woodland, grassland, and rock outcropping, often associated with granitic domes or rocky summits. Soils are circumneutral and derived from such base-rich rocks as greenstone, plagioclase-rich granite, hornblende gneiss, amphibole gneiss, limestones, or calcareous shales. Woodlands in this alliance are currently defined from 1000-3800 feet elevation in the southern and central Blue Ridge, the Ridge and Valley of Virginia, and the upper Piedmont of Georgia, North Carolina, and Virginia.

Comments: Most associations in this alliance are thought to be inherently rare because of their unusual geology and topographic position. Fleming (1999) discusses classification questions related to this alliance in Virginia and in the Nashville Basin of Tennessee: "In a study of woody vegetation in the Tennessee Central Basin, Crites and Clebsch (1986) found communities sorted along a topographic-moisture gradient. A '*Carya - Juniperus - Quercus* Community' that may be similar to the *Fraxinus americana - Carya ovata / Frangula caroliniana / Helianthus hirsutus* Woodland (CEGL008458) (*sensu* Fleming 1999) was classified from subxeric upland habitats. The dominants of the Tennessee community (based on the importance values of woody species >2.5 cm dbh) were *Fraxinus americana*, either *Carya ovata* or *Carya glabra* (pignut hickory), and *Juniperus virginiana*. *Fraxinus americana* was considered a 'local successional species,' the densities of which were 'masking' the importance values of oaks (Crites and Clebsch 1986). Implicit (but not directly stated) in this assessment is the concept that *Quercus muehlenbergii* and other oaks represent a more advanced successional stage on the subxeric uplands. Of course, without data on shrub and herbaceous composition, it is impossible to accurately evaluate the similarity of the Virginia and Tennessee communities" (Fleming 1999). In relation to the possible presence of this alliance in the Central Basin of Tennessee, see the *Fraxinus quadrangulata - (Juniperus virginiana)* Woodland Alliance (A.1913).

Range: Woodlands in this alliance are currently defined from 1000-3800 feet elevation in the southern and central Blue Ridge and in the upper Piedmont of the United States.

States/Provinces: AL? GA MD NC PA SC? TN VA WV?

TNC Ecoregions: 50:C, 51:C, 52:C, 59:C, 60:P
USFS Ecoregions: 212A:CC, 212B:CC, 221A:CC, 221Bd:CCP, 231Aa:CCC, 231Ae:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCC, M221Aa:CCC, M221Ab:CC?, M221B:C?, M221Ca:CC?, M221Cb:CC?, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC
Federal Lands: NPS (Blue Ridge Parkway, Great Smoky Mountains, Shenandoah); USFS (Cherokee, George Washington, Jefferson, Nantahala, Oconee, Pisgah)
Synonymy: Low Elevation Granitic Dome, Basic Variant, in part (Schafale and Weakley 1990); Piedmont / Mountain Basic Woodland, in part (Fleming et al. 2001); Red-cedar - mixed hardwood rich shale woodland (Fike 1999); Appalachian Shale Barren, Central Appalachian subtype (Smith 1991)
References: Crites and Clebsch 1986, Dellinger 1992, Fike 1999, Fleming 1999, Fleming et al. 2001, Schafale and Weakley 1990, Small 1996, Smith 1991
Authors: A.S. WEAKLEY, MOD. L. SNE, RW, Southeast **Identifier:** A.604

JUNIPERUS VIRGINIANA - FRAXINUS AMERICANA - CARYA GLABRA / CAREX PENSYLVANICA - CHEILANTHES LANOSA WOODLAND
Eastern Red-cedar - White Ash - Pignut Hickory / Pennsylvania Sedge - Hairy Lipfern Woodland
Central Appalachian Circumneutral Shale Woodland **G2 (98-11-23)**
Ecological Group (SCS;MCS): Appalachian Shale Glades and Barrens (440-40; 2.3.4.4)

Concept: This shale barren woodland community occurs on steep slopes of the Central Appalachians. The circumneutral to basic soils are derived from calcareous shales of the Jennings and Hampshire Shale formations on steep, south- or southwest-facing slopes. Soils are thin but generally better developed than other shale barren associations of steeper slopes. The woodland canopy ameliorates to some degree the otherwise xeric conditions imposed by exposure and slope. Canopy closure varies from 20-26% cover over an herbaceous layer that forms 30-90% ground cover. The canopy is codominated by *Juniperus virginiana* and *Fraxinus americana*, with other associates including *Carya glabra, Quercus prinus, Quercus rubra*, and *Amelanchier arborea*. The herbaceous layer is very diverse. Characteristic species include *Carex pensylvanica, Danthonia spicata, Cheilanthes lanosa, Woodsia obtusa, Phacelia dubia, Deschampsia flexuosa, Solidago arguta var. harrisii (= Solidago harrisii), Schizachyrium scoparium, Phlox subulata, Silene antirrhina, Elymus hystrix (= Hystrix patula), Tradescantia virginiana, Rhus aromatica*, and *Arenaria serpyllifolia*.
Range: This association is restricted to a single subsection of four states in of the Central Appalachians.
States/Provinces: MD:S?, PA:S?, VA:S?,S?,S1, WV?
TNC Ecoregions: 59:C, 60:P
USFS Ecoregions: 221Bd:CCP, M221Aa:CCC, M221B:C?
Synonymy: Eastern Redcedar: 46 (Eyre 1980) B, Red cedar-white ash alkaline shale woodland (CAP pers. comm. 1998)
References: CAP pers. comm. 1998, Eyre 1980, Fike 1999, Fleming et al. 2001
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006037

II.B.2.N.a.21. QUERCUS MUEHLENBERGII WOODLAND ALLIANCE
Chinquapin Oak Woodland Alliance

Concept: This alliance contains woodland communities in which *Quercus muehlenbergii* is a characteristic, and sometimes dominant, tree. Communities of this alliance are usually restricted to shallow soils derived from calcareous bedrock on gently rolling terrain or on slopes. The moisture regime of these communities is generally dry to well-drained. The canopy is often sparse, with widely spaced trees, although the physiognomy is variable. These woodlands often occur in association with 'glade' vegetation. Associated canopy species include *Quercus alba, Celtis tenuifolia, Cercis canadensis, Cornus florida, Carya ovata, Carya carolinae-septentrionalis, Fraxinus americana, Fraxinus quadrangulata, Ostrya virginiana*, and *Juniperus virginiana var. virginiana*. In addition, *Quercus austrina* may be present within its range. Shrubs are sparse in some examples, the understory characterized by light-demanding herbs such as *Bouteloua curtipendula, Asclepias verticillata, Schizachyrium scoparium, Helianthus divaricatus, Sorghastrum nutans, Eryngium yuccifolium, Carex meadii, Anemone cylindrica, Desmodium* spp., and *Andropogon gerardii*. Some more shrubby Alabama dolomite examples may contain *Sideroxylon lycioides, Acer leucoderme, Cercis canadensis var. canadensis, Cornus florida, Hypericum frondosum*, and *Croton alabamensis var. alabamensis*. Kentucky, Tennessee, and Arkansas examples contain *Cercis canadensis* as an associate in the subcanopy. In addition, Kentucky (and Tennessee) examples would probably have *Acer saccharum, Quercus stellata*, and *Juniperus virginiana var. virginiana* on shallow, dry,

calcareous soils. There are several other associations in the Northeast and Midwest. Primarily on limestone in the Ozarks and the sedimentary rock provinces of the Appalachians.
Comments: Related vegetation of the Interior Low Plateau (Ecoregion 44) is probably placed either in the I.B.2.N.a *Quercus muehlenbergii - (Acer saccharum)* Forest Alliance (A.1912), e.g., *Quercus muehlenbergii - Quercus (falcata, shumardii, stellata) / Cercis canadensis / Viburnum rufidulum* Forest (CEGL007699), or the II.B.2.N.a *Fraxinus quadrangulata - (Juniperus virginiana)* Woodland Alliance (A.1913). Kentucky, Tennessee, and Ecoregion 44 were removed from distribution of this alliance (99-12-22 MP). Related vegetation (without *Quercus macrocarpa*) on the Knobstone escarpment (Knobs region) within the Daniel Boone National Forest would probably be accommodated under *Quercus muehlenbergii - Quercus (falcata, shumardii, stellata) / Cercis canadensis / Viburnum rufidulum* Forest (CEGL007699) in I.B.2.N.a; the same is probably true of vegetation reported by Julian Campbell (pers. comm.), with *Quercus stellata* in the inner Bluegrass 'Palisades' region of Kentucky.
Range: This alliance is found in Iowa, Illinois, Kansas, Missouri, Wisconsin, Alabama, Arkansas, Maryland, Texas, Pennsylvania, Virginia, and West Virginia, and possibly in Michigan (?), and Louisiana (?). It is not thought to occur in Oklahoma (B. Hoagland pers. comm.), nor in Georgia (J. Ambrose pers. comm.).
States/Provinces: AL AR IA IL? KS LA? MD MI MO OH? OK? ON PA TN TX? VA VT WI WV
TNC Ecoregions: 36:C, 37:C, 38:C, 39:?, 40:C, 43:?, 46:C, 48:C, 49:C, 50:C, 59:C
USFS Ecoregions: 212Ea:CCC, 221D:C?, 221Ec:CC?, 221Ha:CCP, 221Hc:CCP, 221Hd:CCP, 221He:CCP, 221Ja:CCP, 221Jb:CCP, 221Jc:CCP, 222Ab:CCC, 222Ac:CCC, 222Af:CCP, 222Ag:CCC, 222Ah:CCP, 222Ak:CC?, 222Am:CC?, 222An:CCC, 222Ao:CCC, 222De:CCP, 222Dg:CCC, 222Ea:CC?, 222Eb:CC?, 222Ec:CCP, 222Ed:CCP, 222Eg:CCP, 222Eh:CC?, 222Fa:CC?, 222Fb:CCP, 222I:CC, 222Lc:CCC, 231Cc:C??, 231Cd:C??, 231Cf:C??, 231Cg:C??, 231Da:CC?, 231Dc:CCC, 231De:CC?, 231Eb:CCC, 231Ga:CP?, 231Gb:CP?, 231Gc:CP?, 232Br:CCC, 251Cq:CCC, 251Ea:CCC, M212A:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Be:CCC, M222Aa:CCC, M222Ab:CCP
Federal Lands: COE (Lake Millwood); NPS (Buffalo); USFS (George Washington, Jefferson, Mark Twain, Ozark)
Synonymy: Red-cedar - redbud shrubland (Fike 1999); Northern Appalachian Calcareous Rocky Summit (Smith 1991)
References: Ambrose pers. comm., Bartgis 1993, Faber-Langendoen et al. 1996, Fike 1999, Hoagland pers. comm., Smith 1991
Authors: D.J. ALLARD, MP, Midwest **Identifier:** A.621

QUERCUS MUEHLENBERGII - CERCIS CANADENSIS / PACKERA OBOVATA - LITHOSPERMUM CANESCENS WOODLAND

Chinquapin Oak - Redbud / Roundleaf Groundsel - Hoary Puccoon Woodland
Limestone Chinquapin Oak Woodland **G3G4 (00-12-27)**
Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Circumneutral Hardwood Forests and Woodlands (401-17; 2.5.3.z)

Concept: This open calcareous glade occurs in the Central Appalachians in the Ridge and Valley of northeastern West Virginia, western Virginia, and in central southeastern Pennsylvania. The vegetation occurs on moderate slopes at elevations ranging from 1300-2400 feet. Slopes are typically south- or southwest-facing and about 20-30 degrees but may be much steeper. Soils are shallow, dry, stony, calcareous loams derived from limestone or dolomite bedrock. Trees are generally widely spaced and relatively short (3-10 m). *Quercus muehlenbergii* is the dominant tree, with associates including *Cercis canadensis, Juniperus virginiana, Celtis tenuifolia, Fraxinus americana*, and *Ostrya virginiana* usually present. Shrubs are often of sparse cover but may include *Rhus aromatica* and *Rosa* sp. *(= Rosa tenuifolia?)*. *Cornus florida* may be a common woody associate in West Virginia and Pennsylvania. The herbaceous layer is patchy but may be quite diverse. Graminoids include *Bouteloua curtipendula, Carex eburnea, Elymus hystrix (= Hystrix patula), Carex pensylvanica, Poa compressa, Danthonia spicata*. Associated forbs include *Anemone virginiana, Symphyotrichum undulatum (= Aster undulatus), Symphyotrichum oblongifolium (= Aster oblongifolius), Asclepias verticillata, Houstonia longifolia, Penstemon hirsutus, Viola* spp., *Antennaria plantaginifolia, Phlox subulata, Lithospermum canescens, Cynoglossum officinale, Allium cernuum, Solidago ulmifolia, Solidago arguta var. harrisii (= Solidago harrisii), Packera obovata (= Senecio obovatus), Blephilia ciliata, Galium pilosum, Arabis lyrata, Heuchera americana, Draba ramosissima, Pycnanthemum incanum, Aquilegia canadensis, Helianthus divaricatus, Scutellaria ovata, Silene caroliniana ssp. pensylvanica (= Silene pensylvanica), Sisyrinchium mucronatum, Minuartia michauxii (= Arenaria stricta), Euphorbia corollata, Paronychia montana*, and *Paronychia virginica*.
Comments: Field survey of this vegetation and its cliff habitats can be a dangerous undertaking and many stands have not been thoroughly explored or plot-sampled. Most Virginia occurrences are small (0.1-1.0 ha) but some exceed 4.0 ha (10 acres) on the more massive cliffs. This community type is distinct from prairie-like calcareous "barrens" occurring on steep hillslopes and dominated by warm-season perennial grasses (e.g., *Schizachyrium scoparium, Andropogon gerardii, Bouteloua curtipendula, Sorghastrum nutans*) with scattered woody scrub. These barrens are represented in western Virginia by two community types, neither of which is known to occur in the George Washington and Jefferson national forests.

At present, this type is a broadly defined unit that encompasses a variety of rocky calcareous habitats. Virginia stands of this vegetation have a strong restriction to cliffs and rocky escarpments, as well as a composition that differs somewhat from stands in other portions of the range. These differences are reflected in the State Name, which is more useful for field identification and descriptive purposes in Virginia. However, there is some compositional and environmental heterogeneity among the plot samples supporting our interpretation of this vegetation, with six plots representing strict cliff/outcrop vegetation on limestone and three plots representing clifftop habitats on dolomite. The latter subgroup has habitats with considerable areas of exposed mineral soil and has much higher mean species richness (n = 83 taxa per 400 m2 vs. 37 taxa per 100 m2). Additional data collection and analysis over the full geographic range and in Virginia is clearly warranted and will likely result in splitting of this type.

A *Juniperus virginiana - Quercus muehlenbergii / Carex eburnea* Woodland community identified by Fleming (1999) appears to be a segregate associated with xeric cliffs.
Range: This community is found in the ridge and valley region of northeastern West Virginia, western Virginia, and calcareous areas in central and southeastern Pennsylvania. Its range in West Virginia is limited.
States/Provinces: MD:S?, OH?, PA:S?,S?, VA:S?, WV:S?
TNC Ecoregions: 49:C, 50:P, 59:C
USFS Ecoregions: 212Ea:CCC, 221D:C?, 221Ec:CC?, M212A:CC, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Be:CCC
Federal Lands: USFS (George Washington, Jefferson)
Synonymy: *Juniperus virginiana var. virginiana - Quercus muehlenbergii / Carex eburnea* Woodland (4.2) (Fleming 1999), *Juniperus virginiana - Quercus muehlenbergii / Carex eburnea - Pellaea atropurpurea* Woodland (Fleming and Coulling 2001), Chinquapin oak-redbud calcareous woodland (northern type?) (CAP pers. comm. 1998), Glade Woodland (Bartgis 1993)
References: Bartgis 1993, CAP pers. comm. 1998, Fike 1999, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Grossman et al. 1994, Sneddon and Menard 2002
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006231

II.B.2.N.a.22. QUERCUS PRINUS - QUERCUS COCCINEA WOODLAND ALLIANCE

Rock Chestnut Oak - Scarlet Oak Woodland Alliance

Concept: This alliance includes open woodlands of shale barrens and shale ridges in the Allegheny Plateau and

Knobs region of Kentucky and Virginia, and possibly ranging into West Virginia. The alliance also includes *Quercus prinus*-dominated woodlands on the siltstone ridgetops of the Kentucky Knobs region. Canopies are dominated by *Quercus prinus*, with lesser coverage by *Pinus virginiana, Quercus velutina, Quercus coccinea, Carya glabra*, and *Amelanchier arborea*. Other species include *Cornus florida, Carya glabra, Carya alba, Vaccinium pallidum, Pityopsis graminifolia var. latifolia, Danthonia spicata, Dichanthelium depauperatum/linearifolium, Aristida dichotoma, Aristida oligantha*, and *Potentilla canadensis*. Some examples may contain *Silene caroliniana* (*ssp. wherryi*, or possibly *ssp. pensylvanica*). Currently this alliance is narrowly defined to cover woodlands associated with shale substrates, but may be expanded if needed.
Comments: Currently only two associations are defined in this alliance. Additional associations for shale woodlands in the central Appalachians will likely be defined within this alliance. A new association may be developed to accommodate the vegetation of the siltstone ridgetops of the Kentucky Knobs region (M. Hines pers. comm.).
Range: This alliance is found in the Allegheny Plateau and Knobs region of Kentucky and Virginia, and possibly ranges into Tennessee (?), West Virginia (?), and elsewhere.
States/Provinces: KY MD? PA? TN? VA WV?
TNC Ecoregions: 44:C, 50:C, 59:C
USFS Ecoregions: 221Ea:CC?, 221Eb:CC?, 222Ei:CCC, 222Ej:CCC, M221Aa:CCC, M221Ab:CCP, M221Da:CCC, M221Dc:CCC
Federal Lands: NPS (Shenandoah); USFS (Daniel Boone, George Washington, Jefferson)
Synonymy: Appalachian sub-xeric forest, in part (Evans 1991); Shale barrens, in part (Evans 1991); Chestnut Oak: 44, in part (Eyre 1980)
References: Evans 1991, Eyre 1980, Hines pers. comm.
Authors: D. TAYLOR, RW, Southeast **Identifier:** A.622

QUERCUS PRINUS / QUERCUS ILICIFOLIA / DANTHONIA SPICATA - SOLIDAGO BICOLOR WOODLAND

Rock Chestnut Oak / Bear Oak / Poverty Oatgrass - White Goldenrod Woodland
Central Appalachian Xeric Shale Woodland (Rock Chestnut Oak / Mixed Herbs Type) **G3? (01-09-21)**
Ecological Group (SCS;MCS): Appalachian Shale Glades and Barrens (440-40; 2.3.4.4)

Concept: The known range of this vegetation type includes the extreme north end of the southern Blue Ridge, the northern Blue Ridge, and the Ridge and Valley region of Virginia. The likely global range encompasses the entire central Appalachian extent of these provinces in Virginia, West Virginia, Maryland, and Pennsylvania. Stands are generally confined to low elevations, from 400-840 m (1400-2760 feet), but exceptionally to 1100 m (3600 feet). Habitats are mostly steep, south- to west-facing, middle to upper slopes with abundant outcrops, loose stones, and exposed mineral soils. However, substrates appear to be relatively stable and lack the ongoing erosional processes of shale barrens, which these habitats often border on the landscape. Slope shape is typically convex in at least one direction. Site moisture potential is very low. This community is an open to very open woodland dominated by *Quercus prinus*. Overstory trees are often stunted and gnarled. *Quercus rubra* and *Carya glabra* are constant, usually minor canopy associates that attain codominance with *Quercus prinus* locally. *Pinus virginiana* is an important canopy associate in some situations, but is entirely absent from other stands of the type. Understory tree layers are sparse, consisting mostly of younger reproduction of the canopy species. *Quercus ilicifolia, Vaccinium stamineum*, and *Vaccinium pallidum* are the chief species of a patchy shrub layer, which may also include *Rosa carolina, Amelanchier arborea*, and *Viburnum rafinesquianum*. *Quercus ilicifolia* usually forms open colonies in this community type, rather than the dense thickets characteristic in pyrophytic pine-oak/heath vegetation. The herb layer is typically quite patchy and sparse, but contains a surprising diversity of xerophytic graminoids and forbs.
Comments: This community type is floristically similar to *Pinus virginiana - Quercus prinus / Quercus ilicifolia / (Hieracium greenii)* Woodland (CEGL008525) but differs in the dominance of hardwoods (versus *Pinus virginiana*) and in its much greater herbaceous diversity and overall species richness (n = 33 versus 15). Edaphic stresses are probably the most important ecological factor maintaining this woodland, but many stands have undoubtedly been influenced by periodic fires as well, which may account for some of the compositional differences with CEGL008525. Although soil samples collected from plots of both community types were similar in pH and base status, we suspect that differences in soil fertility, texture, and/or stability may also distinguish these types. More intensive study of the environmental differences between the two units is warranted.
Range: The known range of this vegetation type includes the extreme north end of the southern Blue Ridge, the northern Blue Ridge, and the Ridge and Valley region of Virginia. The likely global range encompasses the entire central Appalachian extent of these provinces in Virginia, West Virginia, Maryland, and Pennsylvania.

States/Provinces: MD?, PA?, VA:S?, WV?
TNC Ecoregions: 50:C, 59:C
USFS Ecoregions: M221Aa:CCC, M221Ab:CCP, M221Da:CCC, M221Dc:CCC
Federal Lands: NPS (Shenandoah); USFS (George Washington, Jefferson)
Synonymy: *Quercus prinus / Quercus ilicifolia / Danthonia spicata - Solidago bicolor* Woodland (Fleming and Coulling 2001) =, *Pinus pungens - Pinus rigida / Quercus ilicifolia / Gaylussacia baccata* Association: *Andropogon scoparius - Coreopsis verticillata - Dichanthelium depauperatum* Subassociation, *pro parte* (Rawinski et al. 1996). see CEGL008540.
References: Fleming and Coulling 2001, Fleming et al. 2001, Rawinski et al. 1996
Authors: G. Fleming and P. Coulling, ECS **Confidence:** **Identifier:** CEGL008526

II.B.2.N.a.24. QUERCUS RUBRA - QUERCUS PRINUS WOODLAND ALLIANCE

Northern Red Oak - Rock Chestnut Oak Woodland Alliance

Concept: This alliance includes woodland communities occurring on acidic, talus slopes or rocky slopes of higher elevations (e.g., from 1000-2620 feet in New England and to 4500 feet in West Virginia). Soils are shallow and acidic. *Quercus rubra* is sometimes dominant but usually occurs in association with *Quercus alba, Acer rubrum, Betula lenta, Quercus prinus*, and others. Canopies are often stunted. The shrub layer may include, in the northern part of the range, *Acer spicatum, Sambucus racemosa var. racemosa (= Sambucus racemosa ssp. pubens), Rhus typhina, Kalmia latifolia, Hamamelis virginiana*, while in the southern part of the range, *Rhododendron catawbiense, Rhododendron arborescens, Rhododendron calendulaceum, Rhododendron maximum, Menziesia pilosa, Gaylussacia ursina, Leucothoe recurva, Vaccinium simulatum*, and *Viburnum nudum var. cassinoides* are more typical. Herbs include *Pteridium aquilinum var. latiusculum, Aralia nudicaulis, Maianthemum canadense, Oclemena acuminata (= Aster acuminatus), Corydalis sempervirens, Deschampsia flexuosa, Carex pensylvanica*, and *Polypodium virginianum*. Communities of this alliance are known from the Appalachian Mountains, from New York and New England, south to the Blue Ridge of North Carolina.
Range: Communities of this alliance are known from the Appalachian Mountains, from New York and New England, south to the Blue Ridge of North Carolina. This alliance is found in Connecticut, Georgia, North Carolina, Delaware, Maine, Massachusetts, New Hampshire, New York, Pennsylvania, Vermont, Virginia, and West Virginia, and possibly South Carolina (?).
States/Provinces: CT GA MA MD? ME NB NC NH NY PA SC? TN VA VT WV
TNC Ecoregions: 49:C, 50:?, 51:C, 52:?, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Ec:CCC, 212Ed:CC?, 212Fa:CCP, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Db:C??, 221Ea:CCC, 222Ic:PP?, 222Id:PP?, 222Ie:PP?, 222If:PPP, M212Ac:CCC, M212Ad:CCC, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CCP, M212Cb:CCC, M212Cc:CCP, M212Cd:CCP, M212Da:CCP, M212Db:CCP, M212Dc:CCC, M212De:CCC, M212Ea:CCP, M212Eb:CCP, M212Fa:CPP, M212Fb:CPP, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Bb:CCP, M221Bd:CC?, M221Bf:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CCC
Federal Lands: NPS (Acadia); USFS (Chattahoochee, George Washington, Jefferson, Nantahala, Pisgah)
Synonymy: Chestnut Oak: 44, in part (Eyre 1980); Northern Red Oak: 55, in part (Eyre 1980); Circumneutral Rocky Summit/Rock Outcrop (Swain and Kearsley 2001); Acidic Talus Forest / Woodland (Swain and Kearsley 2001); Oak - Hemlock - White Pine Forest (Swain and Kearsley 2001); Dry oak - heath woodland (Fike 1999); Ridgetop Dwarf-tree Forest, in part (Smith 1991)
References: Eyre 1980, Fike 1999, Smith 1991, Swain and Kearsley 2001
Authors: ECS, RW, East **Identifier:** A.624

QUERCUS PRINUS - BETULA LENTA / PARTHENOCISSUS QUINQUEFOLIA TALUS WOODLAND

Rock Chestnut Oak - Sweet Birch / Virginia Creeper Talus Woodland
Chestnut Oak - Black Birch - Virginia Creeper Wooded Talus Slopes **G? (99-07-08)**

Concept: This talus or rocky slope woodland community occurs in the Central Appalachian Mountains and extends west to the Western Allegheny Plateau in Pennsylvania. The substrate is generally quartzite or sandstone talus and usually sloping, but also occurs on benches, ridges, and boulderfields. Soils are shallow, organic, acidic and infertile. The canopy is of variable cover, but generally open with gnarled widely spaced trees.

Characteristic trees are birches, typically *Betula lenta* but may also include *Betula papyrifera, Betula populifolia*, or *Betula alleghaniensis*, as well as *Nyssa sylvatica*. Other tree associates may include *Tsuga canadensis, Acer rubrum, Carya glabra, Quercus prinus, Quercus alba, Quercus velutina*, or *Quercus coccinea*. Typical shrubs include *Acer spicatum, Acer pensylvanicum, Amelanchier arborea, Castanea dentata, Kalmia latifolia, Hamamelis virginiana, Ribes rotundifolium, Vitis* spp., *Toxicodendron radicans, Smilax rotundifolia*, and *Parthenocissus quinquefolia*. Ferns characterize the field layer and may include *Dryopteris marginalis, Polypodium virginianum, Woodsia obtusa*, or *Asplenium platyneuron*. Other species include *Aralia nudicaulis, Vaccinium angustifolium*, or *Menziesia pilosa*. Lichens characterize the nonvascular layer.

Comments: This vegetation type is poorly represented by plot data and additional sampling is needed, particularly of lower-elevation and south-slope stands. Even with limited data, potential variants of the type in Virginia were proposed by Fleming and Moorhead (2000). A variant of sheltered north slopes in which *Tsuga canadensis* is codominant with *Betula lenta* and/or *Quercus* spp. has been reported from Virginia by Hupp (1983) and from Pennsylvania by Fike (1999). Many Virginia populations of the state-rare, northern tree *Betula papyrifera var. cordifolia* are associated with this community type.

This boulderfield woodland represents a long-term sere in the geomorphic and vegetational progression from exposed, lichen-dominated block fields to fully forested mountain slopes with well-developed mineral soils. In addition to edaphic stresses, trees of these habitats are subject to frequent damage from wind and ice storms. Boundaries between the boulderfield woodlands and adjacent forests are often obscure, with composition gradually changing along with substrate conditions and soil depth. This type frequently intergrades with several communities of the Mixed Oak / Heath Forests group, especially *Quercus prinus - Quercus rubra - Carya (glabra, alba) / Gaylussacia baccata* Forest (CEGL006057) of somewhat sheltered, often very rocky slopes.

Range: This community occurs locally throughout the Blue Ridge and Ridge and Valley sections of Pennsylvania, Virginia, West Virginia, and possibly Maryland. In Virginia, it reaches optimal development on sideslopes of linear sandstone and quartzite strike ridges in the Ridge and Valley, and on the western, metasedimentary flank of the Northern Blue Ridge. Landsliding and debris avalanches, which generate and regenerate boulderfield environments, are dominant erosional processes in these landscapes (Hack and Goodlett 1960).

States/Provinces: MD?, PA:S?, VA:S?, WV:S?

TNC Ecoregions: 49:C, 59:C

USFS Ecoregions: 221Ea:CCC, M221Ac:CCC, M221Bf:CCC

Federal Lands: USFS (George Washington, Jefferson)

Synonymy: *Quercus rubra - Quercus montana - Betula lenta / Ilex montana / Menziesia pilosa* Forest (Fleming and Moorhead 2000), *Quercus rubra - Quercus montana - Betula lenta / Parthenocissus quinquefolia* Forest (Fleming and Moorhead 2000), *Betula lenta / Ribes rotundifolium - Menziesia pilosa / Parthenocissus quinquefolia - Polypodium appalachianum* Woodland (Fleming and Coulling 2001), *Betula lenta / Parthenocissus quinquefolia* Association (Rawinski et al. 1996)

References: Anderson et al. 1998, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Hack and Goodlett 1960, Hupp 1983, Rawinski et al. 1996

Authors: G. Fleming and P. Coulling, ECS **Confidence:** **Identifier:** CEGL006565

II.B.2.N.a.28. TILIA AMERICANA - FRAXINUS AMERICANA - (ACER SACCHARUM) WOODLAND ALLIANCE

American Basswood - White Ash - (Sugar Maple) Woodland Alliance

Concept: This alliance contains woodlands occurring on calcareous or circumneutral talus comprised of large boulders, or on rock outcrops. These woodlands often occur in association with rich forests, those of the *Acer saccharum - Fraxinus americana - Tilia americana* Forest Alliance (A.217). As opposed to the forest alliance, communities of woodland alliance have an open canopy and as such support more light-demanding species than are found in the understory of rich forests. Associated canopy species include *Acer saccharum, Quercus rubra*. The shrub layer is usually sparse. Herbs of this alliance include *Adlumia fungosa, Clematis occidentalis, Geranium robertianum, Cystopteris bulbifera, Carex umbellata*, and *Antennaria plantaginifolia*. This alliance occurs in southern Canada, lower New England, the northern Appalachians, and south to mountains of West Virginia and Virginia. In Maryland, this alliance is found along the Potomac River (Garrett County).

Range: This alliance occurs in southern Canada, lower New England, the northern Appalachians, and south to mountains of West Virginia and Virginia. In Maryland, this alliance is found along the Potomac River (Garrett County). It is found in Maine, Maryland, New Hampshire, New York, Vermont, Virginia, and West Virginia, and in

Canada, and possibly in Massachusetts (?) and Pennsylvania (?).
States/Provinces: CT MA MD ME NB NH NY ON PA? VA VT WV
TNC Ecoregions: 48:C, 50:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212A:C?, 212B:C?, 212Dc:CCC, 212Ec:CCP, 212Ed:CCP, 212Ee:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Ga:CCC, 221Af:CC?, 221Ah:CC?, 221Ai:CC?, 221Aj:CCC, 221Ak:CCP, 221Al:CCC, 221Ba:CCP, 221Bb:CCP, 221Bc:CCP, 221Bd:CCC, 222Ib:CCC, 222Ic:CCC, 222Ie:CCP, 222If:CCP, 251F:CP, 255A:CC, 311A:CC, 332E:CC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CCC, M212Bb:CCP, M212Ca:CCC, M212Cc:CC?, M212Cd:CCC, M212Db:CCP, M212Dc:CCC, M212Df:CCC, M212Ea:CCC, M212Eb:CCC, M212Fb:CCC, M221Aa:CCC, M221Ba:CCP, M221Bb:CCP, M221Bd:CC?, M221Be:CC?, M221Ca:CC?, M221Cb:CC?, M221Cc:CC?, M221Cd:CCP, M221Da:CCC, M221Db:CCP
Federal Lands: NPS (Shenandoah); USFS (George Washington, Jefferson)
Synonymy: Circumneutral Talus Forest / Woodland (Swain and Kearsley 2001)
References: Sneddon et al. 1996, Swain and Kearsley 2001
Authors: ECS, RW, East **Identifier:** A.628

TILIA AMERICANA - FRAXINUS AMERICANA / ACER PENSYLVANICUM - OSTRYA VIRGINIANA / PARTHENOCISSUS QUINQUEFOLIA - IMPATIENS PALLIDA WOODLAND

American Basswood - White Ash / Striped Maple - Eastern Hop-hornbeam / Virginia Creeper - Yellow Jewelweed Woodland

Central Appalachian Basic Boulderfield Forest (Montane Basswood - White Ash Type) **G3 (01-10-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Mixed Mesophytic/Cove Forests (420-30; 2.5.3.3)

Concept: This community type occurs throughout the northern Blue Ridge in Virginia and possibly the western Virginia Ridge and Valley region, as well as West Virginia and Maryland. Sites include steep, boulder and stone slides below cliffs; boulder-filled slope concavities and hollow-heads; and other very rocky, submesic to mesic habitats at middle elevations between 760 and 1030 m (2500-3400 feet). This is an open to closed, mixed hardwood forest, with tall, well-formed trees. Because of somewhat unstable substrates and occasional exposure to severe wind and ice storms, downfalls and crown damage may be frequent in some stands. *Tilia americana* (including both *var. americana* and *var. heterophylla*), *Fraxinus americana*, and *Quercus rubra* are the most abundant, variably dominant or codominant canopy trees. *Carya cordiformis, Robinia pseudoacacia*, and *Carya ovata* are minor but constant canopy associates. Understory layers tend to be open, with *Acer pensylvanicum, Ostrya virginiana, Sambucus racemosa (= Sambucus pubens)*, and *Ribes rotundifolium* the most characteristic species. The usually patchy herb layer varies greatly in richness and density with substrate conditions.
Comments: Classification of this unit is supported by 15 plots from Alleghany, Amherst, Botetourt, Greene, Madison, Page, Rappahannock, Rockbridge, and Rockingham counties, Virginia (G. Fleming pers. comm.). Boulderfield forests and woodlands have not been thoroughly inventoried in Virginia and elsewhere. The global ranges and ecological relationships of this and other units are not well known and require additional study. In particular, the distribution and status of *Tilia americana - Fraxinus americana / Acer pensylvanicum - Ostrya virginiana / Parthenocissus quinquefolia - Impatiens pallida* Woodland (CEGL008528) in the Ridge and Valley province needs clarification. The distribution of this community type on the northern Blue Ridge appears to be centered above 760 m (2500 feet), where *Liriodendron tulipifera* begins to reach its upper elevational limits. Similar low-elevation habitats probably support *Liriodendron tulipifera - Tilia americana - Betula lenta / Asimina triloba / Dryopteris marginalis* Forest [Provisional] (CEGL008527). Above 1000-1060 m (3300-3500 feet; depending on aspect), this type is replaced by *Betula alleghaniensis / Sorbus americana - Acer spicatum / Polypodium appalachianum* Forest (CEGL008504).
Range: This community type definitely occurs in suitable habitats throughout the northern Blue Ridge in Virginia. Stands assigned to this type but somewhat transitional to northern hardwood forest, *Betula alleghaniensis - Quercus rubra / Acer (pensylvanicum, spicatum) / Dryopteris intermedia - Oclemena acuminata* Forest (CEGL008502), also occur on the northwest flank of Peters Mountain in Alleghany County. Similar forests have been observed in a few other sites of the western Virginia Ridge and Valley region. Occurrences of this community in West Virginia and Maryland are possible.
States/Provinces: MD?, VA:S?, WV?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Aa:CCP, M221Da:CCC
Federal Lands: NPS (Shenandoah); USFS (George Washington, Jefferson)
Synonymy: *Tilia americana - Fraxinus americana / Acer pensylvanicum - Ostrya virginiana / Parthenocissus*

quinquefolia - Impatiens pallida Woodland (Fleming and Coulling 2001) =, *Tilia americana - Fraxinus americana / Ostrya virginiana / Ageratina altissima* Forest (Fleming and Moorhead 2000), *Liriodendron tulipifera - Acer saccharum - Tilia americana / Laportea candensis - Impatiens pallida* Association, *pro parte* (Rawinski et al. 1996)
References: Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Rawinski et al. 1996
Authors: G. Fleming and P. Coulling, SCS **Confidence:** **Identifier:** CEGL008528

TILIA AMERICANA - FRAXINUS AMERICANA / CORNUS FLORIDA WOODLAND
American Basswood - White Ash / Flowering Dogwood Woodland

G3G5 (97-12-01)

Ecological Group (SCS;MCS): Appalachian Highlands Dry-mesic Circumneutral Hardwood Forests and Woodlands (401-17; 2.5.3.z)

Concept: Open, talus slope woodlands in the mountainous sections of the High Allegheny and central Appalachian ecoregions. These are open woodlands of calcareous or bouldery circumneutral talus with a canopy of *Acer saccharum, Fraxinus americana, Tilia americana, Quercus rubra*. The shrub layer is scattered and viney and may include *Acer spicatum, Acer pensylvanicum, Parthenocissus quinquefolia*. Herbs include *Adlumia fungosa, Clematis occidentalis, Geranium robertianum, Cystopteris bulbifera, Carex umbellata, Antennaria plantaginifolia*.
States/Provinces: MD:S?, PA?, WV:S?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Aa:CCC, M221B:CC
Synonymy: White ash-basswood-dogwood alkaline talus slope (CAP pers. comm. 1998)
References: CAP pers. comm. 1998
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006054

II.B.2.N.f. Tidal cold-deciduous woodland

II.B.2.N.f.1. ACER RUBRUM - FRAXINUS PENNSYLVANICA TIDAL WOODLAND ALLIANCE

Red Maple - Green Ash Tidal Woodland Alliance

Concept: Tidal swamp woodlands of the mid-Atlantic that occur on tidal rivers and receive diurnal flooding with water less than 5 ppt salinity; waters generally oligohaline to fresh. This alliance includes swamp woodlands of low stature found at the fresh tidal marsh/streamside swamp forest boundary. The vegetation is a complex of regularly flooded tidal sediments and tree hummocks raised above the level of regular tidal influence. The hummocks support *Acer rubrum, Fraxinus pennsylvanica, Nyssa sylvatica*, and in Delaware, *Chamaecyparis thyoides*. One association in North Carolina contains *Acer negundo* in the canopy with lesser amounts of *Nyssa aquatica, Taxodium distichum*, and *Ulmus rubra*. Shrub and vine species include *Vaccinium corymbosum, Leucothoe racemosa, Rhododendron viscosum, Clethra alnifolia, Rosa palustris, Smilax rotundifolia, Smilax walteri, Ampelopsis arborea, Sicyos angulatus, Parthenocissus quinquefolia, Vitis rotundifolia, Matelea gonocarpos, Smilax rotundifolia, Clematis crispa*, and *Toxicodendron radicans*. Herbaceous species that occur in the tidal sediments include *Zizania aquatica, Impatiens capensis, Acorus calamus, Cinna arundinacea, Nelumbo lutea, Mikania scandens, Peltandra virginica*, and *Sagittaria latifolia*.
Comments: This alliance may occur in Maryland on Nanticoke [see data collected by Smoot Major 9-95 and verify that these are woodlands and not forests]. Gary Fleming recommends moving at least the Virginia association to I.B.2.N.h *Fraxinus pennsylvanica - Acer rubrum - Ulmus americana* Tidal Forest Alliance (A.356).
Range: This alliance is found in North Carolina, Maryland (?), New Jersey, New York, and Virginia.
States/Provinces: CT DE MA MD NC NJ NY VA
TNC Ecoregions: 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ae:CCC, 221Ag:CCC, 221Ba:CCC, 232Aa:CCP, 232Ab:CC?, 232Ac:CCC, 232Ad:CCP, 232Ba:CC?, 232Bb:CC?, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Cb:CCC, 232Ch:CCC
Synonymy: Red Maple: 108, in part (Eyre 1980); Estuarine Intertidal: Fresh/Brackish Tidal Swamp (Swain and Kearsley 2001)
References: Eyre 1980, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.658

FRAXINUS (PROFUNDA, PENNSYLVANICA) - (NYSSA BIFLORA) / POLYGONUM ARIFOLIUM WOODLAND
(Pumpkin Ash, Green Ash) - (Swamp Blackgum) / Halberd-leaf Tearthumb Woodland
Ash-Blackgum Freshwater Tidal Swamp **G3 (98-12-03)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Tidal Hardwood Swamp Forests (202-90; n/a)

Concept: This open- to closed-canopy swamp occurs on fresh tidal rivers from Delaware to Virginia and is best developed on the Chesapeake Bay drainage. It occurs at the upper reaches of tidal influence (and somewhat beyond in some cases) and generally receives diurnal or irregular tidal flooding. The canopy is dominated by few tree species, generally *Fraxinus profunda, Fraxinus pennsylvanica*, and *Nyssa biflora*. Other canopy associates vary among occurrences and often include *Nyssa sylvatica, Acer rubrum, Liquidambar styraciflua, Magnolia virginiana, Fraxinus profunda, Ulmus americana*, and *Pinus taeda*. The shrub layer is well-developed and includes *Lindera benzoin, Clethra alnifolia, Leucothoe racemosa, Ilex verticillata, Ilex opaca, Ilex laevigata, Alnus serrulata, Rhododendron viscosum, Viburnum dentatum, Viburnum nudum, Morella cerifera, Vaccinium corymbosum, Vaccinium fuscatum, Itea virginica, Rosa palustris*, and *Cornus foemina*. *Alnus maritima* is also characteristic in Delaware and Maryland. Vines may be dense and include *Smilax rotundifolia, Toxicodendron radicans, Apios americana, Parthenocissus quinquefolia, Bignonia capreolata*, and *Dioscorea villosa*. The herbaceous layer is variable in composition and richness. Common associates include *Polygonum arifolium, Polygonum sagittatum, Peltandra virginica, Saururus cernuus, Carex bromoides, Impatiens capensis, Boehmeria cylindrica, Carex intumescens, Leersia oryzoides, Commelina virginica, Cicuta maculata, Arisaema triphyllum, Thalictrum pubescens, Thelypteris palustris, Woodwardia areolata, Carex stricta, Zizania aquatica, Cinna arundinacea, Osmunda cinnamomea*, and *Osmunda regalis*. The invasive exotic *Murdannia keisak* can also occur in this association. This association is differentiated from tidal swamps to the north by the presence of species of southern affinity, including *Magnolia virginiana, Nyssa biflora*, and *Pinus taeda*.
Comments: *Acer rubrum - Fraxinus pennsylvanica / Polygonum* spp. Woodland (CEGL006165) is the northern analog of this association. This association is differentiated from tidal swamps to the north by the presence of species of southern affinity, including *Magnolia virginiana, Nyssa biflora*, and *Pinus taeda*.
Range: This association is restricted to tidal rivers in Delaware, Maryland, and Virginia.
States/Provinces: DE:S3S4, MD:S?, VA:S?
TNC Ecoregions: 57:P, 58:C
USFS Ecoregions: 232A:C?, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCC
Synonymy: Ash-blackgum swamp (Rheinhardt 1992) F, Maple-sweetgum swamp (Rheinhardt 1992) F
References: Berdine 1998, Bowman 2000, Fleming 2001, Fleming et al. 2001, Rheinhardt 1991, Rheinhardt 1992, Tiner 1985a
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006287

II.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous woodland

II.C.3.N.a.9. PINUS (RIGIDA, PUNGENS, VIRGINIANA) - QUERCUS PRINUS WOODLAND ALLIANCE

(Pitch Pine, Table Mountain Pine, Virginia Pine) - Rock Chestnut Oak Woodland Alliance

Concept: This alliance includes woodland vegetation dominated by *Pinus virginiana*, possibly with a mixture of *Pinus rigida, Pinus pungens*, and/or *Quercus prinus*. Associations in this alliance are possible from central Pennsylvania southwest to Virginia and Tennessee, but tend to occur under extreme conditions (such as steep, shaley slopes) that maintain the open structure of the vegetation.
Range: This alliance is found in North Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia.
States/Provinces: MD NC PA TN VA WV
TNC Ecoregions: 43:?, 44:P, 50:C, 51:C, 52:?, 59:C
USFS Ecoregions: 231Aa:CCC, 231E:CC, M221Aa:CCC, M221Ab:CCC, M221Ba:CCP, M221Bd:CCC, M221Da:CCC, M221Dd:CCC
Federal Lands: USFS (Cherokee, Daniel Boone?, George Washington, Jefferson, Pisgah)
Synonymy: Virginia Pine: 79, in part (Eyre 1980)
References: Eyre 1980
Authors: D.J. ALLARD, RW, East **Identifier:** A.677

PINUS (VIRGINIANA, RIGIDA) - QUERCUS PRINUS / GAYLUSSACIA BACCATA - VACCINIUM PALLIDUM WOODLAND [PROVISIONAL]*

(Virginia Pine, Pitch Pine) - Rock Chestnut Oak / Black Huckleberry - Hillside Blueberry Woodland

Virginia Pine - Chestnut Oak Low- to Mid-Elevation Sandstone Pavement Barren **G?**

*** Nonstandard type (needs review)**

Concept: Open to very open (sparse) woodland on sandstone pavement. Sparse trees include *Pinus virginiana, Pinus rigida, Quercus prinus*. Scattered herbs and shrubs: *Gaylussacia baccata, Vaccinium pallidum, Melampyrum lineare, Schizachyrium scoparium, Hypericum gentianoides, Kalmia latifolia*.
Range: The range of this community type includes the Appalachian Mountains in Maryland and possibly Virginia and West Virginia.
State/Provinces: MD:S?
TNC Ecoregions: 59:C
Authors: unknown **Confidence:** 1 **Identifier:** CEGL006563

PINUS VIRGINIANA - QUERCUS PRINUS / DESCHAMPSIA FLEXUOSA - CUNILA ORIGANOIDES WOODLAND

Virginia Pine - Rock Chestnut Oak / Wavy Hairgrass - Rock Oregano Woodland

Central Appalachian Acidic Shale Woodland **G3 (98-12-14)**

Ecological Group (SCS;MCS): Appalachian Shale Glades and Barrens (440-40; 2.3.4.4)

Concept: This shale barren woodland occurs in the central Appalachian Mountains from south-central Pennsylvania to southwestern Virginia. The community occurs on steep unstable shale slopes with areas of exposed bedrock. Canopy dominants are *Pinus virginiana* and *Quercus prinus*. Associates include *Juniperus virginiana, Quercus rubra, Quercus velutina, Carya glabra, Carya ovata*, and *Fraxinus americana*. The shrub layer is open and includes *Vaccinium stamineum, Rosa carolina, Quercus ilicifolia*, and *Rhus copallinum*. The ground layer is characterized by *Carex pensylvanica, Danthonia spicata, Asplenium platyneuron, Cheilanthes lanosa, Helianthus divaricatus, Paronychia montana, Penstemon hirsutus, Viola pedata, Cunila origanoides, Potentilla simplex, Antennaria virginica, Packera antennariifolia (= Senecio antennariifolius), Houstonia longifolia (= var. longifolia, = Houstonia tenuifolia), Solidago arguta var. harrisii (= Solidago harrisii), Silene caroliniana ssp. pensylvanica (= Silene pensylvanica)*, and *Phlox subulata*. Southern examples may contain *Clematis albicoma, Arabis serotina*, and *Penstemon pallidus (= Penstemon brevisepalus)*.
Comments: This community type is representative of shale barren vegetation to the north and south of the region of highest floristic endemism (west-central Virginia and adjacent West Virginia). Further data collection and analysis is needed to better characterize environmental factors influencing this association across its full geographic range.
Range: This community occurs in the Central Appalachian Mountains from the Ridge and Valley of south-central Pennsylvania and Maryland to eastern west Virginia and west-central Virginia. It appears to be the typical vegetation type of more northern shale barrens. In Virginia, this unit is restricted to the Ridge and Valley province. It is most common in northwestern Virginia (Page, Shenandoah, Warren, and Frederick counties), with disjunct stands in Craig and Botetourt counties, near the southern limits of shale barrens in Virginia.
States/Provinces: MD:S?, PA:S?, VA:S?, WV:S?
TNC Ecoregions: 59:C
USFS Ecoregions: M221Aa:CCC, M221Ab:CC?, M221Bd:CCC
Synonymy: Chestnut oak-Virginia pine/hairgrass acidic shale woodland (northern type) (CAP pers. comm. 1998), *Quercus prinus - Pinus virginiana / Deschampsia flexuosa - Selaginella rupestris - Packera antennariifolia* Woodland (Fleming and Coulling 2001)
References: CAP pers. comm. 1998, Fleming and Coulling 2001, Fleming et al. 2001
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006288

II.C.3.N.a.19. PINUS RIGIDA - QUERCUS (COCCINEA, VELUTINA) WOODLAND ALLIANCE

Pitch Pine - (Scarlet Oak, Black Oak) Woodland Alliance

Concept: This alliance contains mixed woodlands of well-drained, nutrient-poor sandy soils, often closely associated with pine barrens communities. This alliance occurs less commonly on bedrock ledges. The canopy is usually dominated by *Pinus rigida* and *Quercus coccinea*, with *Quercus velutina, Quercus alba*, and *Pinus strobus* in association. *Quercus ilicifolia, Quercus prinoides* may form a subcanopy, and ericaceous shrubs such as

Gaylussacia baccata, Vaccinium angustifolium, and *Vaccinium pallidum* are common. Light-demanding species are common in these communities: *Schizachyrium scoparium, Arctostaphylos uva-ursi, Carex pensylvanica, Hudsonia tomentosa, Hudsonia ericoides*, and *Lechea mucronata (= Lechea villosa)*.
Range: This alliance occurs in New York, southern New England, and likely occurs in New Jersey. Its occurrence outside the northeastern United States has not yet been evaluated. It does not occur in Maryland.
States/Provinces: CT MA MD NH NJ NY PA RI WV
TNC Ecoregions: 49:P, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Aa:CCP, 221Ab:CCP, 221Ac:CCP, 221Ad:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Ak:CCC, 221Al:CCP, 221Bc:CCP, 221Bd:CCC, 221Ea:CPP, 221Fa:CPP, 232Aa:CCC, M212Bb:CCP, M212Bc:CCP, M212Bd:CCP, M212Cb:CCC, M212Cc:CCP, M212Ea:CPP, M212Eb:CPP, M221Aa:CCP, M221Bd:CPP, M221Cb:CPP
Synonymy: Maritime Pitch Pine on Dunes (Swain and Kearsley 2001); Coastal Forest/Woodland (Swain and Kearsley 2001); Pitch Pine - Oak Forest / Woodland (Swain and Kearsley 2001); Pitch pine - mixed hardwood woodland (Fike 1999); Ridgetop Dwarf-tree Forest, in part (Smith 1991); Pitch Pine: 45, in part (Eyre 1980)
References: Eyre 1980, Fike 1999, Smith 1991, Swain and Kearsley 2001
Authors: ECS, East **Identifier:** A.687

PINUS RIGIDA - QUERCUS (COCCINEA, VELUTINA) / SCHIZACHYRIUM SCOPARIUM WOODLAND
Pitch Pine - (Scarlet Oak, Black Oak) / Little Bluestem Woodland

G3G5 (97-12-01)

Concept: This type includes dry oak-pine woodlands in the Lower New England region and on dry eastern slopes in the High Alleghenies. The open canopy is codominated by *Pinus rigida* and *Quercus coccinea* and/or *Quercus velutina*. *Quercus alba* and *Pinus strobus* may be present as well. The shrub layer may include *Quercus ilicifolia, Quercus prinoides*, and/or ericaceous shrubs such as *Gaylussacia baccata, Vaccinium angustifolium*, and *Vaccinium pallidum*. Light-demanding species such as *Schizachyrium scoparium, Danthonia spicata*, and *Carex pensylvanica* are common in this community. Other associates include *Arctostaphylos uva-ursi, Hudsonia tomentosa, Hudsonia ericoides*, and *Lechea mucronata (= Lechea villosa)*. It occurs on well-drained, nutrient-poor sandy soils, often associated with pine barrens communities. It also occurs on bedrock ledges / ridges.
States/Provinces: CT:S?, MA:S5,S2, MD:S?, NH:S?, NJ:S?, NY:S3S4, PA:S?, RI:S?, WV:S?
TNC Ecoregions: 49:P, 60:C, 61:C, 63:?
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCP, 221Bd:CCC, 221Ea:CPP, 221Fa:CPP, M212Bb:CCP, M212Bc:CCP, M212Bd:CCP, M212Cb:CCC, M212Cc:CCP, M212Ea:CPP, M212Eb:CPP
Synonymy: SNE dry oak/pine forest on sandy/gravelly soils (Rawinski 1984) B. in part, SNE dry oak/pine forests on acidic bedrock or till (Rawinski 1984) B. in part
References: Breden et al. 2001, Fike 1999, Lundgren 2000, Lundgren 2001, Rawinski 1984, Swain and Kearsley 2001
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006166

III. SHRUBLAND

III.A.2.N.i. Saturated temperate broad-leaved evergreen shrubland

III.A.2.N.i.100. MORELLA CERIFERA SATURATED SHRUBLAND ALLIANCE
Wax-myrtle Saturated Shrubland Alliance

Concept: This alliance includes wetland dune swales and other wetland shrubland situations dominated by *Morella cerifera (= Myrica cerifera)*, including sheltered backdunes, wetland flats, and interdune swales. Associated shrubs may include *Baccharis halimifolia, Acer rubrum, Vaccinium formosum, Rosa palustris, Ilex opaca var. opaca, Juniperus virginiana var. silicicola*, and *Morella pensylvanica (= Myrica pensylvanica)*. This shrubland vegetation can form vast thickets in some cases; there may be inclusions of small wetland graminoid-dominated areas. Vines may be frequent and can include *Toxicodendron radicans ssp. radicans, Smilax* spp., *Vitis* spp., and *Parthenocissus quinquefolia*. Associated herbaceous species can include *Boehmeria cylindrica,*

Calystegia sepium, Carex albolutescens, Carex hormathodes, Chasmanthium laxum, Festuca rubra, Galium obtusum, Hydrocotyle spp., *Juncus dichotomus, Juncus scirpoides, Leersia virginica, Osmunda regalis var. spectabilis, Panicum* spp., *Polygonum pensylvanicum*, and *Woodwardia areolata* (in the northern part of the range); and *Andropogon glomeratus var. pumilus, Fimbristylis castanea, Hydrocotyle bonariensis, Juncus roemerianus, Muhlenbergia filipes*, as well as *Spartina patens* and *Sabatia stellaris* (in southern examples). This is maritime shrub vegetation which generally exists in a tension zone between more exposed or active grassland vegetation and more protected and stable maritime forests. Older stands of maritime shrub vegetation ultimately become dominated by stunted and salt-pruned *Quercus virginiana*. See also the III.A.2.N.c *Quercus virginiana - Ilex vomitoria - (Morella cerifera)* Shrubland Alliance (A.785), which generally occurs in drier and more exposed sites. Soils are deep sands of stabilized dunes, with limited if any horizon development. An overlying layer of 'muck' is reported in northern examples.
Range: This alliance is found in Florida, Georgia, Louisiana, North Carolina, South Carolina, Delaware, Maryland, Virginia, and New Jersey.
States/Provinces: DE FL GA LA MD NC NJ SC VA
TNC Ecoregions: 31:C, 53:?, 54:P, 55:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CPP, 232Ad:CPP, 232Bq:CC?, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCP, 232Ci:CCC, 232E:CC, 232Gb:CCC
Federal Lands: DOD (Cape Canaveral, Fort Benning?); NPS (Assateague Island, Cape Hatteras, Cape Lookout, Fort Pulaski); USFWS (Cape Romain?, Chincoteague, Merritt Island?, Pea Island)
Synonymy: Coastal Interdunal Swale (FNAI 1992a); Maritime interdune shrub vegetation (Ambrose 1990a); Maritime Shrub, in part (Schafale and Weakley 1990); mesic shrub zone, in part (Higgins et al. 1971); Shrub succession community, in part (Hill 1986); thicket community, in part (Boule 1979); swamp thicket, in part (Klotz 1986)
References: Ambrose 1990a, Boule 1979, FNAI 1992a, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990
Authors: A.S. WEAKLEY 9-94, MOD. E, MP, Southeast **Identifier:** A.1906

MORELLA CERIFERA - BACCHARIS HALIMIFOLIA / SPARTINA PATENS SHRUBLAND
Wax-myrtle - Groundsel-tree / Saltmeadow Cordgrass Shrubland
Maritime Wax-myrtle Shrubland **G3G5 (95-11-14)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Maritime Shrublands (240-30; n/a)

Concept: This mesic shrub community occurs on sheltered maritime backdunes of the mid-Atlantic states. The vegetation is not tidally flooded, although it is impacted by salt spray. The substrate is sand or loamy sand with little or no organic layer. The water table is often less than half a meter below the surface. This community is characterized by a moderately open canopy of *Morella cerifera (= Myrica cerifera), Baccharis halimifolia, Morella pensylvanica (= Myrica pensylvanica)*, and *Rhus copallinum*. *Spartina patens* and *Toxicodendron radicans* are characteristic of the herbaceous layer, with other associates include *Panicum virgatum, Andropogon virginicus, Juncus dichotomus, Solidago sempervirens, Smilax* spp., *Parthenocissus quinquefolia, Vitis* spp., and *Schoenoplectus pungens (= Scirpus pungens)*.
Comments: This association is differentiated from *Morella cerifera / Hydrocotyle verticillata* Shrubland (CEGL003840) by the absence of certain wetland species and muck soils, and from *Morella cerifera - Vaccinium corymbosum* Shrubland (CEGL003906) by the absence of bog species. This association can grade into maritime forest types.
Range: This type occurs from New Jersey to Virginia and possibly farther south to South Carolina.
States/Provinces: DE:S4?, MD:S?, NC?, NJ:S?, SC?, VA?
TNC Ecoregions: 57:P, 58:C, 62:C
USFS Ecoregions: 232Ab:CPP, 232Bz:CCC, 232Ch:CCP, 232Ci:CCP
Federal Lands: NPS (Assateague Island)
Synonymy: Mesic shrub community (Higgins et al. 1971) B. Assateague Island., Shrub succession community (Hill 1986) B. Assateague Island., Thicket community (Boule 1979) =. Virginia., Upland thicket (Klotz 1986) =. Virginia., Salt grass sea myrtle red cedar savanna (Martin 1959b) ?. New Jersey., Salt grass sea myrtle savanna (Martin 1959b) ?. New Jersey.
References: Berdine 1998, Boule 1979, Bowman 2000, Breden et al. 2001, Fleming 2001, Higgins et al. 1971, Hill 1986, Klotz 1986, Martin 1959b, Schafale and Weakley 1990
Authors: ECS **Confidence:** 3 **Identifier:** CEGL003809

MORELLA CERIFERA / HYDROCOTYLE VERTICILLATA SHRUBLAND
Wax-myrtle / Whorled Pennywort Shrubland

G? (97-12-01)

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Maritime Shrublands (240-30; n/a)

Concept: This tall wet shrubland of sheltered maritime backdunes is restricted to the mid-Atlantic states. Although the hydrologic regime of this shrubland is somewhat variable, it is influenced by a shallow water table and surface water may be present in pools. A shallow to moderately deep layer of muck usually characterizes the soil profile. This community can form dense wet thickets, particularly in more protected areas. The vegetation is strongly dominated by tall, tree-like shrub growth of *Morella cerifera (= Myrica cerifera)*, with associates including *Baccharis halimifolia, Rosa palustris*, and *Acer rubrum* saplings occurring at very low cover. Shrubs may reach heights of 6 m and appear tree-like in their growth form. Herbaceous vegetation can be quite lush and diverse. Common herbs include *Hydrocotyle verticillata, Hydrocotyle umbellata, Chasmanthium laxum, Woodwardia areolata, Osmunda regalis var. spectabilis, Carex longii, Leersia virginica, Polygonum pensylvanicum, Boehmeria cylindrica, Calystegia sepium, Ludwigia palustris, Juncus canadensis, Ptilimnium capillaceum, Lycopus americanus, Galium obtusum, Samolus valerandi ssp. parviflorus (= Samolus parviflorus), Pluchea odorata, Mikania scandens*, and *Polygonum pensylvanicum*. *Toxicodendron radicans* can be very common and constitutes a large portion of the 'understory' cover. This community can be prone to invasion by *Phragmites australis*.
Comments: The classification of maritime shrublands dominated by *Morella cerifera* is murky and requires further data for clarification.
Range: Currently described from Maryland and Virginia.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232A:CP, 232Bz:CCC, 232C:CC
Federal Lands: NPS (Assateague Island); USFWS (Chincoteague)
Synonymy: Mesic shrub zone (Higgins et al. 1971) B. Assateague Island., Shrub succession community (Hill 1986) B. Assateague Island., Thicket community (Boule 1979) B. Virginia., Swamp thicket (Klotz 1986) B. Virginia.
References: Berdine 1998, Boule 1979, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Klotz 1986
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL003840

III.A.2.N.I. Tidal broad-leaved evergreen temperate shrubland

A.806—MORELLA CERIFERA - ROSA PALUSTRIS TIDAL SHRUBLAND ALLIANCE (III.A.2.N.I.1)

Wax-myrtle - Swamp Rose Tidal Shrubland Alliance

Summary: Tidally flooded shrublands of the middle Atlantic Coastal Plain, occurring in association with freshwater tidal marshes and tidally flooded forests. *Morella cerifera (= Myrica cerifera var. cerifera)* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species 'recruited' from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed in these communities. Farther south, in the South Atlantic Coastal Plain, this alliance occurs on flats adjacent to tidal reaches of rivers. Examples receive seepage from adjacent uplands, maintaining a saturated condition, and also may receive tidal inundation in very rare storm tide events. Scattered trees of *Pinus taeda* and *Sabal palmetto* may be present. *Morella cerifera* and *Toxicodendron radicans ssp. radicans* dominate the dense shrub stratum, and *Baccharis angustifolia* can be a major component. *Spartina bakeri* is the dominant herb; other herbs include *Juncus roemerianus, Cladium mariscus ssp. jamaicense, Cynanchum angustifolium*, and *Ipomoea sagittata*. Occurrences can exceed 50 acres in size. This latter, more southerly example of this alliance is placed here for now; the hydrology is ambiguous.
Environment: Tidally flooded shrublands of the middle Atlantic Coastal Plain, occurring in association with

freshwater tidal marshes and tidally flooded forests. Farther south, in the South Atlantic Coastal Plain, this alliance occurs on flats adjacent to tidal reaches of rivers. Examples receive seepage from adjacent uplands, maintaining a saturated condition, and also may receive tidal inundation in very rare storm tide events.
Physiognomy:
Vegetation: *Morella cerifera (= Myrica cerifera var. cerifera)* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species 'recruited' from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed in these communities. Farther south, scattered trees of *Pinus taeda* and *Sabal palmetto* may be present. *Morella cerifera* and *Toxicodendron radicans ssp. radicans* dominate the dense shrub stratum, and *Baccharis angustifolia* can be a major component. *Spartina bakeri* is the dominant herb; other herbs include *Juncus roemerianus, Cladium mariscus ssp. jamaicense, Cynanchum angustifolium*, and *Ipomoea sagittata*.
Range: This alliance is found in Georgia, Maryland, North Carolina, South Carolina, and Virginia.
States/Provinces: GA MD NC SC VA
TNC Ecoregions: 56:C, 57:C, 58:P
USFS Ecoregions: 232Cb:CC?, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC
References: Fleming 1998
Authors: G.P. FLEMING/A.S. WEAKLEY

MORELLA CERIFERA - ROSA PALUSTRIS / THELYPTERIS PALUSTRIS VAR. PUBESCENS SHRUBLAND
Wax-myrtle - Swamp Rose / Marsh Fern Shrubland
Wind Tidal Wax-myrtle - Willow Thicket **G2G3**
Ecological Group: Atlantic and Gulf Coast Tidal Shrublands (202-20; n/a)

Summary: This shrub community of the central Atlantic Coastal Plain occurs in ecotonal sites between tidal marshes and tidal swamps in fresh to oligohaline portions of coastal rivers and embayments. It occupies soupy peats. It is a natural community, but likely has a long-term and complicated successional relationship with other (primarily marsh communities) in the landscape in which it occurs, related to hydrology and fire. *Morella cerifera (= Myrica cerifera var. cerifera)* is the characteristic dominant species (with 25-75% cover), with *Rosa palustris, Salix caroliniana*, and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species 'recruited' from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed.
Environment: This shrub community occurs in ecotonal sites between tidal marshes and tidal swamps. It occupies soupy peats. According to Fleming et al. (2001), this community is part of a large group of tidal shrublands which occupy tidally flooded and wind-tidally flooded areas of freshwater to oligohaline rivers and embayments.
Vegetation: *Morella cerifera (= Myrica cerifera var. cerifera)* is the characteristic dominant species (with 25-75% cover), with *Rosa palustris, Salix caroliniana*, and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species 'recruited' from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed.
Dynamics: This is a natural community, but likely has a long-term and complicated successional relationship with other (primarily marsh communities) in the landscape in which it occurs, related to hydrology and fire.

Range:
States/Provinces: MD:S3S4, NC:S?, VA:S?
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Bx:CCC, 232Bt:CCC, 232Bz:CCC, 232Ch:CCC, 232Ci:CCC
Synonymy: *Myrica cerifera - Salix caroliniana / Thelypteris palustris ssp. pubescens* Tidally Flooded Shrubland (Fleming 1998)
References: Coulling 2002, Fleming 1998, Fleming et al. 2001, Harrison 2003
Authors: Fleming 1998, Harrison 2003 **Confidence:** 2 **Identifier:** CEGL004656

MORELLA CERIFERA – BACCHARIS HALIMIFOLIA / ELEOCHARIS FALLAX SHRUBLAND
Wax-myrtle – Groundsel Tree / Creeping Spikerush Shrubland
Brackish Tidal Creek Shrubland **G?**

Summary: This oligohaline tidal shrubland of brackish tidal waters occurs in Maryland on firm, partially decomposed peat lacking pronounced hummock-hollow microtopography. This vegetation forms linear stands along tidal channels between freshwater tidal marshes and adjacent swamp forests. The shrub canopy is relatively open to moderately dense, and is dominated by *Morella cerifera*. *Baccharis halimifolia* is a common associate; others include *Acer rubrum* and *Toxicodendron radicans.* The herbaceous layer is relatively diverse and characterized by *Eleocharis fallax, Kosteletzkya virginica, Hibiscus moscheutos, Typha angustifolia, Polygonum punctatum, Cyperus filicinus, Panicum virgatum, Schoenoplectus americanus, Amaranthus cannabinus, Hydrocotyle verticillata, Pluchea purpurascens, Spartina alterniflora, Lythrum lineare, Asclepias incarnata, Ptilimnium capillaceum,* and *Carex hormathodes.*
Range: This vegetation occurs on tidal rivers of the central Atlantic coast.
States/Provinces: DE:SP, MD:S3, VA:SP
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bx:CCC
Authors: J.Harrison / L. Sneddon
References: Harrison 2003 **Confidence:** 3 **Identifier:** CEGL006846

III.B.2.N.a. Temperate cold-deciduous shrubland

III.B.2.N.a.9. MORELLA PENSYLVANICA - (PRUNUS MARITIMA) SHRUBLAND ALLIANCE

Northern Bayberry - (Beach Plum) Shrubland Alliance

Concept: Dune thickets of the Mid-Atlantic Coast; this alliance includes maritime shrublands dominated by *Morella pensylvanica (= Myrica pensylvanica)*, with *Baccharis halimifolia, Rhus copallinum*, and stunted individuals of *Pinus taeda*. *Prunus maritima* is characteristic of this community from Maryland to the north. The constant movement of sand in this community limits the herbaceous cover. Typical herbaceous species include *Ammophila breviligulata, Cenchrus tribuloides, Chamaesyce polygonifolia, Cyperus grayi, Dichanthelium acuminatum, Diodia teres, Hudsonia tomentosa, Lechea maritima, Oenothera humifusa, Panicum amarum var. amarulum, Parthenocissus quinquefolia, Rumex acetosella, Solidago sempervirens, Spartina patens, Toxicodendron radicans*, and *Triplasis purpurea*. This maritime shrubland usually occupies the intermediate areas between the very unstable oceanward portions of the dunes and the more protected backdunes, where it forms partially open to dense shrub thickets. The substrate is sand with no soil profile development, and with variable amounts of accumulated leaf litter. Where this community occupies the lee side of foredunes, greater exposure to winds and storms contributes to a shorter stature and more open aspect of the vegetation. Here there are large patches of open unvegetated or sparsely vegetated sand.
Range: This alliance is found in North Carolina, Delaware, Maryland, Virginia, and others.
States/Provinces: CT DE MA MD ME NC NH NJ NY RI VA
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212A:CC, 212Cb:CPP, 212Db:CPP, 212Dc:CPP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ai:CCP, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bc:CCP, 232Bd:CCP, 232Bz:CCC, 232Ch:CCP, 232Ci:CCC, 232Cj:CCP
Federal Lands: NPS (Acadia, Assateague Island, Fire Island)

Synonymy: Maritime Shrub, in part (Schafale and Weakley 1990); *Prunus maritima-Myrica pensylvanica* coastal dune scrub (Clancy 1993b); dunegrass-shrub transition zone, in part (Higgins et al. 1971); Shrub succession community, in part (Hill 1986); upland (dune) thicket, in part (Klotz 1986); Maritime Dune Community (Swain and Kearsley 2001); Maritime Shrubland Community (Swain and Kearsley 2001)
References: Clancy 1993b, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990, Sneddon et al. 1996, Swain and Kearsley 2001
Authors: ECS, MP, East **Identifier:** A.902

MORELLA PENSYLVANICA / DIODIA TERES SHRUBLAND
Northern Bayberry / Rough Buttonweed Shrubland
Atlantic Coast Maritime Shrubland **G2 (99-01-28)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Maritime Shrublands (240-30; n/a)

Concept: This community is a maritime shrubland dominated by *Morella pensylvanica (= Myrica pensylvanica)*, occurring with *Baccharis halimifolia, Rhus copallinum*, and stunted individuals of *Pinus taeda, Prunus serotina, Quercus virginiana*, and *Diospyros virginiana*. The constant movement of sand in this community limits the herbaceous cover. Typical herbaceous species include *Ammophila breviligulata, Panicum amarum var. amarulum, Cyperus grayi, Lechea maritima, Dichanthelium acuminatum, Spartina patens, Triplasis purpurea, Cenchrus tribuloides, Chamaesyce polygonifolia, Diodia teres, Hudsonia tomentosa, Oenothera humifusa, Parthenocissus quinquefolia, Rumex acetosella, Solidago sempervirens*, and *Toxicodendron radicans*. This maritime shrubland usually occupies the intermediate areas between the very unstable oceanward portions of the dunes and the more protected backdunes, where it forms partially open to dense shrub thickets. The substrate is sand with no soil profile development, and with variable amounts of accumulated leaf litter. Where this community occupies the lee side of foredunes, greater exposure to winds and storms contributes to a shorter stature and more open aspect of the vegetation. Here there are large patches of open unvegetated or sparsely vegetated sand. This community occurs from Delaware south to northern North Carolina.
Comments: This community is a maritime shrubland dominated by *Morella pensylvanica*. It supports the following species characteristic of the *Morella pensylvanica - (Prunus maritima)* Shrubland Alliance (A.902), including *Solidago sempervirens, Oenothera humifusa, Cyperus grayi, Ammophila breviligulata, Chamaesyce polygonifolia, Rhus copallinum*, and from Maryland and north, *Prunus maritima*. This association is further characterized by species that differentiate it from other communities in the alliance, most notably *Morella cerifera (= Myrica cerifera), Panicum amarum, Spartina patens, Baccharis halimifolia*, and stunted individuals of *Pinus taeda*. *Morella pensylvanica - Prunus maritima* Shrubland (CEGL006295) is the northern analog of this association.
Range: This association is restricted to backdunes of shorelines from Delaware to Nag's Head, North Carolina.
States/Provinces: DE:S?, MD:S?, NC:S3, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CPP, 232Ac:CPP, 232Bz:CCC, 232Ch:CCP, 232Ci:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: *Prunus maritima, Myrica pensylvanica* coastal dune scrub association (Clancy 1993a) =. Delaware., Dunegrass-shrub transition zone (Higgins et al. 1971) =. Assateague Island., Shrub succession community (Hill 1986) B. Assateague Island., Upland (dune) thicket (Klotz 1986) B. Virginia.
References: Berdine 1998, Bowman 2000, Clancy 1993a, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990, Sneddon et al. 1996
Authors: L.A. Sneddon, ECS **Confidence:** 2 **Identifier:** CEGL003881

III.B.2.N.a.300. PRUNUS SEROTINA - AMELANCHIER CANADENSIS - QUERCUS SPP. SHRUBLAND ALLIANCE

Black Cherry - Canada Serviceberry - Oak species Shrubland Alliance

Concept: This alliance includes temperate deciduous maritime shrublands, generally occurring on the lee side of sand dunes. The physiognomy of this vegetation is highly variable and may range from open woodland to stunted forest to dense nearly impenetrable thicket. Individual trees tend to be wind-pruned and multiple-stemmed. The canopy may contain *Prunus serotina var. serotina, Amelanchier canadensis, Pinus taeda, Photinia pyrifolia (= Aronia arbutifolia)*, and *Sassafras albidum* in varying proportions. *Acer rubrum, Diospyros virginiana*, and *Malus angustifolia* may also be present; *Pinus taeda* and *Ilex opaca var. opaca* may occur locally. *Morella cerifera (=*

Myrica cerifera) may form a subcanopy, but if the community is particularly stunted, this species may contribute substantially to the canopy as well. This vegetation combines with tall *Vaccinium formosum* to form dense thickets. Examples support vines in great abundance, such as *Smilax rotundifolia, Smilax glauca, Parthenocissus quinquefolia*, and *Toxicodendron radicans*. Herbs are generally scarce to entirely lacking, due to heavy shading from the dense canopy above, and when present are generally tree and vine seedlings sparsely scattered on the dry leaf litter. *Festuca rubra* and *Rumex acetosella* may also be present. Some examples on the coast are subject to salt spray and winds, exhibiting wind pruning. The substrate varies from pure sand directly adjacent to the ocean, to loamy sands in more sheltered areas. Vegetation in these sheltered areas is sometimes referred to as 'sunken forest.' This name refers to the topographic position of these examples, which are found in large depressions, lower in elevation (by 1-3 m) than the interdunes. These examples are shielded from strong prevailing winds and salt spray, which permits lush growth of broadleaf shrub and vine species.
Comments: The physiognomy is better described as shrubland, as height is generally <5 m and is comprised of multiple stems.
Range: This alliance is found in Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, and Virginia.
States/Provinces: CT DE MA MD ME NH NJ NY RI VA
TNC Ecoregions: 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221D:CP, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bb:CC?, 232Bc:CCP, 232Bd:CCP, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: White Oak: 53, in part (Eyre 1980); Black Oak: 110, in part (Eyre 1980); Maritime Shrubland Community (Swain and Kearsley 2001); Maritime Oak - Holly Forest / Woodland (Swain and Kearsley 2001)
References: Bellis 1992, Boule 1979, Dunlop and Crow 1985, Eyre 1980, Higgins et al. 1971, Hill 1986, Martin 1959b, Sneddon et al. 1994, Stalter 1979, Swain and Kearsley 2001
Authors: ECS 12-95, MOD., RW, East **Identifier:** A.237

PRUNUS SEROTINA / MORELLA CERIFERA / SMILAX ROTUNDIFOLIA SHRUBLAND
Black Cherry / Wax-myrtle / Common Greenbrier Shrubland
Chesapeake Bay Deciduous Maritime Shrub Forest **G1G2 (97-11-18)**
Ecological Group (SCS;MCS): Atlantic Zone Tidal Aquatic Vegetation (201-10; n/a)
Atlantic and Gulf Coast Maritime Shrublands (240-30; n/a)

Concept: This association comprises tall, temperate, deciduous maritime shrublands of the mid-Atlantic coast. It generally occurs on the lee side of sand dunes along the coast and is subject to salt spray and winds. The substrate varies from pure sand directly adjacent to the ocean to loamy sands in more sheltered areas of the coast. Although placed within the shrubland class, the physiognomy of this vegetation can be variable and ranges from open woodland to stunted forest to dense nearly impenetrable thicket (this association was previously placed in the forest class). Individual trees tend to be wind-pruned and multi-stemmed. The vegetation is dominated by *Prunus serotina, Amelanchier canadensis, Pinus taeda, Sassafras albidum, Photinia pyrifolia (= Aronia arbutifolia)*, and *Diospyros virginiana* in varying proportions. *Morella cerifera (= Myrica cerifera)* and *Vaccinium corymbosum* may form a subcanopy, but if the community is particularly stunted, this species may contribute substantially to the canopy. Lianas are abundant in the canopy or over the ground layer, and species include *Smilax rotundifolia, Smilax glauca, Parthenocissus quinquefolia*, and *Toxicodendron radicans*. Herbs are generally scarce to lacking entirely, and when present are generally made up of tree and vine seedlings.
Comments: This community is similar to the *Prunus serotina - Sassafras albidum - Amelanchier canadensis / Smilax rotundifolia* Shrubland (CEGL006145) of the same alliance (Sneddon et al. 1994), which ranges from southern New Hampshire to New Jersey but is differentiated from this community by the presence of *Pinus taeda* and *Morella cerifera*.
Range: This association occurs along the mid-Atlantic coast from Virginia north to Cape May, New Jersey.
States/Provinces: DE:S?, MD:S?, NJ:S1, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Woodland community (Hill 1986) B. Assateague Island., Mixed woodland (Higgins et al. 1971) B. Assateague Island., Upland forest (Klotz 1986) I, Woodland (Boule 1979) =. Virginia., Oligotrophic woodland (Rawinski 1992) B, Dune woodland/dune shrubland (Breden 1989) B

References: Bellis 1992, Berdine 1998, Boule 1979, Bowman 2000, Breden 1989, Breden et al. 2001, Dunlop and Crow 1985, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Klotz 1986, Rawinski 1992, Sneddon et al. 1994, Stalter 1979
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006319

III.B.2.N.a.16. SMILAX SPP. - TOXICODENDRON RADICANS VINE-SHRUBLAND ALLIANCE

Greenbrier species - Poison-ivy Vine-Shrubland Alliance

Concept: This alliance includes vine-covered maritime sand dunes. Generally confined to barrier beach systems, this vegetation is comprised of dense vines that cover the crests of dunes exposed to salt spray and winds. Very little soil development occurs, and the water table is located greater than 1 m below the soil surface. The dominant species of any single dune may be one of any number of vine species such as *Smilax glauca, Smilax rotundifolia, Vitis rotundifolia, Parthenocissus quinquefolia*, or *Toxicodendron radicans*. In some cases, the vines are low-growing and occur directly on the sand surface, but in others, the vegetation has a height of 1 m or more, with vines growing over older stems of the same species, or over other shrubs such as *Morella pensylvanica (= Myrica pensylvanica)* or *Morella cerifera (= Myrica cerifera)*. The vegetation is generally low to the ground (less than 0.5 m tall) and generally covers 70-80% of the surface of the ground, the remainder being exposed sand.
Range: This alliance is found in North Carolina, Delaware, Maryland, New York, and possibly Virginia (?).
States/Provinces: DE MA MD NC NJ NY VA?
TNC Ecoregions: 57:C, 58:C, 61:P, 62:C
USFS Ecoregions: 221A:CC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bt:CCP, 232Bz:CCC, 234An:PPP
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Vine dune (Martin 1959b); Greenbrier thicket (Martin 1959b); Maritime Dune Community (Swain and Kearsley 2001); Maritime Shrubland Community (Swain and Kearsley 2001)
References: Martin 1959b, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.909

SMILAX GLAUCA - TOXICODENDRON RADICANS VINE-SHRUBLAND
Whiteleaf Greenbrier - Poison-ivy Vine-Shrubland
North Atlantic Coastal Plain Vine Dune **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Maritime Shrublands (240-30; n/a)

Concept: This community is best described as vine-covered maritime sand dunes. Generally confined to barrier beach systems of the North Atlantic, this vegetation is comprised of dense vines that cover the crests of dunes exposed to wind, salt spray and periodic overwash by storm tides. Very little soil development occurs, and the water table is well below 1 m in depth. The dominant species of any single dune may be one of several vine species such as *Smilax glauca, Smilax rotundifolia, Vitis rotundifolia, Parthenocissus quinquefolia*, or *Toxicodendron radicans*. In some cases, the vines are shallowly rooted in sand or growing over older vine stems or other living or dead shrubs such as *Morella pensylvanica (= Myrica pensylvanica)*. Scattered dune grassland species may be present like *Ammophila breviligulata, Lechea maritima, Solidago sempervirens*, and *Hudsonia tomentosa*. Diagnostic species are *Smilax glauca, Smilax rotundifolia, Toxicodendron radicans*, and *Parthenocissus quinquefolia*. The vegetation is generally low to the ground (less than half a meter tall) and generally covers 70-80% of the surface of the ground, the remainder being exposed sand. This vegetation is not widely described in the literature, but is likely to occur in New England south to Maryland and perhaps Virginia.
Range: This type is likely to occur in New England south to Maryland and perhaps Virginia.
States/Provinces: DE:S?, MA:S2,S2,S3, MD:S?, NJ:S?, NY:S3, VA?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 221A:CC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bt:CCP, 232Bz:CCC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Greenbrier thicket (Martin 1959b). New Jersey., Coastal dune community (Rawinski 1984), SNE coastal rocky headland community (Rawinski 1984)
References: Berdine 1998, Bowman 2000, Edinger et al. 2002, Martin 1959b, Rawinski 1984, Reschke 1990, Sneddon and Lundgren 2001, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL003886

III.B.2.N.d. Temporarily flooded cold-deciduous shrubland

III.B.2.N.d.2. ALNUS SERRULATA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

Smooth Alder Temporarily Flooded Shrubland Alliance

Concept: This alliance includes temporarily flooded shrub thickets dominated by *Alnus serrulata* along rivers and streams on rocky shoals and gravel bars. Other common species include *Cephalanthus occidentalis, Cornus amomum, Cornus obliqua (= Cornus amomum ssp. obliqua), Cornus foemina, Hypericum prolificum, Lyonia ligustrina, Viburnum nudum, Physocarpus opulifolius, Amorpha fruticosa, Xanthorhiza simplicissima*, and others.
Range: Currently this alliance is defined for the Chesapeake Bay Lowlands, Southern Blue Ridge, Ozarks, Ouachitas, Cumberland Plateau, the southern Alleghenies, and the northern Ridge and Valley. It is possible in the upper West and East Gulf coastal plains. This alliance is found in Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Louisiana, Maryland, Delaware, Virginia, West Virginia, and possibly Missouri (?).
States/Provinces: AL AR DE GA KY LA MD MO NC NY OK PA SC TN VA? WV
TNC Ecoregions: 32:P, 38:C, 39:C, 40:?, 43:P, 44:P, 49:P, 50:C, 51:C, 52:P, 53:P, 58:C, 59:C, 60:P, 64:P
USFS Ecoregions: 212F:CP, 212G:CP, 221Bd:CCP, 221Eb:CC?, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CC?, 222E:PP, 231B:CP, 231Cd:CCC, 231Dc:CCC, 231E:CP, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232B:CP, 234Ab:CCC, 255Ac:CCP, 255Ad:CCP, M212Ea:CCP, M212Eb:CCP, M221Aa:CCP, M221Ba:CP?, M221Bd:CP?, M221Cb:CC?, M221Dc:CCC, M221Dd:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Fort Benning); NPS (Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Daniel Boone, Jefferson, Mark Twain, Nantahala, Ouachita, Ozark, Pisgah, Sumter); USFWS (Cahaba River, Little River)
Synonymy: IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990); Mountain stream-edge shrub/scrub vegetation (Ambrose 1990a); Rocky Bar and Shore (Schafale and Weakley 1990); Sand and Mud Bar (Schafale and Weakley 1990); *Alnus serrulata* shrubland alliance (Hoagland 1998a); Shoal and Stream Bar (Nelson 1986); *Alnus/Xanthorhiza* rocky stream margin (Newell and Peet 1995); Mountain River, in part (Wharton 1978); Alder - ninebark wetland (Fike 1999); Circumneutral Shrub Swamp, in part (Smith 1991)
References: Allard 1990, Ambrose 1990a, Cooper 1963, DuMond 1970, Fike 1999, Hoagland 1998a, Nelson 1986, Newell and Peet 1995, Rodgers 1965, Schafale and Weakley 1990, Smith 1991, Tiner 1985a, Tobe et al. 1992, Wharton 1978
Authors: D.J. ALLARD, MOD., RW, Southeast **Identifier:** A.943

ALNUS SERRULATA - PHYSOCARPUS OPULIFOLIUS SHRUBLAND
Smooth Alder - Eastern Ninebark Shrubland
Allegheny Floodplain Alder Thicket **G5 (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Riverfront and Levee Forests and Shrublands (422-30; 1.6.3.4)

Concept: Floodplain alder thicket of the High Alleghenies and Western Allegheny Plateau regions. In the Central Appalachians these are shrub thickets dominated by *Alnus serrulata* along rivers and streams on rocky shoals and gravel and bars.
States/Provinces: MD:S?, NY:S?, PA:S?, VA?, WV:S?
TNC Ecoregions: 49:P, 59:C, 60:P
USFS Ecoregions: 212F:CP, 212G:CP, 221Bd:CCP, 221E:CC, M212Ea:CCP, M212Eb:CCP, M221A:CC, M221B:CP, M221C:CC
Synonymy: Alder-ninebark thickets (CAP pers. comm. 1998)
References: CAP pers. comm. 1998, Fike 1999
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006251

CORNUS AMOMUM - ALNUS SERRULATA SHRUBLAND
Silky Dogwood - Smooth Alder Shrubland
G? (00-10-10)
Ecological Group (SCS;MCS): Southeastern Coastal Plain Floodplain Shrublands (385-25; 1.6.4.5)

Concept: This Coastal Plain alluvial shrubland occurs in the Chesapeake Bay Lowlands on the non-tidal portions of rivers and non-tidal bay mouths. The shrub canopy is characterized by *Cornus amomum* with other associates including *Alnus serrulata, Cephalanthus occidentalis* and *Viburnum* spp., as well as saplings of *Acer rubrum, Fraxinus pennsylvanica*, and *Salix nigra*. Herbaceous associates include *Osmunda regalis, Decodon verticillatus, Utricularia* spp., *Limnobium spongia*, and *Cicuta bulbifera*.
Range: This Coastal Plain alluvial shrubland occurs in the Chesapeake Bay Lowlands.
States/Provinces: DE:S?, MD:S?, VA?
TNC Ecoregions: 58:C
USFS Ecoregions: 232:C
References: Tiner 1985a
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006414

III.B.2.N.d.10. BETULA NIGRA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

River Birch Temporarily Flooded Shrubland Alliance

Concept: *Betula nigra* thickets on sandy, gravelly or cobbly deposits, often forming on river islands where vegetation is frequently battered by floodwaters and thereby maintained in a shrubby condition. Associates include *Prunus* spp. and *Salix* spp., as well as stunted individuals of *Platanus occidentalis*. This alliance occurs in the Allegheny Plateau, Central Appalachians, and Hudson Valley.
Range: This alliance is found in Maryland, Virginia (?), West Virginia, and others. Occurs in Maryland at Chain Bridge on Potomac River and elsewhere.
States/Provinces: MD NJ NY PA VA? WV
TNC Ecoregions: 49:C, 50:P, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCP, 212Fb:CCC, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ak:CP?, 221Am:CPP, 221Ba:CCP, 221Bd:CCC, 221Da:CPP, 221Db:CPP, 221Ea:CCP, 221Ja:C??, 221Jc:C??, 231Aa:CPP, 231Ae:CPP, 231Af:CPP, 231Ak:CPP, 231Al:CPP, 231Am:CPP, 231An:CPP, 231Ao:CPP, 231Ap:CPP, 232Ac:CCC, 232Ad:CCP, 232Br:CPP, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Ba:CCP, M221Bb:CCP, M221Bd:CCP, M221Be:CCC, M221Ca:CC?, M221Cb:CCP, M221Cc:CC?, M221Cd:CCP, M221Da:CCC
Synonymy: River birch - sycamore floodplain scrub (Fike 1999); River Gravel Community (Smith 1991)
References: Fike 1999, Smith 1991
Authors: ECS, MP, East **Identifier:** A.951

BETULA NIGRA - SALIX INTERIOR SHRUBLAND

River Birch - Sandbar Willow Shrubland
Birch - Willow Riverbank Shrubland **G4G5 (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Riverfront and Levee Forests and Shrublands (422-30; 1.6.3.4)

Concept: This early-successional shrub community of riverbank floodplain and river gravel bars and islands occurs in the High Allegheny Plateau, Central Appalachians and Lower New England. It is subject to periodic flooding and ice-scour and occurs on sand, gravel or cobble deposits. It is dominated by stunted trees (less than 5 m tall) of *Acer saccharinum, Acer rubrum, Platanus occidentalis, Betula nigra, Acer negundo, Prunus* spp., and *Ulmus americana*. *Betula nigra* is characteristic and often dominant. Associates include *Cornus amomum, Salix exigua, Salix sericea, Alnus serrulata*, and *Physocarpus opulifolius*. Characteristic herbs include *Polygonum virginianum, Arisaema dracontium, Justicia americana*, and *Lobelia cardinalis*. Exotics such as *Polygonum cuspidatum* are a frequent problem.
Comments: *Salix interior* is listed as "rare" in Maryland and Virginia (Kartesz 1999).
Range: Found in the High Allegheny Plateau and Central Appalachian ecoregions from West Virginia, Maryland (and possibly Virginia) north to New York. Also attributed to the Western Allegheny Plateau.
States/Provinces: MD:S?, NJ:S?, NY:S5, PA:S?, VA?, WV:S?
TNC Ecoregions: 49:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fb:CCC, 212Fc:CCC, 212Fd:CCP, 212Gb:CCP, 221Bd:CCC, 221D:C?, 221E:CC, 231:C, 232Ac:CCC, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Ba:CCP, M221Bd:CCP, M221Be:CCC, M221C:CC, M221Da:CCC
Synonymy: River birch-willow thickets (CAP pers. comm. 1998)

References: CAP pers. comm. 1998, Edinger et al. 2002, Fike 1999, Kartesz 1999
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL003896

III.B.2.N.d.7. SALIX NIGRA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

Black Willow Temporarily Flooded Shrubland Alliance

Concept: Young, or frequently disturbed, thickets of *Salix nigra* along rivers or the shores of artificial lakes, often with few to no other species present. Placement of this vegetation in shrublands is related to disturbance frequency, both natural and anthropogenic. This alliance is present in the following regions: Piedmont, Cumberland Plateau, Coastal Plain, Ozark Highlands, Boston Mountains, Ouachita Mountains, Osage Hills, and Arkansas Valley.
Comments: Now (2000-05-17) includes the former *Salix nigra* Woodland (CEGL003731). Later successional and/or more speciose communities with *Salix nigra* as a dominant will be found in I.B.2.N.d *Salix nigra* Temporarily Flooded Forest Alliance (A.297).
Range: This alliance is present in the following regions: Piedmont, Cumberland Plateau, Coastal Plain, Ozark Highlands, Boston Mountains, Ouachita Mountains, Arkansas Valley, Mississippi River Alluvial Plain, and Florida Peninsula. It is found in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Maryland, Maine, New Hampshire, Vermont, Virginia, and West Virginia, and in Ontario, Canada, and possibly in Texas (?) and Ohio (?).
States/Provinces: AL AR CT FL GA IL? KY LA MA MD ME MS NC NH NY? OH? OK ON? PA SC TN TX VA VT WV
TNC Ecoregions: 32:P, 37:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:P, 50:C, 52:C, 53:C, 55:P, 56:C, 57:C, 59:C, 60:C, 61:C, 64:P
USFS Ecoregions: 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCP, 221Bd:CCP, 221Ec:C??, 221Ed:C??, 221Ef:C??, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Ca:CCC, 231Cd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232:C, 234Aa:CC?, 234Ai:CC?, 234Ak:CC?, 234Al:CC?, 234An:CCC, M212Bb:CCC, M212Bd:CCC, M212Cc:CCC, M212Eb:CCP, M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Fort Benning); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita?, Ozark?, Pisgah); USFWS (Eufaula)
Synonymy: Brownwater stream-edge shrub/scrub vegetation (Ambrose 1990a); Rocky Bar and Shore, in part (Schafale and Weakley 1990); Sand and Mud Bar, in part (Schafale and Weakley 1990); Black Willow: 95, in part (Eyre 1980); Black willow scrub/shrub wetland (Fike 1999); River Gravel Community (Smith 1991)
References: Ambrose 1990a, Eyre 1980, Fike 1999, Schafale and Weakley 1990, Smith 1991
Authors: A.S. WEAKLEY, MP, Southeast **Identifier:** A.948

SALIX NIGRA TEMPORARILY FLOODED SHRUBLAND
Black Willow Temporarily Flooded Shrubland
Black Willow Riverbank Shrubland **G4? (01-09-19)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Riverfront and Levee Forests and Shrublands (385-30; 1.6.4.4)

Concept: This broadly defined type represents vegetation dominated by scrubby forms of *Salix nigra* across the southeastern and northeastern United States, and possibly into Canada. Stature and closure may vary depending on disturbance. Additional types may be developed as more information becomes available.
Comments: This type conceptually includes communities formerly treated as woodlands [see the archived *Salix nigra* Woodland (CEGL003731)].
Range: This is a potentially wide-ranging association found throughout the southeastern and eastern United States, and possibly into Canada. This broadly defined association is found from the Ozarks and Interior Low Plateau, south to the West and East Gulf coastal plains and Florida Peninsula, east to the Atlantic Coastal Plain (excluding the Southern Blue Ridge) and north into the Central Appalachians and Northern Piedmont.
States/Provinces: AL:S?, AR:S?, FL:S?, GA:S?, IL?, KY:S?, LA:S?, MD:S?, MS:S?, NC:S5, OH?, OK:S?, ON?, SC:S?, TN:S?, TX:S?, VA:S?, WV:S?
TNC Ecoregions: 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:P, 50:C, 52:C, 53:C, 55:P, 56:C, 57:C, 59:C
USFS Ecoregions: 221Ec:C??, 221Ed:C??, 221Ef:C??, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Ca:CCC, 231Cd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232:C, M221Aa:CCP, M221Ab:CCP,

M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Fort Benning); USFS (Bankhead, Oconee?, Ouachita?, Ozark?); USFWS (Eufaula)
Synonymy: IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B. in part, Alluvial Shrub Swamp/Woodland (Thompson 1996) B, Palustrine Broad-leaved Deciduous Scrub/Shrub and Forested Wetland, Seasonally Flooded (PSS/FO1C) (Cowardin et al. 1979)
References: ALNHP 2002, Allard 1990, Baalman 1965, Blair 1938, Blair and Hubbell 1938, Cowardin et al. 1979, Fleming et al. 2001, Hefley 1937, Hoagland 2000, Johnson 1984, Kelting and Penfound 1950, McCoy 1958, Penfound 1953, Penfound 1961, Penfound 1965, Petranka and Holland 1980, Schafale and Weakley 1990, Thompson 1996
Authors: SCS **Confidence:** 2 **Identifier:** CEGL003901

III.B.2.N.e. Seasonally flooded cold-deciduous shrubland

III.B.2.N.e.3. CEPHALANTHUS OCCIDENTALIS SEASONALLY FLOODED SHRUBLAND ALLIANCE

Buttonbush Seasonally Flooded Shrubland Alliance

Concept: Vegetation in this alliance occurs in seasonally flooded basins in which the water level generally is beneath the soil surface by the end of the growing season. *Cephalanthus occidentalis* is the dominant species. Herbaceous species that may be present include *Carex striata, Glyceria* spp., *Polygonum amphibium*, and *Panicum verrucosum*. This alliance is distributed in the Coastal Plain in Maryland and Virginia and possibly along the Atlantic north to Massachusetts, the Interior Low Plateau of Tennessee, and possibly adjoining states; it also occurs in California. This alliance includes shrub vegetation of ponds over fragipan soils in southeastern central Tennessee.
Comments: This alliance needs resolution against III.B.2.N.f *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011), which is distributed throughout the Southeast and the Midwest. This description is based primarily upon information from California examples of the alliance. Further documentation and description of the alliance from other portions of its range are needed.
Range: This alliance is distributed in the coastal plain in Maryland and Virginia and possibly along the Atlantic north to Massachusetts, the Interior Low Plateau of Tennessee, and possibly adjoining states; it also occurs in California. This alliance includes shrub vegetation of ponds over fragipan soils in southeastern central Tennessee. In California, this alliance occurs in seasonally flooded basins throughout the inner northern and central Coast Ranges, the foothills of the Klamath, Cascade, and Sierra Nevada mountains, and in the Great Central Valley.
States/Provinces: AL? CA DE GA IL IN KY MA? MD MO MS? RI? TN VA
TNC Ecoregions: 32:P, 38:C, 39:C, 40:C, 43:P, 44:C, 50:C, 58:C, 59:C, 62:C
USFS Ecoregions: 221A:CC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Eb:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ac:CCP, 232B:CC, 234Aa:CCP, 234Ac:CCC, 234Ae:CCC, 234Af:CCP, 234Ag:CCP, 234Ah:CCP, 234Ai:CCP, 234Ak:CCP, 234Al:CCP, 234Am:CCP, 234An:CCC, 262A:CC, M221Ab:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC, M261A:CC, M261C:CC, M261F:CC, M261G:CC, M262A:CC
Federal Lands: DOD (Arnold, Fort Benning); USFS (George Washington, Mark Twain); USFWS (Felsenthal, Pond Creek)
Synonymy: Buttonbush Scrub, in part (Holland 1986b)
References: Holland 1986b, Sawyer and Keeler-Wolf 1995, Sneddon 1994
Authors: ECS, MOD. M. SCHINDEL, MP, East **Identifier:** A.988

CEPHALANTHUS OCCIDENTALIS / POLYGONUM HYDROPIPEROIDES - PANICUM VERRUCOSUM SHRUBLAND
Buttonbush / Swamp Smartweed - Warty Panicgrass Shrubland
North Atlantic Coastal Plain Buttonbush / Warty Panicgrass Pond **G3? (98-12-14)**
Ecological Group (SCS;MCS): Northern Coastal Plain Shrub Swamps (490-18; n/a)

Concept: pond community is known from the Coastal Plain of Delaware and Maryland (and possibly other states), with disjunct examples in the Great Valley of Virginia. Examples include seasonally flooded shrublands that occur in relatively small basins that draw down entirely during dry years, exposing some bare substrate by the end of the growing season. The substrate is a shallow organic layer overlying silt loam or clay loam.

Cephalanthus occidentalis is the dominant shrub, but *Decodon verticillatus* may also be present. Characteristic herbs are *Panicum verrucosum, Dulichium arundinaceum, Polygonum hydropiperoides, Torreyochloa pallida, Rhexia virginica*, and *Panicum hemitomon*. Other associates may include *Bidens frondosa, Scirpus cyperinus, Proserpinaca palustris, Triadenum virginicum, Dichanthelium spretum (= Panicum spretum), Scleria reticularis*, and *Fimbristylis autumnalis*. Species composition of this community tends to be variable among occurrences.
Comments: With a geographic distribution similar to many of the region's unusual plants, Shenandoah Valley stands of this community type appear to be outliers of an association more widespread on the Coastal Plain. Excellent Coastal Plain examples of this community are found at the Grafton Ponds complex in York County (Rawinski 1997). Additional data and analysis are needed to determine whether the regional expressions in Virginia should be considered formal subtypes in the National Vegetation Classification (USNVC).

This vegetation often occurs with other community types in ponds exhibiting distinct hydrologic zonation. In these situations, it often occupies zones intermediate between the semipermanently flooded *Cephalanthus occidentalis / Dulichium arundinaceum* Shrubland (CEGL007854) and the more shortly seasonally flooded *Quercus palustris / Panicum rigidulum var. rigidulum - Panicum verrucosum - Eleocharis acicularis* Herbaceous Vegetation (CEGL007858).
Range: The known range of this community includes the central Atlantic Coastal Plain of Delaware, Maryland, and Virginia, with an uncertain northward extension to Rhode Island and Massachusetts. There are at least 21 disjunct occurrences of the type documented from natural pond complexes along the western foot of the Blue Ridge in Augusta and Rockingham counties, Virginia.
States/Provinces: DE:S?, MA?, MD:S?, RI?, VA:S?
TNC Ecoregions: 58:C, 59:C, 62:C
USFS Ecoregions: 221:C, 232A:CC, 232B:CC, M221Ab:CCC
Federal Lands: USFS (George Washington)
Synonymy: *Cephalanthus occidentalis / Torreyochloa pallida - Decodon verticillatus* Association (Rawinski 1997), *Cephalanthus occidentalis / Proserpinaca palustris - Polygonum hydropiperoides* community (Fleming and Van Alstine 1999), *Cephalanthus occidentalis / Polygonum hydropiperoides - Glyceria acutiflora - Proserpinaca palustris* Shrubland (Fleming and Coulling 2001) F. VA Srank = S1, *Cephalanthus occidentalis / Polygonum hydropiperoides - Torreyochloa pallida - Panicum verrucosum* Shrubland (Fleming and Coulling 2001) F. VA Srank = S1
References: Berdine and Gould 1999, Bowman 2000, Buhlmann et al. 1999, Fleming and Coulling 2001, Fleming and Van Alstine 1999, Fleming et al. 2001, McAvoy and Clancy 1994, Rawinski 1997, Sneddon 1994, Tyndall et al. 1990
Authors: G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006242

III.B.2.N.e.25. MORELLA (CERIFERA, PENSYLVANICA) - VACCINIUM FORMOSUM SEASONALLY FLOODED SHRUBLAND ALLIANCE

(Wax-myrtle, Northern Bayberry) - Southern Highbush Blueberry Seasonally Flooded Shrubland Alliance

Concept: This alliance includes shrub wetlands of mid-Atlantic barrier islands. The two most characteristic shrubs are *Morella cerifera (= Myrica cerifera)* and *Vaccinium corymbosum*. *Rosa palustris* and *Morella pensylvanica (= Myrica pensylvanica)* are two other common shrub associates. Unlike the *Morella cerifera* wetland alliance, this alliance is of generally shorter stature and total shrub cover; and, although quite variable, is usually considerably more open. Herbaceous composition is variable, but *Panicum virgatum, Andropogon virginicus, Schizachyrium scoparium*, and other grasses are common. Other herbs include *Juncus* spp., *Pluchea foetida, Triadenum virginicum, Drosera intermedia*, and *Osmunda regalis*. Standing water is commonly found in the spring, but water levels may drop substantially toward the end of the summer. The southern range limit of this alliance is not well known, but it is confined to barrier islands from Delaware south.
Comments: Alliance name was changed from *Vaccinium corymbosum*; formation changed from seasonally / temporarily flooded.
States/Provinces: DE MD NJ VA
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232A:CC, 232Bz:CCC, 232C:C?
Federal Lands: NPS (Assateague Island)
Synonymy: Shrub bog (Hill 1986); Mesic shrub zone, in part (Higgins et al. 1971); Scrub-shrub/mixed herbaceous interdunal wetland association, in part (McAvoy and Clancy 1994)

References: Higgins et al. 1971, Hill 1986, McAvoy and Clancy 1994
Authors: ECS, East **Identifier:** A.1010

MORELLA CERIFERA - VACCINIUM CORYMBOSUM SHRUBLAND
Wax-myrtle - Highbush Blueberry Shrubland
Barrier Island Bog **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Wooded Interdune Swales and Backdunes (240-40; n/a)

Concept: This shrub bog community of Maryland, Delaware, and New Jersey occurs in interdunal depressions of barrier island dunes. This community is a relatively open, short-statured shrub wetland with a thin veneer of peat. The two most characteristic shrubs are *Morella cerifera (= Myrica cerifera)* and *Vaccinium corymbosum*. *Rosa palustris* and *Ilex glabra* also frequently occur. *Panicum virgatum, Andropogon glomeratus*, and other grasses are common. Other herbs include *Juncus canadensis, Juncus scirpoides, Juncus dichotomus, Pluchea foetida, Triadenum virginicum, Drosera intermedia, Lycopodiella appressa, Xyris torta*, and *Osmunda regalis*.
Range: This shrub bog community occurs in Maryland, Delaware, and New Jersey.
States/Provinces: DE:S?, MD:S?, NJ:S1S2, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232A:CC, 232Bz:CCC, 232C:C?
Federal Lands: NPS (Assateague Island)
Synonymy: Mesic shrub zone (Higgins et al. 1971) B. Assateague Island., Shrub bog (Hill 1986) =. Assateague Island., Scrub-shrub/mixed herbaceous interdunal wetland association (McAvoy and Clancy 1994) ?, Mesic shrub thicket (Martin 1959b) ?. New Jersey., Dune shrubland (Breden 1989). in part
References: Breden 1989, Breden et al. 2001, Clancy 1993b, Higgins et al. 1971, Hill 1986, Martin 1959b, McAvoy and Clancy 1994, TNC 1995c
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL003906

III.B.2.N.e.7. VACCINIUM FORMOSUM - VACCINIUM FUSCATUM SEASONALLY FLOODED SHRUBLAND ALLIANCE

Southern Highbush Blueberry - Black Highbush Blueberry Seasonally Flooded Shrubland Alliance

Concept: This alliance covers depressional wetlands in uplands of the Coastal Plain, lower and northern Piedmont, and lower New England dominated by *Vaccinium formosum, Vaccinium fuscatum*, and/or *Vaccinium corymbosum* as well as other heaths locally, such as *Lyonia ligustrina var. foliosiflora, Lyonia lucida*, and others. Other shrub/vine species which may be present include *Leucothoe racemosa, Smilax walteri*, and *Viburnum nudum var. nudum*. In the northern part of the range, other shrubs include *Ilex verticillata, Spiraea alba*, and *Clethra alnifolia*. The shrub coverage sometimes has an open, sparse structure. Trees may be interspersed among the shrubs; these may include *Liquidambar styraciflua, Acer rubrum var. rubrum, Pinus palustris*, and *Pinus taeda*. In the north, *Nyssa sylvatica* or *Pinus rigida* may occur. Herbaceous species that may be present include *Carex crinita, Carex glaucescens, Eleocharis* sp., *Rhynchospora* sp., *Scleria* sp., and *Utricularia gibba*. *Sphagnum* spp. are present in some examples. *Vaccinium* spp. sometimes exceed 5 m in height, but are placed here.
Range: This alliance is found in uplands of the Coastal Plain, lower and northern Piedmont, and lower New England, south to the Carolinas.
States/Provinces: CT DE MA MD NC NJ NY PA RI SC VA?
TNC Ecoregions: 52:C, 57:C, 58:?, 61:C, 62:C
USFS Ecoregions: 231Af:CCC, 232Ab:CCP, 232Ac:CCC, 232Ch:CCC
Federal Lands: USFS (Uwharrie)
Synonymy: Small Depression Pond (Schafale and Weakley 1990); Upland Pool (Schafale and Weakley 1990)
References: Schafale 2000, Schafale and Weakley 1990
Authors: A.S. WEAKLEY, MOD. M. PYN, MP, Southeast **Identifier:** A.992

VACCINIUM FORMOSUM - VACCINIUM FUSCATUM / SPHAGNUM CUSPIDATUM SHRUBLAND
Southern Highbush Blueberry - Black Highbush Blueberry / Toothed Peatmoss Shrubland
Atlantic Blueberry Pond **G3? (98-01-11)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Upland Depression Shrub Ponds (340-50; 1.6.4.1)

Concept: Depressional wetlands in uplands, dominated by *Vaccinium formosum, Vaccinium fuscatum*, and (locally) other heaths, such as *Lyonia ligustrina var. foliosiflora, Lyonia lucida*, and others. These ponds are smaller, steeper-sided, and flooded for shorter duration than herbaceous-dominated ponds.
States/Provinces: DE:S?, MD:S?, NC:S2, SC:S?, VA?
TNC Ecoregions: 57:C, 58:?
USFS Ecoregions: 232Ch:CCC
Synonymy: Small Depression Pocosin (Blueberry Subtype) (Schafale 2000)
References: Schafale 2000, Schafale and Weakley 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL003907

III.B.2.N.f. Semipermanently flooded cold-deciduous shrubland

III.B.2.N.f.1. CEPHALANTHUS OCCIDENTALIS SEMIPERMANENTLY FLOODED SHRUBLAND ALLIANCE

Buttonbush Semipermanently Flooded Shrubland Alliance

Concept: This alliance, which occurs throughout the eastern half of the United States and southern Ontario, Canada, contains semipermanently flooded stands dominated by *Cephalanthus occidentalis*. Stands vary from dense, tall-shrub thickets to open shrublands. Tree canopy cover may reach 25% in some stands, with tree associates including *Acer saccharinum* and *Quercus palustris* in the North to *Taxodium distichum* in the South. Standing water may cover the ground layer. *Cephalanthus occidentalis* is often the sole dominant in stands of this alliance, particularly in deeper (>0.5 m depth) zones of groundwater basins or lake borders on deep organic soils. Occasional shrub associates in the northern parts of its range include any number of *Salix* spp. or *Cornus* spp., *Viburnum dentatum, Rosa palustris, Ilex verticillata*, and *Vaccinium corymbosum*. Floating aquatics, such as *Lemna* spp., can be common in deepwater habitats, whereas a variety of forbs and graminoids are associates under less flooded conditions. These include *Boehmeria cylindrica, Scutellaria lateriflora, Sium suave*, and *Bidens tripartita, Glyceria* spp., *Leersia oryzoides, Polygonum* spp., and a wide variety of *Carex* spp.

This shrubland vegetation occupies shallow water depressions, oxbow ponds, sinkhole ponds, and backwater sloughs of stream and river floodplains throughout swampy forested areas in the eastern United States. Inundation is usually continuous throughout the year, but these sites can become dry in mid or late summer or during periods of prolonged drought. *Cephalanthus* appears to be very tolerant of extended periods of inundation which, by slowing canopy closure of trees and maintaining higher light levels, may favor this shrub. Soils can vary in texture from clays to sands, with organic horizons overlying these soils.
Comments: Examples from Arkansas include Pond Creek Bottoms in the West Gulf Coastal Plain and the Saline River in the Ouachita Mountains (J. Campbell pers. comm., D. Zollner pers. comm.). Found throughout Kentucky. Occurs in sagponds in the Cumberland Plateau in Alabama (Jackson County).
Range: This alliance is found in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi (?), North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Illinois, Indiana, Kansas, Michigan, Missouri, and Ohio, as well as in southern Ontario, Canada.
States/Provinces: AL AR CT DE FL GA IL IN KS KY LA MA MD? ME MI MO MS? NC NH NY OH OK ON PA RI SC TN TX VA VT WV?
TNC Ecoregions: 31:C, 32:C, 36:C, 37:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 48:C, 49:C, 50:C, 52:P, 53:P, 55:C, 56:C, 57:?, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:P
USFS Ecoregions: 212D:CP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hv:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221D:CC, 221Ec:CCP, 221Ed:CCP, 221Ef:CCP, 221Fa:CCC, 221Fc:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Ab:CCC, 222Ad:CCC, 222Ag:CCC, 222Ah:CCC, 222Am:CCC, 222An:CCC, 222Aq:CCC, 222Cg:CCC, 222Da:CCC, 222Eb:CCC, 222Ec:CCC, 222Ee:CC?, 222Ef:CCP, 222Eg:CCC, 222Ej:CCP, 222En:CCC, 222Eo:CCC, 222F:CP, 222Ga:CCC, 222Gb:CCC, 222Ge:CCC, 222Ha:CCC, 222Hb:CCC, 222Hf:CCP, 222Jb:CCC, 222Jc:CCC, 222Jh:CCC,

222Ji:CCC, 222Jj:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 231A:CP, 231Bc:CCC, 231Bd:CCC, 231Cc:CCC, 231Cd:CCP, 231Ce:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232A:CC, 232Br:CCC, 232Bs:CCC, 232Bt:CCC, 232Cg:CCC, 232Ch:CC?, 232Fa:CPP, 234Aa:CCC, 234Ac:CCC, 234Ae:CCC, 234Af:CCP, 234Ag:CCC, 234Ah:CCP, 234Ai:CCP, 234Ak:CCP, 234Al:CCP, 234Am:CCC, 234An:CCC, 251Cc:CCC, 251Cf:CCC, 251Cj:CCC, 251Ck:CCC, 251Dd:CCP, 251De:CCP, 251Dg:CCC, 251Dh:CCP, 255Db:CCC, M212A:CP, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCP, M221Cd:CCC, M221Da:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

Federal Lands: DOD (Arnold, Fort Benning); NPS (Buffalo, Shiloh?); USFS (Angelina, Bankhead?, Daniel Boone, Davy Crockett, George Washington, Jefferson, Kisatchie, Land Between the Lakes, Ouachita, Ozark, Sabine NF, Sam Houston, Tuskegee, Talladega); USFWS (Holla Bend, Little River, Reelfoot, San Bernard)

Synonymy: IIE1c. Sagpond Complex, in part (Allard 1990); Shrub Swamp, in part (Foti 1994b); Shrub swamp, in part (Evans 1991); Basin Marsh, in part (FNAI 1992a); Sagpond shrub/scrub vegetation (Ambrose 1990a); Natural impoundment pond shrub/scrub vegetation (Ambrose 1990a); *Cephalanthus occidentalis* shrubland alliance (Hoagland 1998a); Buttonbush Series (Diamond 1993); L4B3cI1a. *Cephalanthus occidentalis* (Foti et al. 1994); P4B3cII4a. *Cephalanthus occidentalis* (Foti et al. 1994); Buttonbush wetland (Fike 1999); Circumneutral Shrub Swamp, in part (Smith 1991)

References: Allard 1990, Ambrose 1990a, Anderson 1982, Campbell pers. comm., Conner et al. 1981, Diamond 1993, Evans 1991, FNAI 1992a, FNAI 1992b, Faber-Langendoen and Maycock 1989, Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Hoagland 1998a, Smith 1991, Tyrrell 1987, Voigt and Mohlenbrock 1964, Zollner pers. comm.

Authors: D.J. ALLARD, MP, Midwest **Identifier:** A.1011

CEPHALANTHUS OCCIDENTALIS / GLYCERIA CANADENSIS SHRUBLAND

Buttonbush / Rattlesnake Mannagrass Shrubland

Buttonbush Shrub Swamp **G? (03-03-25)**

Concept: Buttonbush swamps of the eastern and northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. *Cephalanthus occidentalis* is dominant and often monotypic. Occasional associates depend on the environmental setting and most often occur in drier areas. They include *Vaccinium corymbosum, Rhododendron viscosum, Acer rubrum, Cornus* spp., closer to upland borders or *Acer saccharinum, Fraxinus pennsylvanica*, or *Viburnum dentatum* where adjacent to floodplains, or *Decodon verticillatus, Chamaedaphne calyculata*, and *Spiraea alba var. latifolia* in more stagnant basins. Herbaceous species tend to be sparse, but can include *Glyceria canadensis, Dulichium arundinaceum, Carex stricta, Scirpus cyperinus, Thelypteris palustris, Alisma plantago-aquatica, Polygonum* spp., *Sparganium* spp. and floating or submerged aquatic species like *Lemna minor, Potamogeton natans*, and *Nuphar lutea ssp. variegata (= Nuphar variegata)*. Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans (= Drepanocladus fluitans), Drepanocladus aduncus*, or *Sphagnum fallax*.

Comments: This type may be synonymous with *Cephalanthus occidentalis / Carex* spp. Northern Shrubland (CEGL002190), although it occurs south of the glaciation boundary in the east.

States/Provinces: CT:S?, DE:S?, MA:S5, MD?, ME:S5, NH:S4?,S3, NY:S5, PA:S?, RI:S?, VA:S?, VT:S2, WV?

TNC Ecoregions: 58:?, 59:C, 60:C, 61:C, 62:C, 63:C

USFS Ecoregions: 212D:CP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCC, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221D:CC, 221E:CP, 231:C, 232A:CC, 232Bt:CCC, 232C:CC, 234:C, M212A:CP, M212Bb:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212De:CCC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCP, M221Da:CCC

Synonymy: Buttonbush semipermanently flooded shrub swamp (CAP pers. comm. 1998), Buttonbush Swamp (Kettle Basin Shrub Swamp) (Thompson 1996), Palustrine Broad-leaved Deciduous Scrub-Shrub Wetland, Seasonally Flooded (PSS1C)

References: Bowman 2000, CAP pers. comm. 1998, Cowardin et al. 1979, Edinger et al. 2002, Enser 1999, Fike 1999, Fleming et al. 2001, Gawler 2002, Metzler and Barrett 2001, Nichols et al. 2001, Sperduto 2000b, Swain

and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL006069

III.B.2.N.f.3. DECODON VERTICILLATUS SEMIPERMANENTLY FLOODED SHRUBLAND ALLIANCE

Swamp-loosestrife Semipermanently Flooded Shrubland Alliance

Concept: Communities dominated by *Decodon verticillatus* are known from several New England states. These communities occur in association with the wettest portions of *Sphagnum* bog mats in southern New England, and on the shores of ponds and rivers. The status of these communities as an alliance remains in question. Further research is needed to determine the floristic relationship with similar vegetation. Communities of this alliance occur throughout the Eastern Region.
Comments: Formerly IV.B.3.g.ii.
Range: This alliance is found in West Virginia, Delaware, Pennsylvania, Maryland, New York, Connecticut, Massachusetts, New Hampshire, and Ontario, Canada.
States/Provinces: CT DE MA MD NH NY ON PA WV
TNC Ecoregions: 58:C, 61:C, 62:C, 64:P
USFS Ecoregions: 212Fc:PPP, 221Ai:CCC, 221Al:CCC, 221Bd:CPP, 232Ac:CCC, 232Bb:C??
Federal Lands: USFWS (Blackwater?)
Synonymy: Water-willow (*Decodon verticillatus*) shrub wetland (Fike 1999)
References: Fike 1999
Authors: ECS, East **Identifier:** A.1013

DECODON VERTICILLATUS SEMIPERMANENTLY FLOODED SHRUBLAND
Swamp-loosestrife Semipermanently Flooded Shrubland
Water-willow Shrub Swamp **G? (94-12-15)**
Ecological Group (SCS;MCS): Ecological Group Unassignable (999-00; 9.0.0.9)

Concept: Shrub border that occurs as a fringe along aquatic edges of lakes, streams and bog mats in Lower New England and elsewhere. *Decodon verticillatus* forms a dense, often monotypic, tangle. *Cephalanthus occidentalis* can occur, but with less abundance than *Decodon verticillatus*. Herbaceous species vary widely, but may include *Nuphar lutea ssp. variegata (= Nuphar variegata), Nymphaea odorata, Peltandra virginica, Pontederia cordata, Utricularia* spp., and *Potamogeton* spp. Where this vegetation occurs adjacent to bog mats, *Chamaedaphne calyculata* and *Myrica gale* can begin to occur, as well as *Carex canescens, Lysimachia terrestris*, and *Triadenum virginicum*, plus *Sphagnum recurvum, Sphagnum flexuosum, Sphagnum fimbriatum*, and occasionally *Sphagnum papillosum*.
Comments: This vegetation is often considered a zone within other community types.
States/Provinces: CT:S?, DE:S?, MA:S5,S3, MD:S?, NH:S3, NY:S5, ON:S?, PA:S?, WV:S?
TNC Ecoregions: 58:?, 61:C, 62:C
USFS Ecoregions: 221Ai:CCC, 221Al:CCC, 232Ac:CCC
References: Bowman 2000, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL005089

III.B.2.N.h. Tidal cold-deciduous shrubland

A.1024—ALNUS (INCANA, SERRULATA, MARITIMA) TIDAL SHRUBLAND ALLIANCE (III.B.2.N.h.2)

(Speckled Alder, Smooth Alder, Seaside Alder) Tidal Shrubland Alliance

Summary: Tidal freshwater, or perhaps also oligohaline, shrublands dominated by *Alnus serrulata* and/or *Alnus incana*. *Alnus maritima* dominates some tidal shrublands on the Delmarva peninsula. In some examples one or both of these may be characteristically dominant or nearly so. Other examples may be more semi-open with a mixed canopy of *Alnus* with other shrubs such as *Cornus amomum, Rosa palustris*, and *Ilex verticillata*. Other woody plants which may be present include *Sambucus canadensis, Salix* spp., *Amorpha fruticosa, Cephalanthus occidentalis*, and *Toxicodendron radicans*. More northern examples may contain *Viburnum recognitum* and

Spiraea alba var. latifolia (= Spiraea latifolia). This alliance occurs along tidal freshwater reaches of rivers. One association is recognized along the south Atlantic Coast to South Carolina and possibly elsewhere. This can occur as a fringing shrubland, zonal between *Zizania aquatica* tidal marshes and tidal cypress - gum forests. Less commonly it occupies large patches in freshwater marshes. Other species characteristic of tidal situations often occur, including *Rosa palustris* and *Zizania aquatica*. Another association is recognized in coastal areas with tidally influenced river systems from Maine to Virginia. Flood waters are typically slightly acid (pH less than 5) and soils are usually mineral without significant peat deposits. In these examples, *Carex stricta* may also be present and there is a great deal of micro-relief (tussocks and furrows) leading to high species diversity. Some shrub associates include *Decodon verticillatus* and *Toxicodendron vernix*; some herbaceous associates are *Osmunda regalis, Thelypteris palustris, Galium* spp., *Typha latifolia, Peltandra virginica, Mikania scandens, Symphyotrichum novi-belgii (= Aster novi-belgii), Boehmeria cylindrica, Impatiens capensis, Triadenum walteri, Asclepias incarnata, Carex emoryi, Carex atlantica ssp. atlantica (= Carex incomperta), Eriophorum virginicum, Platanthera clavellata*, and *Xyris torta*.

Range: This alliance is found in Georgia, South Carolina, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, and possibly Florida (?), North Carolina (?), and others.
States/Provinces: CT DE FL? GA MA MD ME NC? NJ NY PA SC VA?
TNC Ecoregions: 43:P, 56:C, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221Aa:CCP, 221Ab:CCP, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Ag:CCC, 221Ak:CCC, 221Ba:CCC, 221Bc:CCC, 222:C, 232Aa:CCP, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CC?, 232Ci:CC?
Synonymy: Estuarine Intertidal: Fresh/Brackish Tidal Shrubland (Swain and Kearsley 2001)
References: Sneddon et al. 1996, Swain and Kearsley 2001
Authors: A.S. WEAKLEY, MOD. L.A. S

ALNUS MARITIMA / ACORUS CALAMUS SHRUBLAND

Seaside Alder / Sweetflag Shrubland
Seaside Alder Tidal Shrubland **G?**

Summary: This tidal shrubland of the Delmarva peninsula on the central Atlantic coast occurs on freshwater tidal rivers and tributaries. Waters are generally oligohaline, but may receive pulses of higher salinities during spring high tides or low river discharge. The vegetation occurs on the ecotones between freshwater tidal marshes and tidal swamps. Hummocks and hollows are characteristic, and the substrate is poorly drained slightly acidic tidal muck with silts, fine sands and partially decomposed peat admixed. The shrub canopy is well developed, often dense, and dominated by *Alnus maritima*. Associated shrub species are few and at low cover, but may include *Viburnum dentatum, Cornus amomum* or *Sambucus canadensis*. Vines may include *Toxicodendron radicans* and *Mikania scandens.* The herbaceous layer is dominated by *Acorus calamus*, with other associates including *Impatiens capensis, Peltandra virginica, Polygonum sagittatum, Leersia oryzoides, Cinna arundinacea, Polygonum arifolium, Boehmeria cylindrica, Thalictrum pubescens (= Thalictrum polygamum)*, and *Sambucus canadensis*.

Range: This vegetation occurs on the Delmarva peninsula of the central Atlantic coast.
State/Provinces: MD:S3.1, DE:SP
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bt:CCC, 232Bx:CCC, 232Bz:CCC
References: Harrison 2003
Authors: J. Harrison / L. Sneddon **Confidence:** 3 **Identifier:** CEGL006841

A.3024—AMORPHA FRUTICOSA TIDAL SHRUBLAND ALLIANCE (III.B.2.N.h)

Tall Indigo Bush Tidal Shrubland Alliance

AMORPHA FRUTICOSA TIDAL SHRUBLAND

Tall Indigobush Tidal Shrubland

Tall Indigobush Tidal Shrubland **G?**

Summary: This freshwater tidal shrubland occurs on tidal rivers bordering the Chesapeake Bay on sandy levees and shorelines above mean high tide. Microtopography is variable, from pronounced hummock-and-hollow to essentially flat. Soils are well-drained sands and gravel to poorly drained peat in lower-lying depressions. The shrub canopy is relatively open and characterized by *Amorpha fruticosa*. Other associates may include *Acer rubrum, Fraxinus pennsylvanica, Decodon verticillata, Ilex verticillata,* and *Rosa palustris*. The herbaceous layer is diverse and comprised of a mixture of *Osmunda regalis, Hibiscus moscheutos, Thelypteris palustris, Boehmeria cylindrica, Leersia oryzoides, Peltandra virginica, Polygonum sagittatum, Sium suave,* and *Typha angustifolia.*
Range: This vegetation occurs central Atlantic coast at the headwaters of the Chesapeake Bay.
States/Provinces: MD:S?
TNC Ecoregions: 58:C

USFS Ecoregions: 232Ad:CCC

References: Harrison 2003
Authors: J. Harrison / L. Sneddon **Confidence:** 3 **Identifier:** CEGL006844

A.1023—BACCHARIS HALIMIFOLIA - IVA FRUTESCENS TIDAL SHRUBLAND ALLIANCE (III.B.2.N.h.1)

Groundsel-tree - Maritime Marsh-elder Tidal Shrubland Alliance

Summary: This alliance includes maritime scrub communities typically dominated by *Iva frutescens* or *Baccharis halimifolia* or both, growing in association with salt marshes. These communities occur primarily in estuarine margin situations, especially on the sound sides of barrier islands. Characteristically, these communities form an ecotone between salt marsh and upland vegetation or in areas within the salt marsh having slightly higher elevations and lower salinity levels than the surrounding marsh. Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread. Characteristic species include *Baccharis halimifolia, Iva frutescens, Rosa carolina, Spartina patens*, and *Panicum virgatum*.
Environment: These communities occur primarily in estuarine margin situations, especially on the sound sides of barrier islands. Characteristically, these communities form an ecotone between salt marsh and upland vegetation or in areas within the salt marsh having slightly higher elevations and lower salinity levels than the surrounding marsh. Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread.
Physiognomy:
Vegetation: This alliance includes maritime scrub communities typically dominated by *Iva frutescens* or *Baccharis halimifolia* or both, growing in association with salt marshes. Characteristic species include *Baccharis halimifolia, Iva frutescens, Rosa carolina, Spartina patens*, and *Panicum virgatum*.
Dynamics: Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread.
Range: This alliance is found in Alabama, Florida, Georgia, Louisiana (?), Mississippi, North Carolina, South Carolina, Texas, Connecticut, Delaware, Massachusetts, Maine, Maryland, New Hampshire, New Jersey, New York, Rhode Island, and Virginia.
Nations: US
States: AL CT DE FL GA LA MA MD MS NC NJ NY RI SC TX VA
TNC Ecoregions: 31:C, 53:C, 55:?, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 212P:PP, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Aj:CC?, 221Ak:CCC, 221Dc:CPP, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bb:CC?, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: NPS (Assateague Island, Fire Island, Fort Pulaski); USFS (Croatan); USFWS (Anahuac, Aransas, Big Boggy, Bon Secour, Brazoria, Chincoteague, Matagorda Island, McFaddin, San Bernard)
Synonymy: Tidal Marsh, in part (FNAI 1992a), Salt Shrub, in part (Schafale and Weakley 1990), shrub

succession community, in part (Higgins et al. 1971), Salt marsh community, in part (Hill 1986), swamp thicket, in part (Klotz 1986), salt marsh and upper border (Barry 1980), salt grass - marsh elder savanna (Martin 1959b), saltbush zone (Boule 1979), Estuarine scrub-shrub wetland (Tiner 1985b), Salt bush - salt meadow marsh (Daiber et al. 1976), *Iva frutescens-Baccharis halimifolia* (Good 1965), *Iva frutescens* (Klemas et al. 1973), *Baccharis halimifolia* (Klemas et al. 1973), Salt shrub (Reschke 1990), Salt marsh complex, marsh-upland border (Breden 1989), Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001)
References: Au 1974, Barry 1980, Boule 1979, Breden 1989, Daiber et al. 1976, FNAI 1992a, FNAI 1992b, Good 1965, Higgins et al. 1971, Hill 1986, Hillestad et al. 1975, Hosier 1975, Klemas et al. 1973, Klotz 1986, Martin 1959b, Nelson 1986, Reschke 1990, Schafale and Weakley 1990, Swain and Kearsley 2001, Tiner 1977, Tiner 1985b, Wharton 1978, Wolfe 1990
Authors: D.J. ALLARD, MOD. A.S. WEAKLEY

BACCHARIS HALIMIFOLIA - IVA FRUTESCENS / SPARTINA PATENS SHRUBLAND
Groundsel-tree - Maritime Marsh-elder / Saltmeadow Cordgrass Shrubland
Mid-Atlantic Maritime Salt Shrub **G5**
Ecological Group: Atlantic and Gulf Coast Tidal Shrublands (202-20; n/a)

Summary: This maritime shrubland of the mid-Atlantic states occurs in association with salt marshes. In its natural condition, this community forms the ecotone between the high salt marsh and adjacent upland vegetation. It also occurs in patches on areas of slightly higher elevation within the salt marsh or on spoil mounds adjacent to ditches. *Baccharis halimifolia* and *Iva frutescens* are the most characteristic and dominant shrub species. Other associated shrubs include *Morella pensylvanica (= Myrica pensylvanica)* in the northern portion of the range, while *Borrichia frutescens, Morella cerifera (= Myrica cerifera)* and *Juniperus virginiana var. silicicola* are frequent associates in the southern part of the range. *Spartina patens* is a characteristic and usually abundant grass; other common herbaceous associates include *Panicum virgatum, Distichlis spicata, Hibiscus moscheutos, Toxicodendron radicans, Teucrium canadense, Festuca rubra, Limonium carolinianum, Atriplex prostrata, Sabatia stellaris, Sabatia dodecandra*, and in the north *Hierochloe odorata* and *Juncus gerardii*, and in the south, *Setaria parviflora*. This community often forms an abrupt transition from salt marsh to upland reflecting the relatively higher elevation and less frequent tidal flooding. Shrub cover in this situation tends to be fairly dense, and herbs are sparsely distributed. Where the topographic relief is more gradual, the community is characterized by an open and relatively evenly spaced shrub stratum with a well-developed herbaceous layer, reflecting an intergrading of this community with the adjacent high salt marsh. Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread.
Environment: This maritime shrubland of the mid-Atlantic states occurs in association with salt marshes. It forms an ecotone between the high salt marsh and adjacent upland vegetation. It also occurs in patches on areas of slightly higher elevation within the salt marsh or on spoil mounds adjacent to ditches. This shrubland occurs above mean high tide but can be flooded by storm tides. Substrate is organic peat over glacial till, sand, or sandy loam.
Vegetation: This tidal shrubland is dominated by *Iva frutescens* and *Baccharis halimifolia*. Other associated shrubs include *Morella pensylvanica (= Myrica pensylvanica)* in the northern portion of the range, while *Borrichia frutescens, Morella cerifera (= Myrica cerifera)*, and *Juniperus virginiana var. silicicola* are frequent associates in the southern part of the range. *Spartina patens* is a characteristic and usually abundant grass; other common herbaceous associates include *Distichlis spicata, Hibiscus moscheutos, Toxicodendron radicans, Teucrium canadense, Festuca rubra, Limonium carolinianum*, and in the south, *Setaria parviflora*. This community often forms an abrupt transition from salt marsh to upland reflecting the relatively higher elevation and less frequent tidal flooding. Shrub cover in this situation tends to be fairly dense, and herbs are sparsely distributed. Where the topographic relief is more gradual, the community is characterized by an open and relatively evenly spaced shrub stratum with a well-developed herbaceous layer, reflecting an intergrading of this community with the adjacent high salt marsh.
Dynamics: This association occurs above mean high tide but can be flooded by storm tides. Heavy salt spray and tidal flooding from severe storms can cause die-back in the shrub layer. Seaward, this association grades into high salt marsh dominated by herbaceous vegetation. Landward, shrub cover becomes more dense.

Range: This association ranges from Massachusetts to South Carolina.
States/Provinces: CT:S?, DE:S5, MA:S3, MD:S?, NC:S4, NJ:S2S3, NY:S4, RI:S?, SC:S?, VA:S?
TNC Ecoregions: 56:P, 57:C, 58:C, 62:C
USFS Ecoregions: 221Aa:CC?, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CC?, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island, Fire Island); USFWS (Chincoteague)
Synonymy: Salt Shrub (High Subtype) (Schafale 2000), Shrub succession community (Higgins et al. 1971) B. Assateague Island., Salt marsh community (Hill 1986) B. Assateague Island., Swamp thicket (Klotz 1986) B. Virginia., Salt marsh and upper border (Barry 1980) =. South Carolina., Salt grass - marsh elder savanna (Martin 1959b) =. New Jersey., Saltbush zone (Boule 1979) =. Virginia., Estuarine scrub-shrub wetland (Tiner 1985a) =. Delaware., Estuarine scrub-shrub wetland (Tiner 1985b) =. New Jersey., Salt bush - salt meadow marsh (Daiber et al. 1976) =. Delaware., *Iva frutescens-Baccharis halimifolia* (Good 1965), *Iva frutescens* and *Baccharis halimifolia* (Klemas et al. 1973) =. Delaware., *Iva frutescens / Spartina patens* Tidal Shrubland (Harrison 2003) Salt Marsh Complex, marsh-upland border (Breden 1989) =. New Jersey., Salt shrub (Reschke 1990) =. New York., Salt Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine Salt Marshes.
References: Berdine 1998, Bowman 2000, Breden et al. 2001, Edinger et al. 2002, Enser 1999, Fleming 2001, Harrison 2003, Metzler and Barrett 2001, Reschke 1990, Schafale and Weakley 1990, Swain and Kearsley 2001, TNC 1995c, Tiner 1985a
Concept Authors: L.A. Sneddon and A. Berdine 11-95, mod. S.L. Neid **Confidence:** 2 **Identifier:** CEGL003921

IVA FRUTESCENS / SPARTINA CYNOSUROIDES TIDAL SHRUBLAND
Marsh Elder / Big Cordgrass Shrubland
Brackish Shrubland **G?**

Summary: This brackish tidal shrubland occurs on the mesohaline portion of tidal rivers of the Chesapeake Bay on poorly drained peat overlying sand and mucky sandy. This vegetation forms linear bands along levees and bordering tidal guts. Microtopography is relatively flat and lacks pronounced hummocks and hollows. The shrub canopy is moderately dense and codominated by *Iva frutescens* and *Spartina cynosuroides*. Other associates include *Baccharis halimifolia* and *Hibiscus moscheutos*. The species diversity of this vegetation is relatively low; associated herbs are often found on the edge of the stand and may include *Amaranthus cannabinus, Atriplex patula, Lythrum lineare, Polygonum punctatum, Schoenoplectus americanus, Solidago sempervirens, Spartina alterniflora,* and *Spartina patens.*
Range: This vegetation occurs on tidal rivers of the Chesapeake Bay.
States/Provinces: MD:S4, VA:SP, DE:SP
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ad:CCC, 232Bx:CCC, 232Bz:CCC
References: Harrison 2003
Authors: J. Harrison / L. Sneddon **Confidence:** 3 **Identifier:**CEGL006847

A.3025--SALIX NIGRA TIDAL SHRUBLAND ALLIANCE (III.B.2.N.h)
Black WillowTidal Shrubland Alliance

SALIX NIGRA TIDAL SHRUBLAND
Black Willow Shrubland
Black Willow Tidal Shrubland **G?**

Summary: This tidal black willow shrubland of the Maryland Coastal Plain occurs on freshwater tidal rivers. It forms a zone between adjacent freshwater tidal marshes and uplands. Microtopography is variable, ranging from pronounced hummocks and hollows to flat. The substrate is partially decomposed peat with sand or silt admixed. The shrub canopy is relatively open and dominated by *Salix nigra*, or mixed with other shrubs such as *Cephalanthus occidentalis, Acer rubrum, Alnus serrulata, Cornus amomum, Fraxinus pennsylvanica, Rosa*

palustrus, and *Viburnum dentatum.* Vines include *Mikania scandens* and *Toxicodendron radicans*. The herbaceous layer is relatively diverse and is comprised of *Symphotrichum novi-belgii, Boehmeria cylindrica, Galium obtusum, Hibiscus moscheutos, Impatiens capensis, Leersia oryzoides, Peltandra virginica, Pilea pumila, Polygonum arifolium, Polygonum punctatum, Polygonum sagittatum,* and *Thalictrum pubescens (= Thalictrum polygamum).*
Range: This vegetation occurs on the coastal plain of Virginia and Maryland.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ad:CCC
References: Coulling 2002, Harrison 2003
Authors: J. Harrison / L. Sneddon **Confidence:** 3 **Identifier:** CEGL006843

III.B.2.N.h.1. BACCHARIS HALIMIFOLIA - IVA FRUTESCENS TIDAL SHRUBLAND ALLIANCE

Groundsel-tree - Maritime Marsh-elder Tidal Shrubland Alliance

Concept: This alliance includes maritime scrub communities typically dominated by *Iva frutescens* or *Baccharis halimifolia* or both, growing in association with salt marshes. These communities occur primarily in estuarine margin situations, especially on the sound sides of barrier islands. Characteristically, these communities form an ecotone between salt marsh and upland vegetation or in areas within the salt marsh having slightly higher elevations and lower salinity levels than the surrounding marsh. Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread. Characteristic species include *Baccharis halimifolia, Iva frutescens, Rosa carolina, Spartina patens*, and *Panicum virgatum*.
Range: This alliance is found in Alabama, Florida, Georgia, Louisiana (?), Mississippi, North Carolina, South Carolina, Texas, Connecticut, Delaware, Massachusetts, Maine, Maryland, New Hampshire, New Jersey, New York, Rhode Island, and Virginia.
States/Provinces: AL CT DE FL GA LA MA MD MS NC NJ NY RI SC TX VA
TNC Ecoregions: 31:C, 53:C, 55:?, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 212P:PP, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Aj:CC?, 221Ak:CCC, 221Dc:CPP, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bb:CC?, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: NPS (Assateague Island, Fire Island, Fort Pulaski); USFS (Croatan); USFWS (Anahuac, Aransas, Big Boggy, Bon Secour, Brazoria, Chincoteague, Matagorda Island, McFaddin, San Bernard)
Synonymy: Tidal Marsh, in part (FNAI 1992a); Salt Shrub, in part (Schafale and Weakley 1990); shrub succession community, in part (Higgins et al. 1971); Salt marsh community, in part (Hill 1986); swamp thicket, in part (Klotz 1986); salt marsh and upper border (Barry 1980); salt grass - marsh elder savanna (Martin 1959b); saltbush zone (Boule 1979); Estuarine scrub-shrub wetland (Tiner 1985b); Salt bush - salt meadow marsh (Daiber et al. 1976); *Iva frutescens-Baccharis halimifolia* (Good 1965); *Iva frutescens* (Klemas et al. 1973); *Baccharis halimifolia* (Klemas et al. 1973); Salt shrub (Reschke 1990); Salt marsh complex, marsh-upland border (Breden 1989); Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001)
References: Au 1974, Barry 1980, Boule 1979, Breden 1989, Daiber et al. 1976, FNAI 1992a, FNAI 1992b, Good 1965, Higgins et al. 1971, Hill 1986, Hillestad et al. 1975, Hosier 1975, Klemas et al. 1973, Klotz 1986, Martin 1959b, Nelson 1986, Reschke 1990, Schafale and Weakley 1990, Swain and Kearsley 2001, Tiner 1977, Tiner 1985b, Wharton 1978, Wolfe 1990
Authors: D.J. ALLARD, MOD. A.S. WE, JT, East **Identifier:** A.1023

BACCHARIS HALIMIFOLIA - IVA FRUTESCENS - MORELLA CERIFERA - (ILEX VOMITORIA) SHRUBLAND

Groundsel-tree - Maritime Marsh-elder - Wax-myrtle - (Yaupon) Shrubland
Coastal Salt Shrub Thicket **G4? (97-08-11)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Tidal Shrublands (202-20; n/a)

Concept: This shrubland, dominated by the nominal species, occurs in slightly elevated areas within salt flats and salt marshes as well as in marsh edges throughout much of the East Gulf, South Atlantic, and Mid-Atlantic coastal plains. This community is usually best developed at the upper limit of non-storm tidal inundation, on

natural levees deposited by above-normal tides. The most common species are typically *Baccharis halimifolia, Morella cerifera (= Myrica cerifera), Iva frutescens ssp. frutescens, Yucca gloriosa, Juniperus virginiana var. silicicola, Lycium carolinianum, Baccharis angustifolia*, and *Ilex vomitoria*. Other species which may be present include *Borrichia frutescens, Fimbristylis castanea, Limonium carolinianum*, and *Solidago sempervirens*.
Comments: An example documented in South Carolina on Old Island had an emergent layer of *Juniperus virginiana var. silicicola*, over *Iva frutescens* and *Borrichia frutescens*. The herbaceous layer consisted of *Cynanchum angustifolium, Juncus roemerianus*, and *Fimbristylis castanea*. This type is not known to occur in VA (G.P. Fleming and P. Coulling pers. comm.).
States/Provinces: AL:S?, FL:S4, GA:S?, LA:S?, MD:S?, MS:S?, NC:S4, SC:S?
TNC Ecoregions: 53:C, 55:?, 56:C, 57:C, 58:C
USFS Ecoregions: 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCP, 232Dc:CCC, 232Eb:CCC
Federal Lands: NPS (Assateague Island, Fort Pulaski); USFS (Croatan); USFWS (Bon Secour)
Synonymy: Salt Shrub (Inland High Subtype) (Schafale 2000)
References: Coulling pers. comm., FNAI 1992a, Fleming pers. comm., Lea 2002b, Schafale 2000, Wolfe 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL003920

BACCHARIS HALIMIFOLIA - IVA FRUTESCENS / SPARTINA PATENS SHRUBLAND
Groundsel-tree - Maritime Marsh-elder / Saltmeadow Cordgrass Shrubland
Mid-Atlantic Maritime Salt Shrub **G5 (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Tidal Shrublands (202-20; n/a)

Concept: This maritime shrubland of the mid-Atlantic states occurs in association with salt marshes. In its natural condition, this community forms the ecotone between the high salt marsh and adjacent upland vegetation. It also occurs in patches on areas of slightly higher elevation within the salt marsh or on spoil mounds adjacent to ditches. *Baccharis halimifolia* and *Iva frutescens* are the most characteristic and dominant shrub species. Other associated shrubs include *Morella pensylvanica (= Myrica pensylvanica)* in the northern portion of the range, while *Borrichia frutescens, Morella cerifera (= Myrica cerifera)* and *Juniperus virginiana var. silicicola* are frequent associates in the southern part of the range. *Spartina patens* is a characteristic and usually abundant grass; other common herbaceous associates include *Panicum virgatum, Distichlis spicata, Hibiscus moscheutos, Toxicodendron radicans, Teucrium canadense, Festuca rubra, Limonium carolinianum, Atriplex prostrata, Sabatia stellaris, Sabatia dodecandra*, and in the north *Hierochloe odorata* and *Juncus gerardii*, and in the south, *Setaria parviflora*. This community often forms an abrupt transition from salt marsh to upland reflecting the relatively higher elevation and less frequent tidal flooding. Shrub cover in this situation tends to be fairly dense, and herbs are sparsely distributed. Where the topographic relief is more gradual, the community is characterized by an open and relatively evenly spaced shrub stratum with a well-developed herbaceous layer, reflecting an intergrading of this community with the adjacent high salt marsh. Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread.
Comments: As shrub cover decreases, the community often grades into high salt marsh associations like *Panicum virgatum - Spartina patens* Herbaceous Vegetation (CEGL006150) or *Spartina patens*-dominated high marsh associations. Southern analogs of this salt marsh-upland border shrubland include *Baccharis halimifolia - Iva frutescens - Morella cerifera - (Ilex vomitoria)* Shrubland (CEGL003920) along the southern Atlantic coast from the Carolinas to Florida to Louisiana and *Iva frutescens ssp. frutescens - Baccharis halimifolia / Spartina spartinae* Shrubland (CEGL004616) along the Texas Gulf Coast. This community is differentiated from *Morella cerifera - Baccharis halimifolia / Spartina patens* Shrubland (CEGL003809) by the presence of *Iva frutescens* and by the influence of tidal flooding. According to G.P. Fleming and P. Coulling (pers. comm.), "This type represents the only salt scrub community type for which we have data in Virginia. Documented occurrences (including two from Chincoteague NWR) all contain Morella as a low-cover associate, but Spartina patens and Distichlis spicata are characteristically co-dominant with Iva and Baccharis. Perhaps Chris Lea can clarify the distribution of 3920 on the Delmarva Peninsula. I have wondered whether we need to define separate tidal and supratidal salt scrub types, since the former often lack Baccharis altogether, but we don't have sufficient data to support splitting this group at this time."
Range: This association ranges from Massachusetts to South Carolina.
States/Provinces: CT:S?, DE:S5, MA:S3, MD:S?, NC:S4, NJ:S2S3, NY:S4, RI:S?, SC:S?, VA:S?
TNC Ecoregions: 56:P, 57:C, 58:C, 62:C
USFS Ecoregions: 221Aa:CC?, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CC?, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island, Fire Island); USFWS (Chincoteague)

Synonymy: Salt Shrub (High Subtype) (Schafale 2000), Shrub succession community (Higgins et al. 1971) B. Assateague Island., Salt marsh community (Hill 1986) B. Assateague Island., Swamp thicket (Klotz 1986) B. Virginia., Salt marsh and upper border (Barry 1980) =. South Carolina., Salt grass - marsh elder savanna (Martin 1959b) =. New Jersey., Saltbush zone (Boule 1979) =. Virginia., Estuarine scrub-shrub wetland (Tiner 1985a) =. Delaware., Estuarine scrub-shrub wetland (Tiner 1985b) =. New Jersey., Salt bush - salt meadow marsh (Daiber et al. 1976) =. Delaware., *Iva frutescens-Baccharis halimifolia* (Good 1965), *Iva frutescens* and *Baccharis halimifolia* (Klemas et al. 1973) =. Delaware., Salt Marsh Complex, marsh-upland border (Breden 1989) =. New Jersey., Salt shrub (Reschke 1990) =. New York., Salt Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine Salt Marshes.
References: Barry 1980, Berdine 1998, Boule 1979, Bowman 2000, Breden 1989, Breden et al. 2001, Coulling pers. comm., Daiber et al. 1976, Edinger et al. 2002, Enser 1999, Fleming 2001, Fleming et al. 2001, Fleming pers. comm., Good 1965, Higgins et al. 1971, Hill 1986, Klemas et al. 1973, Klotz 1986, Martin 1959b, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, Swain and Kearsley 2001, TNC 1995c, Tiner 1985a, Tiner 1985b
Authors: ECS **Confidence:** 2 **Identifier:** CEGL003921

IV. DWARF-SHRUBLAND

IV.A.1.N.a. Caespitose needle-leaved or microphyllous evergreen dwarf-shrubland

IV.A.1.N.a.4. HUDSONIA TOMENTOSA DWARF-SHRUBLAND ALLIANCE

Woolly Beach-heather Dwarf-shrubland Alliance

Concept: This alliance consists of sandy or rocky areas dominated by *Hudsonia tomentosa*. This alliance is largely confined to maritime interdunes. This alliance occurs on well-drained sands of back dunes and interdunes, and is documented from Assateague Island; it is a maritime dwarf-shrubland characterized by *Hudsonia tomentosa*, a species adapted to sand burial. *Hudsonia tomentosa* is dominant, occurring as discrete patches that may coalesce into a dense mat on older, more stabilized dunes. A number of other shrubs, such as *Morella pensylvanica (= Myrica pensylvanica), Morella cerifera (= Myrica cerifera), Pinus taeda* saplings, and *Prunus maritima*, may occur but are low in abundance and cover. *Morella pensylvanica* shrubs and *Pinus taeda* saplings are almost non-existent but can occur as scattered individuals. Herbaceous vegetation is also quite sparse (less than 5% cover) but may include scattered individuals of *Panicum amarum var. amarulum, Panicum amarum var. amarum, Solidago sempervirens, Nuttallanthus canadensis, Lechea maritima, Ammophila breviligulata, Pseudognaphalium obtusifolium (= Gnaphalium obtusifolium), Schizachyrium littorale (= Schizachyrium scoparium ssp. littorale), Dichanthelium acuminatum, Oenothera humifusa, Cyperus grayi, Artemisia stelleriana, Chamaesyce polygonifolia*, and *Diodia teres*. *Toxicodendron radicans* is a common vine. Scattered vines of *Smilax rotundifolia* and canes of *Rubus argutus* are occasional. The unstable substrate is influenced by wind-deposited sand and supports no soil development; large patches of sparsely vegetated or unvegetated sand are common.
Range: Communities in this alliance are locally abundant on coastal dunes from Maine to North Carolina. Inland types have been reported only from New Hampshire and Maine.
States/Provinces: CT DE MA MD ME NC NH NJ NY RI VA
TNC Ecoregions: 57:C, 58:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221Al:CCC, 232Aa:CCC, 232Ac:CCC, 232Bz:CCC, 232Ci:CCC, M221:C
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Maritime heathland. NY (Reschke 1990); Coastal dune shrubland. NJ (Breden 1989); *Hudsonia tomentosa* dwarf shrub vegetation. CT (Metzler and Barrett 1992); Maritime Dune Community. MA (Swain and Kearsley 2001); Sandplain Heathland. MA (Swain and Kearsley 2001); *Hudsonia tomentosa - Ammophila breviligulata* dune scrub association. DE (Clancy 1993b); Riverside *Hudsonia* sand / gravel barren. NH (Sperduto 1994); Inland beach strand and Dry riverbluff opening community. NH (Sperduto 1994); River beach community. ME (MENHP 1991); *Hudsonia* dunes (Higgins et al. 1971); *Hudsonia* dune community (Hill 1986); Dunegrass - beach heather - low thicket mixture. NJ (Martin 1959b); dune heath. NY (Johnson 1985b); beach heather community. NJ (Collins and Anderson 1994); dune crest community (Clampitt 1991)

References: Breden 1989, Clampitt 1991, Clancy 1993b, Collins and Anderson 1994, Higgins et al. 1971, Hill 1986, Johnson 1985b, MENHP 1991, Martin 1959b, Metzler and Barrett 1992, Reschke 1990, Sperduto 1994, Swain 1996, Swain and Kearsley 2001
Authors: A.S. WEAKLEY/L.E. MORSE, RW, East **Identifier:** A.1062

HUDSONIA TOMENTOSA / PANICUM AMARUM VAR. AMARULUM DWARF-SHRUBLAND
Woolly Beach-heather / Coastal Panicgrass Dwarf-shrubland
Central Coast Beach Heather Dune Shrubland **G2 (98-10-14)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Dune and Coastal Grasslands (240-25; n/a)

Concept: This association is a maritime beach heather community of mid-Atlantic sand dunes. The unstable substrate is influenced by wind-deposited sand and supports no soil development; large patches of sparsely vegetated or unvegetated sand are common. The community is characterized by *Hudsonia tomentosa* occurring as discrete patches that may coalesce into a dense mat on older, more stabilized dunes. A number of other shrubs such as *Morella pensylvanica (= Myrica pensylvanica), Morella cerifera (= Myrica cerifera), Pinus taeda* saplings, and rarely *Prunus maritima* may occur but are low in abundance and cover. *Schizachyrium littorale (= Schizachyrium scoparium ssp. littorale), Ammophila breviligulata, Aristida tuberculosa, Spartina patens*, and *Panicum amarum var. amarulum* are common grasses of this community, and *Toxicodendron radicans* is a common vine. Other herbaceous associates include *Lechea maritima, Cyperus grayi, Artemisia stelleriana, Chamaesyce polygonifolia, Solidago sempervirens*, and *Diodia teres*. This community is locally common on coastal dunes from New Jersey to northern North Carolina.
Range: The association is restricted to barrier beaches from New Jersey to northern North Carolina.
States/Provinces: DE:S2, MD:S?, NC:S?, NJ:S1S2, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Bz:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: *Hudsonia* dunes (Higgins et al. 1971) =. Assateague Island., *Hudsonia* dune community (Hill 1986) =. Assateague Island., Dunegrass - beach heather - low thicket mixture (Martin 1959b) I. New Jersey., Beach heather community (Collins and Anderson 1994) =. New Jersey., Dune crest community (Clampitt 1991) B. Virginia., *Hudsonia tomentosa - Ammophila breviligulata* dune scrub association (Clancy 1993a) =. Delaware., Coastal dune shrubland (Breden 1989) B. New Jersey.
References: Berdine 1998, Bowman 2000, Breden 1989, Breden et al. 2001, Clampitt 1991, Clancy 1993a, Collins and Anderson 1994, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Martin 1959b, TNC 1995c
Authors: L.A. Sneddon, ECS **Confidence:** 2 **Identifier:** CEGL003950

IV.B.2.N.a. Caespitose cold-deciduous dwarf-shrubland

IV.B.2.N.a.1. VACCINIUM (ANGUSTIFOLIUM, MYRTILLOIDES, PALLIDUM) DWARF-SHRUBLAND ALLIANCE

(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) Dwarf-shrubland Alliance

Concept: This alliance includes communities dominated by heaths or heathlike shrubs (typically blueberries, *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium pallidum (= Vaccinium vacillans))* and commonly referred to as 'heath barrens.' In general, these communities are small and patchy and restricted to two broad habitat types: (a) bedrock outcrops, ledges, summits of igneous or metamorphic rock, or (b) depressions on level outwash plain or valley floor frost pockets. Soils are shallow accumulations of organic material on bedrock habitats, or rapidly drained and nutrient-poor sands on outwash plains. In addition to *Vaccinium*, the communities typically contain other shrubs such as *Gaylussacia baccata* and *Arctostaphylos uva-ursi* along with scattered herbaceous plants such as *Deschampsia flexuosa, Schizachyrium scoparium, Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Rubus hispidus, Euthamia graminifolia, Solidago canadensis, Lycopodium dendroideum*, and *Lycopodium digitatum*. Mosses and lichens usually are present. Scattered individuals of *Picea mariana, Pinus strobus, Prunus serotina, Larix laricina, Abies balsamea, Picea rubens, Betula papyrifera var. cordifolia*, and/or *Sorbus americana* may occur where soil has accumulated. This alliance includes communities which are known locally as 'heath barrens' and 'acidic rocky summits.'

Comments: This alliance occurs on sandstone glades in Garrett County, Maryland.
Range: This alliance is found in Connecticut, Maine, Maryland, New Hampshire, New York, Pennsylvania, and West Virginia, and in Canada, and possibly in Virginia (?).
States/Provinces: CT MA MD ME NH NY ON PA VT WV
TNC Ecoregions: 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions: 212Aa:CPP, 212Ab:CPP, 212Ba:CCP, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCP, 212Db:CCC, 212Dc:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, 221Ab:CCC, 221Ac:CCC, 221Ae:CCP, 221Af:CCP, 221Ag:CCP, 221Ah:CCP, 221Ai:CCP, 221Aj:CCP, 221Ak:CCP, 221Al:CCC, 221Bc:CCP, 221Bd:CCP, 232Aa:CCC, M212Aa:CCC, M212Ab:CCP, M212Ac:CCP, M212Ad:CCP, M212Ba:CCP, M212Bb:CC?, M212Bc:CCC, M212Bd:CCC, M212Ca:CCP, M212Cb:CCC, M212Cc:CCC, M212Cd:CCP, M212Da:CCP, M212Db:CCP, M212Dc:CCP, M212Ea:CCC, M212Eb:CCP, M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ba:CPP, M221Bb:CPP, M221Da:CPP
Federal Lands: NPS (Acadia); USFS (George Washington?, Jefferson?)
Synonymy: Sandplain Heathland (Swain and Kearsley 2001); Low heath shrubland (Fike 1999); Low heath - mountain ash shrubland (Fike 1999); Northern Appalachian Low Elevation Acidic Rocky Summit (Smith 1991); Ridgetop Dwarf-tree Forest, in part (Smith 1991)
References: Fike 1999, Smith 1991, Swain and Kearsley 2001
Authors: ECS, RW, East **Identifier:** A.1113

VACCINIUM (ANGUSTIFOLIUM, MYRTILLOIDES, PALLIDUM) HIGH ALLEGHENY PLATEAU / CENTRAL APPALACHIAN DWARF-SHRUBLAND
(Northern Lowbush Blueberry, Velvetleaf Blueberry, Hillside Blueberry) High Allegheny Plateau / Central Appalachian Dwarf-shrubland
Central Appalachian Blueberry Shrubland **G? (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Shrub Balds (436-20; n/a)

Concept: Northern or high-elevation acidic rock outcrops or summits characterized by abundant dwarf *Vaccinium* spp. This community is dominated by heaths or heath-like shrubs (typically blueberries, *Vaccinium angustifolium, Vaccinium myrtilloides, Vaccinium pallidum (= Vaccinium vacillans)*) and commonly referred to as `heath barrens.' In general, these communities are small and patchy and restricted to two broad habitat types: (1) bedrock outcrops, ledges, summits of igneous or metamorphic rock, or (2) depressions on level outwash plain or valley floor frost pockets. Soils are shallow accumulations of organic material on bedrock habitats, or rapidly drained and nutrient-poor sands on outwash plains. In addition to *Vaccinium*, the communities typically contain other shrubs such as *Gaylussacia baccata* and *Arctostaphylos uva-ursi*, along with scattered herbaceous plants such as *Deschampsia flexuosa, Schizachyrium scoparium, Carex pensylvanica, Piptatherum pungens (= Oryzopsis pungens), Rubus hispidus, Euthamia graminifolia, Solidago canadensis, Lycopodium dendroideum*, and *Lycopodium digitatum*. Mosses and lichens usually are present. Scattered individuals of *Picea mariana, Pinus strobus, Prunus serotina, Larix laricina, Abies balsamea, Picea rubens, Betula papyrifera var. cordifolia (= Betula cordifolia)*, and/or *Sorbus americana* may occur where soil has accumulated. This alliance includes communities which are known locally as `heath barrens' and `acidic rocky summits.'
States/Provinces: MD:S?, PA:S?, WV:S?
TNC Ecoregions: 59:C, 60:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCP, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CCP, M212Ea:CCP, M212Eb:CCP, M221Ac:CCC
References: Fike 1999
Authors: ECS **Confidence:** 2 **Identifier:** CEGL003958

V. HERBACEOUS VEGETATION

V.A.5.N.c. Medium-tall sod temperate or subpolar grassland

V.A.5.N.c.2. AMMOPHILA BREVILIGULATA HERBACEOUS ALLIANCE

American Beachgrass Herbaceous Alliance

Concept: Dune grasslands dominated by *Ammophila breviligulata*. This alliance includes maritime dune

grasslands dominated by *Ammophila breviligulata, Panicum amarum var. amarum*, and *Panicum amarum var. amarulum*. Plant cover is variable, ranging from 10-75%, but is usually low. Other associated species include *Solidago sempervirens, Strophostyles helvula, Triplasis purpurea, Cenchrus tribuloides, Chamaesyce polygonifolia, Oenothera humifusa, Schoenoplectus pungens (= Scirpus pungens)* (where overwashed by sand), *Diodia teres, Cakile edentula ssp. edentula, Nuttallanthus canadensis, Salsola kali ssp. kali (= Salsola caroliniana), Lechea maritima*, and *Spartina patens*. Sparse individuals of stunted *Morella pensylvanica (= Myrica pensylvanica)* shrubs and seedlings may occur, but make up less than 2% of the total vegetation cover. Diagnostic species are *Ammophila breviligulata, Solidago sempervirens, Panicum amarum var. amarulum*, and *Oenothera humifusa*. This dune grassland community occurs almost exclusively on sandy, unstable, droughty substrates with no soil profile development. Eolian processes cause active sand deposition and erosion. The sand substrate is usually visible, and litter accumulation from plant debris is nearly absent. This community generally occurs on foredunes that receive the force of wind and salt spray, but is beyond the influence of most storm tides.
Comments: This grassland often occurs in a complex with *Morella pensylvanica / Diodia teres* Shrubland (CEGL003881). It is restricted to the mid-Atlantic Coast and is vulnerable to development pressure.
Range: This alliance occurs on dunes and sandy shores from Maine south to northern North Carolina, on Lake Champlain shorelines in Vermont, and on the Great Lakes shoreline in Michigan, Wisconsin, and Ontario, Canada.
States/Provinces: CT DE IL IN MA MD ME MI NC NH NJ NY ON RI VA VT WI
TNC Ecoregions: 48:C, 57:C, 58:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCC, 212Ec:CPP, 212Hd:CCC, 212He:CCC, 212Hi:CCP, 212Hj:CCC, 212Hl:CCC, 212Hm:CCP, 212Hn:CCC, 212Ho:CCC, 212Hr:CCP, 212Hw:CCC, 212Hx:CCC, 212Ia:CCC, 212Ja:CCC, 212Oa:CCC, 212Ob:CCC, 212Pa:CCC, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Aj:CCP, 221Ak:CCC, 221E:CC, 222Ia:CPP, 222Ie:CPP, 222Ja:CCC, 222Jj:CCC, 222Kg:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bc:CCP, 232Bd:CCP, 232Bt:CCP, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Acadia, Assateague Island, Fire Island)
Synonymy: Dune Grass, in part (Schafale and Weakley 1990); Dunegrass community (Hill 1986); dunegrass community (Higgins et al. 1971); Mid-Atlantic *Ammophila breviligulata - Panicum amarulum* dune grassland variant (Clancy 1993b); *Ammophila - Panicum amarum* dunes (Harvill 1965); *Panicum - Ammophila* community (Egler 1962); foredune (Klotz 1986); foredune (Boule 1979); sand dune (Fender 1937); dune community (Baumann 1978b); Coastal dune grass community (Breden 1989); primary dune (Stalter 1990); dunegrass community (Clampitt 1991); Maritime Dune Community (Swain and Kearsley 2001)
References: Baumann 1978b, Boule 1979, Breden 1989, Chapman et al. 1989, Clampitt 1991, Clancy 1993b, Egler 1962, Faber-Langendoen et al. 1996, Fender 1937, Harvill 1965, Higgins et al. 1971, Hill 1986, Klotz 1986, Martin 1959b, Schafale and Weakley 1990, Sneddon 1996, Stalter 1990, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.1207

AMMOPHILA BREVILIGULATA - PANICUM AMARUM VAR. AMARUM HERBACEOUS VEGETATION

American Beachgrass - Bitter Panicgrass Herbaceous Vegetation

Beachgrass - Panicgrass Dune Grassland **G2 (98-10-08)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Dune and Coastal Grasslands (240-25; n/a)

Concept: This community is a maritime dune grassland dominated by *Ammophila breviligulata* or *Panicum amarum var. amarum*. Plant cover is variable, ranging from 10-75% but is usually low. Other associated species include *Solidago sempervirens, Strophostyles helvula, Triplasis purpurea, Cenchrus tribuloides, Chamaesyce polygonifolia*. *Oenothera humifusa, Schoenoplectus pungens (= Scirpus pungens)* (where overwashed by sand), *Diodia teres, Cakile edentula ssp. edentula, Nuttallanthus canadensis, Salsola kali ssp. kali (= Salsola caroliniana), Lechea maritima* and *Spartina patens*. Sparse individuals of stunted *Morella pensylvanica (= Myrica pensylvanica)* shrubs and seedlings occur but make up less than 2% of the total vegetation cover. Diagnostic species are *Ammophila breviligulata, Solidago sempervirens, Panicum amarum var. amarum*, and *Oenothera humifusa*. This dune grassland community occurs almost exclusively on sandy, unstable, droughty substrates with no soil profile development. Eolian processes cause active sand deposition and erosion. The sand substrate is usually visible, and litter accumulation from plant debris is nearly absent. This community generally occurs on foredunes that receive the force of wind and salt spray, but is beyond the influence of most storm tides. It is found on maritime dunes from southern New Jersey (Cape May) south to the Chesapeake Bay, Virginia, as well as on the northern North Carolina coast.
Comments: This grassland often occurs in a complex with *Morella pensylvanica / Diodia teres* Shrubland (CEGL003881). It contains several species characteristic to *Cakile edentula ssp. edentula - Mertensia maritima*

Sparse Vegetation (CEGL006106), but this grassland is differentiated by (1) its location beyond storm tide influence, (2) dominance by perennial rather than annual species, (3) greater plant cover on average, and (4) greater prevalence of *Solidago sempervirens*. *Ammophila breviligulata - Lathyrus japonicus* Herbaceous Vegetation (CEGL006274) is the northern analog of this association; it is the beach grass-dominated primary dune association of the North Atlantic Coast. This association differs in being codominated by *Panicum amarum*, whereas CEGL006274 lacks *Panicum amarum* as a significant component and has or is codominated by *Lathyrus japonicus*. These two associations overlap geographically in southern New Jersey.
Range: This community occurs on maritime dunes from Long Island, New York, south to North Carolina.
States/Provinces: DE:S2?, MD:S?, NC:S3, NJ:S1S2, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Ac:CCC, 232Bt:CCP, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Dune Grass (Northern Subtype) (Schafale 2000), Dunegrass community (Hill 1986) =. Assateague Island., Dunegrass community (Higgins et al. 1971) =. Assateague Island., Mid-Atlantic *Ammophila breviligulata, Panicum amarulum* dune grassland variant (Clancy 1993a) =. Delaware., *Ammophila, Panicum amarum* dunes (Harvill 1965) =. Virginia., *Panicum, Ammophila* community (Egler 1962) =. Virginia., Foredune (Klotz 1986) =. Virginia., Foredune (Boule 1979) =. Virginia., Dune community (Baumann 1978b) =. Virginia., Primary dune (Stalter and Lamont 1990) B. Assateague Island, Virginia., Dunegrass community (Clampitt 1991) B. Virginia., Coastal dune grass community (Breden 1989) B. New Jersey., Sand dune (Fender 1937) =. southern New Jersey.
References: Baumann 1978b, Berdine 1998, Boule 1979, Bowman 2000, Breden 1989, Breden et al. 2001, Clampitt 1991, Clancy 1993a, Egler 1962, Fender 1937, Fleming 2001, Fleming et al. 2001, Harvill 1965, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale 2000, Schafale and Weakley 1990, Stalter and Lamont 1990
Authors: L.A. Sneddon, ECS **Confidence:** 2 **Identifier:** CEGL004043

V.A.5.N.e. Short sod temperate or subpolar grassland

V.A.5.N.e.1. SPARTINA PATENS - (SCHOENOPLECTUS PUNGENS) HERBACEOUS ALLIANCE

Saltmeadow Cordgrass - (Threesquare) Herbaceous Alliance

Concept: This alliance includes upland dune grassland of barrier islands of the Mid-Atlantic and Gulf coasts. *Spartina patens* and *Schoenoplectus pungens (= Scirpus pungens)* are characteristically dominant, though other graminoids such as *Schoenoplectus pungens, Sporobolus virginicus, Cenchrus spinifex (= Cenchrus incertus), Cenchrus tribuloides*, and *Paspalum distichum* may be codominant or prominent within their respective ranges. In parts of the range of this alliance, *Spartina patens* is dominant and *Schoenoplectus pungens* may be absent. This community characteristically occupies overwash terraces or low dunes, less well-developed than those dominated by *Uniola paniculata* (from North Carolina south and west to Texas and Tamaulipas, Mexico) or by *Ammophila breviligulata* (from North Carolina northwards). Total vegetation cover is variable, ranging from quite sparse (25% cover) to dense. Bare sand is often visible through the vegetation, and there is no soil profile development. Species diversity is variable; although it may be quite low and confined to the nominal species in the northern part of the range, it may be of greater diversity. Other components of this vegetation include *Strophostyles helvula, Solidago sempervirens, Cenchrus tribuloides, Setaria parviflora, Distichlis spicata, Sabatia stellaris, Ammophila breviligulata, Suaeda linearis, Bassia hirsuta* (an exotic), *Atriplex patula, Polygonum glaucum, Spergularia salina (= Spergularia marina), Salicornia bigelovii, Salicornia virginica, Fimbristylis castanea*, and *Cakile edentula ssp. edentula*. Woody species may include scattered individuals of *Toxicodendron radicans, Solidago sempervirens, Lythrum lineare, Kosteletzkya virginica*, and seedlings of *Baccharis halimifolia*. The plants of this community are influenced by sand deposited by storm surges. Storm overwash is a prevalent natural disturbance to this community. This community appears to be successional between interdunal herbaceous wetlands and interdunal herbaceous/shrub uplands.
Range: This alliance is reported from coastal areas from New York on the Atlantic Coast around to Tamaulipas, Mexico, on the Gulf Coast.
States/Provinces: AL DE FL LA MA? MD MS? MXTM? NC NJ NY TX VA
TNC Ecoregions: 31:C, 53:C, 55:C, 57:C, 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 231Fb:PPP, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bz:CCC, 232Ch:CCP, 232Ci:CC?, 232Dc:CCC, 232Dd:CCC, 232De:CCC, 232Eb:CC?, 232Ed:CCC, 232Ee:CCC, 255Dc:CCC

Federal Lands: NPS (Assateague Island, Fire Island, Padre Island?); USFWS (Bon Secour, Laguna Atascosa, Matagorda Island)
Synonymy: Maritime Dry Grassland (Schafale and Weakley 1990); Wash (Hill 1986); wash (Higgins et al. 1971); grassland community (Baumann 1978b); low dune community (Boule 1979); dunegrass community, in part (Higgins et al. 1971); Dry community of barrier flats (Travis and Godfrey 1976); secondary dunes (Klotz 1986)
References: Baumann 1978b, Boule 1979, Higgins et al. 1971, Hill 1986, Klotz 1986, Schafale and Weakley 1990, Travis and Godfrey 1976
Authors: ECS, JT, East **Identifier:** A.1274

SPARTINA PATENS - SCHOENOPLECTUS PUNGENS - SOLIDAGO SEMPERVIRENS HERBACEOUS VEGETATION
Saltmeadow Cordgrass - Threesquare - Seaside Goldenrod Herbaceous Vegetation
Overwash Dune Grassland **G2G3 (98-11-04)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Dune and Coastal Grasslands (240-25; n/a)

Concept: This community is an upland dune grassland of mid-Atlantic barrier islands on embryo dunes forming from overwash terraces from Delaware to North Carolina. It forms a drier, later successional phase beginning from water-deposited sand of storm overwash. Sand movement, plant burial, and dune formation rates are not so high as to form *Ammophila breviligulata*-dominated primary dunes, but can be found as a fringe around the outer edge of those dunes. *Spartina patens* is dominant, ranging from quite sparse (25% cover) to dense, and can be monotypic in early successional expressions. As the vegetation develops, common associated species can include *Schoenoplectus pungens (= Scirpus pungens)* or *Solidago sempervirens*. Less common associates can include *Cyperus grayi, Cenchrus tribuloides, Setaria parviflora, Festuca rubra*, and occasional scattered individuals of *Toxicodendron radicans* and seedlings of *Baccharis halimifolia*. Bare sand is often visible through the vegetation, and there is no soil profile development. *Ammophila breviligulata* or *Uniola paniculata* may invade from the surrounding dunes. This community appears to be a successional step between interdunal herbaceous wetlands and interdunal herbaceous/shrub uplands.
Comments: This community differs ecologically from dune grasslands dominated by *Ammophila breviligulata* or *Uniola paniculata*, which are primarily impacted by wind-deposited sand. This community is impacted by wave-deposited sand. It is drier than brackish swales and vegetation that immediately colonizes water-borne sand from storm overwash, like *Spartina patens - Eleocharis parvula* Herbaceous Vegetation (CEGL006342). *Spartina patens - Schizachyrium maritimum - Solidago sempervirens* Herbaceous Vegetation (CEGL008445) is a southern analog of this association that occurs along the Gulf Coast.
Range: This community is an upland dune grassland of mid-Atlantic barrier islands from Delaware to North Carolina.
States/Provinces: DE:S2S3?, MA?, MD:S?, NC:S2, NJ:S?, NY:S5, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bz:CCC, 232Ci:C??
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Maritime Dry Grassland (Typic Subtype) (Schafale 2000), Wash (Hill 1986) =. Assateague Island., Wash (Higgins et al. 1971) =. Assateague Island., Dunegrass community (Higgins et al. 1971) B. Assateague Island., Grassland community (Baumann 1978b) =. Virginia., Low dune community (Boule 1979) =. Virginia., Dry community of barrier flats (Travis and Godfrey 1976) B. North Carolina., Secondary dunes (Klotz 1986) B. Virginia., Dry maritime grassland (Lea 2002b). Assateague Island.
References: Baumann 1978b, Berdine 1998, Boule 1979, Bowman 2000, Breden et al. 2001, Edinger et al. 2002, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Klotz 1986, Lea 2002b, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, TNC 1995c, Travis and Godfrey 1976, Zaremba and Leatherman 1984
Authors: L.A. Sneddon, ECS **Confidence:** 2 **Identifier:** CEGL004097

V.A.5.N.j. Temporarily flooded temperate or subpolar grassland

V.A.5.N.j.1. ANDROPOGON GERARDII - (SORGHASTRUM NUTANS) TEMPORARILY FLOODED HERBACEOUS ALLIANCE

Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance

Concept: This alliance includes scoured riverbank 'prairies' in northeastern and southeastern United States, which may be called 'riverside prairies,' 'linear prairies,' 'rivershore grasslands,' or 'scoured riverine bluff prairie.' In

addition to the nominal species, examples may also contain *Schizachyrium scoparium, Chasmanthium latifolium*, and/or *Panicum virgatum*, any of which could be locally dominant. These grasslands may be associated with dry cobble riverbanks and lakeshores, as well as flood-scoured, acidic or calcareous bedrock exposures associated with major rivers. This includes riverine gravel/cobble bar 'prairies' along the upper Cumberland River in Kentucky and Tennessee; scour areas along high gradient sections of major rivers, such as in gorges in Virginia, Maryland, Pennsylvania, and possibly farther west; and scoured limestone bluffs along the Duck River in Tennessee's Central Basin.
Comments: On the Daniel Boone National Forest, this vegetation is found only in the southern part, i.e., Big South Fork and (I believe) Marsh creek and mainstem of the Cumberland above Cumberland Falls (M. Evans pers. comm.).
Range: This alliance is found on scoured riverbanks in the northeastern, southeastern, and midwestern United States from Illinois and Iowa (?) south to Kentucky and Tennessee, and in the east from New England to northern Virginia.
States/Provinces: CT? IA? IL IN KY MA MD ME NH NY OH? PA TN VA VT WV
TNC Ecoregions: 44:C, 50:C, 52:C, 59:C, 60:P, 61:C, 63:C, 64:C
USFS Ecoregions: 212Ba:C??, 212Da:CCC, 212Ea:CCP, 212Ec:CC?, 212Fa:CP?, 212Fc:CPP, 212Ga:CP?, 212Gb:CPP, 221Aa:CCP, 221Af:CCC, 221Ai:CCP, 221Al:CCP, 221Ba:CCP, 221Bc:CCC, 221Bd:CCP, 221Da:CCP, 221Db:CCC, 221Dc:CCC, 221F:C?, 221Hc:CCC, 221Ja:C??, 221Jb:C??, 222Db:CC?, 222Df:CCC, 222Ea:CCP, 222Ec:CCP, 222Ed:CCC, 222Eg:CCP, 222Eh:CCP, 222Ek:CCC, 222Fa:CCP, 222Fb:CCC, 222Fc:CC?, 222Fd:CC?, 222Fe:CCC, 231Ak:CCC, 231Al:CCC, 231Ap:CCP, 231Da:C??, 231Dc:C??, 232Aa:PPP, 232Ac:PPP, M212Bb:CCC, M212Cc:CPP, M212Da:CCP, M212Db:CC?, M212Dc:CCP, M212De:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCP, M221Bd:CCC, M221Be:CCC, M221Ca:CP?, M221Cb:CPP, M221Cc:CP?, M221Cd:CPP, M221Da:CCC, M221Db:CCC
Federal Lands: NPS (Big South Fork, Great Falls); TVA (Columbia); USFS (Daniel Boone, Jefferson)
Synonymy: Big bluestem - Indian grass river grassland (Fike 1999); River Gravel Community (Smith 1991)
References: Faber-Langendoen et al. 1996, Fike 1999, Pyne and Withers 1996, Smith 1991
Authors: ECS, JT, East **Identifier:** A.1337

ANDROPOGON GERARDII - PANICUM VIRGATUM - BAPTISIA AUSTRALIS HERBACEOUS VEGETATION
Big Bluestem - Switchgrass - Tall Blue Wild Indigo Herbaceous Vegetation
Fall-Line Riverwash Bedrock Prairie **G2G3 (98-12-14)**
Ecological Group (SCS;MCS): Appalachian Highlands Riverscour Vegetation (457-40; 2.2.3.2)

Concept: This riverwash grassland community is found in the east-central United States. Stands occur only along high-gradient sections of major rivers, such as in gorges and along the Fall Line. They occur within the active channel shelf at an intermediate level above the low-water level and the bank-full level. Flood scouring and river ice may become a powerful and ecologically important abrasive force along the riverbanks. Soils are rapidly drained Psamments. Often, soil material is restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. This community is characterized by a luxuriant growth of the robust grasses *Andropogon gerardii, Sorghastrum nutans, Panicum virgatum*, and *Spartina pectinata* which resembles prairie vegetation. *Tripsacum dactyloides* may also occur. Many of the forbs are also typical of prairies. Characteristic species include *Baptisia australis, Toxicodendron radicans, Allium cernuum, Cerastium arvense, Clematis viorna, Coreopsis tripteris, Melica mutica, Phlox divaricata, Pycnanthemum virginianum, Silphium trifoliatum, Solidago erecta, Solidago rupestris, Solidago speciosa, Teucrium canadense, Veronicastrum virginicum, Vicia americana*, and *Zizia aurea*.
Comments: The distinctions between this community type and *Salix* spp. / *Andropogon gerardii - Sorghastrum nutans* Gravel Wash Herbaceous Vegetation (CEGL005175) and *(Salix caroliniana, Rhododendron arborescens) - Andropogon gerardii - Baptisia australis - (Solidago simplex var. randii)* Herbaceous Vegetation (CEGL008471) seem quite artificial and further study should be undertaken to determine whether these merely represent geographic subtypes of a single association.

In the Central Appalachian region, the type is found predominantly on Western Allegheny Mountains (M221Be + M221Bd, Gauley M221Ca dammed).
Range: This riverwash grassland community is found in the east-central United States, from Pennsylvania, West Virginia, and Virginia, and possibly Ohio.
States/Provinces: MD:S?, OH?, PA:S?, TN:S?, VA:S?, WV:S?
TNC Ecoregions: 59:C, 61:C

USFS Ecoregions: 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Bd:CCC, M221Be:CCC, M221C:C?, M221Da:CCC, M221Db:CC?
Federal Lands: USFS (Jefferson)
Synonymy: *Fraxinus pennsylvanica / Andropogon gerardii - Panicum virgatum - Baptisia australis* Wooded Herbaceous Vegetation (Lea 2000), Riverwash Grasslands (*Baptisia australis - Lespedeza violacea - Chasmanthium latifolium* Herbaceous Vegetation) (Grossman et al. 1994), *Andropogon gerardii - Panicum virgatum - Rhus radicans - Baptisia australis* Association (Rawinski et al. 1996), *Cornus amomum / Andropogon gerardii - Panicum virgatum - Baptisia australis* Shrub Herbaceous Vegetation (Fleming and Coulling 2001)
References: Fike 1999, Fleming and Coulling 2001, Fleming et al. 2001, Grossman et al. 1994, Lea 2000, Rawinski 1988, Rawinski et al. 1996
Authors: L.A. Sneddon, mod. G. Fleming and P. Coulling, ECS **Confidence:** 2 **Identifier:** CEGL006283

ANDROPOGON GERARDII - PHLOX SUBULATA - SOLIDAGO SIMPLEX VAR. RACEMOSA - PACKERA PAUPERCULA HERBACEOUS VEGETATION
Big Bluestem - Moss Phlox - Sticky Goldenrod - Balsam Ragwort Herbaceous Vegetation
Potomac River Basalt Outcrop Scour Prairie **G2? (97-11-10)**
Ecological Group (SCS;MCS): Appalachian Highlands Riverscour Vegetation (457-40; 2.2.3.2)

Concept: This riverside outcrop vegetation of the Potomac River in Virginia and Maryland occurs on metamorphic rock ledges that are catastrophically flood-scoured. The vegetation is generally herbaceous but may range from sparsely vegetated to herbaceous with sparse shrubs. The habitat is variable, with small pools interspersed among shaded microhabitats and exposed xeric microhabitats. Typical species include *Phlox subulata, Solidago simplex var. racemosa (= Solidago racemosa), Solidago rupestris, Andropogon gerardii*, and *Leucothoe racemosa*. In more shaded locations, *Asplenium platyneuron, Aquilegia canadensis*, and *Mitchella repens* occur, while *Danthonia spicata* is more commonly found in exposed, xeric openings. This association is apparently restricted to the Great Falls area.
Range: This community is known from Virginia, Maryland, and the District of Columbia. In Virginia, it is confined to one stretch of the Potomac River, usually pretty high on the river, and is only scoured in catastrophic floods.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 52:C, 61:C
USFS Ecoregions: 221Da:CCP, 221Db:CCC
Federal Lands: NPS (Great Falls)
Synonymy: Oligotrophic Herbaceous Vegetation (Rawinski 1992) B. in part, *Leucothoe racemosa - Gaylussacia baccata / Solidago simplex ssp. randii var. racemosa* Sparse Shrubland (Fleming pers. comm.)
References: Fleming et al. 2001, Fleming pers. comm., Grossman et al. 1994, Lea 2000, Rawinski 1992
Authors: ECS **Confidence:** 2 **Identifier:** CEGL004284

V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

V.A.5.N.k.39. CALAMAGROSTIS CANADENSIS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Bluejoint Seasonally Flooded Herbaceous Alliance

Concept: This alliance is found throughout the northern states of the United States, excluding the Great Plains states. It is a wide-ranging alliance with much variability in species composition and habitat. Stands of this alliance have a dense graminoid cover, generally over 1 m tall, with either a flat or tussocky microtopography. Tall shrubs may occupy as much as 25% cover. *Calamagrostis canadensis* is the characteristic dominant but can be associated with *Phalaris arundinacea* or a variety of Carices. Other associates include, in the Northeast, shrubs such as *Viburnum nudum, Alnus incana*, or *Alnus serrulata, Viburnum dentatum, Spiraea alba*, and graminoids such as *Agrostis gigantea (= Agrostis alba)*. In the Midwest, typical associates include several Carices, such as *Carex stricta, Carex rostrata*, or *Carex lacustris*, and occasionally *Poa palustris* or *Glyceria grandis* (Harris et al. 1996). The ground layer can be a heavy mat of grass stems and leaves, with patches of bare soil present in wetter locations.

The habitat of this alliance is typically mineral soil or well-decomposed peat, usually held together by a dense root mat. Stands are found in floodplains of small streams, beaver meadows, and lakeshores. The

hydrology is typically seasonally flooded (Harris et al. 1996). In the southern Appalachians of Tennessee and Virginia, this vegetation occurs in depression meadows and occasionally in beaver ponds.
Comments: Where *Calamagrostis* occurs in relatively pure stands or with a variety of forbs as codominants, stands can be assigned relatively confidently to this alliance. However, stands that are codominated by *Carex* species may overlap in composition with alliances such as V.A.5.N.k *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397) or V.A.5.N.k *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367). These relationships require further study, as does the very broad range of the alliance, which currently stretches from California to Maine.
Range: This alliance ranges over much of the northern and western United States. In the eastern United States, it is found from Vermont south and west through the New England states into Virginia, West Virginia and Tennessee. It also occurs in the Upper Midwest in Michigan, Minnesota, and Wisconsin. In the western United States, it is reported from almost all western states, from Montana south into Colorado, and west into Washington, Oregon and California. It has not been reported from New Mexico, Arizona or Nevada. In Canada it is reported from Ontario, but undoubtedly occurs elsewhere.
States/Provinces: BC CA CO CT DE ID MA MD ME MI MN MT ND NH NJ NY ON OR PA RI SD TN UT VA? VT WA WI WV WY
TNC Ecoregions: 10:C, 12:C, 20:C, 25:C, 26:C, 2:C, 35:C, 45:C, 47:P, 48:C, 51:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:CCC, 212Ab:CCC, 212Ba:CC?, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CCC, 212Ea:CPP, 212Eb:CPP, 212Ec:CPP, 212Ed:CP?, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hj:CCC, 212Hs:CCC, 212Hx:CCC, 212Ib:CCC, 212La:CPP, 212Na:CPP, 221Aa:CCP, 221Ab:CC?, 221Ac:CC?, 221Ad:CC?, 221Ae:CCP, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Ak:CC?, 221Al:CCC, 221Am:CCP, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:CPP, 221Db:CPP, 221Ea:CPP, 221Eb:CPP, 221Fa:CPP, 221Fb:CPP, 222Ia:CPP, 222Ib:CPP, 222Ic:CPP, 222Id:CPP, 222Ie:CPP, 222If:CPP, 222Jg:CCC, 222Na:CCC, 231Al:PPP, 232Ac:CCP, 232Ad:CCP, 242A:CC, 251Aa:CCC, M212Aa:CCC, M212Ab:CCC, M212Ac:CCC, M212Ad:CCP, M212Ae:CCC, M212Af:CCC, M212Ag:CCC, M212Ba:CC?, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Ca:CC?, M212Cb:CCC, M212Cc:CC?, M212Cd:CCP, M212Da:CPP, M212Db:CPP, M212Dc:CPP, M212Ea:CCC, M212Eb:CCC, M212Fa:CPP, M212Fb:CPP, M221Aa:CPP, M221Ab:CPP, M221Ba:CPP, M221Bb:CPP, M221Bc:CPP, M221Bd:CPP, M221Be:CPP, M221Bf:CPP, M221Ca:CPP, M221Cb:CPP, M221Da:CCP, M221Db:CCP, M221Dc:CC?, M221Dd:CCC, M242B:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331A:CC, M331D:C?, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC
Federal Lands: NPS (Acadia, Isle Royale, Voyageurs, Yosemite); USFS (Black Hills)
Synonymy: Meadow Marsh, in part (Harris et al. 1996); Wet Meadows, in part (Eggers and Reed 1987); Wet Meadows, in part (MNNHP 1993); *Calamagrostis canadensis* Series. equivalent (Mattson 1984); *Calamagrostis canadensis* Habitat Type. equivalent (Hansen et al. 1995); *Calamagrostis canadensis* Series. equivalent (Johnston 1987)
References: Cooper 1986a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Eggers and Reed 1987, Faber-Langendoen et al. 1996, Girard et al. 1997, Gysel 1960, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Harris et al. 1996, Johnston 1987, Kittel et al. 1999a, Komarkova 1976, Komarkova 1986, Kovalchik 1993, MNNHP 1993, Mattson 1984, Mutel 1976, Mutel and Marr 1973, Mutz and Queiroz 1983, Padgett et al. 1989, Wilson 1969
Authors: MCS/ECS/SCS 6-96, MOD. M., RW, Midwest **Identifier:** A.1400

CALAMAGROSTIS CANADENSIS - PHALARIS ARUNDINACEA HERBACEOUS VEGETATION
Bluejoint - Reed Canary Grass Herbaceous Vegetation
Bluejoint Wet Meadow **G4G5 (00-03-31)**
Ecological Group (SCS;MCS): Northern Wet Meadows (490-23; 1.5.1.1)
Midwestern Wet Prairies and Meadows (n/a; 1.5.3.1)

Concept: This wet meadow vegetation is of widespread distribution in the northeastern and midwestern United States and central and eastern Canada. Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, and lakeshores. Soils are typically mineral soil or well-decomposed peat, with a thick root mat. Water regime varies between temporarily and seasonally flooded. Graminoid cover is typically dense, and can form hummocky microtopography. *Calamagrostis canadensis* is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis, Carex lacustris, Carex rostrata*, and *Carex stricta*.

In fen transitions, *Carex lasiocarpa* can be present. *Agrostis gigantea (= Agrostis alba), Glyceria grandis, Poa palustris, Scirpus cyperinus*, and *Typha latifolia* are sometimes abundant. Forbs include *Campanula aparinoides, Epilobium leptophyllum, Eupatorium maculatum, Iris versicolor, Polygonum amphibium*, and *Comarum palustre (= Potentilla palustris)*. Scattered shrubs, such as *Viburnum nudum, Viburnum dentatum, Spiraea alba, Alnus incana*, or *Alnus serrulata*, may be present.
Comments: This type can grade into sedge meadows. A guideline of perhaps <50% sedges may be suggested as a criteria for the definition of this type compared to sedge meadow types. Harris et al. (1996) suggest that the bluejoint meadow type is drier than sedge meadows and less peaty than shore fens.
Range: This wet meadow vegetation is widely distributed in the northeastern and midwestern United States and south-central and southeastern Canada. It ranges from Maine south to West Virginia and possibly Virginia and west to Minnesota.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S3, MI:S?, MN:S?, NH:S?,S?,S?, NJ:S?, NY:S5, ON:S?, PA:S?, RI:S?, TN:S?, VA?, VT:S4, WI:SU, WV:S?
TNC Ecoregions: 35:C, 45:C, 47:P, 48:C, 51:C, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Hj:CCC, 212Hs:CCC, 212Hx:CCC, 212Ib:CCC, 212La:CPP, 212Na:CPP, 221Ae:CCP, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 222Jg:CCC, 222Na:CCC, 251Aa:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Ea:CCC, M212Eb:CCC, M221Db:???, M221Dc:???, M221Dd:???
Federal Lands: NPS (Isle Royale, Voyageurs)
Synonymy: Meadow marsh: bluejoint grass (W13) (Harris et al. 1996) =, Boreal alluvial tall meadow (NAP pers. comm. 1998), Canada bluejoint-tussock sedge meadow (CAP pers. comm. 1998), SNE low-energy riverbank community (Rawinski 1984), Shallow Emergent Marsh (Thompson 1996), Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979)
References: Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Fike 1999, Gawler 2002, Harris et al. 1996, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: ECS **Confidence:** 3 **Identifier:** CEGL005174

V.A.5.N.k.65. CAREX STRIATA SEASONALLY FLOODED HERBACEOUS ALLIANCE

Peatland Sedge Seasonally Flooded Herbaceous Alliance

Concept: This alliance includes Coastal Plain depression meadows, dominated by *Carex striata (= Carex walteriana)*. Associations include vegetation on the outer margins of Coastal Plain pondshores in New York and Delaware or in localized swales in the New Jersey pine barrens. Substrate is typically composed of sand and gravel, but some community types may occur on organic muck. *Carex striata* usually occurs in dense stands with few other associates, which may include seedlings of *Cephalanthus occidentalis* and *Acer rubrum*, as well as *Cladium mariscoides, Rhexia virginica*, and *Panicum hemitomon*. *Sphagnum* is often abundant. Tyndall et al. (1990) describe *Carex striata* communities from Maryland. This alliance is also known from depression meadows in North Carolina and South Carolina, and is assumed to occur in Virginia. A Florida association is found in seasonally flooded peat depressions.
Comments: The northern part of the alliance's range is occupied by *Carex striata var. brevis*, the southern by *Carex striata var. striata*. The latter taxon occurs in zones of a depression pond at Fort Benning, Georgia, but not at a sufficient scale to be recognized as an association.
Range: This alliance is found in Florida, North Carolina, South Carolina, Delaware, Maryland, New Jersey, New York, and Virginia. Tyndall et al. (1990) describe *Carex striata* (as *Carex walteriana*) communities from Maryland. This alliance is also known from depression meadows in North Carolina and South Carolina, and is assumed to occur in Virginia.
States/Provinces: DE FL GA? MD NC NJ NY SC VA
TNC Ecoregions: 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 221Aa:???, 232Aa:CPP, 232Ac:CPP, 232Ba:CCP, 232Br:CCP, 232Bt:CCC, 232Ca:CCC, 232Cb:CCC, 232Ch:CCC, 232Dc:CCC
Federal Lands: USFS (Osceola)
Synonymy: Depression Meadow, in part (Nelson 1986)
References: Nelson 1986, Tyndall et al. 1990
Authors: D.J. ALLARD, MOD. M. PYNE, MP, East **Identifier:** A.1426

CAREX STRIATA VAR. BREVIS HERBACEOUS VEGETATION
Northern Peatland Sedge Herbaceous Vegetation

G? (97-12-01)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Emergent Ponds and Marshes (345-30; n/a)

Concept: This vegetation occupies Coastal Plain depression meadows around the perimeter of Coastal Plain ponds and is dominated by *Carex striata var. brevis (= Carex walteriana var. brevis)*. Examples include vegetation on the outer margins of Coastal Plain pond shores in New York, Maryland and Delaware or in localized swales in the New Jersey pine barrens. The substrate is typically composed of sand and gravel but some community types may occur on organic muck. *Carex striata* usually occurs in dense stands with few other associates, which may include seedlings of *Cephalanthus occidentalis* and *Acer rubrum*, as well as *Cladium mariscoides, Rhexia virginica, Bidens frondosa, Rhynchospora macrostachya, Rhynchospora chalarocephala, Fimbristylis autumnalis, Juncus canadensis, Dulichium arundinaceum*, and *Panicum hemitomon*. *Sphagnum* is often abundant.
States/Provinces: DE:S?, MD:S?, NC:S?, NJ:S1S3, NY:S?, SC:S?, VA:S?
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232A:C?, 232Bt:CCC, 232Cb:CCC, 232Ch:CCC
Synonymy: Coastal Plain Intermittent Pond (Breden 1989) B
References: Berdine and Gould 1999, Bowman 2000, Breden 1989, Breden et al. 2001, Fleming et al. 2001, Nelson 1986, Tyndall et al. 1990
Authors: ECS **Confidence:** 1 **Identifier:** CEGL004120

V.A.5.N.k.36. CAREX STRICTA SEASONALLY FLOODED HERBACEOUS ALLIANCE
Tussock Sedge Seasonally Flooded Herbaceous Alliance

Concept: This alliance, found primarily in the Great Lakes and northeastern regions of the United States, includes seasonally flooded communities dominated by the sedge *Carex stricta*, often occurring with other tussock-forming sedges. *Carex stricta* often occurs with *Calamagrostis canadensis*. A variety of forb species are found in these stands, including tall forbs such as *Asclepias incarnata, Angelica atropurpurea, Eupatorium maculatum, Eupatorium perfoliatum, Thalictrum dasycarpum*, and low forbs such as *Lycopus americanus, Galium obtusum*, and *Thelypteris palustris*.

Stands occur along slow streams and near inlets and outlets of lakes or ponds and may be inundated with water during floods. These wetlands generally contain little or no *Sphagnum* and can be the result of beaver-caused flooding of once more sphagnous wetlands. The ground may be flooded in the spring or after heavy rains, but it typically lies just above the permanent water table. Soils are either a raw sedge peat or a muck comprised of decomposed peat.
Comments: Curtis (1959) discusses a number of differential species that in Wisconsin may distinguish Southern Sedge Meadow (*Carex stricta*-dominated) from Northern Sedge Meadow. *Carex stricta* meadows are usually more moist than wet prairies and drier than shallow marshes, such as those dominated by *Carex lacustris*.
Range: This alliance is found in Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia, Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota (?), and Wisconsin; and in Canada in Ontario.
States/Provinces: CT DE IA IL IN MA MD ME MI MN ND NH NJ NY ON PA RI VT WI WV
TNC Ecoregions: 26:C, 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 59:C, 61:C, 62:?, 63:C, 64:P
USFS Ecoregions: 212Aa:C??, 212Ab:C??, 212Ba:CC?, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CC?, 212Dc:CCC, 212Ea:CP?, 212Eb:CP?, 212Ec:CPP, 212Ed:CPP, 212Fa:C??, 212Fb:C??, 212Fc:C??, 212Ga:CPP, 212Gb:CP?, 212Hb:CCC, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCP, 212Hp:CCP, 212Hq:CCP, 212Hr:CCP, 212Hs:CCP, 212Ht:CCP, 212Hu:CCP, 212Hv:CCC, 212Hw:CCP, 212Hx:CCP, 212Hy:CCC, 212Ib:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCC, 212Jj:CCP, 212Jk:CCC, 212Jl:CCP, 212Jm:CCC, 212Ka:CPP, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 221Aa:CC?, 221Ab:CC?, 221Ac:CC?, 221Ad:CC?, 221Ae:CC?, 221Af:CC?, 221Ag:CC?, 221Ah:CC?, 221Ai:CCC, 221Aj:CC?, 221Ak:CCC, 221Al:CCC, 221Am:CC?, 221Ba:C??, 221Bb:C??, 221Bc:C??, 221Bd:C??, 221Da:C??, 221Dc:C??, 221Ea:C??, 221Fa:C??, 222Ha:CPP, 222Hb:CPP, 222Ia:C??, 222Ib:C??, 222Ic:C??, 222Id:C??, 222Ie:C??, 222If:C??, 222Ja:CCP, 222Jb:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ka:CCC, 222Kb:CCC, 222Kd:CCC, 222Ke:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Ki:CCC, 222Kj:CCC, 222Lb:CCC, 222Lc:CCC, 222Le:CCC, 222Lf:CCC, 222Me:CCC, 232Aa:???, 232Ad:???, 232Bc:???, 232Bd:???, 232Br:???, 232Ch:???, 251Aa:CCC, 251Ab:CCC, 251Bb:CCC, 251Bd:CCC, 251Ca:CCC,

251Cc:CCC, 251Cf:CCC, 251Ch:CCC, 251Dc:CCC, 251Dd:CCP, 251Dg:CCC, 251Dh:CCP, M212Aa:CC?, M212Ab:CC?, M212Ac:CCC, M212Ad:CC?, M212Ae:CCC, M212Ba:CP?, M212Bb:CP?, M212Ca:CP?, M212Cb:CPP, M212Cc:CP?, M212Cd:CP?, M212Da:CC?, M212Db:CC?, M212Dc:CC?, M212Ea:C??, M212Eb:C??, M212Fa:C??, M212Fb:C??, M221Aa:CC?, M221Ab:CC?, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CC?, M221Bd:CCC, M221Be:CC?, M221Ca:C??, M221Cb:C??
Federal Lands: NPS (Acadia)
Synonymy: Tussock sedge marsh (Fike 1999); Graminoid Marsh, in part (Smith 1991); Southern Sedge Meadow (Sytsma and Pippen 1981b)
References: Curtis 1959, Faber-Langendoen et al. 1996, Fike 1999, Nelson and Anderson 1983, Smith 1991, Sytsma and Pippen 1981b
Authors: A.S. WEAKLEY/K.D. PATTERS, RW, Midwest **Identifier:** A.1397

CAREX STRICTA - CAREX VESICARIA SEASONALLY FLOODED HERBACEOUS VEGETATION
Tussock Sedge - Inflated Sedge Seasonally Flooded Herbaceous Vegetation
Eastern Tussock Sedge Meadow **G? (00-08-29)**
Ecological Group (SCS;MCS): Northern Marshes (490-20; n/a)

Concept: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended. The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse, but may occasionally reach over 50%. *Carex stricta*, in its tussock form, is the usual dominant. *Carex vesicaria, Carex utriculata*, and *Calamagrostis canadensis* may also be locally abundant. Associated graminoids include *Carex canescens, Carex comosa, Carex scoparia, Carex stipata, Carex vulpinoidea, Glyceria canadensis, Dulichium arundinaceum, Leersia oryzoides*, and *Scirpus cyperinus*; forbs and ferns include *Asclepias incarnata, Thelypteris palustris, Eupatorium maculatum, Campanula aparinoides, Osmunda regalis, Comarum palustre (= Potentilla palustris), Lysimachia terrestris, Angelica atropurpurea, Eupatorium perfoliatum, Lycopus americanus, Galium obtusum*, and others. *Lythrum salicaria* may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana, Myrica gale, Ilex verticillata, Chamaedaphne calyculata*, and *Spiraea alba* are often present. Bryophytes, where present, include *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum palustre, Drepanocladus aduncus*, and others. This association is differentiated from other wet meadows by the strong dominance of *Carex stricta*.
Range: This tussock sedge meadow is found in northern New England, the Adirondack Mountains, and parts of the Appalachians.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S3, NH:S?,S?, NJ:S?, NY:S4, PA:S?, RI:S?, VT:S4, WV:S?
TNC Ecoregions: 59:C, 61:C, 62:?, 63:C
USFS Ecoregions: 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Dc:CCC, 221Ai:CCC, 221Ak:CCC, 221Al:CCC, 232Aa:???, M212Ac:CCC, M212Ae:CCC, M212B:CP, M212C:CP, M212D:CC, M221Ac:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCP
Federal Lands: NPS (Acadia)
Synonymy: Coastal Plain Intermittent Pond (Breden 1989) B, Tussock sedge meadow (NAP pers. comm. 1998), *Carex stricta* wet meadow (CAP pers. comm. 1998), Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984), Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984), Sedge Meadow (Thompson 1996), Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979)
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Curtis 1959, Edinger et al. 2002, Fike 1999, Gawler 2002, Metzler and Barrett 2001, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: S.C. Gawler, ECS **Confidence:** 2 **Identifier:** CEGL006412

V.A.5.N.k.11. FIMBRISTYLIS CASTANEA - SCHOENOPLECTUS PUNGENS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Chestnut Fimbry - Threesquare Seasonally Flooded Herbaceous Alliance

Concept: Wetlands dominated or codominated by *Fimbristylis castanea* that often occur in interdune swales. The general aspect and species composition of this vegetation are variable, not only among occurrences, but also over the course of the growing season. Documented from Assateague National Seashore, where it is typically characterized by dense *Schoenoplectus pungens (= Scirpus pungens)* (up to 80% cover). When *Schoenoplectus pungens* is not as dense, it is most often associated with an even mixture of *Spartina patens* or *Fimbristylis castanea*. In spring, *Schoenoplectus pungens* is generally dominant with few other associates except *Eleocharis* spp., imparting a distinct aerial photo signature. By late summer a number of other species, such as *Fimbristylis castanea* and *Sabatia stellaris*, contribute more substantial cover. Other herbs are sparse and contribute very little to the overall vegetative cover. These associated species include *Andropogon virginicus, Eleocharis rostellata, Phragmites australis, Pluchea foetida, Juncus scirpoides, Hydrocotyle umbellata, Eleocharis parvula, Panicum amarum var. amarulum, Fimbristylis autumnalis, Sabatia stellaris, Ptilimnium capillaceum*, and *Juncus canadensis*. Diagnostic species are *Schoenoplectus pungens, Fimbristylis castanea, Eleocharis* spp., and *Juncus* spp. There is usually standing water present in these swales in the spring. In Florida, these are early successional, interdune swales which are dominated by *Fimbristylis castanea*, sometimes monospecific, sometimes intermixed with *Triglochin striata, Sesuvium portulacastrum*, and *Lilaeopsis carolinensis*.
Range: This alliance is found in Florida, Delaware, Maryland, North Carolina, and Virginia. Its status in South Carolina and Georgia is unclear.
States/Provinces: FL GA? MD NC SC? VA
TNC Ecoregions: 53:C, 54:P, 55:P, 56:?, 57:C, 58:C
USFS Ecoregions: 232Bz:CCC, 232Cb:CC?, 232Ce:CCP, 232Ch:CC?, 232Ci:CC?, 232Db:CC?, 232Dc:CCC, 232De:CC?, 232Gb:C??
Federal Lands: NPS (Assateague Island)
Synonymy: Maritime Wet Grassland, in part (Schafale and Weakley 1990); Fresh marsh community, in part (Hill 1986); fresh marsh community, in part (Higgins et al. 1971); *Scirpus-Hydrocotyle* community (Tyndall and Levy 1978); *Spartina-Scirpus* community (Tyndall and Levy 1978); *Juncus scirpoides-Scirpus pungens* interdunal wetland association (McAvoy and Clancy 1994); wet community of barrier flats? (Travis and Godfrey 1976)
References: Au 1974, Higgins et al. 1971, Hill 1986, McAvoy and Clancy 1994, Sauer 1967, Schafale and Weakley 1990, Sneddon et al. 1996, Travis and Godfrey 1976, Tyndall and Levy 1978
Authors: ECS, MP, East **Identifier:** A.1372

SCHOENOPLECTUS PUNGENS - FIMBRISTYLIS (CASTANEA, CAROLINIANA) HERBACEOUS VEGETATION
Threesquare - (Chestnut Fimbry, Tufted Fimbry) Herbaceous Vegetation
Interdunal swale **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Interdune Herbaceous Wetlands (240-20; n/a)

Concept: This interdunal swale community of the Atlantic coast (Chesapeake and Delaware drainages) is characterized by dense cover of *Schoenoplectus pungens (= Scirpus pungens)* in association with *Spartina patens* and *Fimbristylis castanea*. There is usually standing water present in these swales in the spring, when *Schoenoplectus pungens* is generally dominant with few other associates except species of *Eleocharis*. By late summer a number of other species such as *Fimbristylis castanea* and *Sabatia stellaris* contribute more substantial cover. Other herbs contribute very little to the overall vegetative cover. These associated species include *Andropogon virginicus, Eleocharis rostellata, Phragmites australis, Pluchea foetida, Juncus scirpoides, Hydrocotyle umbellata, Eleocharis parvula, Panicum amarum, Fimbristylis autumnalis, Sabatia stellaris, Ptilimnium capillaceum, Fuirena pumila*, and *Juncus canadensis*. Diagnostic species are *Schoenoplectus pungens* and *Fimbristylis castanea*. Related vegetation of the Atlantic coast from North Carolina southward is accommodated under *Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Vegetation (CEGL003790).
Comments: This association is similar to *Juncus (dichotomus, scirpoides) - Drosera intermedia* Herbaceous Vegetation (CEGL004111) in environment, but lacks *Xyris* spp., *Pogonia* spp., and *Lycopodiella appressa (= Lycopodium appressum)*. It may represent a successional phase or be slightly more brackish.
Range: Currently described from Maryland and Virginia.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bz:CCC, 232Ci:CC?
Federal Lands: NPS (Assateague Island)
Synonymy: Fresh marsh community (Higgins et al. 1971) B. Assateague Island., Fresh marsh community (Hill 1986) B. Assateague Island., *Scirpus-Hydrocotyle* community (Tyndall and Levy 1978). Virginia., *Spartina-*

Scirpus community (Tyndall and Levy 1978). Virginia., *Juncus scirpoides-Scirpus pungens* interdunal wetland association (McAvoy and Clancy 1994). Delaware., Wet community of barrier flats (Travis and Godfrey 1976) ?. North Carolina., Maritime Wet Grassland (Threesquare Subtype) (Schafale 2000)
References: Berdine 1998, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, McAvoy and Clancy 1994, Peet et al. 2002, Schafale 2000, Sneddon et al. 1996, TNC 1995c, Travis and Godfrey 1976, Tyndall and Levy 1978
Authors: ECS **Confidence:** 2 **Identifier:** CEGL004117

V.A.5.N.k.66. JUNCUS DICHOTOMUS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Forked Rush Seasonally Flooded Herbaceous Alliance

Concept: This alliance encompasses rush-dominated vegetation of small, interdunal, very shallow, seasonally flooded basins. The 'dune swales' of the related *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094) (Sneddon et al. 1994) share some species with this alliance, such as *Lycopodiella appressa, Utricularia subulata*, and *Drosera intermedia*. However, sedges and rushes rather than *Vaccinium macrocarpon* are more characteristic of the *Juncus dichotomus* Seasonally Flooded Herbaceous Alliance (A.1427). Associates include *Andropogon virginicus, Juncus dichotomus, Juncus canadensis, Juncus biflorus, Juncus scirpoides, Drosera intermedia, Fimbristylis autumnalis, Linum medium, Schoenoplectus pungens (= Scirpus pungens)*, and *Solidago sempervirens*. Soils are characterized by a shallow organic layer overlying sands. The water table is generally high (from 10-50 cm from the surface). This alliance occurs in close association, and often as part of a finely textured mosaic, with the III.A.2.N.i *Morella cerifera* Saturated Shrubland Alliance (A.1906) and the *Morella (cerifera, pensylvanica) - Vaccinium formosum* Seasonally Flooded Shrubland Alliance (A.1010) (which is not known from south of Maryland). Further data analysis will be required to establish the status and range of this alliance with greater confidence.
Range: This alliance is found in Maryland, New Jersey, and Virginia, and possibly Delaware (?).
States/Provinces: DE MD NJ VA
TNC Ecoregions: 57:P, 58:C, 62:C
USFS Ecoregions: 232A:C?, 232Bz:CCC, 232Ch:C??, 232Ci:C??
Federal Lands: NPS (Assateague Island)
References: Hill 1986, Jones 1992a, Sneddon et al. 1994, Sneddon et al. 1996, Tyndall and Levy 1978
Authors: ECS, MP, East **Identifier:** A.1427

JUNCUS (DICHOTOMUS, SCIRPOIDES) - DROSERA INTERMEDIA HERBACEOUS VEGETATION
(Forked Rush, Needle-pod Rush) - Water Sundew Herbaceous Vegetation
Forked Rush Dune Swale **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Interdune Herbaceous Wetlands (240-20; n/a)

Concept: This interdunal swale community of the Atlantic coast (Chesapeake Bay and Delaware Bay drainages) occurs in small, shallow, seasonally flooded depressions. Soils are characterized by a shallow organic layer overlying sands. Sedges and rushes are strongly dominant, including species such as *Juncus dichotomus, Juncus canadensis, Juncus biflorus, Juncus scirpoides, Juncus acuminatus, Juncus megacephalus, Juncus canadensis, Cyperus odoratus, Scleria verticillata, Rhynchospora colorata*, and *Fimbristylis castanea*. Common associates include *Drosera intermedia, Linum medium, Lycopodiella appressa, Utricularia subulata, Utricularia juncea, Triadenum virginicum, Fuirena pumila, Xyris jupicai, Xyris caroliniana, Andropogon virginicus*, and *Solidago sempervirens*.
Comments: This community occurs in close association, and often as part of a finely textured mosaic, with *Morella cerifera - Vaccinium corymbosum* Shrubland (CEGL003906) and *Morella cerifera / Hydrocotyle verticillata* Shrubland (CEGL003840). It is similar to *Schoenoplectus pungens - Fimbristylis (castanea, caroliniana)* Herbaceous Vegetation (CEGL004117) and may represent a successional phase.
Range: This community occurs from New Jersey south to Virginia.
States/Provinces: DE:S2, MD:S?, NJ:S?, VA:S?
TNC Ecoregions: 57:P, 58:C, 62:C
USFS Ecoregions: 232A:C?, 232Bz:CCC, 232C:C?
Federal Lands: NPS (Assateague Island)
Synonymy: Bog community (Hill 1986) =. Assateague Island., *Andropogon* community (Tyndall and Levy 1978)

?. Virginia., Interdunal wetlands (Jones 1992a) ?. Virginia.
References: Berdine 1998, Bowman 2000, Breden et al. 2001, Fleming 2001, Fleming et al. 2001, Hill 1986, Jones 1992a, Sneddon et al. 1994, Sneddon et al. 1996, TNC 1995c, Tyndall and Levy 1978
Authors: ECS **Confidence:** 2 **Identifier:** CEGL004111

V.A.5.N.k.18. PANICUM HEMITOMON SEASONALLY FLOODED TEMPERATE HERBACEOUS ALLIANCE

Maidencane Seasonally Flooded Temperate Herbaceous Alliance

Concept: This alliance encompasses a variety of temperate wetland communities dominated by *Panicum hemitomon*, including various ponds, lakes, depression meadows, flatwoods ponds, pineland ponds, Carolina bays, interdune swales, etc. It is wide-ranging, occurring throughout the eastern and southeastern Coastal Plain of the United States. It is very common in Florida, where it occurs in thousands of lakes and ponds. It is also common in Louisiana.
Comments: Data exists for some South Carolina depression meadows. Formation placement is problematic; some *Panicum hemitomon* communities have temporarily flooded hydrology, while others are semipermanently flooded. It may be desirable to split this and recognize two or more categories. Kirkman and Sharitz (1994) report a vegetation type dominated by *Panicum hemitomon* in "Carolina Bays" in Allendale and Barnwell counties, South Carolina. This includes examples at the DOE Savannah River Site. It is not clear which association would accommodate these samples.
Range: This alliance is found in Alabama, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Texas, and possibly Virginia (?).
States/Provinces: AL DE FL GA LA MD MS NC NJ SC TN TX
TNC Ecoregions: 31:C, 40:?, 41:C, 42:C, 43:?, 44:C, 53:C, 55:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 222Eb:CCC, 231Cc:C??, 231Cd:C??, 231Fb:CCC, 232A:CC, 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Be:CCP, 232Bf:CCC, 232Bg:CCC, 232Bh:CCP, 232Bi:CCP, 232Bj:CCC, 232Bk:CCC, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bq:CCC, 232Bv:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Cd:CCC, 232Cf:CCP, 232Ch:CCC, 232Da:CCP, 232Db:CCP, 232Dc:CCC, 232Ea:CCC, 232Eb:CCC, 232Fa:CCC, 232Fb:CCC, 232Fd:CCC, 232Fe:CCP, 232Ga:CCP, 232Gc:CCP, 234Aa:CCC
Federal Lands: DOD (Arnold, Fort Benning, Sunny Point); DOE (Savannah River Site); USFS (Angelina, Apalachicola, Conecuh, Croatan, De Soto, Ocala, Osceola); USFWS (Eufaula, McFaddin)
Synonymy: IIE1f. Coastal Plain Small Depression Pond Complex, in part (Allard 1990); Small Depression Pond, in part (Schafale and Weakley 1990); Depression Meadow, in part (Nelson 1986); Basin Marsh, in part (FNAI 1992a); Flatwoods Pond, in part (Smith 1996a); Flatwoods Pond, in part (Smith 1996b)
References: Allard 1990, FNAI 1992a, FNAI 1992b, Kirkman and Sharitz 1994, Nelson 1986, Schafale and Weakley 1990, Smith 1996a, Smith 1996b, Wolfe 1990
Authors: D.J. ALLARD, MP, Southeast **Identifier:** A.1379

PANICUM HEMITOMON - PANICUM VERRUCOSUM HERBACEOUS VEGETATION

Maidencane - Warty Panicgrass Herbaceous Vegetation

G? (97-08-28)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Open Ponds and Marshes (345-05; n/a)

Concept: This seasonally flooded, Coastal Plain wetland occurs in small topographically isolated basins on the central Atlantic Coastal Plain. This vegetation usually occurs on the relatively higher, outer margin of the basin, occurring on loamy sands. *Panicum hemitomon* is the dominant species, often occurring in monotypic stands. Associates that may occur at low cover include *Cladium mariscoides, Dulichium arundinaceum, Panicum verrucosum, Dichanthelium spretum (= Panicum spretum), Carex striata, Juncus repens*, and *Eleocharis quadrangulata*. Occasional seedlings of *Liquidambar styraciflua, Acer rubrum*, and *Diospyros virginiana* also may occur.
States/Provinces: DE:S?, MD:S?, NJ:S1S2
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232A:CC, 232B:CC
References: Berdine and Gould 1999, Bowman 2000, Breden et al. 2001
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006338

V.A.5.N.k.1. PANICUM VIRGATUM SEASONALLY FLOODED HERBACEOUS ALLIANCE
Switchgrass Seasonally Flooded Herbaceous Alliance

Concept: This alliance encompasses seasonally flooded areas dominated by *Panicum virgatum*. Most examples are maritime-related, including interdunal depressions, but associations are also described from areas in Arkansas and other interior states where streams cross prairies and natural depressions in prairies. Associated species in the maritime examples include *Spartina patens, Juncus canadensis, Solidago sempervirens, Festuca rubra, Eleocharis palustris, Toxicodendron radicans, Linum medium, Carex albolutescens*, and *Euthamia caroliniana (= Euthamia tenuifolia)*. This community is variable in its expression but is typically dominated by 40-85% cover of *Panicum virgatum* and occurs in larger interdunal depressions (up to 0.5 hectare). Variability occurs in the cover of *Panicum virgatum* and the richness of associated species. In some Coastal Plain cases, *Morella cerifera (= Myrica cerifera)* or *Baccharis halimifolia* will constitute less than 10% shrub cover. The vegetation is similar in total floristic composition to *Morella*-dominated shrublands, but shrubs are generally lacking or at very low cover and grasses are much more abundant. In most cases, shrub coverage is much less or none and other herbs codominate. When *Panicum virgatum* is not as dense, it is most often associated with *Schoenoplectus pungens (= Scirpus pungens), Spartina patens*, or a mixture of both. Soils are characterized by a shallow organic layer (usually a few centimeters in depth) overlying loamy sand or sand. The water table is at or close to the surface in the spring. These depressions are saturated or seasonally flooded and somewhat poorly drained. Many other associations remain to be described in this alliance, and its complete range of variation described.
Range: This alliance is found in Arkansas, Kentucky, Delaware, Maryland, New Jersey, New York, and possibly in North Carolina (?), Oklahoma (?), Tennessee (?), and Virginia (?).
States/Provinces: AR CT DE KY LA MD NC NJ OK? TN? VA
TNC Ecoregions: 32:C, 39:?, 40:P, 41:C, 42:C, 43:?, 44:?, 50:P, 56:P, 57:?, 58:C, 62:C
USFS Ecoregions: 222:?, 231Da:CP?, 231Dc:CP?, 231Eb:C??, 231Ga:CC?, 231Gb:CC?, 231Gc:CCC, 232Aa:CCC, 232Ad:CC?, 232Bt:CCC, 232Bz:CCC, 232Cb:C??, 232Ch:C??, 232Ci:C??, 234Ae:CCC, M231Aa:???, M231Ab:???, M231Ac:???, M231Ad:???
Federal Lands: DOD (Arnold?, Fort Chaffee); NPS (Assateague Island); USFWS (Felsenthal)
Synonymy: P5A4aI2a. *Panicum virgatum* (Foti et al. 1994); Fresh marsh community, in part (Hill 1986); mesic shrub community, in part (Higgins et al. 1971); Freshwater marsh, in part (Fender 1937); *Panicum virgatum* Wetland Association, in part (Heckscher et al. 1995)
References: Campbell pers. comm., Fender 1937, Foti et al. 1994, Heckscher et al. 1995, Higgins et al. 1971, Hill 1986, Sneddon et al. 1996, Zollner pers. comm.
Authors: ECS, JT, East **Identifier:** A.1362

(MORELLA CERIFERA) - PANICUM VIRGATUM - SPARTINA PATENS HERBACEOUS VEGETATION
(Wax-myrtle) - Switchgrass - Saltmeadow Cordgrass Herbaceous Vegetation
Interdune Switchgrass Freshwater Depression **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Interdune Herbaceous Wetlands (240-20; n/a)

Concept: This medium-tall grassland association occurs in seasonally flooded basins, or interdunal swales, landward of maritime backdunes along the mid-Atlantic coast. The water table is at or close to the surface in the spring. Freshwater maintains these depressions as saturated or seasonally flooded and somewhat poorly drained. The community is generally strongly dominated by *Panicum virgatum* but can be variable in its expression. Associated species include *Spartina patens, Juncus canadensis, Solidago sempervirens, Eleocharis palustris, Toxicodendron radicans, Linum medium, Carex longii*, and *Euthamia caroliniana (= Euthamia tenuifolia)*. This community is typically dominated by 40-85% cover of *Panicum virgatum* and occurs in larger interdunal depressions (up to one-half hectare). Variability occurs in the cover of *Panicum virgatum* and the richness of associated species. When *Panicum virgatum* is not as dense, it is most often associated with an even mixture of *Schoenoplectus pungens (= Scirpus pungens)* or *Spartina patens*. In some cases, *Morella cerifera (= Myrica cerifera)* or *Baccharis halimifolia* will constitute less than 10% shrub cover, but shrub coverage is usually much less or none, and other herbs codominate. Soils are characterized by a shallow organic layer (usually a few centimeters in depth) overlying loamy sand or sand. The range of this vegetation is poorly known due to the low confidence of the classification. The vegetation is similar in total floristic composition to *Morella cerifera - Vaccinium corymbosum* Shrubland (CEGL003906), but shrubs are generally lacking or at very low cover, and grasses are much more abundant. The community apparently occurs in New Jersey, Delaware, Maryland, and may extend to North Carolina, but the full range will require further study.
Comments: This association is very similar floristically to *Panicum virgatum - Spartina patens* Herbaceous

Vegetation (CEGL006150); more data are needed.
Range: The community apparently occurs in New Jersey, Delaware, Maryland, and may extend to North Carolina, but the full range will require further study.
States/Provinces: CT:S?, DE:S?, MD:S?, NC:S2?, NJ:S?, VA:S?
TNC Ecoregions: 57:?, 58:C, 62:C
USFS Ecoregions: 232Aa:CCC, 232Bt:CCC, 232Bz:CCC, 232Ci:C??
Federal Lands: NPS (Assateague Island)
Synonymy: Fresh marsh community (Hill 1986) B. in part, Mesic shrub community (Higgins et al. 1971) B. in part, Freshwater marsh (Fender 1937) B. in part, *Panicum virgatum* Wetland Association (Heckscher et al. 1995) B. in part, Maritime Wet Grassland (Switchgrass Subtype) (Schafale 2000)
References: Berdine 1998, Bowman 2000, Breden et al. 2001, Fender 1937, Fleming 2001, Fleming et al. 2001, Heckscher et al. 1995, Higgins et al. 1971, Hill 1986, Metzler and Barrett 2001, Schafale 2000, Schafale and Weakley 1990, Sneddon et al. 1996
Authors: ECS **Confidence:** 3 **Identifier:** CEGL004129

V.A.5.N.k.23. RHYNCHOSPORA SPP. - PANICUM (RIGIDULUM, VERRUCOSUM) - RHEXIA VIRGINICA SEASONALLY FLOODED HERBACEOUS ALLIANCE

Beaksedge species - (Redtop Panicgrass, Warty Panicgrass) - Virginia Meadow-beauty Seasonally Flooded Herbaceous Alliance

Concept: This alliance accommodates a variety of seasonally flooded vegetation of pondshore and lakeshore environments. It occurs primarily along the Atlantic Coastal Plain from Nova Scotia, Canada, south to Georgia, with inland stations in the central Great Lakes area, the Great Valley of Virginia, and central Tennessee. Occurrences of this alliance are usually small and are dominated predominantly by herbaceous, mostly graminoid, species. Many species are annual or short-lived perennial plants. They persist for years in the seed bank until the hydrologic conditions are right for germination. Thus, species composition of particular stands may change from year to year. In interior stations of this alliance, many of these seedbank plants are species significantly disjunct from their main range on the Atlantic Coastal Plain. There are two major vegetation zones that occur in this environment: Zone 1 is a seasonally flooded zone of sparse cover by graminoids; and Zone 2 is a saturated zone of dense graminoid cover. Some associations may include a zone dominated by taller graminoids, including *Saccharum* spp. or *Scirpus cyperinus*. These zones remain largely intact, but a succession of wet or dry years can cause them to shift slightly in location. Pondshore examples of this alliance occupy a zone around a more open pond center with a longer hydroperiod. These ponds have a pronounced seasonal fluctuation in water level, filling in the winter and drying in the summer. Abundant species in this alliance include the graminoids *Calamagrostis canadensis, Carex* spp., *Carex scoparia, Cladium mariscoides, Eleocharis melanocarpa, Fimbristylis autumnalis, Juncus* spp., *Rhynchospora capitellata, Rhynchospora scirpoides*, and *Schoenoplectus hallii (= Scirpus hallii)*. Some prominent forbs include *Ludwigia* spp., *Rhexia mariana*, and *Rhexia virginica*. Other species that may occur are *Agalinis purpurea, Dulichium arundinaceum, Eleocharis melanocarpa, Eleocharis obtusa, Eleocharis palustris (= Eleocharis smallii), Eupatorium perfoliatum, Euthamia caroliniana (= Euthamia tenuifolia), Fimbristylis autumnalis, Fuirena squarrosa, Hypericum boreale, Juncus effusus, Lobelia canbyi, Rhynchospora corniculata, Rhynchospora glomerata, Rhynchospora macrostachya, Rhynchospora perplexa, Rotala ramosior, Scirpus cyperinus, Spiraea alba, Spiraea tomentosa, Stachys hyssopifolia, Triadenum virginicum, Viola lanceolata*, and *Xyris difformis*. Examples of this alliance from Lower New England and the North Atlantic Coast of Nova Scotia south to Delaware may be found on Coastal Plain pondshores with cobble substrates and little or no organic material accumulation; the broad margins and shorelines of shallow basins or deeper ponds on variable substrates; or on the shores of glacial outwash ponds or large lakes. In the Great Lakes, stands of this alliance are found on sandy pitted outwash plains and glacial lake plains. The level topography of these plains produces gently sloping, shallow basins with no outlets and sometimes no inlets. The water table fluctuates seasonally and yearly. It is highest in late winter and spring, and during years of high precipitation. The soils are derived mainly from sand. The sand is poor in nutrients and is acidic, with pH ranging from 4.4-7.0. These conditions inhibit microbial decomposition and considerable organic material accumulates as peat. The peat mixes with sand or forms more-or-less pure deposits. Basin shorelines typically have stretches of pure sand in areas where wave action is greatest, pure peat in protected areas, and a mixture of the two substrates in other areas. In some basins, an impermeable layer of clay develops 2-5 m below the surface. This layer may hold the local water table above the regional water table for long periods. In the South, this alliance is found in upland depression ponds of the Interior Low Plateau (Eastern Highland Rim) of Tennessee, seasonally

flooded anthropogenic peatland depressions in the Great Dismal Swamp of Virginia (where it may occupy seasonally ponded depressions of anthropogenic origin, such as experimental marsh restoration clearings, burned-out peat areas, or depressional basins in powerlines), seasonally flooded upland depressions occurring on clays in the Inner Coastal Plain of southeastern Virginia, as well as Grady Ponds in Georgia and possibly some vegetation of Carolina bays. In central Tennessee examples, vegetation of this alliance may grade down into that of the V.A.5.N.k *Juncus repens - Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376).
Range: This alliance is found in Wisconsin, Michigan, Indiana, Massachusetts, Rhode Island, New York, Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee, and Kentucky. It also occurs in Canada in southern Ontario and Nova Scotia.
States/Provinces: AL? CT DE GA IN KY? MA MD MI NH? NJ NS NY ON RI SC? TN VA VT WI
TNC Ecoregions: 44:C, 45:C, 46:C, 47:?, 48:C, 53:P, 56:C, 57:C, 58:C, 59:C, 61:C, 62:C, 63:C
USFS Ecoregions: 212C:CP, 212D:CP, 212Hu:CCC, 212Hv:CCP, 212Hx:CCC, 212Ka:C??, 221Aa:CCP, 221Ab:CCP, 221Ac:CCP, 221Ad:CCP, 221Ae:CC?, 221Af:CCP, 221Ag:CCP, 221Ai:CCP, 221Al:CCP, 221Ba:CPP, 222Eb:CCC, 222Ge:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Ka:CCC, 222Kb:CCC, 232Aa:CCP, 232Ac:CCC, 232Ba:CCP, 232Bq:CCC, 232Br:CCC, 232Bv:CCC, 232Cb:CCC, 232Ch:CCC, M221Ab:CCC
Federal Lands: DOD (Arnold, Fort Benning, Fort Gordon, Fort Lee); USFS (George Washington); USFWS (Great Dismal Swamp)
References: Brodowicz 1989, Faber-Langendoen et al. 1996, Keddy and Sharp 1989, Russo 1997
Authors: ECS, MP, East **Identifier:** A.1384

SACCHARUM GIGANTEUM - (DICHANTHELIUM SPRETUM, PANICUM VERRUCOSUM) HERBACEOUS VEGETATION
Giant Plumegrass - (Eaton's Witchgrass, Warty Panicgrass) Herbaceous Vegetation
Delmarva Bay Tall Grassland **G1G2 (00-04-17)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Emergent Ponds and Marshes (345-30; n/a)

Concept: This seasonally flooded, Coastal Plain wetland occurs on the central Atlantic Coastal Plain in topographically defined basins. This vegetation occurs on the relatively higher, outer margin of the basin. The substrate is a thin organic horizon overtopping deep sandy loam. The dominant species are *Saccharum giganteum, Panicum verrucosum, Dichanthelium spretum (= Panicum spretum)*, and *Fimbristylis autumnalis*. Other associates include *Polygonum hydropiperoides, Panicum rigidulum, Scirpus cyperinus, Proserpinaca pectinata, Rhynchospora corniculata, Juncus repens, Rhexia virginica, Scleria reticularis, Carex striata, Woodwardia virginica, Oldenlandia uniflora*, and *Triadenum virginicum*.
States/Provinces: MD:S?, VA?
TNC Ecoregions: 58:C
USFS Ecoregions: 232B:CC
References: Berdine and Gould 1999, Fleming et al. 2001
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006609

V.A.5.N.k.25. SCIRPUS CYPERINUS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Woolgrass Bulrush Seasonally Flooded Herbaceous Alliance

Concept: This alliance, which is found in the eastern and southeastern United States, inhabits seasonally flooded marshes or emergent zones of upland depression ponds. The vegetation is dominated by *Scirpus cyperinus*, or at least with substantial cover of this species. The habitat of this alliance may have a pronounced seasonal fluctuation in water level, becoming saturated to ponded in the winter and often drying completely in the summer. The vegetation is typically dominated by patches or zones of *Scirpus cyperinus*; other species present may include *Carex* spp., *Dichanthelium* spp., *Dulichium arundinaceum, Glyceria* spp., *Juncus* spp., *Leersia* spp., *Panicum rigidulum, Rhynchospora* spp., and *Thelypteris palustris*, as well as other species of *Scirpus* including *Scirpus microcarpus (= Scirpus rubrotinctus)* and *Scirpus atrovirens*. The vegetation may consist of monospecific clumps of the component species, either scattered in the marsh or around the pond margin. Mats of *Sphagnum* mosses may be prominent in some examples (e.g., *Sphagnum lescurii, Sphagnum pylaesii, Sphagnum cuspidatum, Sphagnum palustre*, and *Sphagnum recurvum*. Some examples may have scattered woody plants,

including shrubs and small trees such as *Acer rubrum, Alnus serrulata, Cephalanthus occidentalis, Rosa palustris*, and *Nyssa sylvatica*. To the north, *Vaccinium corymbosum* is a typical associate, while *Hibiscus moscheutos, Itea virginica, Liquidambar styraciflua, Pinus taeda*, and *Quercus phellos* occur more frequently in the southern portion of the range. Sparsely distributed shrubs in montane examples may include *Vaccinium* spp. and *Leucothoe racemosa*. The floristics and physiognomic expression may vary with context and management. In a burned or mowed context, examples of this vegetation type may grade down into other wetland herbaceous types, but in a more forested context may grade into upland depression forests.
Range: This alliance is documented from the Southern Blue Ridge of North Carolina, the Interior Low Plateau of Tennessee and other states, the East Gulf Coastal Plain, Upper East Gulf Coastal Plain, Lower New England, the North Atlantic Coast, and from the Chesapeake Bay Lowlands (Delmarva Peninsula of Virginia, Chincoteague NWR). It could occur in adjacent provinces (e.g., Central Appalachians, High Allegheny Plateau, Piedmont, Ridge and Valley, South Atlantic, and Mid-Atlantic Coastal Plain).
States/Provinces: AL AR? CT DE FL? GA IN KY LA? MA MD? ME MS? NC NH NJ NY PA RI SC? TN VA VT WV
TNC Ecoregions: 42:P, 43:C, 44:C, 50:P, 51:C, 52:P, 53:C, 56:P, 57:P, 58:C, 59:C, 60:?, 61:C, 62:C, 64:C
USFS Ecoregions: 221H:PP, 221J:PP, 222Cf:CCP, 222Cg:CCP, 222Eb:CCC, 222Eg:CCP, 222Eh:CCP, 231A:CP, 231Bc:CCC, 232B:CC, 232C:CP, 232D:CP, 234A:PP, M221Dc:CCC
Federal Lands: DOD (Arnold, Fort Benning); USFS (Chattahoochee?, Oconee?, Pisgah, Talladega, Tuskegee?); USFWS (Chincoteague)
Synonymy: IIE1g. Interior Vernal Pool Complex, in part (Allard 1990); Upland Pool, in part (Schafale and Weakley 1990); *Scirpus cyperinus-Dulichium* Pond (Newell and Peet 1995); Shallow emergent marsh (Cowardin et al. 1979)
References: Allard 1990, Cowardin et al. 1979, Newell and Peet 1995, Schafale and Weakley 1990, Weakley and Schafale 1994
Authors: ECS, MOD. ECS/SCS, MP, Southeast **Identifier:** A.1386

SCIRPUS CYPERINUS SEASONALLY FLOODED HERBACEOUS VEGETATION
Woolgrass Bulrush Seasonally Flooded Herbaceous Vegetation

G? (97-12-01)

Ecological Group (SCS;MCS): Northern Marshes (490-20; n/a)

Concept: Seasonally flooded marshes dominated or characterized by *Scirpus cyperinus*. Composition is variable. Associates include *Glyceria* spp., *Thelypteris palustris*, as well as other species of *Scirpus* including *Scirpus microcarpus (= Scirpus rubrotinctus)* and *Scirpus atrovirens*.
States/Provinces: CT:S?, DE:S?, MA:S4, MD?, ME:S5, NH:S?,S?, NJ:S?, NY:S5, PA:S?, RI:S?, VA:S?, VT:S4, WV:S?
TNC Ecoregions: 57:?, 58:C, 60:?, 61:C, 62:C, 64:C
USFS Ecoregions: 232:C
Federal Lands: USFWS (Chincoteague)
Synonymy: Shallow emergent marsh (Cowardin et al. 1979)
References: Breden et al. 2001, Cowardin et al. 1979, Fike 1999, Gawler 2002
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006349

V.A.5.N.k.29. SPARTINA PATENS SEASONALLY FLOODED HERBACEOUS ALLIANCE
Saltmeadow Cordgrass Seasonally Flooded Herbaceous Alliance

Concept: This alliance consists of seasonally flooded (non-tidal) wetlands dominated by *Spartina patens*, occurring from northeastern United States south and west to Tamaulipas, Mexico.
Range: This alliance is found in Florida, Louisiana, North Carolina, Texas, New York, Virginia, and possibly in Georgia (?), South Carolina (?), Connecticut (?), Delaware (?), Massachusetts (?), Maryland (?), New Jersey (?), Rhode Island (?), and Tamaulipas (?), Mexico.
States/Provinces: AL FL GA? LA MA MD MXTM? NC NH NJ NY SC? TX VA?
TNC Ecoregions: 31:C, 53:C, 56:P, 57:C, 58:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ak:CCC, 231Fb:CCC, 232Aa:CCC, 232Bz:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: NPS (Fire Island, Padre Island); USFWS (Aransas, Bon Secour, Brazoria?, Laguna Atascosa, Matagorda Island, Sabine NWR, St. Marks, St. Vincent)

Synonymy: Maritime Wet Grassland, in part (Schafale and Weakley 1990)
References: Schafale and Weakley 1990
Authors: ECS, JT, East **Identifier:** A.1390

SPARTINA PATENS - ELEOCHARIS PARVULA HERBACEOUS VEGETATION
Saltmeadow Cordgrass - Dwarf Spikerush Herbaceous Vegetation
Northeastern Atlantic Brackish Interdunal Swale **G? (97-12-01)**
Ecological Group (SCS;MCS): Virginian Zone Tidal Aquatic Vegetation (201-20; n/a)
Atlantic and Gulf Coast Interdune Herbaceous Wetlands (240-20; n/a)

Concept: This brackish, interdunal swale and overwash community of the northeastern Atlantic coast occurs in low areas behind primary or secondary sand dunes. The substrate is sand with little or no organic accumulation. The water source for this wetland community is variable, including seasonally high groundwater table, salt spray, and sporadic tidal overwash, resulting in widely variable salinity levels. The dominant species is generally *Spartina patens*, but it can be *Eleocharis parvula, Schoenoplectus pungens (= Scirpus pungens), Cyperus polystachyos*, and/or *Juncus articulatus*. Associated species depend on salinity and hydrology of a site and can include *Leptochloa fusca ssp. fascicularis (= Diplachne maritima), Schoenoplectus maritimus (= Scirpus maritimus), Juncus ambiguus (= Juncus bufonius var. halophila), Juncus scirpoides, Ptilimnium capillaceum, Rumex maritimus, Symphyotrichum subulatum (= Aster subulatus), Chenopodium rubrum, Pluchea odorata, Hibiscus moscheutos ssp. moscheutos (= Hibiscus palustris), Polygonum ramosissimum, Triglochin maritima, Panicum virgatum, Schoenoplectus robustus*, and *Argentina anserina (= Potentilla anserina)*. *Iva frutescens* and *Baccharis halimifolia* may occur on hummocks within the swale. Mats of blue-green and/or brown algae can proliferate across the soil surface.
Comments: This association is similar to coastal salt pond vegetation, *Schoenoplectus pungens - Eleocharis parvula* Herbaceous Vegetation (CEGL006398).
Range: This association is currently described from Maryland, New Jersey, New York, Massachusetts, and New Hampshire. It likely occurs in other states.
States/Provinces: MA:S1, MD:S?, NH:S2, NJ:S1S2, NY:S1S2, VA?
TNC Ecoregions: 57:?, 58:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ak:CCC, 232Aa:CCC, 232Bz:CCC
Federal Lands: NPS (Fire Island)
Synonymy: Overwash Community (Lea 2002b), Coastal interdunal marsh/swale (Rawinski 1984)
References: Breden et al. 2001, Edinger et al. 2002, Lea 2002b, Lundgren 1998, Rawinski 1984, Reschke 1990, Sneddon and Lundgren 2001, Sperduto 2000b, Swain and Kearsley 2001
Authors: D. Hunt, mod. S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006342

V.A.5.N.I. Semipermanently flooded temperate or subpolar grassland

V.A.5.N.I.16. SCHOENOPLECTUS ACUTUS - (SCHOENOPLECTUS TABERNAEMONTANI) SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE

Hardstem Bulrush - (Softstem Bulrush) Semipermanently Flooded Herbaceous Alliance

Concept: This alliance is found in the midwestern and western United States and central Canada. Vegetation is characterized by medium to tall graminoids which typically range from 1 to over 2 m. The vegetation is moderately dense to dense. Some stands are heavily dominated by one or two *Scirpus* species while others have several graminoids common throughout the stand. The most abundant species are typically *Schoenoplectus acutus (= Scirpus acutus), Schoenoplectus fluviatilis (= Scirpus fluviatilis)*, and *Schoenoplectus tabernaemontani (= Scirpus tabernaemontani)*. Species composition and abundance can vary from year to year depending mostly on water level fluctuations. In most years, typical species include *Lemna* spp., *Phragmites australis, Schoenoplectus americanus (= Scirpus americanus)* (in alkaline stands), *Triglochin maritima* (in alkaline stands), *Typha latifolia*, and *Utricularia macrorhiza*. *Potamogeton* spp. often occur in the deeper parts of stands of this alliance and where emergent species are not densely packed. Shrubs, such as *Salix* spp., are not common but may become established in shallow water areas. During droughts, species more tolerant of low water, such as *Polygonum amphibium*, may invade and alter the species composition of stands of this alliance.

Stands of this alliance are flooded for most or all of the growing season. Stands can have water from 0 (exposed soil) to approximately 1.5 m deep, but usually are less than 1 m. Within a stand, water levels can vary

by up to 1 m during the year. The water can be fresh to mildly saline throughout most of this alliance's range; however, in the Nebraska Sandhills, some stands occur in moderately alkaline water. Across the range of this alliance, soils are deep, poorly drained, muck, peat, or mineral.
Range: This alliance is found in Nebraska, Iowa, South Dakota, North Dakota, Minnesota, California, Oregon, Washington, Idaho, and Montana, and in Canada in British Columbia, southern Manitoba, and northwestern Ontario. It is also known from Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.
States/Provinces: BC CA CT DE IA ID MA MB MD ME MN MT ND NH NJ NV NY ON OR PA RI SD UT VA? VT WA WV WY
TNC Ecoregions: 10:C, 11:C, 17:C, 26:C, 2:C, 33:C, 34:C, 35:C, 46:C, 47:P, 58:C, 59:C, 60:C, 61:C, 63:C, 64:C, 6:C
USFS Ecoregions: 212Aa:C??, 212Ab:C??, 212Ba:CP?, 212Bb:CP?, 212Ca:CC?, 212Cb:CCC, 212Da:CC?, 212Db:CC?, 212Dc:CC?, 212Ea:CC?, 212Eb:CC?, 212Ec:CCP, 212Ed:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212La:CPP, 221Aa:CC?, 221Ab:CC?, 221Ac:CC?, 221Ad:CC?, 221Ae:CCC, 221Af:CC?, 221Ag:CC?, 221Ah:CCC, 221Ai:CCC, 221Aj:CC?, 221Ak:CC?, 221Al:CC?, 221Ba:CCC, 221Bb:CC?, 221Bc:CC?, 221Bd:CCP, 221Db:C??, 221Ea:C??, 221Fa:C??, 221Ja:C??, 221Jc:C??, 222Ia:C??, 222Ib:C??, 222Ic:C??, 222Id:C??, 222Ie:C??, 222If:C??, 222Lc:CCC, 231Aa:P??, 231Ae:P??, 231Af:P??, 231Ak:P??, 231Al:P??, 231Am:P??, 231An:P??, 231Ao:P??, 231Ap:P??, 232Ad:C??, 232Bc:C??, 232Bd:C??, 232Br:C??, 232Ch:C??, 232Cj:C??, 242A:CC, 251Aa:CCC, 251Bb:CCC, 251Be:CCC, 262A:CC, 322A:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 332C:CC, 341C:CC, 341E:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342H:CC, 342I:CC, M212Aa:C??, M212Ab:C??, M212Ac:C??, M212Ad:C??, M212Ba:C??, M212Bb:C??, M212Ca:CP?, M212Cb:CPP, M212Cc:CP?, M212Cd:CP?, M212Da:C??, M212Db:C??, M212Dc:C??, M212Ea:CCP, M212Eb:CCP, M212Fa:C??, M212Fb:C??, M221Aa:CC?, M221Ab:CCC, M221Ba:C??, M221Bd:C??, M221Be:C??, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??, M221Da:C??, M221Db:C??, M221Dc:C??, M242A:CC, M242B:CC, M242C:CC, M261C:CC, M262A:CC, M262B:CC, M331A:CC, M331D:CC, M332B:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC
Federal Lands: NPS (Acadia, Voyageurs); USFWS (Ouray)
Synonymy: Hardstem Bulrush Herbaceous Vegetation (Christy et al. 1998); Semipermanent ponds and lakes, slightly brackish, deep-marsh zone (Stewart and Kantrud 1971); Sandhills Marsh and Alkaline Sandhills Marsh (Steinauer 1989); Bulrush marsh (Fike 1999); Robust Emergent Marsh, in part (Smith 1991)
References: Christy et al. 1998, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 1997, Fike 1999, Hansen et al. 1991, Hansen et al. 1995, Kunze 1994, Smith 1991, Steinauer 1989, Stewart and Kantrud 1971, Tolstead 1942, Weaver 1960
Authors: MCS, MOD. M.S. REID, MP, Midwest **Identifier:** A.1443

SCHOENOPLECTUS (TABERNAEMONTANI, ACUTUS) EASTERN HERBACEOUS VEGETATION

(Softstem Bulrush, Hardstem Bulrush) Eastern Herbaceous Vegetation
Bulrush Deepwater Marsh **G? (97-12-01)**
Ecological Group (SCS;MCS): Northern Marshes (490-20; n/a)

Concept: These deepwater bulrush marshes occur across the northeastern United States and adjacent Canadian provinces. They are found in a variety of wetland settings, most commonly in quiet-water areas along the shores of ponds, lakes, rivers, and larger streams, but also in flooded basins and ditches. The vegetation occurs in deep water (usually 0.4-1 m deep) that is present in all but the driest of conditions. Seasonal spring flooding and heavy rainstorms provide nutrient input. The substrate is usually deep muck overlying mineral soil; where wave action is more prevalent, the mineral soil may be exposed. The vegetation is dominated by bulrushes and robust graminoids, with scattered emergent forbs. Trees and shrubs are absent. Dominant species are usually *Schoenoplectus acutus (= Scirpus acutus), Schoenoplectus tabernaemontani (= Scirpus tabernaemontani)*, and/or *Schoenoplectus americanus (= Scirpus americanus)*. Associated herbs include *Carex aquatilis, Carex pellita (= Carex lanuginosa), Carex utriculata, Thelypteris palustris, Typha latifolia, Asclepias incarnata, Impatiens capensis, Pontederia cordata, Sagittaria latifolia, Schoenoplectus fluviatilis (= Scirpus fluviatilis), Scutellaria lateriflora, Verbena hastata*, and others. Floating-leaved and submerged plants (such as *Potamogeton* spp., *Sparganium* spp., *Elodea canadensis*, *Ceratophyllum* spp.) may be scattered among the emergent plants. This association is distinguished from other northeastern standing-water marsh communities by the strong dominance of tall bulrush species.
Range: This variable deepwater marsh community occurs in the northeastern United States and adjacent

Canadian provinces.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S4, NH:S4, NJ:S2S4, NY:S5, PA:S?, RI:S?, VA?, VT:S4, WV:S?
TNC Ecoregions: 58:?, 59:C, 60:C, 61:C, 63:C, 64:C
USFS Ecoregions: 212B:CP, 212Cb:CCC, 212D:CC, 212Ed:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ah:CCC, 221Bd:CCP, 231:P, 232:C, M212Ea:CCP, M212Eb:CCP, M221Ab:CCC
Federal Lands: NPS (Acadia)
Synonymy: Spring swamp (Hill 1923), Bulrush marsh (CAP pers. comm. 1998), Deep Rush Marsh (Thompson 1996) B, Palustrine Narrow-leaved Persistent Emergent Wetland, Permanently Flooded (PEM5H) (Cowardin et al. 1979)
References: Bowman 2000, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Edinger et al. 2002, Fike 1999, Gawler 2002, Hill 1923, Northern Appalachian Ecology Working Group 2000, Sperduto 2000b, Swain and Kearsley 2000, Thompson 1996, Thompson and Sorensen 2000
Authors: S.C. Gawler, ECS **Confidence:** 3 **Identifier:** CEGL006275

V.A.5.N.I.9. TYPHA (ANGUSTIFOLIA, LATIFOLIA) - (SCHOENOPLECTUS SPP.) SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE

(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Semipermanently Flooded Herbaceous Alliance

Concept: This alliance, found in virtually every state in the United States and probably most Canadian provinces, contains stands dominated by *Typha angustifolia* and/or *Typha latifolia*, either alone or in combination with other tall emergent marsh species. Associated species vary widely; in the Midwest they include many sedges such as *Carex aquatilis, Carex rostrata, Carex pellita (= Carex lanuginosa)*, bulrushes such as *Schoenoplectus americanus (= Scirpus americanus), Schoenoplectus acutus (= Scirpus acutus)*, and *Schoenoplectus heterochaetus (= Scirpus heterochaetus)*, and broad-leaved herbs such as *Thelypteris palustris, Asclepias incarnata, Impatiens capensis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum, Hibiscus moscheutos*, and *Verbena hastata*. Floating aquatics such as *Lemna minor* may predominate in deeper zones.

This alliance is found most commonly along lake margins and in shallow basins, and occasionally in river backwaters. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. *Typha angustifolia* can grow in deeper water compared to *Typha latifolia*, although both species reach maximum growth at a water depth of 50 cm. *Typha* often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes. *Lythrum salicaria*, an exotic species from Europe, has become a common associate of many eastern *Typha* marshes. In the Southeast, this alliance is widespread and currently representative of a wide variety of mixed marshes with no clear dominants. Vegetation in this alliance may be natural or semi-natural and includes mixed stands of the nominal species, as well as essentially monospecific stands of *Typha latifolia*. These monospecific stands occur especially in artificial wetlands, such as borrow pits or ponds. This alliance occurs on hydric soils in wetlands, ditches, ponds, lakes, and rivers, as well as on shorelines and streambanks. Inundation is commonly 3-6 dm (1-2 feet) in depth. These marshes have hydric soils and are flooded with water levels ranging from several centimeters to more than 1 m for a significant part of the growing season. Occurrences may display areas of open water, but emergent vegetation dominates (80% cover). Seasonal flooding during winter and spring or flooding during heavy rains help maintain these marshes by causing water exchange which replenishes freshwater and circulates nutrients and organic debris. Soils which support this community can be mineral or organic but are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Vegetative diversity and density is highly variable in response to water depth, water chemistry, and natural forces.
Comments: It has been suggested that mixed emergent marshes tend to occur on harder pond, lake, or river bottoms and are less likely to contain a peaty mat with its diverse mixture of forbs (MNNHP 1993). Alliances that describe marshes dominated by mixed emergents other than cattails and the associates listed above include the V.A.5.N.I *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431), the V.A.5.N.I *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443), the V.A.5.N.I *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432), and the V.A.5.N.I *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441). In shallow flooded conditions this alliance grades into the V.A.5.N.k *Typha spp. - (Schoenoplectus spp., Juncus*

spp.) Seasonally Flooded Herbaceous Alliance (A.1394), as well as V.A.5.N.k *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387). *Typha latifolia* can hybridize with *Typha angustifolia*, and the hybrid, *Typha X glauca*, may be more invasive of disturbed areas than the parent species. In the West, some studies have classified marshes dominated by *Typha domingensis* as phases of *Typha latifolia* marshes. This alliance now includes wetland communities dominated by *Typha latifolia*, often in disturbed or sedimented situations. The concept and distribution of this alliance in the Southeast needs reassessment. Many of the presettlement occurrences of this alliance have been drained and converted to cropland or destroyed by siltation, which greatly accelerates the natural successional process from shallow inundation to moist soil. *Lythrum salicaria* is an aggressive exotic species that threatens this vegetation type in Canada, the Northeast, and more recently in the Midwest.

Range: This alliance is found in virtually every state in the United States and is likely to be found in most Canadian provinces. In the southeastern United States, it is found in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

States/Provinces: AL AR AZ BC CA CO CT DE FL? GA IA ID IL IN KS KY LA MA MB MD ME MI MN MO MS MT NC ND NE NH NJ NM NV NY OH OK ON OR PA QC RI SC SD TN TX UT VA VT WA WI WV WY

TNC Ecoregions: 10:C, 11:C, 12:C, 17:C, 19:C, 20:C, 25:C, 26:C, 27:C, 2:C, 31:C, 32:C, 33:C, 34:C, 35:C, 36:C, 37:C, 38:C, 39:C, 40:C, 41:C, 42:P, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:P, 51:P, 52:C, 53:C, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C, 6:C

USFS Ecoregions: 212Aa:C??, 212Ab:C??, 212Ba:C??, 212Bb:C??, 212Ca:CC?, 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Dc:CC?, 212Ea:CCC, 212Ec:CCP, 212Ed:CCP, 212Ee:CCP, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 212Ha:CCP, 212Hb:CCP, 212He:CCC, 212Hh:CCP, 212Hi:CCP, 212Hj:CCC, 212Hk:CCC, 212Hl:CCC, 212Hm:CCP, 212Hn:CCP, 212Ho:CCC, 212Hp:CCP, 212Hq:CCP, 212Hr:CCP, 212Hs:CCP, 212Ht:CCC, 212Hu:CCC, 212Hv:CCC, 212Hw:CCC, 212Hx:CCC, 212Hy:CCP, 212Ia:CCC, 212Ib:CCP, 212Ja:CCC, 212Jb:CCP, 212Jc:CCP, 212Jf:CCP, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCP, 212Jn:CCC, 212Jo:CCP, 212Jr:CCC, 212Ka:CCP, 212Kb:CCC, 212La:CPP, 212Lb:CPP, 212Lc:CPP, 212Ld:CPP, 212Ma:CPP, 212Mb:CPP, 212Na:CCP, 212Nb:CCP, 212Nc:CCC, 212Nd:CCP, 212Oa:CCC, 212Ob:CCC, 212Pa:CCC, 212Pb:CCC, 221Aa:CC?, 221Ab:CC?, 221Ac:CC?, 221Ad:CC?, 221Ae:CCP, 221Af:CC?, 221Ag:CC?, 221Ah:CC?, 221Ai:CC?, 221Aj:CC?, 221Ak:CC?, 221Al:CCC, 221Am:CC?, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 221Da:C??, 221Db:C??, 221Dc:C??, 221Ea:CC?, 221Eb:CC?, 221Ec:CCC, 221Eg:CCC, 221Fa:C??, 221Fb:C??, 221H:CC, 221Ja:CC?, 221Jc:CC?, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222Am:CCC, 222An:CCC, 222Cf:CCP, 222Cg:CCP, 222D:CC, 222Eb:CCC, 222Eg:CCP, 222Eh:CCP, 222F:CC, 222Ge:CCC, 222Ha:CCC, 222Hb:CCC, 222Ia:CCC, 222Ib:CCP, 222Ic:CC?, 222Id:CC?, 222Ie:CCP, 222If:CCC, 222Ja:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Jj:CCC, 222Kd:CCC, 222Ke:CCC, 222Kf:CCC, 222Kg:CCC, 222Kj:CCC, 222Lc:CCC, 222Mb:CCC, 222Mc:CCC, 222Md:CCC, 222Me:CCC, 222Na:CCC, 222Q:CC, 231Aa:C??, 231Ae:C??, 231Af:C??, 231Ak:C??, 231Al:C??, 231Am:C??, 231An:C??, 231Ao:C??, 231Ap:C??, 231C:CC, 231E:CC, 231Fb:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Aa:C??, 232Ac:C??, 232Ad:C??, 232Bc:C??, 232Bd:C??, 232Br:C??, 232Ce:CCC, 232Ch:CC?, 232Cj:CC?, 234Ac:PP?, 242A:CC, 251Aa:CCC, 251Ab:CCC, 251Ba:CCC, 251Bb:CCC, 251Bd:CCC, 251Be:CCC, 251Cb:CCC, 251Cc:CCC, 251Cd:CC?, 251Cf:CCC, 251Cg:CCC, 251Ch:CCC, 251Cm:CCC, 251Cp:CCC, 251Dc:CCC, 251Dg:CCC, 251Ea:CCC, 251Eb:CCC, 251Ed:CCC, 251F:CC, 255Aa:CCC, 255C:CC, 255Da:CCC, 255Dc:CCC, 261A:CC, 262A:CC, 263A:CC, 311A:CC, 331C:CC, 331F:CP, 331H:CC, 331I:CC, 332A:CP, 332B:C?, 332C:CC, 332D:CP, 332E:CC, 341C:CC, 342:C, M212Aa:CP?, M212Ab:CP?, M212Ac:CP?, M212Ad:CP?, M212Ba:CP?, M212Bb:CP?, M212Ca:CP?, M212Cb:CPP, M212Cc:CP?, M212Cd:CP?, M212Da:CC?, M212Db:CC?, M212Dc:CC?, M212Ea:CCC, M212Eb:CCC, M212Fa:C??, M212Fb:C??, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??, M221Da:CCC, M221Db:CCP, M221Dc:CCP, M221Dd:CCP, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC, M261E:CC, M331F:CC, M331I:CC, M333C:CC, M334A:CC

Federal Lands: DOD (Arnold, Fort Benning); NPS (Acadia, Badlands, Fort Laramie, Isle Royale, Scotts Bluff, Theodore Roosevelt, Voyageurs, Wind Cave, Yosemite); USFS (Black Hills, Daniel Boone, Kisatchie, Oconee?, Ouachita, Ozark, Pisgah, Talladega?, Tuskegee?); USFWS (Anahuac, Brazoria, Lacreek, Little River, Ouray, San Bernard)

Synonymy: Cattail Marsh, in part (Foti 1994b); *Typha (angustifolia, latifolia)* herbaceous alliance (Hoagland 1998a); *Typha latifolia* herbaceous alliance (Hoagland 2000); P5A4bII2a. *Typha latifolia* (Foti et al. 1994); L5D2aI2a. *Typha latifolia* (Foti et al. 1994); *Typha latifolia* Habitat Type (Hansen et al. 1995); Cattail Series, in part (Sawyer and Keeler-Wolf 1995); Cat-tail marsh (Fike 1999); Robust Emergent Marsh, in part (Smith 1991)

References: Anderson 1982, Apfelbaum 1985, Bundy et al. 1996, Bunin 1985, Christy 1973, Eggers and Reed 1987, Faber-Langendoen et al. 1996, Fike 1999, Foti 1994b, Foti et al. 1994, Grace and Wetzel 1981, Great Plains Flora Association 1986, Hansen et al. 1991, Hansen et al. 1995, Hoagland 1998a, Hoagland 2000, Jones and Walford 1995, Kittel et al. 1996, Kittel et al. 1999a, Komarkova 1976, Komarkova 1986, Kovalchik 1993, Lindauer 1978, Lindauer and Christy 1972, MNNHP 1993, Masek 1979, McEachern 1979, Mitsch and Gosselink 1993, Mohlenbrock 1959, Muldavin et al. 1993b, Muldavin et al. 2000a, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Segadas-Vianna 1951, Simkins 1931, Smith 1991, TNC 1995b, Tolstead 1942, Wharton 1978, Youngblood et al. 1985a
Authors: MCS, MOD. M.S. REID, MP, Midwest **Identifier:** A.1436

TYPHA (ANGUSTIFOLIA, LATIFOLIA) - (SCHOENOPLECTUS SPP.) EASTERN HERBACEOUS VEGETATION

(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Eastern Herbaceous Vegetation
Eastern Cattail Marsh **G5 (97-12-01)**
Ecological Group (SCS;MCS): Eastern Emergent Marshes (480-20; 1.4.1.2)

Concept: These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover), and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies, and is rarely extensive; bryophytes are mostly confined to the hummocks. *Typha angustifolia, Typha latifolia*, or their hybrid *Typha X glauca* dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges such as *Carex aquatilis, Carex lurida, Carex rostrata, Carex pellita (= Carex lanuginosa), Scirpus cyperinus*, and bulrushes such as *Schoenoplectus americanus (= Scirpus americanus)* and *Schoenoplectus acutus (= Scirpus acutus)* occur, along with patchy grasses such as *Calamagrostis canadensis*. Broad-leaved herbs include *Thelypteris palustris, Asclepias incarnata, Calla palustris, Impatiens capensis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum*, and *Verbena hastata*. Floating aquatics, such as *Lemna minor*, may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale, Ilex verticillata*, and *Spiraea alba* are common. The invasive exotic plants *Lythrum salicaria* and *Phragmites australis* may be abundant in parts of some occurrences. This association is distinguished from other northeastern freshwater marshes by the strong dominance of *Typha* spp.
Comments: *Typha angustifolia* can grow in deeper water compared to *Typha latifolia*, although both species reach maximum growth at a water depth of 50 cm (Grace and Wetzel 1981). *Typha* often occurs in pure stands and can colonize areas recently exposed by either natural or human causes.
States/Provinces: CT:S?, DE:S?, MA:S4, MD:S?, ME:S5, NC:S?, NH:S4?, NJ:S5, NY:S5, PA:S?, RI:S?, VA:S?, VT:S4, WV:S?
TNC Ecoregions: 48:C, 52:C, 58:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Da:CCC, 212Db:CCC, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCP, 221Al:CCC, 221Ba:CCP, 221Bb:CCC, 221Bc:CCP, 221Bd:CCC, 222:C, 231:C, M212A:CP, M212B:CP, M212C:CP, M212D:CC, M212Ea:CCC, M212Eb:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCP, M221Dd:CCP
Federal Lands: NPS (Acadia)
Synonymy: Robust Emergent Marsh (Breden 1989), Cattail marsh (CAP pers. comm. 1998), Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984), Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984), Cattail Marsh (Thompson 1996), Palustrine Narrow-leaved Persistent Emergent Wetland, Permanently Flooded (PEM5H) (Cowardin et al. 1979)
References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Edinger et al. 2002, Fike 1999, Gawler 2002, Grace and Wetzel 1981, Metzler and Barrett 2001, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorensen 2000
Authors: S.C. Gawler, ECS **Confidence:** 3 **Identifier:** CEGL006153

V.A.5.N.m. Saturated temperate or subpolar grassland

V.A.5.N.m.1. CLADIUM MARISCOIDES SATURATED HERBACEOUS ALLIANCE

Twig-rush Saturated Herbaceous Alliance

Concept: This alliance currently includes a variety of palustrine herbaceous vegetation dominated by *Cladium mariscoides* in combination with other grasses and sedges; shrubs typically account for less than 25% cover in these communities. This alliance contains a diversity of vegetation types, with variable species composition. Associations in this alliance include sea-level fens of the mid-Atlantic coast, high-elevation (4200 feet) fens over mafic geology in the Southern Blue Ridge, communities of floodplains, streams, and stream channels in the New Jersey Pine Barrens, certain Coastal Plain pondshore communities in Delaware, and Coastal Plain poor fens in Rhode Island and New York.
Range: This alliance is found in North Carolina, Connecticut, Delaware, Maryland, New Jersey, New York, Rhode Island, Virginia, and possibly West Virginia (?).
States/Provinces: CT DE MA MD NC NH? NJ NY RI TN VA
TNC Ecoregions: 48:C, 51:C, 58:C, 59:C, 61:?, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CC?, 221Ad:CCC, 221Ak:CC?, 221Db:C??, 222If:CCC, 232Aa:CCC, 232Ab:CC?, 232Ad:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, M221Dc:CCC
Federal Lands: NPS (Isle Royale); USFS (Jefferson?, Pisgah?)
Synonymy: IIE1b. Calcareous Fen Complex, in part (Allard 1990); Southern Appalachian Fen (Schafale and Weakley 1990)
References: Allard 1990, Richardson and Gibbons 1993, Schafale and Weakley 1990, Tucker 1967, Weakley and Schafale 1994
Authors: K.D. PATTERSON, RW, East **Identifier:** A.1447

CLADIUM MARISCOIDES - DROSERA INTERMEDIA - ELEOCHARIS ROSTELLATA HERBACEOUS VEGETATION
Twig-rush - Water Sundew - Beaked Spikerush Herbaceous Vegetation
Sea Level Fen **G1 (97-11-14)**
Ecological Group (SCS;MCS): Atlantic Coast Sea-level Fens (202-80; n/a)

Concept: This association comprises "sea-level fens" of the central and north Atlantic coast. These are small-patch communities occurring at the edge of salt marshes adjacent to sandy or gravelly slopes where there is acidic, oligotrophic groundwater seepage. Although its association with salt marshes is diagnostic, it is only infrequently influenced by salt or brackish overwash during unusually high tides. The physiognomy is dominated by herbs, occasionally with some scattered shrubs or short trees. The diagnostic species include *Cladium mariscoides, Rhynchospora alba, Eleocharis rostellata, Drosera intermedia*, and *Schoenoplectus pungens (= Scirpus pungens)*. Other associated species may include *Symphyotrichum novi-belgii (= Aster novi-belgii), Carex exilis, Carex hormathodes, Carex leptalea, Eleocharis fallax, Juncus canadensis, Juncus pelocarpus, Lysimachia terrestris, Rosa palustris, Vaccinium macrocarpon, Sanguisorba canadensis, Teucrium canadense*, and *Schoenoplectus americanus (= Scirpus americanus)* and *Eriocaulon decangulare* in the southern portion of the association range. Woody species occurring at low cover may include *Morella pensylvanica (= Myrica pensylvanica), Baccharis halimifolia, Juniperus virginiana, Iva frutescens*, and in the southern portion of the range, *Morella cerifera (= Myrica cerifera)*. Substrate is sedgy peat over sand or gravel.
Range: This type occurs from Virginia to Massachusetts, and possibly New Hampshire.
States/Provinces: CT:S?, DE:S1, MA:S1, MD:S?, NH?, NJ:S?, NY:S1, RI:S?, VA:S1
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CC?, 221Ad:CCC, 221Ak:CC?, 232Aa:CCC, 232Ab:CC?, 232Bx:CCC, 232Bz:CCC
Synonymy: *Myrica cerifera / Eriocaulon decangulare - Eleocharis rostellata* Sparse Shrubland (Grossman et al. 1994)
References: Berdine 1998, Bowman 2000, Breden et al. 2001, Edinger et al. 2002, Fleming 2001, Fleming et al. 2001, Grossman et al. 1994, Ludwig 1995, Metzler and Barrett 2001, Reschke 1990, Swain and Kearsley 2001
Authors: C. Ludwig, mod. S.L. Neid, ECS **Confidence:** 1 **Identifier:** CEGL006310

V.A.5.N.n. Tidal temperate or subpolar grassland

V.A.5.N.n.300. ACORUS CALAMUS TIDAL HERBACEOUS ALLIANCE

Sweetflag Tidal Herbaceous Alliance

Concept: This alliance includes associations of freshwater tidal marsh dominated by *Acorus calamus* that occur in fresh to oligohaline reaches of tidal rivers along the Atlantic coast. This association is best developed in higher, irregularly flooded elevations within freshwater tidal marshes but can occur in areas with a wide tidal range. Substrate is generally fine-particled, but varies from silts and silty mucks to peats and sands. The setting within the tidal marsh tends to be poorly drained; tidal flooding is ponded and of longer duration than other areas. *Acorus calamus* is dominant, generally comprising at least 50% cover, over extensive patches within the interior of high marshes. Associated species are variable and can include *Schoenoplectus fluviatilis, Peltandra virginica, Sagittaria latifolia, Polygonum punctatum*, and *Impatiens capensis*. Species that can occasionally occur include *Pontederia cordata, Zizania aquatica, Leersia oryzoides, Typha latifolia, Polygonum arifolium, Bidens coronata, Hibiscus moscheutos*, and other *Schoenoplectus* spp. *Murdannia keisak* has been noted in the southern portion of the range. *Acorus calamus* is conspicuously dominant in spring and early summer. Later in the season, culms tend to lodge and form mats and be overtopped by other species.
Range: This alliance is currently described from Massachusetts to Virginia.
States/Provinces: CT DE MA MD NJ VA
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 221Ad:CCC, 221Af:CCP, 221Ak:CCC, 232Ac:CCC, 232Ad:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCC
References: Barrett 1989, Barrett 1994, Caldwell 1990, Coulling 2002, Harrison 2001, McCormick and Ashbaugh 1972, Odum et al. 1984
Authors: S.L. NEID, East **Identifier:** A.3018

ACORUS CALAMUS TIDAL HERBACEOUS VEGETATION

Sweetflag Tidal Herbaceous Vegetation

G? (02-05-10)

Concept: This is an association of tidal freshwater marsh dominated by *Acorus calamus* that occurs in fresh to oligohaline reaches of tidal rivers along the Atlantic coast from Massachusetts to Virginia. This association is best developed in higher, irregularly flooded elevations within freshwater tidal marshes but can occur in areas with a wide tidal range. Substrate is generally fine-particled, but varies from silts and silty mucks to peats and sands. The setting within the tidal marsh tends to be poorly drained; tidal flooding is ponded and of longer duration than other areas. *Acorus calamus* is dominant, generally comprising at least 50% cover, over extensive patches within the interior of high marshes. Associated species are variable and can include *Schoenoplectus fluviatilis, Peltandra virginica, Sagittaria latifolia, Polygonum punctatum*, and *Impatiens capensis*. Species that can occasionally occur include *Pontederia cordata, Zizania aquatica, Leersia oryzoides, Typha latifolia, Polygonum arifolium, Bidens coronata, Hibiscus moscheutos*, and other *Schoenoplectus* spp. *Murdannia keisak* has been noted in the southern portion of the range. *Acorus calamus* is conspicuously dominant in spring and early summer. Later in the season, culms tend to lodge and form mats and be overtopped by other species.
Comments: This vegetation is considered a modified type by the Delaware Natural Heritage Program. Although the native status of *Acorus calamus* has been debated, North American specimens are apparently sterile triploids introduced from Europe (Coulling 2002).
Range: Currently described from Massachusetts to Virginia.
States/Provinces: CT:S?, DE:S?, MA:S1, MD:S4?, NJ:S?, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 221Ad:CCC, 221Af:CCP, 221Ak:CCC, 232Ac:CCC, 232Ad:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCC
References: Barrett 1989, Barrett 1994, Caldwell 1990, Coulling 2002, Fleming 2001, Harrison 2001, McCormick and Ashbaugh 1972, Metzler and Barrett 2001, Odum et al. 1984
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006833

V.A.5.N.n.301. CAREX HYALINOLEPIS TIDAL HERBACEOUS ALLIANCE

Shoreline Sedge Tidal Herbaceous Alliance

Concept: This alliance contains oligohaline to mesohaline marshes dominated by *Carex hyalinolepis* that form adjacent to main channels of tidal rivers in Virginia and Maryland. *Carex hyalinolepis* forms nearly monospecific stands. Associated species occurring with low cover include *Hibiscus moscheutos ssp. moscheutos, Kosteletzkya virginica*, and *Spartina cynosuroides*.
Range: This alliance is currently described from Virginia and Maryland.
States/Provinces: MD VA
TNC Ecoregions: 58:C
USFS Ecoregions: 232Br:CCC, 232Bt:CCC
References: Coulling 2002, Harrison pers. comm.
Authors: P.P. COULLING AND S.L. NE, East **Identifier:** A.3019

CAREX HYALINOLEPIS TIDAL HERBACEOUS VEGETATION
Shoreline Sedge Tidal Herbaceous Vegetation

G? (02-05-10)

Concept: This oligohaline marsh, dominated by *Carex hyalinolepis*, forms adjacent to main tidal river channels in the Chesapeake Bay. *Carex hyalinolepis* forms nearly monospecific stands. Associated species occurring with low cover include *Hibiscus moscheutos ssp. moscheutos, Kosteletzkya virginica*, and *Spartina cynosuroides*.
Comments: On the Rapphannock River (White Marsh) a sampled stand is codominated by *Carex hyalinolepis* and *Acorus calamus* and supports much greater diversity, but analysis suggests that this plot represents a compositionally different, possibly ecotonal community type. *Carex hyalinolepis* forms extensive dominance patches in the understories of tidal and wind-tidal oligohaline *Taxodium distichum* woodlands along the James, North Landing and Northwest rivers. A similar herb stratum has been documented from an apparently seasonally flooded *Acer rubrum - Pinus taeda* forest adjacent to a tidal marsh along a tributary of Back River in James City County (Coulling 2002).
Range: This community type has been documented only from the Pamunkey River (Hill and Lee marshes) in Virginia.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Br:CCC, 232Bt:CCC
Synonymy: *Carex hyalinolepis* Tidal Herbaceous Vegetation (Coulling 2002)
References: Coulling 2002, Harrison pers. comm.
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006177

V.A.5.N.n.4. ELEOCHARIS FALLAX - ELEOCHARIS ROSTELLATA TIDAL HERBACEOUS ALLIANCE

Creeping Spikerush - Beaked Spikerush Tidal Herbaceous Alliance

Concept: This alliance includes peaty oligohaline marshes, well away from tidal guts, with frequent to dominant *Eleocharis fallax* and *Eleocharis rostellata*; these have been termed 'spikerush lawns' in very slightly brackish (oligohaline) marshes. Other characteristic species can include *Centella erecta, Eriocaulon decangulare, Ludwigia alata, Cyperus haspan, Cladium mariscoides, Sabatia dodecandra, Eryngium aquaticum, Proserpinaca palustris, Ludwigia alata*, and *Juncus* spp. This alliance ranges from Maryland southwards along the southeastern Coastal Plain. Salinity is 0.5-5 ppt. Even though there is some variability in the expression of this marsh vegetation between North Carolina and Virginia examples, only one association has been described.
Range: This alliance ranges from Maryland southwards along the southeastern coastal plain. It is found in Alabama, Delaware, Florida, Louisiana, North Carolina, Maryland, Virginia, and possibly elsewhere.
States/Provinces: AL DE FL LA MD NC NY VA
TNC Ecoregions: 31:C, 53:C, 55:P, 57:C, 58:C, 62:C
USFS Ecoregions: 232Aa:CCC, 232Br:CCC, 232Bx:CCP, 232Bz:CCC, 232Ch:CCC, 232Dc:CCC, 232Dd:CCC
Federal Lands: DOD (Eglin); NPS (Assateague Island, Fire Island); USFWS (Chincoteague)
Synonymy: Tidal Freshwater Marsh, Oligohaline Variant, in part (Schafale and Weakley 1990)
References: Fleming 1998, Schafale and Weakley 1990
Authors: A.S. WEAKLEY 1-95, MOD. G, JT, Southeast **Identifier:** A.1474

ELEOCHARIS FALLAX - ELEOCHARIS ROSTELLATA - SCHOENOPLECTUS AMERICANUS - SAGITTARIA LANCIFOLIA HERBACEOUS VEGETATION

Creeping Spikerush - Beaked Spikerush - Chairmaker's Bulrush - Lanceleaf Arrowhead Herbaceous Vegetation

Atlantic Coast Tidal Oligohaline Spikerush Marsh **G1 (00-01-23)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Oligohaline and Fresh Tidal Marshes (202-40; n/a)

Concept: This association represents oligohaline tidal marshes of the Atlantic coast dominated by *Eleocharis fallax, Eleocharis rostellata, Schoenoplectus americanus (= Scirpus americanus), Pontederia cordata, Sagittaria lancifolia*, and others. Other characteristic species can include *Centella erecta, Eriocaulon decangulare, Ludwigia alata, Cyperus haspan, Cladium mariscoides, Sabatia dodecandra, Eryngium aquaticum, Proserpinaca palustris, Ludwigia alata*, and *Juncus* spp. Sites are peaty, oligohaline marshes, well away from tidal guts, and have been called 'spikerush lawns.' Salinity is 0.5-5 ppt.
Comments: Marshes in North Carolina and Virginia have been described as having somewhat different species composition. It is not clear, though, that the differences are significant. They are grouped together here at this time.
States/Provinces: DE:S1, MD:S?, NC:S3, VA:S?
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Bz:CCC, 232Ch:CCC
Synonymy: Tidal Freshwater Marsh (Oligohaline Low Marsh Subtype) (Schafale 2000), *Eleocharis fallax - Sagittaria lancifolia - Polygonum punctatum* Tidally Flooded Herbaceous Vegetation (Fleming and Moorhead 1998), *Eleocharis rostellata - Eleocharis fallax - Cladium mariscoides* Tidally Flooded Herbaceous Vegetation (Fleming and Moorhead 1998)
References: Bowman 2000, Fleming 1998, Fleming and Moorhead 1998, Fleming et al. 2001, Frost et al. 1990, Harrison 2001, Schafale 2000, Schafale and Weakley 1990
Authors: SCS **Confidence:** 1 **Identifier:** CEGL004628

ELEOCHARIS ROSTELLATA - SPARTINA PATENS HERBACEOUS VEGETATION

Beaked Spikerush - Saltmeadow Cordgrass Herbaceous Vegetation

Spikerush Lawn Tidal Marsh **G? (00-04-17)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This association is an irregularly flooded brackish marsh occurring as a narrow band in the transition zone between high salt marsh and salt shrub vegetation. Groundwater seepage dilutes tidal floodwaters. It occurs on peat or muck of variable depth over sand. It is heavily dominated by *Eleocharis rostellata*, growing in association with *Spartina patens, Schoenoplectus pungens (= Scirpus pungens), Typha angustifolia, Distichlis spicata, Juncus gerardii, Cladium mariscoides, Eleocharis fallax, Lythrum lineare, Samolus valerandi ssp. parviflorus (= Samolus parviflorus)*, and *Galium tinctorium*, and *Centella erecta* and *Fimbristylis castanea* in the southern extent of the range. *Baccharis halimifolia* and *Iva frutescens* can occur sporadically. It is currently described from barrier islands along the Mid- and North Atlantic Coast.
Range: This association occurs along the Atlantic Coast from Virginia and Maryland, and northward to New York.
States/Provinces: MD:S?, NY:S3S4, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Aa:CCC, 232Br:CCC, 232Bx:CCP, 232Bz:CCC, 232C:CC
Federal Lands: NPS (Assateague Island, Fire Island); USFWS (Chincoteague)
References: Bowman 2000, Coulling 2002, Edinger et al. 2002, Sneddon and Lundgren 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006611

V.A.5.N.n.5. JUNCUS ROEMERIANUS TIDAL HERBACEOUS ALLIANCE

Black Needlerush Tidal Herbaceous Alliance

Concept: *Juncus roemerianus*-dominated marshes with tidal hydrology. Associations in this alliance have a range of water chemistry, including saline, brackish, and (rarely) freshwater. This widely distributed salt marsh alliance occurs in association with low salt marshes or in brackish marshes, and is characterized by discrete, dense patches of vegetation usually strongly dominated by *Juncus roemerianus* with few other associates. Associates which occur at low cover may include *Borrichia frutescens, Baccharis halimifolia, Spartina alterniflora,*

Distichlis spicata, Schoenoplectus robustus (= Scirpus robustus), Symphyotrichum tenuifolium (= Aster tenuifolius), and *Symphyotrichum subulatum (= Aster subulatus)*. This community may occur as isolated patches within low salt marsh, or may dominate vast areas at the heads of tidal creeks that drain the marsh. Its hydrology is generally irregularly tidally flooded. Soils of this association are generally poorly to very poorly drained, often with standing water atop peat accumulations (averaging 15 cm in depth) which in turn overlie gleyed sands. Degree of tidal inundation and relative elevation control the distribution of salt marsh vegetation in general; *Juncus roemerianus* is typically found at lower elevation than the associated *Spartina patens* marshes or mixed marshes. *Juncus roemerianus* generally occurs on sandy substrates. The alliance may more rarely occur in freshwater, wind tidal situations. In these examples, *Juncus roemerianus* is the dominant, but other characteristic species may include *Thelypteris palustris var. pubescens, Polygonum punctatum, Cladium mariscus ssp. jamaicense, Asclepias lanceolata, Osmunda regalis var. spectabilis, Eleocharis fallax, Boehmeria cylindrica*, and others. This species composition is indicative of the freshwater marsh conditions, as they do not occur in more brackish and saline associations in the *Juncus roemerianus* alliance.
Comments: Few associations have been described; more may be necessary to accommodate variation in this wide-ranging alliance.
Range: This alliance occurs in the southeastern coastal plain from Maryland south to Florida and west to Louisiana and Texas.
States/Provinces: AL DE FL GA LA? MD MS NC SC TX VA
TNC Ecoregions: 30:P, 31:C, 41:P, 42:P, 53:C, 54:C, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231Fb:CCC, 232Ad:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232Db:CCP, 232Dc:CCC, 232Dd:CCC, 232De:CCP, 232Eb:CCC, 232Ec:CC?, 232Ed:CCC, 232Gb:CCC, 255Da:CCP, 255Dc:CCC
Federal Lands: NPS (Assateague Island, Fort Pulaski); USFS (Croatan); USFWS (Anahuac, Big Boggy, Bon Secour, Brazoria, McFaddin, San Bernard, Texas Point)
Synonymy: Tidal Marsh, in part (FNAI 1992a); Brackish Marsh, in part (Smith 1996a); Brackish Marsh, in part (Wieland 1994b); Brackish Marsh, in part (Schafale and Weakley 1990); Brackish Marsh, in part (Nelson 1986); Smooth Cordgrass Series, in part (Diamond 1993); Brackish Marsh (Wieland 1994a)
References: Bowman 2000, Cooper and Waits 1973, Diamond 1993, FNAI 1992a, Gosselink 1984, Harrison 2001, Higgins et al. 1971, Hill 1986, Montague and Wiegert 1990, Nelson 1986, Penfound 1952, Schafale and Weakley 1990, Smith 1996a, Tiner 1977, Wharton 1978, Wieland 1994a, Wieland 1994b
Authors: D.J. ALLARD, MOD. A.S. WE, JT, Southeast **Identifier:** A.1475

JUNCUS ROEMERIANUS HERBACEOUS VEGETATION
Black Needlerush Herbaceous Vegetation
Needlerush High Marsh **G5 (01-03-29)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This broad-ranging *Juncus roemerianus* salt marsh community is characterized by discrete, dense patches usually strongly dominated by *Juncus roemerianus* with few other associates. As currently defined, this community occurs in a variety of settings in different marsh regions including both "high" and "low" marshes. For example, large expanses of this type are found in northwest Florida at or below the mean high water line. In other regions it may be found as isolated patches within high salt marsh, or may dominate vast areas at the heads of tidal creeks. In general, the prevalence of *Juncus roemerianus* in Florida indicates the prevalence of high marshes (above mean high water). Its hydrology is generally irregularly tidally flooded.
Comments: This community is common on the southeastern seaboard, but large undisturbed areas are of high conservation concern. Although this community exhibits little floristic variation across its range, the associated animal species may vary to a greater extent. Further analysis may suggest a further subdivision of this community; two variants are recognized in Virginia, one depauperate lunar tidal type and another more species diverse wind-tidal type. This community may not occur west of Texas.

Juncus roemerianus was found to be lower in elevation than the associated *Spartina patens* type and mixed type (Cooper and Waits 1973).
Range: This community is widespread along the Atlantic and Gulf coasts of North America ranging from Delaware south to Florida, and west to Texas.
States/Provinces: AL:S2S3, DE:S2S3, FL:S?, GA:S?, LA?, MD:S4, MS:S3, NC:S5, SC:S?, TX:S4, VA:S?
TNC Ecoregions: 31:C, 53:C, 54:C, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231Fb:CCC, 232Ad:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232Db:CCP, 232Dc:CCC, 232Dd:CCC, 232De:CCP, 232Eb:CCC,

232Ec:CC?, 232Ed:CCC, 232Gb:CCC, 255Da:CCP, 255Dc:CCC
Federal Lands: NPS (Assateague Island, Fort Pulaski); USFS (Croatan); USFWS (Anahuac, Big Boggy, Bon Secour, Brazoria, McFaddin, San Bernard, Texas Point)
Synonymy: Brackish Marsh (Needlerush Subtype) (Schafale 2000), Saline Marsh (Wieland 1994a) B. in part, Brackish Marsh (Wieland 1994b) B. in part, Salt marsh community (Hill 1986) B. Assateague Island., Salt marsh (Higgins et al. 1971) B. Assateague Island., *Spartina - Distichlis - Juncus* associes (Penfound 1952) B, *Juncus roemerianus* association of the low marsh (Adams 1963) =. North Carolina., *Juncus* type (Cooper and Waits 1973) =. North Carolina., Irregularly flooded salt marsh (Jenkins 1974) =. Chesapeake Bay., Lower high marsh (Stalter 1973a) =. South Carolina., Needlerush - saltmeadow type (Nicholson and Van Deusen 1954) =. Maryland., Needlerush Marsh. [common name], Smooth Cordgrass Series (Diamond 1993) B
References: Adams 1963, Bowman 2000, Cooper and Waits 1973, Diamond 1993, Eleuterius and Caldwell 1984, Eleuterius and Eleuterius 1979, Fleming et al. 2001, Hackney and de la Cruz 1981, Hackney and de la Cruz 1982, Harrison 2001, Higgins et al. 1971, Hill 1986, Jenkins 1974, Kruczynski et al. 1978, Lynch 1941, Montague and Wiegert 1990, Nelson 1986, Nicholson and Van Deusen 1954, Peet et al. 2002, Penfound 1952, Schafale 2000, Schafale and Weakley 1990, Smith 1996a, Stalter 1973a, Stalter 1973b, Stout 1984, Wieland 1994a, Wieland 1994b, Wieland 2000b
Authors: R.E. Evans, SCS **Confidence:** 1 **Identifier:** CEGL004186

V.A.5.N.n.6. PANICUM VIRGATUM TIDAL HERBACEOUS ALLIANCE
Switchgrass Tidal Herbaceous Alliance

Concept: This alliance consists of brackish to oligohaline tidal marshes dominated by *Panicum virgatum*. Hydrology of this alliance is irregularly tidally inundated, usually occurring above *Juncus roemerianus* and other tidal marshes, and at the conceptual edge of tidal and upland communities. Associated species in the northern part of the alliance's range include *Spartina pectinata, Agrostis stolonifera, Cladium mariscoides, Schoenoplectus americanus (= Scirpus americanus), Solidago sempervirens, Baccharis halimifolia*, and *Tripsacum dactyloides*. Associates in the southern portion of the range include *Cladium mariscus ssp. jamaicense, Sagittaria lancifolia*, and *Spartina cynosuroides*.
Comments: This vegetation typically intergrades with the *Baccharis halimifolia - Iva frutescens* Tidal Shrubland Alliance (A.1023); its status as a distinct alliance may require further study. More information is needed on its expression and extent in the southeastern U.S.
Range: This alliance is found in Alabama, Mississippi, Connecticut, Delaware, Massachusetts, Maryland, New Jersey, New York, Rhode Island, and Virginia, and possibly in Florida (?) and Louisiana (?).
States/Provinces: AL CT DE FL? LA? MA MD MS NJ NY RI VA
TNC Ecoregions: 53:C, 55:P, 56:P, 57:P, 58:C, 61:C, 62:C
USFS Ecoregions: 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CC?, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bc:CCP, 232Bd:CC?, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCP, 232Ch:CC?, 232Ci:CCP, 232Cj:CC?, 232Dc:CCC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001); Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001)
References: Sneddon et al. 1994, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.1476

PANICUM VIRGATUM - SPARTINA PATENS HERBACEOUS VEGETATION
Switchgrass - Saltmeadow Cordgrass Herbaceous Vegetation
Brackish Meadow **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast High Tidal Marsh Grasslands (202-45; n/a)

Concept: This brackish meadow of the northern Atlantic coast occurs at the upland border of high salt marshes. It occurs on freely drained, shallow, sandy peat that is moist from upland seepage and brackish from irregular tidal flooding. Vegetation is dominated by *Panicum virgatum* and occasionally codominated by *Spartina patens*. Common associates can include *Schoenoplectus americanus, Solidago sempervirens, Teucrium canadense, Distichlis spicata, Carex silicea*, and *Juncus* spp. (*Juncus gerardii* in the north, *Juncus roemerianus* in the south). Additional species can include *Kosteletzkya virginica, Hibiscus moscheutos, Amaranthus cannabinus*, and *Typha* spp., especially in oligohaline situations. Shrubs may occur sporadically, especially *Baccharis halimifolia, Morella pensylvanica (= Myrica pensylvanica), Prunus maritima*, and *Iva frutescens*. Vegetation can be quite diverse and

is a mixture of freshwater and brackish species. This association is best developed in salt marshes with a gradual elevation gradient that lends itself to vegetation zonation. The diagnostic species of this association is *Panicum virgatum* in brackish settings near upland-marsh borders.
Comments: This association is similar in species composition to the herbaceous component of *Baccharis halimifolia - Iva frutescens / Spartina patens* Shrubland (CEGL003921). This association is less developed in the northern edge of its range (New Hampshire).
Range: This association occurs from New Hampshire to Delaware.
States/Provinces: CT:S?, DE:S3?, MA:S3,S1, MD:S?, NJ:S2S3, NY:S1S2, RI:S?, VA:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bx:CCC, 232Bz:CCC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Salt marsh complex, upland border (Breden 1989), *Panicum virgatum* upland border (Nixon 1982), Salt Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine Salt Marshes., Brackish Tidal Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine., Fresh marsh (Hill 1986) B. Assateague Island., Mesic shrub community (Higgins et al. 1971) B. Assateague Island., Freshwater marsh (Fender 1937) B. New Jersey., *Panicum virgatum* Wetland Association (Heckscher et al. 1995) B. Delaware.
References: Bowman 2000, Breden 1989, Breden et al. 2001, Edinger et al. 2002, Enser 1999, Fender 1937, Harrison 2001, Heckscher et al. 1995, Higgins et al. 1971, Hill 1986, Hunt 2000, Lundgren et al. 2000, Metzler and Barrett 2001, Nixon 1982, Rawinski 1984, Sperduto 2000b, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006150

V.A.5.N.n.100. SCHOENOPLECTUS AMERICANUS TIDAL HERBACEOUS ALLIANCE

Chairmaker's Bulrush Tidal Herbaceous Alliance

Concept: This alliance includes tidal, mesohaline to oligohaline marshes dominated or codominated by *Schoenoplectus americanus (= Scirpus olneyi)*. Other associated species can include *Spartina patens, Spartina alterniflora, Spartina cynosuroides, Phragmites australis, Juncus roemerianus, Typha* spp., and *Typha domingensis*. The general aspect and species composition of this vegetation are variable, not only among occurrences, but also over the course of the growing season. Dominance patterns are not well understood but are likely related to gradients in salinity and hydrology. This alliance is known from the Gulf Coast of Texas, the Chenier Plain of Louisiana, and the mid-Atlantic coast of Maryland and Delaware; it may also occur along the Gulf Coast of Mississippi and Alabama and possibly along the lower Atlantic coast of the United States.
Comments: This alliance was created to cover coastal marsh vegetation dominated by *Schoenoplectus americanus* (JT 4-01).
Range: This alliance is currently only known from the Gulf Coast of Texas, the Chenier Plain of Louisiana, and the mid-Atlantic coast of Maryland and Delaware, but it may range throughout the Gulf Coast and lower and mid-Atlantic coast of the U.S.
States/Provinces: AL? DE GA? LA MD MS? NC? SC? TX VA
TNC Ecoregions: 31:C, 56:?, 57:C, 58:C, 62:C
USFS Ecoregions: 231Fb:CCC, 232Ac:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: USFWS (Anahuac, Brazoria, McFaddin, San Bernard)
References: Visser and Sasser 1998, Visser et al. 1998
Authors: J. TEAGUE, Southeast **Identifier:** A.2007

SCHOENOPLECTUS AMERICANUS - SPARTINA PATENS HERBACEOUS VEGETATION

Chairmaker's Bulrush - Saltmeadow Cordgrass Herbaceous Vegetation

G? (00-04-17)

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This brackish marsh occurs in wet depressions at the upper reaches of irregularly flooded tidal marshes of the mid-Atlantic coast. It occurs at the ecotone between low and high salt marsh zones. It is irregularly flooded, occurring just above the zone of regular tidal flooding, but is more frequently flooded than *Spartina patens*-dominated high marsh. This community is dominated by colonies of *Schoenoplectus americanus*, which often accounts for 40-75% of the total vegetation cover or codominant with *Spartina patens* at some sites. Associated species can include *Pluchea odorata, Juncus roemerianus, Spartina alterniflora, Spartina*

cynosuroides, Distichlis spicata, and *Limonium carolinianum* plus *Typha* spp. and *Phragmites australis*. This community often grades into *Spartina patens*- or *Juncus roemerianus*-dominated high marsh landward or *Spartina alterniflora*- or *Spartina cynosuroides*-dominated low marsh seaward. This association is best developed where the elevation gradient across the marsh is more gradual, allowing for greater diversity of physical conditions of duration and frequency of flooding.
Comments: The relationship between this alliance and the similar *Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance (A.1481) is not well understood. Dominance patterns are likely related to gradients in salinity and hydrology. *Schoenoplectus americanus* may dominate in areas with higher average water levels, lower salinities, and lower frequency of flooding than areas typically dominated by *Spartina patens*.
Range: This association is currently described from mid-Atlantic states of Delaware, Maryland and Virginia. It possibly extends south to Georgia.
States/Provinces: DE:S?, GA?, MD:S4, NC?, SC?, VA:S?
TNC Ecoregions: 56:?, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC
References: Bowman 2000, Fleming 2001, Fleming et al. 2001, Harrison 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006612

V.A.5.N.n.8. SCHOENOPLECTUS PUNGENS TIDAL HERBACEOUS ALLIANCE
Threesquare Tidal Herbaceous Alliance

Concept: This alliance is characterized by seasonally wet maritime interdunal depressions, commonly known as interdunal swales. It includes irregularly flooded brackish marshes dominated or codominated by *Schoenoplectus pungens (= Scirpus pungens)*, and peaty oligohaline marshes (salt 0.5-5 ppt) dominated by *Schoenoplectus pungens*, sometimes with *Osmunda regalis var. spectabilis* as codominant. Other associated species can include *Spartina patens, Juncus canadensis, Juncus scirpoides, Hydrocotyle umbellata*, and *Eleocharis parvula*. The general aspect and species composition of this vegetation is variable, not only among occurrences, but also over the course of the growing season. This alliance occurs in the Atlantic Coastal Plain from North Carolina north to Massachusetts.
Range: This alliance occurs in the Atlantic Coastal Plain from North Carolina north to Massachusetts. It is found in North Carolina, Connecticut, Delaware, Maryland, Massachusetts, New Jersey, and Virginia.
States/Provinces: CT MA MD ME NC NH NJ NY RI VA
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ad:CCC, 232Bt:CCC, 232Ch:CCC
Synonymy: Estuarine Intertidal: Coastal Salt Pond (Swain and Kearsley 2001); Estuarine Intertidal: Coastal Salt Pond Marsh (Swain and Kearsley 2001); Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001)
References: Higgins et al. 1971, Hill 1986, Swain and Kearsley 2001
Authors: A.S. WEAKLEY, JT, East **Identifier:** A.1478

SCHOENOPLECTUS PUNGENS TIDAL HERBACEOUS VEGETATION
Threesquare Tidal Herbaceous Vegetation
Atlantic Coast Brackish Tidal Marsh **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Salt Marshes (202-70; n/a)

Concept: This association occurs on fresh to brackish, mid-tidal, sandy/gravelly rivershores along the north and mid-Atlantic coast. It occurs in low areas where there is a longer duration of flooding. Wave and ice scour can have a significant influence on the year-to-year appearance of the vegetation, which tends to be sparse. This vegetation often occurs in nearly pure stands of *Schoenoplectus pungens (= Scirpus pungens)* but can be intermixed with *Spartina alterniflora* or *Spartina cynosuroides* in more brackish areas. Species diversity tends to be low due to winter storm scour, but associates can include *Amaranthus cannabinus, Polygonum punctatum, Cyperus bipartitus (= Cyperus rivularis)*, and *Bidens* spp. *Sagittaria graminea, Sagittaria latifolia, Eleocharis palustris (= Eleocharis smallii), Gratiola virginiana, Elatine americana, Isoetes riparia*, and *Cyperus bipartitus* can occur, but are absent in the northern part of the range. As the salinity decreases *Zizania aquatica* can also be an associate.
Comments: The nominal species has long been known as *Scirpus americanus*.
Range: This association occurs along the Atlantic coast from New Hampshire to Virginia.
States/Provinces: CT:S?, MA:S1, MD:S?, NH:S1S2,S?, NJ:S1S3, VA:S?

TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221Ad:CCC, 232Ad:CCC, 232Bt:CCC, 232Ch:CCC
Synonymy: *Scirpus* marsh community (brackish mid-tidal marsh border) (Barrett 1989), *Scirpus* complex zone (Metzler and Rosza 1982), Brackish intertidal marsh complex (Breden 1989), Brackish Tidal Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine.
References: Barrett 1989, Breden 1989, Breden et al. 2001, Caldwell 1990, Fleming 2001, Fleming et al. 2001, Metzler and Barrett 2001, Metzler and Rosza 1982, Rawinski 1984, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL004188

V.A.5.N.n.1. SPARTINA ALTERNIFLORA TIDAL HERBACEOUS ALLIANCE

Saltmarsh Cordgrass Tidal Herbaceous Alliance

Concept: This alliance includes various tidal marshes dominated by *Spartina alterniflora*. The hydrology is usually regularly tidally flooded. In the northern part of its range, southern Maine to Cape Hatteras, North Carolina, this alliance is generally limited to the zone between mean sea level and the mean high water level. The habitat occurs in protected inlets behind barrier beaches or in drowned river valleys. Peat depth ranges from a few feet, if the community formed over a mud flat, to 80 feet in drowned river valleys. *Spartina alterniflora* is limited to the low marsh zone by moderate salinity; it can withstand longer submergence than other salt marsh grasses, but still requires periodic exposure of the substrate. It also requires moderately high levels of iron (7-15 ppm). This community is commonly known as the 'low salt marsh,' occurring as a tall grassland strongly dominated by *Spartina alterniflora*. There is little variation in vascular plant species composition across the range. It occurs in nearly pure stands, with occasional low growing species such as *Spergularia salina (= Spergularia marina), Salicornia* spp., *Suaeda maritima*, and seaweeds such as *Ulva lactuca* and other algae such as *Fucus vesiculosus* and *Ascophyllum nodosum*, which grow at the bases of the *Spartina* plants. Herbs of *Salicornia virginica* and *Salicornia bigelovii* can be quite common mixed in with the *Spartina*, often becoming more apparent later in the growing season. *Limonium carolinianum* is another characteristic herb, but only as scattered individuals. More detailed information is needed on the variability of the alliance in the southern parts of its range.
Range: This alliance is found in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, Connecticut, Delaware, Massachusetts, Maine, Maryland, New Hampshire, New Jersey, Rhode Island, and Virginia.
States/Provinces: AL CT DE FL GA LA MA MD ME MS NB NC NH NJ NS NY RI SC TX VA
TNC Ecoregions: 30:P, 31:C, 41:P, 53:C, 54:P, 55:P, 56:C, 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCC, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Aj:CCP, 221Ak:CCC, 221Dc:CPP, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Ae:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232Db:CCP, 232Dc:CCC, 232Dd:CCC, 232De:CCP, 232Eb:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CPP, 255Da:CC?, 255Dc:CCC
Federal Lands: NPS (Acadia, Assateague Island, Cape Hatteras, Cape Lookout, Fire Island, Fort Pulaski); USFS (Croatan); USFWS (Anahuac?, Aransas?, Big Boggy, Bon Secour, Brazoria, Matagorda Island, McFaddin, San Bernard, Texas Point)
Synonymy: Tidal Marsh, in part (FNAI 1992a); Saline Marsh, in part (Wieland 1994a); Saline Marsh, in part (Wieland 1994b); Salt Marsh (Schafale and Weakley 1990); Salt Marsh (Smith 1996a); Salt Marsh (Nelson 1986); Brackish Marsh, in part (Nelson 1986); Smooth Cordgrass Series, in part (Diamond 1993); Smooth Cordgrass Marsh (Wharton 1978); Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001); Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001)
References: Cowardin et al. 1979, Diamond 1993, Eleuterius 1972, FNAI 1992a, Kurz and Wagner 1957, Montague and Wiegert 1990, Nelson 1986, Odum 1988, Schafale and Weakley 1990, Smith 1996a, Swain and Kearsley 2001, Tiner 1977, Wharton 1978, Wieland 1994a, Wieland 1994b
Authors: D.J. ALLARD, JT, East **Identifier:** A.1471

SPARTINA ALTERNIFLORA - AMARANTHUS CANNABINUS HERBACEOUS VEGETATION

Saltmarsh Cordgrass - Water-hemp Herbaceous Vegetation

G? (00-11-15)

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This oligohaline brackish marsh occurs in the mid-tidal range of tidal rivers in Delaware and Maryland. The dominant species are *Spartina alterniflora* and *Amaranthus cannabinus*, with other associates, such as

Kosteletzkya virginica, Hibiscus moscheutos, Symphyotrichum subulatum (= Aster subulatus), Schoenoplectus robustus (= Scirpus robustus), Spartina patens, and *Atriplex prostrata*, occurring infrequently. The shrub *Baccharis halimifolia* sometimes occurs at low cover.
Comments: This association contains perennials with *Spartina alterniflora* as a strong component, whereas *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080) is dominated by annuals. However, the types may reflect seasonal variation within freshwater tidal marsh systems and be similar enough to warrant merging. *Spartina alterniflora - Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193) occurs along oligo- to mesohaline reaches of large tidal rivers (Delaware River, Connecticut River), whereas this association occurs along smaller tidal rivers and creeks.
Range: Currently described from Maryland and Delaware.
States/Provinces: DE:S?, MD:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bt:CCC
References: Bowman 2000
Authors: P. Bowman, ECS **Confidence:** 2 **Identifier:** CEGL006417

SPARTINA ALTERNIFLORA - PTILIMNIUM CAPILLACEUM - POLYGONUM PUNCTATUM HERBACEOUS VEGETATION

Saltmarsh Cordgrass - Mock Bishopweed - Dotted Smartweed Herbaceous Vegetation

G? (00-11-15)

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This oligohaline to mesohaline marsh occurs in silty mud along meanders in tidal rivers and creeks where there is significant freshwater seepage. It is often adjacent to uplands. The taxonomic relationship of this type has not been fully assessed. The vegetation is diverse and is codominated by *Spartina alterniflora, Ptilimnium capillaceum*, and *Polygonum punctatum*. Other associates include *Pluchea odorata, Bidens coronata, Kosteletzkya virginica, Eleocharis parvula, Cyperus filicinus, Hibiscus moscheutos, Amaranthus cannabinus, Eleocharis palustris, Asclepias incarnata, Sium suave, Schoenoplectus tabernaemontani (= Scirpus tabernaemontani), Schoenoplectus americanus (= Scirpus americanus), Schoenoplectus robustus (= Scirpus robustus), Echinochloa walteri, Typha angustifolia, Peltandra virginica, Pontederia cordata, Lobelia cardinalis*, and *Sagittaria latifolia*.
Comments: The taxonomic relationship of this type has not been fully assessed. It differs from *Spartina alterniflora - Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193) and *Spartina alterniflora - Amaranthus cannabinus* Herbaceous Vegetation (CEGL006417) by having greater species diversity presumably from the freshwater seepage input.
Range: Currently described from Delaware and Maryland.
States/Provinces: DE:S?, MD:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Bt:CCC, 232Bx:CCC
References: Bowman 2000
Authors: P. Bowman, ECS **Confidence:** 3 **Identifier:** CEGL006418

SPARTINA ALTERNIFLORA / (ASCOPHYLLUM NODOSUM) ACADIAN/VIRGINIAN ZONE HERBACEOUS VEGETATION

Saltmarsh Cordgrass / (Yellow Tang) Acadian/Virginian Zone Herbaceous Vegetation

Spartina Low Salt Marsh **G5 (97-12-01)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This tall grassland dominated by *Spartina alterniflora* forms the low salt marsh of the north and mid-Atlantic coast. It is diurnally flooded by tides, occurring in the intertidal zone between mean high tide and mean sea level in protected inlets behind barrier beaches or in the seaward reaches of drowned river valleys. It forms a coarse peat over sandy substrate. The low salt marsh occurs elevationally between high marsh that occurs landward and subtidal communities that occur seaward. *Spartina alterniflora* is limited to the low marsh zone by interspecific competition and by moderate salinity; it can withstand longer submergence than other salt marsh grasses but still requires periodic exposure of the substrate. *Spartina alterniflora* forms nearly monotypic stands with little variation across the geographic range of the community. Tall form *Spartina alterniflora* occurs adjacent

to salt water and colonizes unvegetated flats. This association also grades into short form *Spartina alterniflora* landward. Associated species occur in low abundance and commonly include *Limonium carolinianum, Salicornia virginica, Salicornia bigelovii, Spergularia maritima, Spergularia canadensis*, and *Suaeda maritima*. Brown algae can form extensive mats at the bases of the grass culms, especially *Ascophyllum nodosum, Fucus vesiculosus, Enteromorpha* spp., and *Ulva* spp. Macroalgae associates may be sparse or absent at the southern edge of the range. This community occurs from Nova Scotia to Cape Hatteras, North Carolina. Low marshes at the northern edge of the geographic range are far less extensive in size than those farther south due to differences in geomorphology and time since last glaciation.
Comments: The northern limit of this type occurs where there is a slower accumulation of silt and corresponding absence of algal species (Chapman 1937). The southern limit corresponds with the southern limit of the Virginian province of the American Atlantic Temperate Region, a transitional area harboring animal species of both southern and northern affinities (Gosner 1979, Cowardin 1979). Southern occurrences, where *Ascophyllum nodosum* may be sparse or absent, are placed within this type because of the associated characteristic faunal assemblage, including *Uca pugnax, Littorina saxatilis, Littorina obtusata*, and *Brachidontes demissus*. Analogous low salt marsh associations in other geographic areas include *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191) and *Spartina alterniflora - Juncus roemerianus - Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190) for the Atlantic Coast of the southeastern U.S. (Cape Hatteras, North Carolina, to Florida) and the Gulf Coast (Florida to Texas), respectively (see Cowardin 1979 for regional boundaries). *Spartina alterniflora - Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193) is a *Spartina alterniflora*-dominated association occurring in the mid-tidal range of tidal rivers that have a minimum tidal range of one meter.
Range: This association occurs along the Atlantic coastline from Nova Scotia and New Brunswick south to Cape Hatteras, North Carolina.
States/Provinces: CT:S?, DE:S5, MA:S3, MD:S5, ME:S4, NB:S?, NC:S5, NH:S?, NJ:S5, NS:S?, NY:S3S4, RI:S?, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Ae:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC, 232Ci:CCC
Federal Lands: NPS (Acadia, Assateague Island, Fire Island)
Synonymy: Salt marsh (Higgins et al. 1971) B. Assateague Island., Salt marsh community (Hill 1986) B. Assateague Island., Salt marsh complex, low marsh (Breden 1989). New Jersey., *Spartina alterniflora* salt marsh (Clancy 1993b). Delaware., Low salt marsh (Reschke 1990). New York., Cordgrass saltmarsh community (MENHP 1991). Maine., Low salt marsh (Enser 1993). Rhode Island., Low salt marsh community (Sperduto 1994). New Hampshire., Salt Marsh (Virginian Subtype) (Schafale 2000), Salt Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine Salt Marshes., *Spartina alterniflora* community (Metzler and Barrett 1992). Connecticut.
References: Adams 1963, Bertness 1988, Bowman 2000, Breden 1989, Breden et al. 2001, Chapman 1937, Clancy 1993b, Cowardin et al. 1979, Edinger et al. 2002, Enser 1993, Enser 1999, Fleming et al. 2001, Gawler 2001, Gawler 2002, Gosner 1979, Higgins et al. 1971, Hill 1986, MENHP 1991, Metzler and Barrett 1992, Metzler and Barrett 2001, Moul 1973, Rawinski 1984, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, Sperduto 1994, Sperduto 2000b, Swain and Kearsley 2001, Teal 1986
Authors: S.L. Neid, ECS **Confidence:** 1 **Identifier:** CEGL004192

V.A.5.N.n.10. SPARTINA CYNOSUROIDES TIDAL HERBACEOUS ALLIANCE
Giant Cordgrass Tidal Herbaceous Alliance

Concept: This alliance occurs as narrow, almost pure, stands of *Spartina cynosuroides* along tidal creeks and sloughs or on levees of oligohaline tidal marshes. Some *Spartina cynosuroides* communities are nearly monospecific, while others have a diverse component of other graminoids and forbs. Associated plants include *Schoenoplectus pungens (= Scirpus pungens), Schoenoplectus robustus (= Scirpus robustus), Schoenoplectus tabernaemontani (= Scirpus validus), Pontederia cordata, Peltandra virginica, Typha domingensis*, and *Typha angustifolia*, among others. Communities in this alliance occur mainly in the mid-Atlantic states with the northern extent of distribution being southern New England.
Comments: There may be several associations, determined by salinity.
Range: Communities in this alliance occur mainly in the mid-Atlantic states with the northern extent of distribution being southern New England. It is found in Georgia, North Carolina, South Carolina, Connecticut, Delaware,

Maryland, New Jersey, New York, and Virginia.
States/Provinces: DE GA MD NC NJ SC VA
TNC Ecoregions: 52:P, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 221A:??, 232Ab:CCP, 232Ac:CCP, 232Ad:CCC, 232Br:CCP, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC
Federal Lands: NPS (Fort Pulaski)
Synonymy: Tidal Freshwater Marsh, Oligohaline Variant (Schafale and Weakley 1990); Brackish Marsh, in part (Schafale and Weakley 1990); Brackish Marsh, in part (Nelson 1986); Brackish Marsh, in part (Wharton 1978); Big Cordgrass Community Type (Odum et al. 1984)
References: Fleming 1998, Nelson 1986, Odum 1988, Odum and Smith 1981, Odum et al. 1984, Schafale and Weakley 1990, Wharton 1978
Authors: ECS, JT, Southeast **Identifier:** A.1480

SPARTINA CYNOSUROIDES HERBACEOUS VEGETATION
Giant Cordgrass Herbaceous Vegetation
Atlantic Giant Cordgrass Marsh **G4 (97-08-13)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Oligohaline and Fresh Tidal Marshes (202-40; n/a)

Concept: This community includes narrow, almost pure stands of *Spartina cynosuroides* along tidal creeks and sloughs or on levees of oligohaline tidal marshes along the mid- to north Atlantic coast. Some *Spartina cynosuroides* communities are nearly monospecific, while others have a diverse component of other graminoids and forbs. Where mixed, associated plants include *Schoenoplectus pungens (= Scirpus pungens), Schoenoplectus robustus (= Scirpus robustus), Schoenoplectus americanus (= Scirpus olneyi), Kosteletzkya virginica, Hibiscus moscheutos, Amaranthus cannabinus, Panicum virgatum*, and *Polygonum punctatum*. Where more saline, *Spartina alterniflora* and *Iva frutescens* can become more frequent. Where less saline, associates can include *Schoenoplectus tabernaemontani (= Scirpus validus), Pontederia cordata, Peltandra virginica, Leersia oryzoides, Mikania scandens, Rumex verticillatus, Echinochloa walteri, Polygonum hydropiperoides*, and *Typha angustifolia* (or *Typha domingensis* in the south), among others. In more disturbed areas, this association can be displaced by *Phragmites australis*.
Comments: *Spartina cynosuroides - Panicum virgatum - Phyla lanceolata* Herbaceous Vegetation (CEGL007741) is similar in terms of dominant and codominant species, however, associated species differ somewhat and CEGL007741 occurs in wind-tidal situations in North Carolina and Virginia. North of New Jersey, *Spartina cynosuroides* is a component of brackish high marsh associations, but does not tend to dominate.
Range: This association occurs along the Atlantic coast from New Jersey to Georgia.
States/Provinces: DE:S3?, GA:S?, MD:S4?, NC:S3,S5, NJ:S3, SC:S?, VA:S?
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Ac:CCP, 232Ad:CCC, 232Br:CCP, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC
Federal Lands: NPS (Fort Pulaski)
Synonymy: Brackish Marsh (Wharton 1978) B. in part, Big Cordgrass Community Type (Odum et al. 1984), Brackish tidal marsh complex (Breden 1989). in part, Tidal Freshwater Marsh (Giant Cordgrass Subtype) (Schafale 2000)
References: Bowman 2000, Breden 1989, Breden et al. 2001, Fleming 2001, Fleming and Moorhead 1998, Fleming et al. 2001, Harrison 2001, Nelson 1986, Odum 1988, Odum and Smith 1981, Odum et al. 1984, Schafale 2000, Schafale and Weakley 1990, Wharton 1978
Authors: S.L. Neid, SCS **Confidence:** 2 **Identifier:** CEGL004195

V.A.5.N.n.11. SPARTINA PATENS - (DISTICHLIS SPICATA) TIDAL HERBACEOUS ALLIANCE

Saltmeadow Cordgrass - (Saltgrass) Tidal Herbaceous Alliance

Concept: This alliance comprises "high salt marsh" vegetation dominated or codominated by *Spartina patens* along the Gulf and Atlantic coasts from Maine to Texas. The high salt marsh is irregularly flooded by tides and forms at slightly higher elevations than regularly flooded low marshes; they establish where peat accumulation raises the marsh surface above mean high tide. Landward the vegetation can transition to brackish marsh or upland vegetation. Vegetation of this alliance also occurs in mesohaline zones along lower reaches of tidal rivers.

Variation in codominant species occurs across the geographic range. From the Canadian maritime provinces south to Delaware (discontinuously south to Virginia), this alliance is characterized by the dominance of *Spartina patens, Distichlis spicata*, and *Juncus gerardii* and the presence of more northerly distributed marsh species such as *Puccinellia fasciculata, Plantago maritima*, and *Triglochin maritima*. In brackish reaches of tidal rivers, this alliance includes *Spartina patens*-dominated vegetation that may also be characterized by the presence of *Agrostis stolonifera, Festuca rubra, Symphyotrichum novi-belgii (= Aster novi-belgii), Hierochloe odorata, Carex paleacea*, or *Spartina pectinata*.

From Delaware south to Florida, this high salt marsh coastal community is dominated by *Spartina patens*, forming meadows at slightly higher elevations in relation to the adjacent *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471). Diagnostic species for this community are *Spartina patens, Distichlis spicata, Borrichia frutescens, Kosteletzkya virginica*, and *Pluchea odorata*. Shrub seedlings such as *Baccharis halimifolia* and *Morella cerifera (= Myrica cerifera)* may also be present. The associated *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475) often occurs as discrete patches which may reach substantial size.

This alliance also includes mesohaline to oligohaline marshes of the Gulf Coast of Texas and Louisiana. In these associations, *Spartina patens* may strongly dominate, *Distichlis spicata, Spartina alterniflora*, and *Spartina patens* may codominate, *Distichlis spicata* may form pure stands, *Paspalum vaginatum* may strongly dominate, or *Spartina patens* and *Vigna luteola* may codominate. Other characteristic species include *Juncus roemerianus, Spartina spartinae, Spartina cynosuroides* (within its range), *Schoenoplectus robustus, Schoenoplectus americanus, Sagittaria lancifolia, Phragmites australis*, and *Eragrostis* spp. Here, this alliance forms mosaics with *Spartina spartinae* and *Spartina alterniflora* marshes and saline herbaceous vegetation.

Western states have a different alliance for inland situations dominated by *Distichlis spicata*, the *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332).

Comments: This may represent multiple zones; more research is needed.

Range: This alliance is found along the Atlantic and Gulf coasts from Maine south to Florida and west to Texas.

States/Provinces: AL CT DE FL GA LA MA MD ME MS NC NH NJ NY RI SC TX VA

TNC Ecoregions: 30:P, 31:C, 41:P, 53:C, 54:P, 55:P, 56:C, 57:C, 58:C, 62:C, 63:C

USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCC, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCC, 221Aj:CCP, 221Ak:CCC, 221Dc:CCC, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232Db:CCP, 232Dc:CCC, 232Dd:CCC, 232De:CCP, 232Eb:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCP, 255Da:CCP, 255Dc:CCC, 315F:CC

Federal Lands: NPS (Acadia, Assateague Island, Fire Island, Fort Pulaski); USFWS (Anahuac, Big Boggy, Brazoria, Matagorda Island, McFaddin, San Bernard, Texas Point)

Synonymy: Intermediate Marsh (Smith 1996a); Salt Marsh, in part (Smith 1996a); Salt Marsh, in part (Wieland 1994b); Salt Marsh, in part (Schafale and Weakley 1990); Salt Marsh, in part (Nelson 1986); Brackish Marsh, in part (Wieland 1994b); Brackish Marsh, in part (Nelson 1986); Marshhay Cordgrass Series, in part (Diamond 1993); Saltgrass-Cordgrass Series (Diamond 1993); Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001); Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001)

References: Adams 1963, Berdine 1998, Bowman 2000, Clancy 1993b, Cooper and Waits 1973, Diamond 1993, Gawler 2001, Higgins et al. 1971, Hill 1986, Metzler and Barrett 2001, Montague and Wiegert 1990, Nelson 1986, Odum 1988, Odum and Smith 1981, Penfound 1952, Schafale and Weakley 1990, Smith 1996a, Sperduto 2000b, Swain and Kearsley 2001, Tiner 1977, Wieland 1994a, Wieland 1994b

Authors: A.S. WEAKLEY 9-94, MOD. J, JT, East **Identifier:** A.1481

SPARTINA PATENS - DISTICHLIS SPICATA - JUNCUS ROEMERIANUS HERBACEOUS VEGETATION

Saltmeadow Cordgrass - Saltgrass - Black Needlerush Herbaceous Vegetation

High Marsh **G4G5 (97-12-01)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt and Brackish Tidal Marshes (202-30; n/a)

Concept: This coastal community is an irregularly tidally flooded high salt marsh of the mid- and southern Atlantic coast. It is dominated by *Spartina patens*, which forms meadows with a distinct "cowlicked" appearance. These meadows occur at slightly higher elevations than adjacent, regularly flooded low salt marsh occupying the zone extending from mean high tide landward approximately to the limit of high spring tides. The substrate is peat of variable depths overlying sand. *Distichlis spicata* can be codominant. Additional associated species that generally occur in low abundance can include *Limonium carolinianum, Agalinis maritima, Salicornia virginica, Juncus roemerianus, Sabatia stellaris, Borrichia frutescens, Lythrum lineare, Solidago sempervirens, Pluchea*

odorata (= Pluchea purpurascens), Hibiscus moscheutos ssp. moscheutos (= Hibiscus palustris), or *Atriplex prostrata (= Atriplex patula var. hastata)*. Shrub seedlings of *Baccharis halimifolia, Iva frutescens*, and/or *Morella cerifera (= Myrica cerifera)* may occur sporadically. Diagnostic species are *Spartina patens, Distichlis spicata, Borrichia frutescens, Kosteletzkya virginica*, and *Pluchea odorata*. This community ranges from Delaware south to Florida.
Comments: This community is differentiated from *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation (CEGL006006), which occurs to the north, by the absence or relative infrequent occurrence of *Juncus gerardii, Plantago maritima*, and *Triglochin maritima* (in pannes), and by the importance of species of southern distribution such as *Borrichia frutescens, Kosteletzkya virginica, Fimbristylis castanea*, and *Lythrum lineare*. If discrete patches of *Juncus roemerianus* occur in substantial size (several acres), the community is considered *Juncus roemerianus* Herbaceous Vegetation (CEGL004186). Currently, some unusually diverse variants exist in Virginia that may warrant recognition as a separate association.
Range: This association occurs along the Atlantic coast from Delaware to Florida.
States/Provinces: DE:S4, FL:S?, GA:S?, MD:S5, NC:S5, SC:S?, VA:S?
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island, Fort Pulaski)
Synonymy: Brackish Marsh (Salt Meadow Cordgrass Subtype) (Schafale 2000), Salt marsh community (Hill 1986) B. Assateague Island., Salt marsh (Higgins et al. 1971) B. Assateague Island., *Spartina patens - Distichlis spicata* high marsh (Clancy 1993b) =. Delaware., *Spartina - Distichlis - Juncus* associes (Penfound 1952) =. of southern salt marshes., *Spartina patens* type (Cooper and Waits 1973) =. North Carolina., *Aster tenuifolius - Distichlis spicata - Fimbristylis castanea - Borrichia frutescens - Spartina patens* association (Adams 1963) =. of the high marsh described from North Carolina., High marsh (Cooper 1974) =. of the high marsh of south Atlantic and Gulf coast marshes.
References: Adams 1963, Bowman 2000, Clancy 1993b, Cooper 1974, Cooper and Waits 1973, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Nelson 1986, Peet et al. 2002, Penfound 1952, Schafale 2000, Schafale and Weakley 1990
Authors: ECS **Confidence:** 2 **Identifier:** CEGL004197

V.A.5.N.n.2. TYPHA (ANGUSTIFOLIA, DOMINGENSIS) TIDAL HERBACEOUS ALLIANCE

(Narrowleaf Cattail, Southern Cattail) Tidal Herbaceous Alliance

Concept: Tidal marshes dominated by *Typha angustifolia* and/or *Typha domingensis*. Examples of this alliance are composed of a mixture of salt marsh and freshwater tidal marsh species. The vegetation is dense and characterized by tall graminoids such as *Typha angustifolia*, with associates including *Spartina cynosuroides, Phragmites australis* or *Schoenoplectus americanus (= Scirpus americanus), Pontederia cordata, Lilaeopsis chinensis, Hibiscus moscheutos (= Hibiscus palustris)*, and *Pluchea odorata*. Other characteristic species include *Hibiscus moscheutos, Spartina patens, Distichlis spicata, Schoenoplectus pungens (= Scirpus pungens), Lycopus americanus, Eleocharis palustris, Hydrocotyle umbellata, Eupatorium capillifolium, Ptilimnium capillaceum, Bidens* spp., and *Spartina alterniflora*. This community is typically a brackish tidal marsh occurring where water salinity ranges from 0.5-18.0 ppt. Brackish marshes are most extensive on large tidal rivers, but smaller marshes of this alliance also occur at the upper limits of larger tidal creeks. The alliance occurs along the Atlantic coast from Maine through South Carolina and along the Gulf coast in Alabama and Texas. Alabama and Texas communities occur in oligohaline tidal marshes and are dominated by *Typha domingensis*. Further research is necessary to determine the classification, and thus the range, with confidence.
Range: The alliance occurs along the Atlantic coast from Maine through South Carolina and along the Gulf coast in Alabama and Texas.
States/Provinces: AL CT DE FL? MA MD ME MS? NC? NH NJ NY RI SC? TX VA
TNC Ecoregions: 31:C, 53:C, 56:C, 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Db:CPP, 212Dc:CPP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Aj:CCP, 221Ak:CCC, 221Ba:C??, 221Da:C??, 221Dc:C??, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bs:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ch:CCC, 232Ci:CCC, 232Dd:CCC
Federal Lands: NPS (Acadia, Assateague Island, Fire Island); USFWS (McFaddin)
Synonymy: Tidal Freshwater Marsh, in part (Schafale and Weakley 1990); Cattail Community Type (Odum et al. 1984); Transitional fresh marsh, in part (Hill 1986); *Typha angustifolia-Hibiscus palustris* community (Metzler and Barrett 1992); Brackish tidal marsh (Reschke 1990); Brackish tidal marsh complex (Breden 1989); Brackish tidal

marsh community (MENHP 1991); Brackish marsh (Sperduto 1994); *Hibiscus* marsh (Cahoon and Stevenson 1986); narrowleaf cattail type (McCormick and Ashbaugh 1972); *Typha angustifolia* community (Good and Good 1975b); *Typha angustifolia* type (Ferren et al. 1981); fresh-brackish marsh (Klotz 1986); Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001)
References: Breden 1989, Cahoon and Stevenson 1986, Ferren et al. 1981, Good and Good 1975b, Hill 1986, Klotz 1986, MENHP 1991, McCormick and Ashbaugh 1972, Metzler and Barrett 1992, Nelson 1986, Odum et al. 1984, Reschke 1990, Schafale and Weakley 1990, Sperduto 1994, Swain and Kearsley 2001
Authors: ECS/A.S. WEAKLEY, JT, East **Identifier:** A.1472

TYPHA ANGUSTIFOLIA - HIBISCUS MOSCHEUTOS HERBACEOUS VEGETATION
Narrowleaf Cattail - Eastern Rosemallow Herbaceous Vegetation
Brackish Tidal Marsh (Cattail Type) **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Salt Marshes (202-70; n/a)

Concept: This community is a brackish tidal marsh of the northern to central Atlantic coast, occurring along the margin of tidal rivers and at the upper margins of some high salt marshes and coastal salt ponds where water salinity ranges from 0.5-18.0 ppt. Brackish marshes are most extensive on large tidal rivers, but smaller marshes of this alliance also occur at the upper limits of larger tidal creeks. The vegetation of this tall grassland is a mixture of freshwater and saltmarsh species dominated by *Typha angustifolia*. *Phragmites australis* and/or *Typha latifolia* can be codominant. The *Phragmites australis* component is the native strain. Common associates include *Hibiscus moscheutos, Schoenoplectus pungens, Impatiens capensis, Amaranthus cannabinus, Peltandra virginica*, and *Bidens* spp., plus *Spartina cynosuroides* in the south. Other infrequent associates include *Mikania scandens, Polygonum punctatum, Pluchea odorata, Eleocharis* spp., and *Schoenoplectus robustus*, plus *Schoenoplectus americanus* farther south. Species from adjacent high salt marsh may also be present. Substrate is muck or peat, and there is often an accumulation of *Typha* litter.
Comments: A non-tidal barrier wetland documented at the Cove Point Wetland, Calvert County, Maryland (Steury 1999), appears to fit this concept.
Range: This association occurs along the Atlantic coast from Maine to Virginia and possibly to South Carolina.
States/Provinces: CT:S?, DE:S4, MA:S1, MD:S4, ME:S3, NC?, NH:S?, NJ:S4, NY:S3S4, RI:S?, SC?, VA:S?,S?
TNC Ecoregions: 56:?, 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCC, 232Ch:CCC, 232Ci:CCC
Federal Lands: NPS (Acadia, Assateague Island, Fire Island)
Synonymy: Tidal Freshwater Marsh (Narrowleaf Cattail Subtype) (Schafale 2000), Cattail Community Type (Odum et al. 1984), Transitional fresh marsh (Hill 1986) B. Assateague Island., Brackish tidal marsh complex (Breden 1989). New Jersey., Brackish tidal marsh community (MENHP 1991). Maine., Brackish marsh (Sperduto 1994). New Hampshire., *Hibiscus* marsh (Cahoon and Stevenson 1986). Maryland., Narrowleaf cattail type (McCormick and Ashbaugh 1972). New Jersey., *Typha angustifolia* community (Good and Good 1975b). New Jersey., *Typha angustifolia* type (Ferren et al. 1981). New Jersey., Fresh-brackish marsh (Klotz 1986). Virginia., Brackish Tidal Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine., *Typha angustifolia - Hibiscus palustris* community (Metzler and Barrett 1992). Connecticut., Brackish tidal marsh (Reschke 1990). New York., *Typha* association (Shreve et al. 1910) =. Maryland.
References: Bowman 2000, Breden 1989, Breden et al. 2001, Cahoon and Stevenson 1986, Coulling 2002, Edinger et al. 2002, Ferren et al. 1981, Fleming 2001, Fleming and Moorhead 1998, Fleming et al. 2001, Gawler 2002, Good and Good 1975b, Harrison 2001, Hill 1986, Klotz 1986, MENHP 1991, McCormick and Ashbaugh 1972, Metzler and Barrett 1992, Metzler and Barrett 2001, Odum et al. 1984, Rawinski 1984, Reschke 1990, Saltonstall 2002, Schafale 2000, Schafale and Weakley 1990, Shreve et al. 1910, Sperduto 1994, Sperduto 1997a, Sperduto 2000b, Steury 1999, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004201

V.A.5.N.n.14. ZIZANIA AQUATICA TIDAL HERBACEOUS ALLIANCE
Indian Wild Rice Tidal Herbaceous Alliance

Concept: This alliance contains freshwater tidal marshes dominated by tall graminoids. *Zizania aquatica* is usually dominant or codominant with other graminoids such as *Typha angustifolia, Schoenoplectus fluviatilis (=*

Scirpus fluviatilis), and *Sparganium eurycarpum*. These marshes typically occur along tidal river systems (in shallow bays, shoals, or at the mouth) within the reach of the tide, but beyond the influence of saline waters. Soils are highly variable and are composed of varying amounts of silts, silty mucks, fine peat, to very coarse sands. Other characteristic species include *Sagittaria latifolia, Leersia oryzoides, Amaranthus cannabinus, Impatiens capensis, Bidens bidentoides, Acorus americanus*, and *Echinochloa walteri*. In the Southeast, *Zizania aquatica*-dominated vegetation occurs primarily as fringing marshes along tidal freshwater rivers. Communities of this alliance occur in Coastal Plain from Maine south and west to Louisiana.
Range: Communities of this alliance occur in coastal plain from Maine south and west to Louisiana. This alliance is found in Alabama, Louisiana, Mississippi, North Carolina, Connecticut, Delaware, Massachusetts, Maine, Maryland, New Jersey, New York, Rhode Island, and Virginia, and possibly Florida (?), Georgia (?), and South Carolina (?).
States/Provinces: AL CT DE FL? GA? LA MA MD ME MS NC NJ NY RI SC? VA
TNC Ecoregions: 53:C, 55:P, 56:?, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 212Da:PPP, 212Db:PPP, 212Dc:PPP, 212Ea:P??, 221Aa:CCP, 221Ab:CC?, 221Ac:CC?, 221Ad:CCC, 221Ae:CCP, 221Af:CCC, 221Ag:CCC, 221Ak:CCP, 221Ba:C??, 222Ie:???, 232Aa:CCP, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCP, 232Ci:CCP, 232Cj:CCP, 232Db:CCP, 232Dc:CCC
Federal Lands: USFS (Croatan)
Synonymy: Tidal Freshwater Marsh, in part (Schafale and Weakley 1990); Wild Rice Community Type (Odum et al. 1984); Estuarine Intertidal: Freshwater Tidal Marsh (Swain and Kearsley 2001)
References: Odum et al. 1984, Schafale and Weakley 1990, Swain and Kearsley 2001, Wharton 1978
Authors: A.S. WEAKLEY, JT, East **Identifier:** A.1484

ZIZANIA AQUATICA TIDAL HERBACEOUS VEGETATION

Indian Wild Rice Tidal Herbaceous Vegetation
Atlantic Coast Wild Rice Tidal Marsh **G4? (97-08-13)**
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: This is a freshwater tidal marsh characterized by *Zizania aquatica* that occurs in oligohaline zones of tidal rivers along the north and mid-Atlantic coast of North America. These marshes occur in the lower reaches of freshwater tidal systems, in fresh to slightly brackish areas along flats that are infrequently exposed at very low tides. Soils are highly variable and are composed of varying amounts of silts, silty mucks, fine peat, to very coarse sands. *Zizania aquatica* is dominant, although only conspicuously so in mid to late summer, when it overtops early season vegetation. This community can be codominated by species such as *Pontederia cordata, Peltandra virginica, Polygonum arifolium, Polygonum punctatum*, and/or *Bidens* spp. Common associates are generally a mixture of freshwater and brackish species and can include *Sagittaria latifolia, Ludwigia palustris, Impatiens capensis, Leersia oryzoides, Amaranthus cannabinus, Hibiscus moscheutos, Sium suave, Acorus americanus*, and *Schoenoplectus fluviatilis*. This vegetation provides an important food source for migratory birds.
Range: This association occurs along the Atlantic Coastal Plain from Maine and Massachusetts south to North Carolina, possibly extending into South Carolina and Georgia.
States/Provinces: CT:S?, DE:S3, FL?, GA?, MA:S1, MD:S3, ME:S2, MS:S?, NC:S3, NJ:S2S3, NY:S2, RI:S?, SC?, VA:S?
TNC Ecoregions: 56:?, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221Ad:CCC, 221Af:CCC, 221Ag:CCC, 232Ab:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCP, 232Ci:CCP, 232Cj:CCP
Federal Lands: USFS (Croatan)
Synonymy: Tidal Freshwater Marsh (Wild Rice Subtype) (Schafale 2000), Wild Rice Community Type (Odum et al. 1984), Freshwater Tidal Marsh: Wild Rice - Smartweed Type (McCoy and Fleming 2000), Freshwater tidal marsh complex, midtidal zone (Breden 1989), *Zizania aquatica* marsh community (Barrett 1989), *Zizania aquatica - Polygonum punctatum* Tidal Herbaceous Vegetation (Coulling 2002), FW Tidal Marsh (Rawinski 1984). formerly Southern New England FW Tidal.
References: Barrett 1989, Barrett 1994, Bowman 2000, Breden 1989, Breden et al. 2001, Coulling 2002, Edinger et al. 2002, Enser 1999, Ferren and Good 1977, Fleming et al. 2001, Gawler 2001, Gawler 2002, Good and Good 1975b, Harrison 2001, McCormick and Ashbaugh 1972, McCormick et al. 1970, McCoy and Fleming 2000, Metzler and Barrett 2001, Metzler and Rosza 1982, Odum et al. 1984, Rawinski 1984, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, Swain and Kearsley 2001, Wharton 1978

Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004202

V.A.6.N.q. Bedrock temperate or subpolar grassland with a sparse tree layer

V.A.6.N.q.101. (JUNIPERUS VIRGINIANA) / SCHIZACHYRIUM SCOPARIUM - (BOUTELOUA CURTIPENDULA) WOODED HERBACEOUS ALLIANCE

(Eastern Red-cedar) / Little Bluestem - (Sideoats Grama) Wooded Herbaceous Alliance

Concept: Perennial grasslands (variously locally called barrens, glades, and/or prairies) dominated by *Schizachyrium scoparium*, possibly also *Bouteloua curtipendula*, with a scattered canopy of needle-leaved trees, or mixed needle-leaved evergreen and broad-leaved deciduous trees, particularly one or more of *Juniperus virginiana var. virginiana, Quercus muehlenbergii*, and/or *Quercus stellata*. Specimens of *Juniperus virginiana* are relatively short and compact. The open grown canopy oaks have short trunks, spreading limbs, and rounded crowns with many branches. These trees can be found scattered individually or in isolated clumps and patches. *Juniperus ashei* may replace *Juniperus virginiana var. virginiana* in the southwestern-most portion of the alliance's range. The subcanopy is absent or very sparse. Commonly encountered shrubs include *Cornus florida, Ulmus alata, Rhus copallinum*, and *Symphoricarpos orbiculatus*. *Toxicodendron radicans* also displays a shrubby growth form. Herbaceous cover is very uneven, ranging from very dense in some areas to absent in others. Characteristic species include *Andropogon gerardii, Bouteloua curtipendula, Schizachyrium scoparium, Sorghastrum nutans, Helianthus divaricatus, Manfreda virginica, Silphium* spp., *Liatris* spp., *Rudbeckia* spp., *Sabatia angularis*, and *Verbesina alternifolia*. In the western portion of the alliance's range, some characteristic species may include *Rudbeckia missouriensis, Draba reptans, Mentzelia oligosperma, Physalis pumila, Astragalus distortus, Erysimum capitatum, Castilleja purpurea, Lesquerella filiformis, Nothocalais cuspidata, Penstemon cobaea*, and *Clematis fremontii*. *Smilax bona-nox* and *Smilax glauca* are the most frequently encountered vines and may form dense mats when present. Aspect is variable; stands occur primarily on south- and southwest-facing slopes. Soils which support stands of this alliance are stony, shallow to moderately deep, neutral to alkaline, and primarily composed of weathered mineral matter, loess, and organic debris which collects in cracks and crevices of the bedrock. Parent material is limestone rock, cherty limestone, dolomite, or calcareous shale which is exposed at the surface, resulting in a very shallow, well-drained substrate. The soils may contain a homogenous mixture of rock fragments of various sizes. Organic matter is low, and there is little or no horizon development. These soils are nutrient poor, and are extremely susceptible to erosion, partly due to freeze-thaw and subsequent mass wasting. Although predominantly droughty and excessively drained, these sites can be seasonally wet, and water is occasionally ponded in shallow depressions.
Comments: An additional association may be required for the Southern Ridge and Valley of eastern Tennessee.
Range: This alliance is found in Alabama, Arkansas, Connecticut, Georgia, Kentucky, Oklahoma, New Jersey, New York, Pennsylvania, Tennessee, Virginia, West Virginia, Illinois, Indiana, Kansas, Missouri, Ohio, and possibly in Maryland (?), Louisiana (?) and Texas (?).
States/Provinces: AL AR CT GA IL IN KS KY LA? MA? MD? MO NJ NY OH OK PA TN TX? VA WV
TNC Ecoregions: 32:C, 36:C, 37:C, 38:C, 39:C, 40:C, 43:C, 44:C, 45:?, 46:C, 49:C, 50:C, 59:?, 61:C
USFS Ecoregions: 221A:CC, 221Ea:CCP, 221Ec:CCC, 221Hb:CCP, 221Ja:CCP, 222Aa:CCC, 222Ab:CCC, 222Ac:CCC, 222Ad:CCC, 222Ae:CCC, 222Af:CCC, 222Ag:CCC, 222Ah:CCP, 222Aj:CCC, 222Ak:CCC, 222Al:CCC, 222Am:CCC, 222An:CC?, 222Aq:CCC, 222De:CCC, 222Df:CCC, 222Dg:CCC, 222Dh:CCC, 222Di:CCC, 222Eg:CCC, 222Ei:CCC, 222Ek:CCC, 222El:CCC, 222En:CCP, 222Eo:CCC, 222Fa:CCC, 222Fc:CCC, 222Fd:CCC, 222Fe:CCC, 231Be:CCC, 231Ce:CCC, 231Dc:CCC, 231Eb:CCC, 251Cd:CCP, 251Ce:CCP, 251Cf:CCC, 251Ci:CCC, 251Ea:CCP, 255:C, M222Aa:CCP, M222Ab:CCC, M231Aa:CCP, M231Ab:CCC, M231Ac:CCP, M231Ad:CCP
Federal Lands: COE (J. Percy Priest?, Lake Millwood?); NPS (Stones River); TVA (Columbia); USFS (Bankhead?, Daniel Boone, Mark Twain, Ouachita, Ozark)
Synonymy: ID4f. Limestone Prairie, in part (Allard 1990); IE10a. Interior Upland Limestone Barren. in part? (Allard 1990); Calcareous Glade/Outcrop (Foti 1994b); Coastal Plain Limestone Glade (Foti 1994b); *Schizachyrium scoparium / Juniperus virginiana* herbaceous alliance, in part (Hoagland 1998a); Red-cedar - redbud shrubland (Fike 1999); Northern Appalachian Calcareous Rocky Summit (Smith 1991)
References: Allard 1990, Carpenter 1996, DeSelm 1988, Faber-Langendoen et al. 1996, Fehrenbacher et al. 1982, Fike 1999, Foti 1994b, Fralish 1987, Hoagland 1998a, Nelson 1985, Smith 1991, White and Madany 1978

Authors: MCS/SCS, MP, Southeast **Identifier:** A.1919

JUNIPERUS VIRGINIANA / BOUTELOUA CURTIPENDULA - CAREX EBURNEA WOODED HERBACEOUS VEGETATION

Eastern Red-cedar / Sideoats Grama - Bristleleaf Sedge Wooded Herbaceous Vegetation
Limestone Red-cedar Woodland **G1G2 (98-11-30)**
Ecological Group (SCS;MCS): Appalachian Highlands Carbonate Glades and Barrens (440-05; 2.3.4.1)

Concept: This small-patch calcareous rocky summit community occurs in southern New England and portions of the northern Piedmont. Dry, south-facing slopes of calcareous bedrock support small grassland openings characterized by *Schizachyrium scoparium* and *Bouteloua curtipendula*. *Juniperus virginiana* is usually present as a stunted, sparse canopy. Other possible woody associates may include *Fraxinus americana, Ostrya virginiana*, or *Quercus muehlenbergii*. Shrubs are sparse but when present may include *Celtis occidentalis* or *Cornus alternifolia*. The herbaceous composition is quite variable among occurrences but often includes such species as *Carex eburnea, Anemone cylindrica, Solidago bicolor, Panicum virgatum, Carex pensylvanica, Lespedeza* spp., *Asclepias viridiflora, Asclepias verticillata, Muhlenbergia sobolifera, Sorghastrum nutans, Onosmodium* spp., *Packera aurea (= Senecio aureus), Packera obovata (= Senecio obovatus)*, and others. This community occurs in association with forests characterized by *Quercus muehlenbergii*.
Comments: These communities are closely related to several other sparse woodlands in the *Juniperus virginiana* alliance. They also intergrade substantially with limestone/calcareous woodlands. Several of the more northern occurrences of this community are essentially small, successional, herbaceous patches occurring within *Quercus muehlenbergii* woodlands. Floristically they may be considered depauperate versions of the more extensive occurrences of this community in West Virginia. New York may contain some examples of this community which they classify under the name "red cedar rocky summit community."
Range: This community has been described from calcareous regions in western Connecticut, eastern Pennsylvania, northeastern New Jersey, the ridge and valley province of northeastern West Virginia and Virginia. A few examples may occur in New York.
States/Provinces: CT:S?, MA?, MD?, NJ:S1, NY:S3, PA:S?, VA?, WV:S?
TNC Ecoregions: 49:P, 61:C
USFS Ecoregions: 221A:CC, 221Ea:CPP
Synonymy: Limestone Glade (Breden 1989), SNE Calcareous Rocky summit/ Rock Outcrop Community (Rawinski 1984)
References: Bartgis 1985a, Bartgis 1993, Breden 1989, Breden et al. 2001, Edinger et al. 2002, Fike 1999, Grossman et al. 1994, Metzler and Barrett 2001, Rawinski 1984, Smith n.d. (a), Swain and Kearsley 2001
Authors: M. Anderson, ECS **Confidence:** 2 **Identifier:** CEGL006047

V.A.6.N.q.103. (PINUS RIGIDA) / SCHIZACHYRIUM SCOPARIUM WOODED HERBACEOUS ALLIANCE

(Pitch Pine) / Little Bluestem Wooded Herbaceous Alliance

Concept: *Schizachyrium scoparium*-dominated grasslands with scattered *Pinus rigida*. This alliance includes ultramafic outcrop barrens of Virginia and serpentine barrens of the mid-Atlantic Piedmont region. This latter vegetation consists of open, herb-dominated grasslands on serpentine, which contain *Schizachyrium scoparium* and *Scleria pauciflora* under scattered *Pinus rigida*. The Piedmont examples in Virginia actually do not contain *Pinus rigida*, but instead are adjacent to areas with *Pinus virginiana*.
Range: This alliance occurs in Maryland, New York, Pennsylvania, and Virginia.
States/Provinces: MD NY PA VA
TNC Ecoregions: 52:C, 61:C
USFS Ecoregions: 221D:CC, 231Ak:CCC, 232A:CC
Synonymy: Red-cedar - pine serpentine shrubland (Fike 1999); Serpentine grassland (Fike 1999); Eastern Serpentine Barren, in part (Smith 1991)
References: Fike 1999, Smith 1991
Authors: ECS, MP, East **Identifier:** A.1921

PINUS RIGIDA / SCHIZACHYRIUM SCOPARIUM - SCLERIA PAUCIFLORA WOODED HERBACEOUS VEGETATION
Pitch Pine / Little Bluestem - Papillose Nutrush Wooded Herbaceous Vegetation
Eastern Serpentine Barren **G2 (98-07-24)**

Concept: This serpentine grassland community is essentially restricted to a 97-km chain of large serpentine outcrops in Maryland and Pennsylvania. This community occurs on thin Alfisols or Mollisols developed over serpentinite or similar ultra-mafic rock. Soils generally have a low calcium to magnesium ratio, and they are stony and shallow with a low moisture-holding capacity. Some form of disturbance is necessary to prevent extensive soil development, generally burning or grazing. This community occurs as herbaceous grassland openings with scattered trees. Typically it occurs as part of a woodland/grassland complex with the specific canopy composition shifting between *Pinus rigida, Pinus virginiana*, and *Juniperus virginiana*. *Quercus marilandica* and *Quercus stellata* may also be present. The actual species composition of the canopy probably reflects site history and available seed sources. The herbaceous layer is generally dominated by *Schizachyrium scoparium* but is characteristically rich in other herbaceous species such as *Sorghastrum nutans, Dichanthelium depauperatum, Dichanthelium linearifolium, Dichanthelium oligosanthes, Dichanthelium sphaerocarpon, Dichanthelium villosissimum, Panicum philadelphicum, Cerastium arvense ssp. velutinum, Sporobolus heterolepis, Viola sagittata, Sisyrinchium mucronatum, Saxifraga virginiensis, Fimbristylis annua, Juncus secundus, Oenothera fruticosa, Arabis lyrata, Aristida purpurascens, Asclepias verticillata, Asclepias viridiflora, Polygonum tenue, Scleria pauciflora, Packera anonyma (= Senecio anonymus), Talinum teretifolium, Symphyotrichum depauperatum (= Aster depauperatus), Lobelia spicata, Polygala verticillata*, and *Andropogon gerardii*. In eastern North America, outcrops of serpentine occur in a broken chain from Quebec to Alabama. Most outcrops, however, are small and do not develop this community. Distinct but closely related communities occur in western North Carolina, Virginia and Georgia. In addition, there are four small, degraded occurrences (17 ha) in New York, and several other degraded remnants were documented in Delaware, but any remaining vegetation is deemed too degraded to be considered a community, and so are regarded as extirpated (W. McAvoy, Delaware Natural Heritage Program, pers. comm.).
Comments: Physiognomically this community may occasionally occur as a treeless prairie. Some researchers recognize both a prairie and savanna type. However, as they are virtually identical in floristic composition and as the presence of at least a few trees is generally the rule (except after a severe fire or in microsites of solid bedrock), they have been combined here. Somewhat related serpentine outcrop communities, which are extremely small and patchy, are described separately.
Range: This community occurs on serpentine outcrops primarily in Maryland and southeastern Pennsylvania, with a few small, degraded remnants on Staten Island in New York.
States/Provinces: MD:S?, NY:S1, PA:S?,S?
TNC Ecoregions: 61:C
USFS Ecoregions: 221D:CC, 232A:CC
References: Brooks 1987, Edinger et al. 2002, Fike 1999, Grossman et al. 1994, Jones 1956, Lapham and McKague 1964, Latham 1983, Latham 1993, Marye 1920, Marye 1955a, Marye 1955b, Marye 1955c, Miller 1977, Miller 1981, Montferrante 1973, Pennell 1910, Pennell 1912, Pennell 1929, Reed 1986, Reschke 1990, Smith n.d. (a), Tyndall 1992a, Tyndall 1992b, Tyndall and Farr 1989, Tyndall and Farr 1990, Wherry 1963
Authors: M. Anderson, ECS **Confidence:** 2 **Identifier:** CEGL006159

V.A.7.N.g. Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer

V.A.7.N.g.1. SCHIZACHYRIUM LITTORALE SHRUB HERBACEOUS ALLIANCE
Seaside Bluestem Shrub Herbaceous Alliance

Concept: Dune grasslands dominated by *Schizachyrium littorale (= Schizachyrium scoparium ssp. littorale)*. This alliance occurs on deep well-drained sands of old leveled interdunes. It usually occurs within the influence of offshore winds and salt spray. Although highly variable in species composition, the typical expression of this alliance is characterized by a predominance (25-50% cover) of bunch grasses including *Schizachyrium littorale, Andropogon virginicus, Panicum amarum var. amarulum, Ammophila breviligulata, Dichanthelium scoparium*, and *Dichanthelium acuminatum*. Generally one or two of these species will dominate while the others occur as more infrequent, scattered clumps. Occasionally *Spartina patens*, growing in a dry 'wispy' condition, will form the dominant graminoid cover. Shrubs of *Morella pensylvanica (= Myrica pensylvanica)* are sparse, and stunted

Baccharis halimifolia and *Diospyros virginiana* are even less frequent. Dense tangles of *Toxicodendron radicans* are very characteristic of this alliance as they sprawl over the bareground and sparse vegetation. *Rubus argutus* is also scattered throughout. Much of the remaining dry sands are exposed with sparsely distributed herbs. Characteristic herb species include *Cirsium horridulum, Solidago sempervirens, Pseudognaphalium obtusifolium (= Gnaphalium obtusifolium), Nuttallanthus canadensis, Euthamia caroliniana (= Euthamia tenuifolia), Oenothera humifusa*, and *Diodia teres*. This vegetation is related to maritime grasslands of New England and New York. Further analysis is required to determine the classification, and thus the range, with confidence.
Range: This vegetation is related to maritime grasslands of New England and New York. This alliance is found in North Carolina, Maryland, New Jersey, and Virginia, and elsewhere.
States/Provinces: CT DE MA MD ME NC? NJ NY RI VA
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221Aa:CCP, 221Ab:CCC, 221Ac:CCP, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Bb:CC?, 232Bc:CCP, 232Bd:CCP, 232Bx:CCP, 232Bz:CCC, 232Ch:CCP, 232Ci:CCC, 255:P
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Sandplain Grassland (Swain and Kearsley 2001)
References: Higgins et al. 1971, Hill 1986, Sneddon et al. 1996, Swain and Kearsley 2001
Authors: A.S. WEAKLEY, JT, East **Identifier:** A.1533

MORELLA (PENSYLVANICA, CERIFERA) / SCHIZACHYRIUM LITTORALE - EUPATORIUM HYSSOPIFOLIUM SHRUB HERBACEOUS VEGETATION

(Northern Bayberry, Wax-myrtle) / Seaside Bluestem - Hyssopleaf Thoroughwort Shrub Herbaceous Vegetation

Mid-Atlantic Coast Backdune Grassland **G2 (98-12-02)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Dune and Coastal Grasslands (240-25; n/a)

Concept: These mid-Atlantic maritime grasslands occurs on deep well-drained sands of old leveled interdunes and backdunes. They usually occur within the influence of offshore winds and salt spray. Although highly variable in species composition, the typical expression of this community is characterized by a predominance (25-50% cover) of bunch grasses including *Schizachyrium littorale (= Schizachyrium scoparium ssp. littorale), Andropogon virginicus, Panicum amarum var. amarulum, Ammophila breviligulata, Dichanthelium scoparium*, and *Dichanthelium acuminatum*. Generally one or two of these species will dominate while the others occur as more infrequent, scattered clumps. Occasionally *Spartina patens*, growing in a dry 'wispy' condition, will form the dominant graminoid cover. Shrubs of *Morella pensylvanica (= Myrica pensylvanica)* and/or *Morella cerifera (= Myrica cerifera)* are sparse and stunted *Baccharis halimifolia, Prunus maritima*, and *Diospyros virginiana* are even less frequent. Dense tangles of *Toxicodendron radicans* are very characteristic of this community as they sprawl over the bare ground and sparse vegetation. *Rubus argutus* and *Rhus copallinum* are also scattered throughout. Much of the remaining dry sands are exposed with sparsely distributed herbs. Characteristic herb species include *Cirsium horridulum, Solidago sempervirens, Pseudognaphalium obtusifolium (= Gnaphalium obtusifolium), Nuttallanthus canadensis, Euthamia caroliniana (= Euthamia tenuifolia), Oenothera humifusa, Oenothera oakesiana, Pityopsis falcata, Opuntia humifusa*, and *Diodia teres*. The range of this community is not well known; North Carolina is likely the southern extent. This community is related to maritime grasslands of New England and New York. Further analysis is required to determine the classification, and thus the range, with confidence. Diagnostic species are *Morella pensylvanica, Schizachyrium littorale, Eupatorium hyssopifolium*, and *Eupatorium rotundifolium*.
Range: This community ranges from New Jersey to Virginia and possibly North Carolina on coastal dunes.
States/Provinces: DE:S?, MD:S?, NC?, NJ:S2?, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Bz:CCC, 232Ci:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Maritime Dry Grassland (Northern Bayberry Subtype) (Schafale 2000), Shrub succession community (Hill 1986) B. Assateague Island., Xeric shrub community (Higgins et al. 1971) B. Assateague Island (particularly at lower elevations)., Sandplain grassland (Dunwiddie et al. 1993) ?, Maritime grassland (Reschke 1990) ?. New York.
References: Berdine 1998, Blizzard 1931, Breden et al. 2001, Dunwiddie et al. 1993, Fleming 2001, Fleming et al. 2001, Higgins et al. 1971, Hill 1986, Reschke 1990, Schafale 2000, Sneddon et al. 1996, TNC 1995c
Authors: A. Berdine, mod. S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004240

V.B.2.N.d. Temporarily flooded temperate perennial forb vegetation

V.B.2.N.d.2. JUSTICIA AMERICANA TEMPORARILY FLOODED HERBACEOUS ALLIANCE

Common Water-willow Temporarily Flooded Herbaceous Alliance

Concept: This alliance covers rocky river shoals dominated by *Justicia americana* with *Orontium aquaticum, Podostemum ceratophyllum, Leersia* spp., *Lemna minor, Saururus cernuus*, and others. A sparse canopy may be present, and species may include *Carpinus caroliniana ssp. caroliniana, Fagus grandifolia*, and *Fraxinus pennsylvanica*. There is some apparent regional variation in the associated species. More Appalachian examples may contain *Orontium aquaticum* as a codominant. In parts of the Ridge and Valley and Piedmont, *Hymenocallis caroliniana (= Hymenocallis coronaria)* is codominant. In the Edwards Plateau of central Texas, associated with *Justicia americana* are *Bacopa monnieri, Fuirena simplex, Eleocharis geniculata (= Eleocharis caribaea), Eleocharis montevidensis*, and *Cyperus* spp.
Range: This alliance is distributed in the Edwards Plateau of Texas, Ozark Highlands, Boston Mountains, Ouachita Mountains, Interior Low Plateau, Cumberland Plateau, Piedmont, and Arkansas Valley. It is found in Ohio, Alabama, Arkansas, Georgia, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and possibly Virginia (?).
States/Provinces: AL AR DE GA KY MD? NC OH OK PA SC TN TX VA? WV
TNC Ecoregions: 29:C, 38:C, 39:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCP, 212Fb:CCC, 212Ga:CCP, 212Gb:CCP, 221Am:CCP, 221Ba:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Eb:CCC, 222Eg:CCC, 222Ej:CCP, 222En:CCC, 222Eo:CCC, 222Ha:CCC, 231Af:CCC, 231B:CC, 231Cd:CCC, 231Dc:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 315D:CC, 321B:PP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: NPS (Natchez Trace, Stones River); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ozark, Pisgah, Sumter, Uwharrie); USFWS (Cahaba River)
Synonymy: IIE3a. Riverside Shoal and Stream Bar Complex, in part (Allard 1990); Rocky Bar and Shore, in part (Schafale and Weakley 1990); *Justicia americana* herbaceous alliance (Hoagland 2000); Shoal and Stream Bar, in part (Nelson 1986); Water-willow (*Justicia americana*) - smart-weed riverbed community (Fike 1999)
References: Allard 1990, Faber-Langendoen et al. 1996, Fike 1999, Foti et al. 1994, Hoagland 2000, Nelson 1986, Schafale and Weakley 1990, Schmalzer and DeSelm 1982
Authors: A.S. WEAKLEY, MP, Southeast **Identifier:** A.1657

JUSTICIA AMERICANA HERBACEOUS VEGETATION
Common Water-willow Herbaceous Vegetation
Water-willow Rocky Bar and Shore **G4G5 (97-09-12)**
Ecological Group (SCS;MCS): Rocky Riverbeds (457-30; 2.2.3.1)

Concept: This association is found primarily in the Piedmont, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. Stands occur on the shoals or bars of rocky streams and riverbeds. It provides habitat in some portions of its range for globally rare dragonflies and herbs. *Justicia americana* is the characteristic dominant. Other herbaceous species that may be present include *Diodia teres, Gratiola brevifolia, Leersia* sp., *Lemna minor, Orontium aquaticum, Podostemum ceratophyllum, Scirpus* sp., *Saururus cernuus*, and *Xyris difformis var. difformis*. A sparse canopy layer, which can include *Carpinus caroliniana ssp. caroliniana, Salix interior, Fagus grandifolia*, and *Fraxinus pennsylvanica* among other species, may be present.
Comments: This type, in Ohio, often forms pure patches, but consistent identification may require a simple cutoff rule, such as at least 50% cover of *Justicia* (Anderson 1982). However, Anderson (1996) no longer recognizes this type.
Range: This type is found primarily in the Piedmont, Interior Low Plateau, Cumberland Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. It ranges from Alabama, Georgia and the Carolinas west to Arkansas and Oklahoma and north to Ohio, Pennsylvania, and Delaware.
States/Provinces: AL:S?, AR:S?, DE:S?, GA:S?, KY:S?, MD?, NC:S5, OH:S4, OK:S?, PA:S?, SC?, TN:S?, VA?, WV:S?

TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCP, 212Fb:CCC, 212Ga:CCP, 212Gb:CCP, 221Am:CCP, 221Ba:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222Ej:CCP, 222En:CCC, 222Eo:CCC, 222Ha:CCC, 231Af:CCC, 231B:CC, 231Cd:CCC, 231D:CC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M222A:CC, M231A:CC
Federal Lands: NPS (Natchez Trace, Stones River); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ozark, Pisgah, Sumter?, Uwharrie)
Synonymy: IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B. in part, Aquatic Types (Schmalzer and DeSelm 1982) B. in part, Rocky Bar and Shore (Water Willow Subtype) (Schafale 1998b), Water-willow Aquatic Bed. [common name]
References: Allard 1990, Anderson 1982, Anderson 1996, Fike 1999, Fleming et al. 2001, Hoagland 1997, Hoagland 2000, Major et al. 1999, McCoy 1958, Nelson 1986, Palmer-Ball et al. 1988, Peet et al. 2002, Penfound 1953, Schafale 1998b, Schafale and Weakley 1990, Schmalzer and DeSelm 1982
Authors: A.S. Weakley, mod. D. Faber-Langendoen, SCS **Confidence:** 2 **Identifier:** CEGL004286

V.B.2.N.e. Semipermanently flooded temperate perennial forb vegetation

V.B.2.N.e.1. PONTEDERIA CORDATA - PELTANDRA VIRGINICA SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE

Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance

Concept: This alliance includes very wet or partially submerged forb vegetation of rivershores and lakeshores, and sometimes of artificial ponds, lakes, and impoundments. In addition to the nominal species, typical associates include *Nuphar lutea, Glyceria striata, Schoenoplectus tabernaemontani (= Scirpus validus), Schoenoplectus americanus (= Scirpus americanus)*, and *Sagittaria latifolia*.
Comments: ECS concept includes vegetation of the low zone of freshwater tidal marshes within this alliance.
Range: This alliance is found in Arkansas, Kentucky, North Carolina, South Carolina, Tennessee, Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.
States/Provinces: CT DE? MA MD? ME NC NH NJ? NY PA RI TN VA VT
TNC Ecoregions: 38:P, 42:C, 43:C, 44:C, 48:?, 49:?, 51:C, 52:C, 57:C, 58:P, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Aa:C??, 212Ab:C??, 212Ba:C??, 212Bb:C??, 212Ca:C??, 212Cb:C??, 212Da:C??, 212Db:C??, 212Dc:C??, 212Ea:C??, 212Eb:C??, 212Ec:C??, 212Ed:C??, 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCP, 212Gb:CC?, 221Aa:CC?, 221Ab:CC?, 221Ac:CC?, 221Ad:CC?, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCC, 221Ai:CCC, 221Aj:CC?, 221Ak:CC?, 221Al:CCC, 221Am:CCC, 221Ba:CCP, 221Bb:CCP, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ec:CCC, 221Ed:CCC, 221Fa:C??, 221Ja:C??, 221Jc:C??, 222Ch:CCC, 222Db:CCC, 222Eb:CCC, 222Ia:C??, 222Ib:C??, 222Ic:C??, 222Id:C??, 222Ie:C??, 222If:C??, 231Aa:C??, 231Ae:C??, 231Af:C??, 231Ak:C??, 231Al:C??, 231Am:C??, 231An:C??, 231Ao:C??, 231Ap:C??, 232Aa:P??, 232Ac:P??, 232Ad:P??, 232Bb:P??, 232Bc:P??, 232Bd:P??, 232Br:P??, 232Ch:P??, 234An:CCC, M212Aa:C??, M212Ab:C??, M212Ac:C??, M212Ad:C??, M212Ba:CC?, M212Bb:CCC, M212Ca:CC?, M212Cb:CCC, M212Cc:CC?, M212Cd:CC?, M212Da:C??, M212Db:C??, M212Dc:C??, M212Ea:CCP, M212Eb:CCP, M212Fa:C??, M212Fb:C??, M221Aa:CC?, M221Ab:CC?, M221Ac:CCC, M221Ad:CCC, M221Ba:C??, M221Bd:C??, M221Da:CC?, M221Db:CC?, M221Dc:CCC
Federal Lands: DOD (Arnold)
Synonymy: Piedmont/Mountain Semipermanent Impoundment, in part (Schafale and Weakley 1990); Pickerel-weed - arrow-arum - arrowhead wetland (Fike 1999); Natural Pond, in part (Smith 1991); Artificial Pond, in part (Smith 1991); Stable Natural Pool, in part (Smith 1991)
References: Fike 1999, Schafale and Weakley 1990, Smith 1991, Sneddon et al. 1996
Authors: ECS, MP, East **Identifier:** A.1669

PELTANDRA VIRGINICA - SAURURUS CERNUUS - CAREX CRINITA / CLIMACIUM AMERICANUM HERBACEOUS VEGETATION
Green Arrow-arum - Lizard's-tail - Fringed Sedge / Tree Moss Herbaceous Vegetation
Floodplain Pool **G2? (98-12-14)**
Ecological Group (SCS;MCS): Appalachian Highlands Floodplain Pools and Rocky Riverbeds (457-20; n/a)

Concept: This vegetation occupies depressions of Piedmont and mountain floodplains. Vegetative cover is generally low and may be confined to edges or shallower portions that dry out during the growing season. The vascular plant species vary widely among examples. Emergent vegetation may include *Peltandra virginica, Dulichium arundinaceum*, and *Polygonum* spp. *Carex crinita* or some other wetland *Carex* species are almost always present, and *Climacium americanum* is often abundant on the landward side. Larger examples may have pad-leaved aquatic species such as *Brasenia schreberi* or *Nymphaea odorata*. Piedmont examples may also have *Saururus cernuus* and *Boehmeria cylindrica*. Some examples have wetland shrubs on edges or in shallow portions, including *Cornus amomum* and *Cephalanthus occidentalis*. These depressions are usually abandoned channel segments or swales behind natural levees in which water is ponded for all or much of the year. Water may be supplied primarily by stream flooding or by rainfall.
Comments: These floodplain pools are transitional between wetland vegetated communities and aquatic communities. They are more distinctive for their aquatic fauna (and probably microflora) than for their higher plant communities. Two distinct kinds can be recognized based on the aquatic animal communities: Pools that are flooded by overbank stream flow at least as often as they dry out support fish as the dominant animal component. Those that are flooded more rarely and dry out between floods lack fish most of the time and support significant amphibian communities. These differences are not known to be reflected in vegetation, but are important ecologically.
Range: Found in the Piedmont, Southern Blue Ridge and related ecoregions. Possible range is from Delaware and Maryland south to Tennessee and North Carolina.
States/Provinces: CT:S?, DE?, MD?, NC:S2, NJ?, TN?, VA:S?,S?
TNC Ecoregions: 51:C, 52:C, 61:C
USFS Ecoregions: 221Ae:CCC, 231:C, M221Dc:CCC
Synonymy: Floodplain Pool (Schafale 1998a)
References: Breden et al. 2001, Fleming et al. 2001, Metzler and Barrett 2001, Schafale 1998a, Schafale and Weakley 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL007696

V.B.2.N.f. Saturated temperate perennial forb vegetation

V.B.2.N.f.4. CHRYSOSPLENIUM AMERICANUM SATURATED HERBACEOUS ALLIANCE
Golden-saxifrage Saturated Herbaceous Alliance

Concept: This alliance consists of small seepages with scattered cover of small forbs, including *Chrysosplenium americanum, Cardamine clematitis, Circaea alpina*, and usually also with the moss *Rhizomnium appalachianum*. Vegetation in this alliance is normally over-shaded by trees rooted in adjacent (non-wetland) communities. The spatial extent of this alliance is small, with individual occurrences normally much less than a hectare in size. Despite its small spatial scale, this alliance is an important component of the diversity of the landscapes in which it occurs. The alliance is distributed primarily in the Appalachian Mountains.
Range: The alliance is distributed primarily in the Appalachian Mountains. It is found in Maryland, Pennsylvania, Virginia, and West Virginia, and possibly New Hampshire (?).
States/Provinces: CT MA MD NH? NY? PA TN VA? VT WV
TNC Ecoregions: 59:C, 60:C, 61:C, 64:P
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Bd:CCC, 221Da:C??, 221Ea:C??, 221Eb:C??, 221Fa:C??, 231Al:???, 231Ap:???, M212Ca:C??, M212Cd:C??, M212Ea:CCC, M212Eb:CCC, M221Ba:C??, M221Bb:C??, M221Bc:C??, M221Bd:C??, M221Be:C??, M221Ca:C??, M221Cb:C??, M221Cc:C??, M221Cd:C??
Synonymy: Golden saxifrage - Pennsylvania bitter-cress spring run (Fike 1999); Spring Community (Smith 1991); Spring Run Community (Smith 1991)
References: Fike 1999, Smith 1991
Authors: ECS/SCS, RW, East **Identifier:** A.1685

CHRYSOSPLENIUM AMERICANUM HERBACEOUS VEGETATION
Golden-saxifrage Herbaceous Vegetation
Golden-saxifrage Seep **G3G5 (97-12-01)**
Ecological Group (SCS;MCS): Appalachian Highlands Acid Seeps (475-12; n/a)
Appalachian Highlands Bogs (475-10; n/a)

Concept: This type includes small herbaceous seepage areas with scattered cover of forbs, including *Chrysosplenium americanum, Cardamine bulbosa, Circaea alpina, Viola cucullata*? (= *Viola apiculata*?), *Chelone glabra, Glyceria melicaria, Glyceria striata, Cinna arundinacea, Impatiens capensis, Poa paludigena, Carex scabrata, Mimulus ringens, Symplocarpus foetidus, Pilea pumila, Galium triflorum, Saxifraga pensylvanica, Thelypteris noveboracensis*, and the mosses *Rhizomnium punctatum (= Mnium punctatum), Rhizomnium appalachianum, Brachythecium rivulare, Thuidium delicatulum, Rhynchostegium serrulatum*, and *Bryhnia novae-angliae*. Typically the community is over-topped by trees and shrubs such as *Fraxinus nigra, Lindera benzoin*, and *Cornus* spp.
States/Provinces: CT:S?, MA:S?, MD:S?, NH?, NY?, PA:S?, TN:S?, VA?, VT:S?, WV:S?
TNC Ecoregions: 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Bd:CCC, M212Ea:CCC, M212Eb:CCC
Synonymy: Golden-Saxifrage Seep (Schafale 1998b), Golden saxifrage forested seep (CAP pers. comm. 1998)
References: CAP pers. comm. 1998, Fike 1999, Metzler and Barrett 2001, Schafale 1998b, Swain and Kearsley 2000, Thompson and Sorensen 2000
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006193

V.B.2.N.g. Tidal temperate perennial forb vegetation

V.B.2.N.g.6. AMARANTHUS CANNABINUS TIDAL HERBACEOUS ALLIANCE

Water-hemp Tidal Herbaceous Alliance

Concept: This alliance occupies a mid-tidal position on sandy intertidal rivershores of meso-oligohaline waters. It is dominated by *Amaranthus cannabinus*, which can be mixed with *Zizania aquatica, Schoenoplectus pungens (= Scirpus pungens), Bidens* spp., and numerous small rosette plants. More data are needed to fully characterize this alliance.
Range: This alliance is found in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia.
States/Provinces: CT DE MA MD ME NJ NY RI
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 212Cb:PPP, 212Db:PPP, 212Dc:PPP, 221Aa:CCP, 221Ab:CCP, 221Ac:CCP, 221Ad:CCP, 221Ae:CCP, 221Aj:CCP, 221Ak:CCP, 221Ba:CC?, 221Da:C??, 221Dc:C??, 232Aa:CCP, 232Ac:CCC, 232Bt:CCC, 232Bz:CC?, 232Ch:CCP, 232Ci:CCP, M212Eb:PPP
Synonymy: Estuarine Intertidal: Freshwater Tidal Marsh (Swain and Kearsley 2001)
References: Sneddon et al. 1996, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.1706

AMARANTHUS CANNABINUS TIDAL HERBACEOUS VEGETATION
Water-hemp Tidal Herbaceous Vegetation
G3G5 (97-12-01)
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Salt Marshes (202-70; n/a)

Concept: This brackish marsh vegetation occupies a mid-tidal position on sandy intertidal rivershores along the north and mid-Atlantic coast where floodwaters are oligohaline to mesohaline. *Amaranthus cannabinus* is dominant and can be mixed with *Bidens* spp., *Polygonum punctatum, Sagittaria latifolia, Zizania aquatica*, and *Schoenoplectus pungens*. This association occurs on wave- and ice-scoured riverbanks or other brackish marsh habitat with coarse substrate and where tidal flooding freely drains. Species composition and abundance can change dramatically from year to year.
Comments: This association is dominated by annuals whereas *Spartina alterniflora - Amaranthus cannabinus* Herbaceous Vegetation (CEGL006417) contains perennials with *Spartina alterniflora* as a strong component.

However, the types may reflect seasonal variation within freshwater tidal marsh systems and be similar enough to warrant merging.
Range: This association occurs along tidal rivers from Maine to Virginia.
States/Provinces: CT:S?, DE:S?, MA:S1, MD:S?, ME:S2, NJ:S2S3, NY:S2, RI:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221A:CC, 221B:CC, 232Ac:CCC, 232Bt:CCC, 232C:CP
Synonymy: Freshwater tidal marsh complex, midtidal zone (Breden 1989), FW Tidal Marsh (Rawinski 1984). formerly Southern New England FW Tidal.
References: Bowman 2000, Breden 1989, Breden et al. 2001, Caldwell 1990, Edinger et al. 2002, Enser 1999, Gawler 2001, Gawler 2002, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Swain and Kearsley 2000, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006080

V.B.2.N.g.1. ERIOCAULON PARKERI TIDAL HERBACEOUS ALLIANCE

Estuary Pipewort Tidal Herbaceous Alliance

Concept: This alliance is freshwater tidal vegetation occurring on sandy or gravelly shores that are exposed only at low tide. This vegetation type is restricted to areas that receive substantial scour during spring floods, since *Eriocaulon parkeri* is very susceptible to siltation. Associated species may include *Sagittaria subulata, Isoetes riparia, Elatine minima*, and *Sagittaria calycina*.
Range: This alliance is found in North Carolina, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia, and in Canada, and possibly in South Carolina (?).
States/Provinces: CT DE MA MD ME NB? NC NJ NS? NY SC? VA
TNC Ecoregions: 56:?, 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 212Da:CCC, 212Db:CCP, 212Dc:CCC, 221Aa:CC?, 221Ac:CCC, 221Ad:CCC, 221Ae:CC?, 221Ag:CCP, 221Ak:CCC, 221Ba:CC?, 232Aa:CCP, 232Ac:CCP, 232Br:CCP, 232Bt:CCC, 232Cb:CCC, 232Ci:CCC
Synonymy: Estuarine Intertidal: Freshwater Tidal Marsh (Swain and Kearsley 2001)
References: Swain and Kearsley 2001
Authors: A.S. WEAKLEY AFTER VAHP, JT, East **Identifier:** A.1701

ERIOCAULON PARKERI - POLYGONUM PUNCTATUM HERBACEOUS VEGETATION

Estuary Pipewort - Dotted Smartweed Herbaceous Vegetation
Estuary Pipewort Brackish Intertidal Flat **G2 (98-11-09)**
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: This freshwater tidal community occurs in estuaries of the northern Atlantic coast generally confined to low marsh where it is subjected to high levels of flood disturbance. As a result, the substrate is generally sandy or gravelly with low organic matter content. The vegetation is low, generally less than 35 cm in height, with variable cover of scattered to fairly dense *Eriocaulon parkeri*. Associates include *Polygonum punctatum, Isoetes riparia, Lindernia dubia, Bidens eatonii*, and *Ludwigia palustris*.
Comments: The floristics and environmental setting of this association show overlap with *Isoetes riparia* Tidal Herbaceous Vegetation (CEGL006058).
States/Provinces: CT:S?, DE:S1, MA:S1, MD:S?, ME:S2, NB?, NC:S?, NJ:S2?, NS?, NY:S1S2,S2, SC?, VA:S?
TNC Ecoregions: 57:C, 58:C, 61:?, 62:C
USFS Ecoregions: 212Da:CCC, 212Dc:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Bt:CCC
Synonymy: Palustrine (Cowardin et al. 1979) B, Freshwater tidal marsh complex, lower intertidal mudflat (Breden 1989), Freshwater tidal marsh, mudflat zone (MENHP 1991), FW Tidal Marsh (Rawinski 1984). formerly Southern New England FW Tidal.
References: Barrett 1994, Bowman 2000, Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Edinger et al. 2002, Fleming et al. 2001, Gawler 2002, Haines 2001, MENHP 1991, Metzler and Barrett 2001, Rawinski 1984, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006352

V.B.2.N.g.301. ISOETES RIPARIA TIDAL HERBACEOUS ALLIANCE

Riverbank Quillwort Tidal Herbaceous Alliance

Concept: Mudflats with *Isoetes riparia*. This alliance includes communities occurring on the upper limits of freshwater intertidal shores. The vegetation can be quite sparse with few plants growing in patches within the open sand. Associated species include *Cyperus bipartitus (= Cyperus rivularis), Eleocharis obtusa (= Eleocharis obtusa var. peasei)*, and in more muddy areas, *Schoenoplectus smithii (= Scirpus smithii)*. Occurs in coastal areas discontinuously from Massachusetts south to New Jersey, Virginia, and North Carolina.
Range: Occurs in coastal areas discontinuously from Massachusetts south to New Jersey, Virginia, and North Carolina. This alliance is found in North Carolina, Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Virginia.
States/Provinces: CT DE MA MD NC NJ NY RI VA?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221A:??, 232Ac:CCC, 232C:C?
Synonymy: Estuarine Intertidal: Saline/Brackish Flats (Swain and Kearsley 2001)
References: Sneddon et al. 1996, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.1879

ISOETES RIPARIA TIDAL HERBACEOUS VEGETATION

Riverbank Quillwort Tidal Herbaceous Vegetation

G? (97-12-01)

Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: This freshwater tidal flat community of the central and northern Atlantic coast occurs on mud, sand, or gravelly banks of freshwater tidal streams. The vegetation is sparse, but is characterized by *Isoetes riparia*. Associated species include *Cyperus bipartitus (= Cyperus rivularis), Elatine americana, Sagittaria graminea, Sagittaria subulata, Sagittaria calycina, Sagittaria montevidensis, Heteranthera reniformis, Crassula aquatica (= Tillaea aquatica), Eriocaulon parkeri, Orontium aquaticum, Gratiola virginiana, Eleocharis obtusa (= var. peasei)*, and in more muddy areas, *Schoenoplectus smithii (= Scirpus smithii)*. This is the potential habitat of *Micranthemum micranthemoides*.
Comments: The floristics of this association show overlap with *Eriocaulon parkeri - Polygonum punctatum* Herbaceous Vegetation (CEGL006352). This association may be too small to be mapped in most locations. More information is needed on the range of variability present in this association and its relationship to related vegetation, namely CEGL006352. There is a possibility that these associations may be similar enough to lump due to species overlap (S. Neid pers. obs.)
States/Provinces: CT:S?, DE:S1, MA:S3, MD:S?, NC:S?, NJ:S2S3, NY:S1S2, RI:S?, VA?
TNC Ecoregions: 57:C, 58:?, 62:C
USFS Ecoregions: 221A:??, 232Ac:CCC
Synonymy: Tidal Mud Flat (Quillwort Subtype) (Schafale 2000), Freshwater tidal marsh complex, lower intertidal flat (Breden 1989), Southern New England/Gulf of Maine Saline/ Brackish Intertidal Flat (Rawinski 1984), Southern New England/Gulf of Maine Fresh/ Brackish Subtidal Estuarine Community. (Rawinski 1984)
References: Bowman 2000, Breden 1989, Breden et al. 2001, Edinger et al. 2002, Rawinski 1984, Schafale 2000, Swain and Kearsley 2001, Whitlatch 1982
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL006058

V.B.2.N.g.300. NELUMBO LUTEA TIDAL HERBACEOUS ALLIANCE

American Lotus Tidal Herbaceous Alliance

Concept: This community type occurs as a distinct zone along fresh reaches of tidal rivers in the Coastal Plain. *Nelumbo lutea* forms a thin band of vegetation along the river in water that is 2-3 m deep at low tide.
Comments: Description based on GAP project sample taken along Salem River (SALEM2). Also found in Virginia and Maryland.
Range: This alliance is currently described from the mid-Atlantic coast, in New Jersey, Maryland, and Virginia.
States/Provinces: MD NJ VA
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Ac:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCC
References: Coulling pers. comm., NJNHP unpubl. data

Authors: S.L. NEID, East **Identifier:** A.3020

NELUMBO LUTEA TIDAL HERBACEOUS VEGETATION
American Lotus Tidal Herbaceous Vegetation

G? (97-12-01)

Concept: This community type occurs as a distinct zone along tidal rivers in the Coastal Plain. *Nelumbo lutea* forms a thin band of vegetation along the river that is 2-3 m deep at low tide.
Comments: Description based on GAP project sample taken along Salem River (SALEM2). Also found in Virginia and Maryland.
Range: Currently observed from New Jersey, Maryland, and Virginia.
States/Provinces: MD:S?, NJ:S?, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 232Ab:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCC
References: Coulling pers. comm., NJNHP unpubl. data
Authors: ECS **Confidence:** **Identifier:** CEGL006913

V.B.2.N.g.8. NUPHAR LUTEA TIDAL HERBACEOUS ALLIANCE
Yellow Pond-lily Tidal Herbaceous Alliance

Concept: Tidal mudflats dominated by *Nuphar lutea*. This alliance includes vegetation of freshwater tidal rivers where the water depth is approximately 2-3 m or less. *Nuphar lutea* and *Nymphaea odorata* are dominant; these species quickly spread from their rhizomes and shade out other vegetation. Other species may include *Potamogeton epihydrus, Peltandra virginica, Nymphoides cordata*, and *Zizania aquatica*. In Delaware, this alliance occurs in nearly pure stands below mean low water on mudflats that are exposed at low tide and on the submerged point bars of stream meanders.
Range: This alliance is found in North Carolina, Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Virginia.
States/Provinces: DC DE MD ME NC NJ NY PA VA
TNC Ecoregions: 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221A:CC, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC, 232Ci:CCC
Synonymy: Spatterdock: 31 (McCormick and Somes 1982); Spatterdock Community Type (Odum et al. 1984); V.C.2.a.2. *Nuphar lutea* Herbaceous Alliance. in part? (Sneddon et al. 1996)
References: McCormick and Somes 1982, Odum et al. 1984, Sneddon et al. 1996
Authors: ECS/SCS, JT, East **Identifier:** A.1708

NUPHAR LUTEA SSP. ADVENA TIDAL HERBACEOUS VEGETATION
Broadleaf Pond-lily Tidal Herbaceous Vegetation

G? (97-12-01)

Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: This association comprises submerged freshwater tidal mud flats of coastal rivers along the Atlantic coast that are dominated by *Nuphar lutea ssp. advena*. This association occurs at low elevations within freshwater tidal marshes, within tidal range but beyond the influence of salinity. It generally occurs below mean low water level where water depth is approximately 1-3 m or less. It receives a relatively long duration of flooding and is infrequently exposed at only the lowest tides. The association occurs on unconsolidated tidal mud flats and submerged point bars of large coastal river meanders adjacent to open water of river or tidal creek channels. Substrate is silty alluvial mud that is high in organic matter content. Vegetation of this association is characterized by large clonal stands of dense leafy forbs dominated by *Nuphar lutea ssp. advena*. Associated species tend to occur as scattered individuals and include *Peltandra virginica*, which can also be locally codominant, *Pontederia cordata, Zizania aquatica, Sagittaria latifolia, Bidens laevis, Acorus calamus*, and/or *Schoenoplectus fluviatilis*. *Nuphar lutea ssp. advena* forms nearly monotypic stands early in the growing season. Associated species emerge later in the season and can eventually overtop *Nuphar* plants, which senesce and tend to become insect-infested in late summer. Submerged aquatic species can occur in this association, including *Potamogeton epihydrus, Ceratophyllum demersum*, and the invasive exotic *Hydrilla verticillata*.
Comments: This association differs from *Nuphar lutea ssp. advena - Nymphaea odorata* Herbaceous Vegetation

(CEGL002386) in that it is tidal rather than inland marsh.
Range: This association occurs along tidal rivers from New York to North Carolina.
States/Provinces: DC:S?, DE:S4, MD:S4, ME:S2, NC:S3, NJ:S2S3, NY:S2, PA:S?, VA:S?
TNC Ecoregions: 57:C, 58:C, 61:C, 62:C
USFS Ecoregions: 221:C, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232C:CC
Synonymy: Tidal Freshwater Marsh (Pondlily Subtype) (Schafale 2000), Freshwater Tidal Marsh: Mud Flat Type (McCoy and Fleming 2000), Freshwater Tidal Marsh complex (Breden 1989), *Nuphar advena - (Ceratophyllum demersum)* Tidal Herbaceous Vegetation (Coulling 2002), *Nuphar advena - Peltandra virginica* Tidal Herbaceous Vegetation (Coulling 2002), FW Tidal Marsh (Rawinski 1984). formerly Southern New England FW Tidal.
References: Bowman 2000, Breden 1989, Breden et al. 2001, Brumback and Mehrhoff 1996, Coulling 2002, Edinger et al. 2002, Fleming 2001, Fleming et al. 2001, Gawler 2002, Good and Good 1975b, Harrison 2001, McCormick and Ashbaugh 1972, McCormick et al. 1970, McCoy and Fleming 2000, Odum et al. 1984, Peet et al. 2002, Rawinski 1984, Reschke 1990, Schafale 2000, Schafale and Weakley 1990
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004472

V.B.2.N.g.3. PELTANDRA VIRGINICA - PONTEDERIA CORDATA TIDAL HERBACEOUS ALLIANCE

Green Arrow-arum - Pickerelweed Tidal Herbaceous Alliance

Concept: Freshwater tidal marshes dominated by variable mixtures of *Peltandra virginica* and *Pontederia cordata*. Other species present can include *Bidens* spp., *Zizania aquatica, Sagittaria* spp., *Acorus americanus*, and *Polygonum* spp. This alliance occurs primarily in low portions of the intertidal zone, on mucky substrates.
Range: This alliance is found in Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Virginia, and possibly Pennsylvania (?).
States/Provinces: CT DE MA MD ME NJ NY PA? VA
TNC Ecoregions: 57:P, 58:C, 61:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221Ba:CCC, 221D:CP, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCP
Synonymy: Pickerelweed/Arrowarum: 32 (McCormick and Somes 1982); Arrow-arum/Pickerelweed Community Type (Odum et al. 1984); Estuarine Intertidal: Freshwater Tidal Marsh (Swain and Kearsley 2001)
References: McCormick and Somes 1982, Odum et al. 1984, Swain and Kearsley 2001
Authors: A.S. WEAKLEY AFTER ODUM E, JT, Southeast **Identifier:** A.1703

HIBISCUS MOSCHEUTOS - POLYGONUM ARIFOLIUM - LEERSIA ORYZOIDES - (CAREX STRICTA) TIDAL HERBACEOUS VEGETATION

Eastern Rosemallow - Halberd-leaf Tearthumb - Rice Cutgrass - (Tussock Sedge) Tidal Herbaceous Vegetation

Oligohaline Mixed Forbs Marsh **G? (02-05-12)**

Concept: This association is a diverse oligohaline marsh characterized by variable dominance of species found in the Chesapeake Bay. Species that form locally dominant patches can include *Polygonum arifolium, Hibiscus moscheutos ssp. moscheutos, Polygonum punctatum, Peltandra virginica, Leersia oryzoides, Polygonum sagittatum, Mikania scandens, Spartina cynosuroides* and *Toxicodendron radicans*, among others. All of these species are able to tolerate a broad range of halinity, and the high mean species richness of this type suggests that it is generally restricted to only slightly oligohaline habitats. Infrequently present are several species that are more specific to oligohaline conditions, including *Echinochloa walteri, Kosteletzkya virginica, Pluchea odorata, Rumex verticillatus, Sagittaria lancifolia*, and *Teucrium canadense*. The colonial sedge *Carex stricta* often forms local dominance patches, characteristically on hummocks raised 20-25 cm above the primary marsh surface.
Comments: In Virginia, occurrences are known from the Mattaponi (New and Gleason marshes), Pamunkey (Sweet Hall, Cousiac, and Cohoke marshes), and Rappahannock (Otterburn Marsh) rivers. In Maryland, an occurrence documented from the Pocomoke River (Cypress Swamp) is currently attributed to this type. In New Jersey, an occurrence is known from Rancocas Creek.
Range: Currently described from Virginia, Maryland, and New Jersey.
States/Provinces: MD:S?, NJ:S?, VA:S?
TNC Ecoregions: 58:C, 62:C

USFS Ecoregions: 232Ab:CCC, 232Br:CCC, 232Bt:CCC
Synonymy: *Hibiscus moscheutos - Polygonum arifolium - Leersia oryzoides - (Carex stricta)* Tidal Herbaceous Vegetation (Coulling 2002)
References: Coulling 2002, Harrison pers. comm.
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006181

IMPATIENS CAPENSIS - PELTANDRA VIRGINICA - SAGITTARIA LATIFOLIA - (TYPHA ANGUSTIFOLIA) TIDAL HERBACEOUS VEGETATION

Orange Jewelweed - Green Arrow-arum - Broadleaf Arrowhead - (Narrowleaf Cattail) Tidal Herbaceous Vegetation

Freshwater Tidal Mixed Forbs High Marsh **G? (97-12-01)**

Ecological Group (SCS;MCS): Atlantic and Gulf Coast Oligohaline and Fresh Tidal Marshes (202-40; n/a)

Concept: This association occurs in reliably flooded swales or backmarshes within the upper reaches of freshwater tidal marshes along tidal rivers of the Atlantic coast. Salinity is fresh to slightly brackish. These low-lying depressions are flooded for a longer duration than the surrounding habitat as they trap floodwaters as tides recede. Species composition and abundance in these small-patch wet depression are highly variable. They are best characterized by the presence and/or dominance of *Peltandra virginica, Impatiens capensis, Sagittaria latifolia*, and/or *Typha angustifolia*. Associated species commonly include *Pontederia cordata, Polygonum* spp. (*Polygonum arifolium, Polygonum sagittatum, Polygonum hydropiperoides, Polygonum punctatum*), *Bidens* spp. (*Bidens laevis, Bidens frondosa, Bidens coronata*), *Schoenoplectus fluviatilis, Leersia oryzoides, Zizania aquatica, Amaranthus cannabinus, Sium suave, Apios americana, Iris versicolor, Echinochloa walteri*, and others. The exotic *Murdannia keisak* has been noted in this community in the southern portion of the range. Species of the surrounding oligohaline or mesohaline marshes or from palustrine setting can occur in these microhabitats, but are usually not dominant. Substrate is highly variable ranging from silts, silty mucks, peats, or sands.
Comments: Species composition can differ between swales within the high marsh and those in low marsh settings.
Range: This association occurs in freshwater tidal marshes along the Atlantic coast from Maine to Virginia.
States/Provinces: CT:S?,S?, DE:S4, MA:S1, MD:S4?, ME:S2, NJ:S3, NY:S2, PA?, VA:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221Ba:CCC, 221D:CP, 232Ac:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232C:CP
Synonymy: Freshwater Tidal Marsh Complex, upper tidal zone (Breden 1989), *Peltandra* backmarsh (Barrett 1989), *Impatiens capensis - Polygonum sagittatum - Zizania aquatica - (Bidens laevis, coronata)* Tidal Herbaceous Vegetation (Coulling 2002), FW Tidal Marsh (Rawinski 1984). formerly Southern New England FW Tidal.
References: Barrett 1989, Barrett 1994, Bowman 2000, Breden 1989, Breden et al. 2001, Coulling 2002, Edinger et al. 2002, Fleming 2001, Fleming et al. 2001, Gawler 2002, Harrison 2001, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL006325

PELTANDRA VIRGINICA - PONTEDERIA CORDATA TIDAL HERBACEOUS VEGETATION

Green Arrow-arum - Pickerelweed Tidal Herbaceous Vegetation

G3G4 (98-11-04)

Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: These are freshwater tidal marshes dominated by variable mixtures of *Peltandra virginica* and *Pontederia cordata* that are best expressed along the north Atlantic coast southward to Virginia. It occurs at low elevations within the freshwater tidal zone, often bordering open water. *Peltandra virginica* and *Pontederia cordata* are codominant. Associated species can include *Bidens* spp., *Zizania aquatica, Sagittaria latifolia, Acorus americanus, Polygonum arifolium, Polygonum hydropiperoides*, and *Polygonum sagittatum*. This community occurs on mucky substrates of variable depth.
Comments: This community occurs in very similar environmental settings as *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation (CEGL004472), low freshwater tidal marshes with a long duration of flooding. Species composition has some overlap. These two associations are best expressed where the elevation gradient is very mild, allowing the associations to occupy different zones, with this association occurring at slightly higher

elevation than *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation. *Impatiens capensis - Peltandra virginica - Sagittaria latifolia - (Typha angustifolia)* Tidal Herbaceous Vegetation (CEGL006325) is a small-patch community that tends to form in ponded areas within freshwater high marsh and differs in having a much more varied species composition.
Range: Occurs from Maine to Virginia, excluding Rhode Island and New Hampshire.
States/Provinces: DE:S?, MA:S1, MD:S?, NJ:S?, NY:S2, VA:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Ac:CCP, 232Ad:CCC, 232Br:CCC, 232Bx:CCP, 232Ch:CCP
Synonymy: Arrow-arum/Pickerelweed Community Type (Odum et al. 1984), *Peltandra virginica* Tidal Herbaceous Vegetation (Coulling 2002), *Pontederia cordata* Tidal Herbaceous Vegetation (Coulling 2002)
References: Bowman 2000, Breden et al. 2001, Coulling 2002, Edinger et al. 2002, Fleming 2001, Fleming et al. 2001, Harrison 2001, McCoy and Fleming 2000, Odum et al. 1984, Peet et al. 2002
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004706

V.B.2.N.g.10. SAGITTARIA SUBULATA - LIMOSELLA AUSTRALIS TIDAL HERBACEOUS ALLIANCE

Awl-leaf Arrowhead - Awlwort Tidal Herbaceous Alliance

Concept: Low intertidal marshes, characterized by sparse to more dense vegetation of *Sagittaria subulata* and *Limosella australis*.
Range: This alliance is found in North Carolina, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island (?), and Virginia, and in Canada.
States/Provinces: CT DE MA MD ME NB? NF? NH NJ NS? NY PE? QC? RI VA?
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Dc:CCC, 221Ab:CCC, 221Ad:CCC, 221Af:CCP, 221Ag:CCC, 221Ak:CCC, 232Ab:CCP, 232Ac:CCC, 232Ad:CCP, 232Bt:CCC, 232Bx:CCC, 232Bz:CCP, 232Ch:CCC
Synonymy: Estuarine Intertidal: Saline/Brackish Flats (Swain and Kearsley 2001)
References: Swain and Kearsley 2001, Whitlatch 1982
Authors: ECS/SCS, JT, East **Identifier:** A.1710

SAGITTARIA SUBULATA - LIMOSELLA AUSTRALIS TIDAL HERBACEOUS VEGETATION
Awl-leaf Arrowhead - Awlwort Tidal Herbaceous Vegetation
North Atlantic Coast Intertidal Mud Flat **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic Coast Rivershore - Tidal Fresh Marshes (202-75; n/a)

Concept: This brackish tidal flat community occurs along the northeastern Atlantic coast on muddy to sandy substrates of broad, flat tidal river shores. The flats are exposed at low tide and submerged at high tide. Vegetation is of variable cover and may be quite sparse. Characteristic plants are low-growing rosette species such as *Sagittaria subulata, Sagittaria calycina var. spongiosa (= Sagittaria spathulata), Limosella australis (= Limosella subulata), Lilaeopsis chinensis, Zannichellia palustris*, and *Eleocharis parvula*.
Range: This association occurs along the Atlantic coast from Maine to Virginia. It may also occur in Canada.
States/Provinces: CT:S?, DE:S1, MA:S3, MD:S?, ME:S3, NB?, NF?, NH:S?, NJ:S1S3, NS?, NY:S1S2, PE?, QC?, RI:S?, VA?
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Dc:CCC, 221Ab:CCC, 221Ad:CCC, 221Af:CCP, 221Ag:CCC, 221Ak:CCC, 232Ac:CCC, 232Bt:CCC, 232C:CC
Synonymy: Southern New England/Gulf of Maine Saline/ Brackish Intertidal Flat (Rawinski 1984), Southern New England/Gulf of Maine Fresh/ Brackish Subtidal Estuarine Community (Rawinski 1984)
References: Bowman 2000, Breden et al. 2001, Edinger et al. 2002, Enser 1999, Gawler 2002, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Sperduto 2000b, Swain and Kearsley 2001, Whitlatch 1982
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004473

V.B.2.N.g.4. SARCOCORNIA PERENNIS - (DISTICHLIS SPICATA, SALICORNIA SPP.) TIDAL HERBACEOUS ALLIANCE

Woody Glasswort - (Saltgrass, Saltwort species) Tidal Herbaceous Alliance

Concept:
Comments: This alliance is reported from two very disjunct areas, California and New Hampshire. In California it is very poorly known, and documented only by Sawyer and Keeler-Wolf (1995). Not enough information was available to complete a description of this alliance at this time, and the two associations (one from New Hampshire and one from California) need to be reviewed to determine if they belong to the same alliance.
Range: This alliance is found in Oregon (?), California (?), Washington (?), and New Hampshire.
States/Provinces: CT DE MA MD ME NB NC? NH NJ NS NY RI SC? VA
TNC Ecoregions: 57:P, 58:C, 62:C, 63:C
USFS Ecoregions: 212C:PP, 212D:PP, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bx:CCC, 232Bz:CCC, 232Ci:CCP, 261A:CC, 261B:CC, 263A:CC, M242A:CC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001)
References: Breeding et al. 1974, Sawyer and Keeler-Wolf 1995, Swain and Kearsley 2001
Authors: M.S. REID, West **Identifier:** A.1704

SALICORNIA (VIRGINICA, BIGELOVII, MARITIMA) - SPARTINA ALTERNIFLORA HERBACEOUS VEGETATION
(Virginia Glasswort, Dwarf Glasswort, Sea Saltwort) - Saltmarsh Cordgrass Herbaceous Vegetation
Salt Panne **G5 (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Salt Pannes and Hypersaline Coastal Flats (202-55; n/a)

Concept: This association represents tidally flooded hypersaline flats or very shallow depressions (pannes) dominated by halophytic herbs, including *Salicornia virginica, Salicornia bigelovii, Salicornia maritima*, and stunted *Spartina alterniflora*, that occur along the Atlantic coast. Vegetation of this association tends to develop in shallow depressions within high salt marshes where drainage is poor. The depressions are flooded by high tides, but as the water evaporates during low tide, the salinity concentration increases forming 'salt pannes.' Formation of the pannes may result from ice scouring, rafting flotsam, peat compaction, mosquito ditch levees, or erosion of tidal creek banks, which create small, sparsely vegetated to unvegetated impoundments. Pannes form in both high and low salt marsh habitats; this community is regularly to irregularly flooded by tides. Bare peat and/or mucky soils are prevalent (up to 85% bare soils). Total vegetative cover is variable in pannes, from near total absence of vascular plants to a dense cover of *Salicornia virginica, Salicornia bigelovii, Salicornia maritima*, or *Spartina alterniflora* (short form). Common associates include *Limonium carolinianum, Plantago maritima var. juncoides, Triglochin maritima, Suaeda maritima*, and *Atriplex* spp. Algal mats are characteristically present, visible even in densely vegetated pannes. Blue-green algae are an important component of these mats, in some cases contributing significantly more biomass to the community than do vascular species. Diagnostic species include *Salicornia bigelovii* and *Salicornia virginica*.
Comments: This community occurs in coastal salt marshes from Nova Scotia to the Carolinas, north of the range of *Batis maritima*. Salt pannes can potentially be classified based on morphology, salinity gradients, or substrate (Godfrey et al. 1978), which may elucidate further variation.
Range: This association occurs along the Mid- and North Atlantic Coast from the Canadian maritime provinces south to North Carolina.
States/Provinces: CT:S?, DE:S3, MA:S3, MD:S?, ME:S3, NB:S?, NC?, NH:S?, NJ:S3S4, NS:S?, NY:S3, RI:S?, SC?, VA:S?
TNC Ecoregions: 57:P, 58:C, 62:C, 63:C
USFS Ecoregions: 212C:PP, 212D:PP, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bx:CCC, 232Bz:CCC, 232Ci:CCP
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Salt Flat (Schafale 2000), Pans (Hill 1986) =. Assateague Island., Pans (Higgins et al. 1971) =. Assateague Island., Salt marsh complex, pannes (Breden 1989) =. New Jersey., Salt panne (Reschke 1990) =. New York., *Spartina alterniflora / Salicornia europaea* community (Clancy 1993b) =. Delaware., Salt panne (Clancy 1993b) =. Delaware., Pan (Nichols 1920) =. Connecticut., Panne (Good 1965) =. New Jersey., *Salicornia* tidal flat (Clovis 1968) =. Virginia., Salt pan (Klotz 1986) =. Virginia., *Salicornia - Bassia* salt flat (Harvill 1965) =. Virginia., *Salicornietum ambiguae* (Conard 1935) =. New York., Salt panne (Miller and Egler 1950) =. Connecticut., Stunted *Spartina alterniflora* community (Miller and Egler 1950) =. Connecticut., Panne marsh (Baumann 1978b) =. Virginia., Salt Marsh (Rawinski 1984). formerly Southern New England and Gulf of Maine Salt Marshes., *Salicornia europaea - Spartina alterniflora* community (Metzler and Barrett 1992) =.

Connecticut.
References: Baumann 1978b, Berdine 1998, Bertness et al. 1992, Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1993b, Clovis 1968, Conard 1935, Edinger et al. 2002, Enser 1999, Fleming 2001, Fleming et al. 2001, Gawler 2001, Gawler 2002, Godfrey et al. 1978, Good 1965, Harvill 1965, Higgins et al. 1971, Hill 1986, Klotz 1986, Metzler and Barrett 1992, Metzler and Barrett 2001, Miller and Egler 1950, Nichols 1920, Niering and Warren 1980, Peet et al. 2002, Rawinski 1984, Redfield 1972, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, Sperduto 2000b, Swain and Kearsley 2001, Webber 1967
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004308

V.B.2.N.h. Seasonally flooded temperate perennial forb vegetation

V.B.2.N.h.3. WOODWARDIA VIRGINICA SEASONALLY FLOODED HERBACEOUS ALLIANCE

Virginia Chainfern Seasonally Flooded Herbaceous Alliance

Concept: This alliance covers seasonally flooded wetland depressions, often strongly dominated by *Woodwardia virginica*, which occur in acid sands of the Coastal Plain. More information is needed. It is attributed to various states in the Atlantic Coastal Plain from Delaware to Florida.
Range: This alliance is found in Florida, Georgia, North Carolina, South Carolina, Maryland, and Delaware.
States/Provinces: DE FL GA MD NC SC
TNC Ecoregions: 53:P, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 232Bf:CC?, 232Bz:CC?, 232Ca:CCP, 232Cb:CCC, 232Ch:CCC, 232Ga:CCC
Synonymy: Small Depression Pond, in part (Schafale and Weakley 1990); *Anchistea/Sphagnum* Association (Laessle 1942)
References: Laessle 1942, Schafale and Weakley 1990
Authors: M.P. SCHAFALE/A.S. WEAKLE, MP, Southeast **Identifier:** A.1713

WOODWARDIA VIRGINICA / SPHAGNUM CUSPIDATUM HERBACEOUS VEGETATION
Virginia Chainfern / Toothed Peatmoss Herbaceous Vegetation
Chainfern Small Depression Pond **G2? (97-12-01)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Open Sandhill Ponds and Emergent Marshes (345-20; n/a)

Concept: This generally defined association covers seasonally flooded wetland depressions, often strongly dominated by *Woodwardia virginica*, which occur in acid sands of the Coastal Plain. More information is needed on this vegetation type. It is attributed to various states in the Atlantic Coastal Plain from Delaware to Florida.
Range: It is attributed to various states in the Atlantic Coastal Plain from Delaware to Florida.
States/Provinces: DE:S?, FL:S?, GA:S?, MD:S?, NC:S2, SC:S?
TNC Ecoregions: 53:P, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 232Bf:CC?, 232Bz:CC?, 232Ca:CCP, 232Cb:CCC, 232Ch:CCC, 232Ga:CCC
Synonymy: Small Depression Drawdown Meadow/Savanna (Boggy Pool Subtype) (Schafale 2000)
References: Berdine and Gould 1999, Laessle 1942, Schafale 2000, Schafale and Weakley 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL004475

V.C.2.N.a. Permanently flooded temperate or subpolar hydromorphic rooted vegetation

V.C.2.N.a.102. NYMPHAEA ODORATA - NUPHAR SPP. PERMANENTLY FLOODED TEMPERATE HERBACEOUS ALLIANCE

White Water-lily - Yellow Pond-lily species Permanently Flooded Temperate Herbaceous Alliance

Concept: This alliance, common throughout most of the eastern and central United States and adjacent Canadian provinces, contains vegetation which may occur in a variety of slow-moving water bodies, including

rivers, millponds, blackwater rivers, streams, shallow ponds or lakes, or on shores of deeper water bodies including freshwater tidal areas. The water depth is generally greater than 0.5 m and up to 2 m. Stands are dominated by hydromorphic rooted aquatic plants, typically *Nuphar lutea* (any of its various subspecies), with or without *Nymphaea odorata*. Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* spp., *Potamogeton* spp., and others. In the north, *Brasenia schreberi* may be locally dominant. Other characteristic northern species include *Nymphaea tetragona* and *Potamogeton amplifolius*. Associates found in the Midwest include *Polygonum amphibium*. In the Southeast, examples may include the floating or emergent 'pad-leaved' species *Nelumbo lutea* or *Nymphoides aquatica*. Submerged aquatic species which may be present include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*. Stands of this alliance are permanently to semipermanently flooded.
Comments: Field guidelines for separating floating-leaved aquatic alliances from submerged aquatic alliances are also needed.
Range: This alliance is common throughout most of the eastern and central United States and adjacent Canadian provinces. It is also found in Oregon, Washington, California, Idaho, Colorado, and possibly Wyoming (?).
States/Provinces: AL AR BC CA CO CT DE FL GA IA ID IL IN KY LA MA MB MD ME MI MN MO MS NC NH NJ NY OH OK ON OR PA RI SC TN TX VA VT WA WI WV WY?
TNC Ecoregions: 10:C, 20:C, 2:C, 31:C, 32:P, 36:C, 37:C, 39:C, 40:P, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 55:C, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 6:C
USFS Ecoregions: 212Aa:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Ha:CPP, 212Hb:CPP, 212He:CPP, 212Hh:CPP, 212Hi:CPP, 212Hj:CPP, 212Hk:CPP, 212Hl:CPP, 212Hm:CPP, 212Hn:CPP, 212Ho:CPP, 212Hp:CPP, 212Hq:CPP, 212Hr:CPP, 212Hs:CPP, 212Ht:CPP, 212Hu:CPP, 212Hv:CPP, 212Hw:CPP, 212Hx:CPP, 212Hy:CPP, 212Ib:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCP, 212Jj:CCP, 212Jk:CCP, 212Jl:CCP, 212Jm:CCC, 212Jn:CCP, 212Jo:CCP, 212Jr:CCP, 212Ka:CPP, 212La:CCP, 212Lb:CCC, 212Lc:CCP, 212Ld:CCC, 212Ma:CPP, 212Mb:CPP, 212Na:CPP, 212Nb:CPP, 212Nc:CPP, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Ed:CC?, 221Ef:CCC, 221He:CCC, 222Ch:CCC, 222Db:CCC, 222Gc:C??, 222Ha:CCC, 222Ja:CCC, 222Jb:CCC, 222Je:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 231Bc:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ac:CCC, 232Bf:CCC, 232Bg:CCC, 232Bj:CC?, 232Ca:CCC, 232Cb:CCC, 232Cc:CC?, 232Cd:CCC, 232Ch:CCC, 232Dc:CCC, 234Ac:CC?, 234An:CCC, 242A:CC, 251Cf:CCC, 251Dd:CCC, 251Dg:CCC, 251Eb:CCC, M212Af:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC, M331A:CC, M331D:CC, M331H:CC, M332E:CC, M333A:CC, M333B:CC, M333D:CC
Federal Lands: DOD (Eglin, Fort Benning); NPS (Acadia, Carl Sandburg Home, Isle Royale, Voyageurs); USFS (Angelina, Conecuh, Croatan?, Davy Crockett, Kisatchie, Ocala, Ozark, Sabine NF, Sam Houston?, Talladega); USFWS (Okefenokee, Reelfoot)
Synonymy: Spring-run Stream, in part (FNAI 1990); Open water/aquatic bed veg., natural impoundment pond (Ambrose 1990a); Small Depression Pond, in part (Schafale and Weakley 1990); *Nuphar lutea* herbaceous alliance, in part (Hoagland 1998a); L5D2aI1a. *Nuphar lutea* (Foti et al. 1994); *Nymphaea odorata* herbaceous alliance (Hoagland 1998a); Spatterdock - water lily wetland (Fike 1999); Natural Pond, in part (Smith 1991); Artificial Pond, in part (Smith 1991); Stable Natural Pool, in part (Smith 1991)
References: Ambrose 1990a, FNAI 1990, Faber-Langendoen et al. 1996, Fike 1999, Foti et al. 1994, Harris et al. 1996, Heineke 1987, Hoagland 1998a, Kovalchik 1993, Marr et al. 1980, Penfound 1952, Ramaley 1909, Sawyer and Keeler-Wolf 1995, Schafale and Weakley 1990, Smith 1991, Wharton 1978, Wolfe 1990
Authors: M. PYNE, MOD. M.S. REID, MP, Southeast **Identifier:** A.1984

NUPHAR LUTEA SSP. ADVENA - NYMPHAEA ODORATA HERBACEOUS VEGETATION

Broadleaf Pond-lily - White Water-lily Herbaceous Vegetation
Water-lily Aquatic Wetland **G4G5 (96-10-03)**
Ecological Group (SCS;MCS): Eastern Open Ponds and Marshes (480-10; 1.4.1.1)

Concept: This rooted aquatic or open marsh community occupies shallow water depressions, oxbow ponds, backwater sloughs of river floodplains, slow moving streams, ponds, and small lakes throughout the central and eastern United States. It is dominated by rooted, floating-leaved aquatic species, with both submergent and

emergent aquatics also present. *Nuphar lutea ssp. advena* and *Nymphaea odorata* are dominants. Other species present may include *Brasenia schreberi*, various *Potamogeton* spp., *Polygonum amphibium*, and *Polygonum amphibium var. emersum (= Polygonum coccineum)*. Submerged aquatics more common in the southern part of the range include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*.
Comments: Occurs in borrow pits on Kisatchie National Forest. On the Conecuh National Forest (Alabama), vegetation of this alliance occurs in Gum Pond and Open Pond as a mix of *Nymphaea odorata* and *Nuphar lutea ssp. advena*.
Range: This rooted aquatic community occupies shallow, quiet waters throughout the central and eastern United States, extending from Maine to Ontario and Minnesota, south to Oklahoma and east to Georgia.
States/Provinces: AL:S?, AR:S?, CT:S?, DE:S?, GA:S?, IA:SU, IL:S?, IN:S?, KY:S?, LA:S?, MA:S4, MD:S?, ME:S5, MI:S?, MN:S?, MO:S?, MS:S?, NC:S2, NH:S?, NJ:S4, NY:S5, OH:S?, OK:S?,S?, ON:S?, PA:S?, RI:S?, SC:S?, TN:S?, TX:S?, VA:S?, VT:S4, WI:S?, WV:S?
TNC Ecoregions: 31:C, 32:P, 36:C, 37:C, 39:C, 40:P, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 55:P, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C
USFS Ecoregions: 212Aa:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Hb:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCP, 212Jj:CCP, 212Jl:CCP, 212Jm:CCC, 212Ka:CPP, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Ed:CC?, 221Ef:CCC, 221He:CCC, 222Ch:CCC, 222Db:CCC, 222Gc:C??, 222Ha:CCC, 222Ja:CCC, 222Jb:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 231Bc:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Bf:CCC, 232C:CC, 232D:CC, 234Ac:CC?, 234An:CCC, 251Cf:CCC, 251Dd:CCC, 251Dg:CCC, 251Eb:CCC, M212Af:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Dc:CCC
Federal Lands: DOD (Fort Benning); NPS (Acadia, Carl Sandburg Home); USFS (Angelina, Conecuh, Davy Crockett, Kisatchie, Ocala, Ozark, Sabine NF, Sam Houston?, Talladega); USFWS (Reelfoot)
Synonymy: Open Water/Aquatic Bed Veg., Natural Impoundment Pond (Ambrose 1990a) B, New England coastal plain pondshore (Rawinski 1984), L5D2aI1a. *Nuphar lutea* (Foti et al. 1994), Open water marsh with floating-leaved plants (NAP pers. comm. 1998)
References: Ambrose 1990a, Anderson 1982, Breden et al. 2001, FNAI 1990, Fike 1999, Fleming et al. 2001, Foti et al. 1994, Gawler 2002, Hoagland 2000, NAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. 2002, Penfound 1953, Rawinski 1984, Schafale and Weakley 1990, Swain and Kearsley 2001, Zanoni et al. 1979
Authors: D. Faber-Langendoen, MCS **Confidence:** 3 **Identifier:** CEGL002386

NYMPHAEA ODORATA - ELEOCHARIS ROBBINSII HERBACEOUS VEGETATION
White Water-lily - Robbins Spikerush Herbaceous Vegetation
Coastal Plain Pond **G2 (98-12-07)**
Ecological Group (SCS;MCS): Southeastern Coastal Plain Open Ponds and Marshes (345-05; n/a)

Concept: This hydromorphic Coastal Plain pond community ranges from southern New England to Maryland. It occurs in standing water in all but exceptionally dry years. The substrate is most often deep muck, but in oligotrophic ponds an organic layer may be absent or much reduced and the vegetation occurs on sand or mucky sand. Characteristic species include *Nymphaea odorata, Nymphoides cordata*, and *Eleocharis robbinsii*, with frequent associates including *Scleria reticularis, Gratiola aurea, Proserpinaca pectinata, Utricularia juncea, Brasenia schreberi, Pontederia cordata, Ludwigia* spp., *Utricularia* spp., and *Eriocaulon aquaticum*.
Range: This association is limited to the Atlantic and Coastal plains from southern New England to Maryland.
States/Provinces: DE:S?, MA:S2, MD:S?, NH:S?, NJ:S1S2, NY:S?, RI:S?
TNC Ecoregions: 58:C, 61:C, 62:C
USFS Ecoregions: 221A:CC, 221B:CC, 232Ac:CCC, 232C:CP
Synonymy: Coastal Plain Intermittent Pond (Breden 1989) B, New England coastal plain pondshore (Rawinski 1984)
References: Breden 1989, Breden et al. 2001, Rawinski 1984, Sneddon 1994, Swain and Kearsley 2001
Authors: ECS **Confidence:** 1 **Identifier:** CEGL006086

V.C.2.N.a.12. PODOSTEMUM CERATOPHYLLUM PERMANENTLY FLOODED HERBACEOUS ALLIANCE

Riverweed Permanently Flooded Herbaceous Alliance

Concept: Vegetation of shoals in rocky streambeds and riverbeds in mature drainage systems where the streams have cut down to rock, and the floodplain is relatively narrow; or on dams in moderately fast- to fast-flowing water. The vegetation grows attached to rocks in outcrops and stream rubble, or to dams in moderate- to fast-flowing water. This almost always is a monospecific community dominated by *Podostemum ceratophyllum* with no other vascular plants present; some Rhodophyta (red algae) may be present.
Comments: Vegetation of this alliance has been documented from the Sepulga River in the East Gulf Coastal Plain of Alabama. In the Interior Low Plateau of Tennessee, this vegetation is known from the upper Duck River at Manchester (Old Stone Fort State Park).
Range: This alliance is found in Alabama, Arkansas, Georgia, Kentucky, North Carolina, Oklahoma, South Carolina, Tennessee, Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.
States/Provinces: AL AR CT DE GA KY LA? MA MD ME NC NH NJ NY OK PA RI SC TN VA VT
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCP, 221Am:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCP, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222En:CCP, 222Eo:CCP, 231Af:CCC, 232Bj:CCC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCP, M221Aa:CC?, M221Ab:CC?, M221Ac:CCC, M221Ad:CC?, M221Bb:C??, M221Bd:C??, M221Be:C??, M221Bf:C??, M221Da:CC?, M221Dc:CCC, M221Dd:CCC, M222Aa:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: USFS (Daniel Boone, Oconee?, Ouachita, Ozark, Sumter, Uwharrie)
Synonymy: Rocky Bar and Shore, in part (Schafale and Weakley 1990); *Podostemum ceratophyllum* herbaceous alliance (Hoagland 1998a); Shoal and Stream Bar, in part (Nelson 1986)
References: DuMond 1970, Hoagland 1998a, Nelson 1986, Schafale and Weakley 1990, Tobe et al. 1992
Authors: A.S. WEAKLEY, MP, Southeast **Identifier:** A.1752

PODOSTEMUM CERATOPHYLLUM HERBACEOUS VEGETATION
Riverweed Herbaceous Vegetation
Rocky Bar and Shore (Riverweed Type) **G3G5 (02-08-19)**
Ecological Group (SCS;MCS): Appalachian Highlands Riverine Vegetation (457-10; n/a)

Concept: This association represents essentially monospecific beds of *Podostemum ceratophyllum*, although some algae may also be present. This submersed vegetation forms a low mat or crust attached to rocks in moderately fast- to fast-flowing water. Typical habitat for this association in the Central Appalachians and related areas includes rocky surfaces of streambeds and riverbeds in mature drainage systems where the streams have cut down to rock and the floodplain is relatively narrow, or on dams. It tends to be associated with higher pH streams which cut through diabase, limestone or calcareous shales.
Comments: *Podostemum* could easily be the poster child of Piedmont rivers (B. Adams pers. comm.); it is unlikely that many aquatic plant species in the Piedmont have been hit harder. It is very sensitive to sedimentation and, accordingly, has declined greatly throughout its range and has been lost from nearly all areas it once occupied in some drainages such as the Upper Neuse Basin of North Carolina (Adams pers. comm.). This vegetation has been documented from the Sepulga River in the East Gulf Coastal Plain of Alabama, the upper Duck River at Manchester (Old Stone Fort State Park) in the Interior Low Plateau of Tennessee, the Middle Oconee River, Georgia (Nelson and Scott 1962), the Eno River and formerly many sites in the Upper Neuse River Basin in the Piedmont of North Carolina (B. Adams pers. comm.), the Savannah River, and the Mechums and South Anna rivers in Virginia (Mulholland and Lenat 1992). It is apparently rare in Arkansas, found primarily in the Arkansas River and apparently in the Ouachita River (Smith 1988b). This type may also occur in the base-rich waters of the Shenandoah River and its two forks, the James River and portions of the Roanoke River (Fleming et al. 2001). In Georgia, this type appears to be restricted to the Piedmont and is apparently absent from the northwestern part of the state (Jones and Coile 1988).
Range: This community is wide-ranging, occurring in rivers throughout the eastern and southeastern United States.
States/Provinces: AL:S?, AR:S?, CT:S?, DE:S?, GA:S?, KY:S?, LA?, MA:S?, MD:S?, ME:S?, NC:S5, NH:S?, NJ:S?, NY:S?, OK:S?, PA:S?, RI:S?, SC:S?, TN:S?, VA:S?, VT:S?

TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 59:C, 60:C, 61:C
USFS Ecoregions: 212Fa:CCP, 212Fc:CCC, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 221Ae:CCC, 221Af:CCC, 221Ag:CCC, 221Ah:CCP, 221Ai:CCC, 221Al:CCP, 221Am:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CCP, 221Dc:CCP, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222En:CCP, 222Eo:CCP, 231Af:CCC, 232Bj:CCC, M212Bb:CCC, M212Bc:CCP, M212Bd:CCP, M221Aa:CC?, M221Ab:CC?, M221Ac:CCC, M221Ad:CC?, M221Bb:C??, M221Bd:C??, M221Be:C??, M221Bf:C??, M221Da:CC?, M221Dc:CCC, M221Dd:CCC, M222Aa:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: USFS (Daniel Boone, Oconee?, Ouachita, Ozark, Sumter, Uwharrie)
Synonymy: Open Water/Aquatic Bed Veg., Mountain Stream (Ambrose 1990a) B, Rocky Bar and Shore (Riverweed Subtype) (Schafale 1998b), River-weed shallow shore (CAP pers. comm. 1998), Mountain river (Wharton 1978)
References: Adams pers comm., Ambrose 1990a, Breden et al. 2001, CAP pers. comm. 1998, Campbell et al. 1990, Fleming et al. 2001, Hoagland 2000, Jones and Coile 1988, Mulholland and Lenat 1992, Nelson 1986, Nelson and Scott 1962, Peet et al. 2002, Schafale 1998b, Schafale and Weakley 1990, Smith 1988b, Thomas and Allen 1993, Wharton 1978
Authors: R.E. Evans, SCS **Confidence:** 2 **Identifier:** CEGL004331

V.C.2.N.a.17. VALLISNERIA AMERICANA PERMANENTLY FLOODED TEMPERATE HERBACEOUS ALLIANCE

Tape-grass Permanently Flooded Temperate Herbaceous Alliance

Concept: This alliance consists of aquatic vegetation in alluvial rivers and springs dominated by *Vallisneria americana*. The extent and distribution of this alliance is only partly understood. The habitat includes alluvial rivers, above or extending to the upper limit of tidal influence. Stands are dominated by submergent or emergent plants with only minor floating-leaved components. Stands in the northeastern United States may additionally contain *Potamogeton perfoliatus, Potamogeton epihydrus, Utricularia* spp., and *Eriocaulon aquaticum*. New River occurrences have *Elodea canadensis, Potamogeton foliosus*, and *Potamogeton nodosus*. Stands in Florida may have dominance or codominance by *Sagittaria kurziana* or *Stuckenia pectinata (= Potamogeton pectinatus)*. In addition, *Heteranthera dubia (= Zosterella dubia)* may be locally abundant. Further study is needed to fully characterize the variability in this alliance.
Range: This alliance occurs in Iowa, Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Kentucky, Virginia, West Virginia, North Carolina, and Florida; and in Canada in Ontario. It may occur in the Coastal Plain of Alabama, Georgia, and Mississippi. The species has a very broad range, extending from Nova Scotia to Minnesota and South Dakota south to Texas and east to Florida.
States/Provinces: AL? CT DE FL GA? IA KY MA MD ME MS? NC NH NJ NY ON PA RI SC? TN VA VT WV
TNC Ecoregions: 48:C, 50:C, 51:P, 52:C, 53:C, 55:C, 57:P, 59:C, 60:C, 61:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Ga:CCP, 221Bd:CCP, 221Hc:CCC, 231A:CC, 232Bf:CCC, 232Db:CCP, 232Dc:CCC, 251:P, M212:C, M221Aa:CCC, M221Ab:CCP, M221Ac:CCC, M221Ad:CC?, M221Ba:CPP, M221Bb:CP?, M221Bc:CP?, M221Bd:CP?, M221Be:CP?, M221Bf:CP?, M221Da:CP?, M221Db:CPP, M221Dc:CPP
Federal Lands: NPS (Acadia); USFS (Apalachicola, Daniel Boone, Jefferson?, Ocala)
Synonymy: Spring-run Stream, in part (FNAI 1990); Spring-run Stream, in part (FNAI 1992b); Tape-grass shallow shore (CAP pers. comm. 1998)
References: Allard 1990, CAP pers. comm. 1998, Campbell et al. 1990, FNAI 1990, FNAI 1992b, Faber-Langendoen et al. 1996, Schafale and Weakley 1990, Voss 1972, Wolfe 1990
Authors: M. PYNE, MP, East **Identifier:** A.1757

VALLISNERIA AMERICANA - POTAMOGETON PERFOLIATUS HERBACEOUS VEGETATION

Tape-grass - Clasping-leaf Pondweed Herbaceous Vegetation
Open Water Marsh with Mixed Submergents/Emergents **G5 (97-12-01)**
Ecological Group (SCS;MCS): Northern Marshes (490-20; n/a)

Concept: This aquatic vegetation of sheltered bays of the northeastern United States occurs on lakes and streams where it is not highly disturbed by wave action. The vegetation is dominated by submergent or emergent plants with only minor floating-leaved components. Characteristic species may include *Vallisneria americana,*

Potamogeton perfoliatus, Potamogeton epihydrus, Potamogeton nodosus, Heteranthera dubia, Heteranthera reniformis, Myriophyllum spp., *Elodea canadensis, Utricularia* spp., and *Eriocaulon aquaticum*.
States/Provinces: CT:S?, DE:S4?, MA:S?, MD:S?, ME:S5, NH:S?, NJ:S4, NY:S?, PA:S?, RI:S?, VT:S?, WV:S?
TNC Ecoregions: 59:C, 60:C, 61:C, 63:C
USFS Ecoregions: 212Cb:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Ga:CCP, 221Bd:CCP, 231:?, 232:P, M212:C, M221Aa:CCC, M221Ab:CC?, M221Ac:CCC, M221Ad:CC?, M221Ba:C??, M221Bb:C??, M221Bc:C??, M221Bd:C??, M221Be:C??, M221Bf:C??, M221Da:C??
Federal Lands: NPS (Acadia)
Synonymy: Tape-grass shallow shore (CAP pers. comm. 1998)
References: Breden et al. 2001, CAP pers. comm. 1998, Gawler 2002
Authors: ECS **Confidence:** 3 **Identifier:** CEGL006196

V.C.2.N.b. Permanently flooded-tidal temperate or subpolar hydromorphic rooted vegetation

V.C.2.N.b.2. CERATOPHYLLUM DEMERSUM PERMANENTLY FLOODED - TIDAL HERBACEOUS ALLIANCE

Coontail Permanently Flooded - Tidal Herbaceous Alliance

Concept: Wind-tidally flooded floating/submergent wetlands of fresh to oligohaline, river basin guts and large pools. This community is dominated (or codominated) by *Ceratophyllum demersum*. Other abundant species can include *Utricularia macrorhiza* and *Nymphaea odorata*. Other species include *Elodea nuttallii, Spirodela polyrrhiza, Wolffiella gladiata, Lemna* spp., and *Utricularia purpurea*. This alliance likely occurs in Louisiana, where it occupies lower (tidal) reaches of bayous.
Range: This alliance is found in Virginia, and possibly in Louisiana (?) and North Carolina (?).
States/Provinces: MD NC? VA
TNC Ecoregions: 57:C, 58:C
USFS Ecoregions: 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCC, 232Cj:CCC
References: Fleming 1998
Authors: G.P. FLEMING/A.S. WEAKLEY, JT, Southeast **Identifier:** A.1767

CERATOPHYLLUM DEMERSUM - VALLISNERIA AMERICANA - NAJAS SPP. TIDAL HERBACEOUS VEGETATION
Coontail - Tape-grass - Waternymph species Tidal Herbaceous Vegetation
Mixed Freshwater Subtidal Community **G? (02-05-13)**

Concept: This association comprises mixed freshwater subtidal aquatic beds of the mid-Atlantic coast. It occurs in fresh reaches of upper bays and tributaries within estuarine systems. Species composition is variable and includes *Vallisneria americana, Ceratophyllum demersum, Heteranthera dubia, Elodea canadensis, Najas guadalupensis, Najas gracillima, Najas minor, Potamogeton pusillus*, and others. There is often a strong component of exotic species that can be locally or extensively dominant including *Myriophyllum spicatum, Hydrilla verticillata*, and *Potamogeton crispus*, which may be indicative of poorer water quality. This association can have dramatic seasonal fluctuations in species composition and biomass.
Comments: This association is similar to *Stuckenia pectinata - Potamogeton perfoliatus - (Zannichellia palustris)* Tidal Herbaceous Vegetation (CEGL006027) in environment and has some overlap in species composition. It is distinguished by its higher species diversity (including the presence of several exotics) and the lack of dominance by *Potamogeton* species.
Range: The geographic range of this type is centered in the Chesapeake Bay estuary, it but likely occurs in other locations.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232Ad:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Ch:CCC, 232Cj:CCC
Synonymy: Freshwater Mixed Community (Moore et al. 2000)
References: Fleming 2001, Fleming et al. 2001, Moore et al. 2000, Orth and Moore 1988
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL006048

V.C.2.N.b.4. RUPPIA MARITIMA PERMANENTLY FLOODED - TIDAL TEMPERATE HERBACEOUS ALLIANCE

Beaked Ditch-grass Permanently Flooded - Tidal Temperate Herbaceous Alliance

Concept: This alliance includes communities of submerged, rooted aquatic vegetation occurring in tidal creeks, pools, and coves with brackish waters. The substrate is often mud-bottomed but may also include sand. Characteristic species include *Ruppia maritima, Vallisneria americana*, and *Stuckenia pectinata (= Potamogeton pectinatus)*. This is the most widely distributed seagrass alliance in eastern North America. It ranges around the entire Atlantic and Gulf coasts, from New England to Texas. This vegetation is patchily distributed along the Texas coast, where *Ruppia maritima* often occurs mixed with *Halodule beaudettei*. *Ruppia maritima* is the only seagrass capable of growing in freshwater and is therefore often found in the oligohaline to mesohaline upper reaches of estuaries and lower reaches of tidal creeks, bayous and rivers. Because it often behaves as an annual, the distribution and abundance of *Ruppia maritima* is often shifting both spatially and temporally.
Comments: Because floristic composition of occurrences of this alliance are similar, but the composition of other biota are thought to differ with geographic distribution, this alliance has been separated into several associations based on marine biogeographic provinces.
Range: This is the most widely distributed seagrass alliance in eastern North America. It ranges around the entire Atlantic and Gulf coasts, from New England to Texas. It is found in Florida, Louisiana, Mississippi, North Carolina, Texas, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia, and possibly Alabama (?), Georgia (?), and South Carolina (?).
States/Provinces: AL? CT DE FL GA? LA MA MD ME MS NC NH NJ NY RI SC? TX VA
TNC Ecoregions: 30:P, 31:C, 53:C, 55:C, 56:C, 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Db:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Af:CCC, 221Ak:CCC, 221Ba:CCP, 231Fb:PPP, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCP, 232Ch:CCC, 232Ci:CCP, 232Db:CCP, 232Dc:CCC, 232Dd:CCP, 232De:CCP, 232Eb:CPP, 232Ee:CPP, 232Gb:CPP, 255Da:CC?, 255Dc:CCC
Federal Lands: NPS (Acadia, Assateague Island); USFWS (Anahuac, Aransas, Big Boggy, Brazoria, Laguna Atascosa, McFaddin, Matagorda Island, San Bernard, St. Marks?)
Synonymy: Wigeon Grass Bed (Wieland 1994a); Wigeon Grass Bed (Wieland 1994b); Estuarine Subtidal: Saline/Brackish Flats (Swain and Kearsley 2001)
References: Kantrud 1991, Swain and Kearsley 2001, Wieland 1994a, Wieland 1994b
Authors: A.S. WEAKLEY, JT, Southeast **Identifier:** A.1769

RUPPIA MARITIMA ACADIAN/VIRGINIAN ZONE TEMPERATE HERBACEOUS VEGETATION
Beaked Ditch-grass Acadian/Virginian Zone Temperate Herbaceous Vegetation
Northern Atlantic Coast Beaked Ditch-grass Bed **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic Zone Tidal Aquatic Vegetation (201-10; n/a)

Concept: This brackish/saline tidal community of the central and northern Atlantic coast is dominated by *Ruppia maritima*. It occurs in large beds in estuarine bays as well as small patches within brackish tidal creeks. Substrates are sand or muck, and salinity is generally brackish. *Ruppia maritima* has a wide range of salinity tolerance and overlaps with other species, although generally not in the same locations. Common associates include *Zannichellia palustris, Stuckenia pectinata (= Potamogeton pectinatus)*, and *Potamogeton perfoliatus* in brackish/fresh areas or *Zostera marina* as waters get deeper and more saline. There can also be a diverse array of macroalgae.
Comments: *Ruppia maritima* tends to occur in shallower and slightly less saline waters than *Zostera marina* (Orth and Moore 1988). The range of this type is consistent with the "Virginian Province" and "Acadian Province" of Cowardin et al. (1979).
Range: This association occurs along the mid- and north Atlantic coast from Maine to North Carolina.
States/Provinces: CT:S?, DE:S4?, MA:S4, MD:S?, ME:S3, NC?, NH:S?,S?, NJ:S3S4, NY:S3S4,S3S4, RI:S?,S?, VA:S?
TNC Ecoregions: 57:?, 58:C, 62:C, 63:C
USFS Ecoregions: 212Db:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Af:CCC, 221Ak:CCC, 221Ba:CCP, 232Ac:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Polyhaline subtidal aquatic bed (Breden 1989). in part, *Ruppia* Community (Moore et al. 2000), Southern New England & Gulf of Maine Saline/ Brackish Subtidal Estuarine Community (Rawinski 1984)

References: Bowman 2000, Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Edinger et al. 2002, Enser 1999, Fleming 2001, Fleming et al. 2001, Gawler 2002, Metzler and Barrett 2001, Moore et al. 2000, Orth and Moore 1988, Rawinski 1984, Reschke 1990, Schafale and Weakley 1990, Sperduto 2000b, Swain and Kearsley 2001, Thayer et al. 1984
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006167

V.C.2.N.b.3. STUCKENIA PECTINATA - ZANNICHELLIA PALUSTRIS PERMANENTLY FLOODED - TIDAL HERBACEOUS ALLIANCE

Sago Pondweed - Horned Pondweed Permanently Flooded - Tidal Herbaceous Alliance

Concept: This alliance includes shallow subtidal fresh/brackish water and sediments exposed at extreme low tide. It supports a predominance of vascular aquatics such as *Stuckenia pectinata (= Potamogeton pectinatus), Potamogeton perfoliatus, Vallisneria americana, Elodea nuttallii*, and *Zannichellia palustris*, and occasionally *Ruppia maritima* as salinity begins to increase. Communities in this alliance occur in maritime coastal areas from Virginia north to Connecticut and in Louisiana and possibly Texas.
Range: This alliance is found in maritime coastal areas of Louisiana, Connecticut, Delaware, Maryland, New Jersey, Virginia, and possibly Texas. It is present in tidal waters of Lake Pontchartrain, Louisiana (L. Smith pers. comm.).
States/Provinces: CT DE LA MA MD NJ NY TX? VA
TNC Ecoregions: 31:C, 42:P, 58:C, 62:C
USFS Ecoregions: 212Db:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Ak:CCC, 221Ba:CCP, 231Fb:PPP, 232Aa:CCC, 232Ab:CCP, 232Ac:CCC, 232Br:CCP, 232Bx:CCP, 232Bz:CCP, 232Ch:CCP, 232Ec:CCC, 255Dc:PPP
Federal Lands: USFWS (Anahuac?, Aransas?, Big Boggy?, Brazoria?, McFaddin?, San Bernard?)
Synonymy: Estuarine Subtidal: Fresh / Brackish Flats (Swain and Kearsley 2001)
References: Smith pers. comm., Sneddon et al. 1996, Swain and Kearsley 2001
Authors: S.L. NEID, JT, East **Identifier:** A.1768

STUCKENIA PECTINATA - POTAMOGETON PERFOLIATUS - (ZANNICHELLIA PALUSTRIS) TIDAL HERBACEOUS VEGETATION

Sago Pondweed - Clasping-leaf Pondweed - (Horned Pondweed) Tidal Herbaceous Vegetation

G3G5 (97-12-01)

Ecological Group (SCS;MCS): Atlantic Zone Tidal Aquatic Vegetation (201-10; n/a)

Concept: This type includes vegetation of shallow subtidal fresh to slightly brackish water and mud or sand sediments exposed at extreme low tide occurring along the mid- and north Atlantic coast. Common and dominant species include *Stuckenia pectinata (= Potamogeton pectinatus), Zannichellia palustris, Vallisneria americana, Najas guadalupensis, Elodea nuttallii*, and *Ceratophyllum demersum*. *Ruppia maritima* may occur sporadically, but it is more prevalent in brackish and saline habitats. Invasive exotics often occur in this habitat, including *Myriophyllum spicatum* and *Trapa natans*. This association grades almost imperceptibly into brackish/saline aquatic bed vegetation.
Comments: The vegetation composition of this association intergrades with that of saline/brackish subtidal aquatic beds. This association can be distinguished from *Ruppia maritima* Acadian/Virginian Zone Temperate Herbaceous Vegetation (CEGL006167) in that *Stuckenia pectinata* and *Zannichellia palustris* rather than *Ruppia maritima* are strongly dominant. Southern analogs of fresh to oligohaline subtidal aquatic bed vegetation include *Ceratophyllum demersum - Utricularia macrorhiza - Nymphaea odorata* Herbaceous Vegetation (CEGL004661), which occurs in wind-tidal situations in the Chesapeake Bay area, and *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634) in the Gulf Coast. The vegetation composition of this association is very similar to, if not indistinguishable from, that of non-tidal submerged aquatic beds.
Range: This association occurs along the mid- and north Atlantic coast from Massachusetts to Virginia.
States/Provinces: CT:S?, DE:S1, MA:S2, MD:S?, NJ:S2S3, NY:S3S4,S3, VA:S?
TNC Ecoregions: 58:C, 62:C
USFS Ecoregions: 212Db:CCP, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CCP, 221Ak:CCC, 221Ba:CCP, 232Aa:CCC, 232Ab:CCP, 232Ac:CCC, 232Br:CCP, 232Bx:CCP, 232Bz:CCP, 232Ch:CCP
Synonymy: Polyhaline subtidal aquatic bed (Breden 1989). in part, *Potamogeton* Community (Moore et al. 2000), Southern New England & Gulf of Maine Fresh /Brackish Subtidal Estuarine Communities (Rawinski 1984)

References: Berdine 1998, Bowman 2000, Breden 1989, Breden et al. 2001, Edinger et al. 2002, Enser 1999, Fleming 2001, Fleming et al. 2001, Metzler and Barrett 2001, Moore et al. 2000, Rawinski 1984, Reschke 1990, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL006027

V.C.2.N.b.1. ZOSTERA MARINA PERMANENTLY FLOODED - TIDAL HERBACEOUS ALLIANCE

Eel-grass Permanently Flooded - Tidal Herbaceous Alliance

Concept: This alliance includes subtidal aquatic beds characterized by *Zostera marina*. These communities usually occur in quiet waters below the lowest tide level and where fluctuations in salinity are minor. Substrate ranges from soft mud to coarse sand. Light availability is the primary limiting factor in occurrences of this alliance, within the geographic, temperature, and salinity range (10-30 ppt) of *Zostera marina*. The long leaves of *Zostera marina* provide substrate for epiphytic organisms such as macroalgae, bay scallops, and other marine invertebrates, as well as nursery and/or adult habitat for fin fish. Characteristic associate nonvascular plants (algae) include *Ulva lactuca, Enteromorpha* spp., and *Polysiphonia* spp.
Comments: This alliance has a potential range of approximately 3090 km along the North American Atlantic coast (Thayer et al. 1984).
Range: This alliance is found in North Carolina, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia, and in Canada in Nova Scotia.
States/Provinces: CT DE MA MD ME NC NH NJ NY RI VA
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Cb:CPP, 212Da:CCP, 212Db:CCC, 212Dc:CCC, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221Ba:CCP, 232Aa:CCC, 232Ab:CCC, 232Ad:CCP, 232Af:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ch:CCP, 232Ci:CCC, 232Cj:CCC
Federal Lands: NPS (Assateague Island)
Synonymy: Marine Subtidal: Flats (Swain and Kearsley 2001); Estuarine Subtidal: Coastal Salt Pond (Swain and Kearsley 2001)
References: Sneddon et al. 1996, Swain and Kearsley 2001, Thayer et al. 1984
Authors: ECS, JT, East **Identifier:** A.1766

ZOSTERA MARINA HERBACEOUS VEGETATION
Eel-grass Herbaceous Vegetation
Eel-grass Meadow **G? (97-12-01)**
Ecological Group (SCS;MCS): Atlantic Zone Tidal Aquatic Vegetation (201-10; n/a)

Concept: These aquatic beds occur in the subtidal zone along the north Atlantic coast, south to North Carolina. *Zostera marina* is dominant and occurs most often in nearly pure stands. *Ruppia maritima* can occur sporadically in this association, especially as waters become less saline. Additional associated species include macroalgae, especially *Ulva lactuca, Enteromorpha* spp., *Cladophora* spp., and *Polysiphonia* spp. Where water is less saline, *Enteromorpha, Chaetomorpha, Gracilaria, Agardhiella, Ectocarpus*, and *Pilayella* can occur. Elevation/depth of the beds is determined by low tide level at the upper end and light penetration at the lower end, the latter being a function of water depth and turbidity. The beds generally occur in areas with only moderate wave action where salinity fluctuations are minor. Eel-grass beds tend to stabilize and enrich substrate and provide habitat for epiphytes and other marine organisms.
Comments: According to Thayer et al. (1984) *Zostera marina* has a range of approximately 3090 km along the North American Atlantic coast which may be represented as 4 smaller subregions. The bulk of the southern range corresponds with the Virginian Zone of Cowardin et al. (1979). *Zostera marina* is extirpated from Delaware.
Range: This community occurs in subtidal habitat along the north and mid-Atlantic coast.
States/Provinces: CT:S?, DE:SX, MA:S4,S4,S4,S2, MD:S?, ME:S?, NC:S?, NH:S1, NJ:S3, NY:S3, RI:S?, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212Db:CCC, 212Dc:CCC, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221Ba:CCP, 232Aa:CCC, 232Ab:CCC, 232Ad:CCP, 232Af:CCC, 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ci:CCC, 232Cj:CCC
Federal Lands: NPS (Assateague Island)

Synonymy: Polyhaline subtidal aquatic bed (Breden 1989), *Zostera* Community (Moore et al. 2000), Southern New England & Gulf of Maine Saline/ Brackish Subtidal Estuarine Community (Rawinski 1984), Coastal Salt Pond (Rawinski 1984)
References: Berdine 1998, Bowman 2000, Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Edinger et al. 2002, Enser 1999, Fleming 2001, Fleming et al. 2001, Metzler and Barrett 2001, Moore et al. 2000, Orth and Moore 1988, Rawinski 1984, Reschke 1990, Sperduto 2000b, Swain and Kearsley 2001, Thayer et al. 1984
Authors: S.L. Neid, ECS **Confidence:** 3 **Identifier:** CEGL004336

V.D.2.N.g. Seasonally flooded temperate annual grassland

V.D.2.N.g.1. ERAGROSTIS HYPNOIDES - LIPOCARPHA MICRANTHA - MICRANTHEMUM UMBROSUM SEASONALLY FLOODED HERBACEOUS ALLIANCE

Creeping Lovegrass - Small-flower Hemicarpha - Shaded Mudflower Seasonally Flooded Herbaceous Alliance

Concept: Seasonally flooded riverbanks, depressional wetlands, and other sandy shores, with a seasonal drawdown zone dominated by annuals, many of them diminutive. Includes annual-dominated drawdown banks of blackwater rivers and other seasonally flooded muddy to silty banks. Annuals dominate this community and can include *Eragrostis hypnoides, Lipocarpha micrantha, Lindernia dubia var. dubia, Lindernia dubia var. anagallidea, Micranthemum umbrosum, Oldenlandia uniflora, Cyperus strigosus, Bidens discoidea, Bidens frondosa, Fimbristylis perpusilla, Fimbristylis autumnalis*, and *Juncus pelocarpus*. Perennials are also present, including *Juncus repens, Cyperus strigosus, Helenium flexuosum, Gratiola aurea, Ludwigia sphaerocarpa, Polygonum hydropiperoides, Polygonum amphibium*, and *Sabatia kennedyana*, but the community is generally dominated by a sparse to dense turf of annuals, most of the cover from 2-10 cm tall.
Range: This alliance is found in the southeastern coastal plain of North Carolina, South Carolina, Virginia, ranging north to the Chesapeake Bay region of Maryland, and possibly elsewhere.
States/Provinces: GA? MD NC SC VA
TNC Ecoregions: 56:P, 57:C, 58:C
USFS Ecoregions: 232A:CC, 232B:CC, 232Cb:CCC, 232Ch:CCC
Synonymy: *Lindernia dubia - Eragrostis hypnoides - Panicum dichotomiflorum* Association (Rawinski 1997)
References: Berdine and Gould 1999, Ludwig 1996, Rawinski 1997
Authors: ECS/SCS, MOD. M. PYNE, MP, Southeast **Identifier:** A.1816

ERAGROSTIS HYPNOIDES - LUDWIGIA SPHAEROCARPA - POLYGONUM HYDROPIPEROIDES HERBACEOUS VEGETATION

Creeping Lovegrass - Globe-fruit Seedbox - Swamp Smartweed Herbaceous Vegetation

G? (00-04-17)

Ecological Group (SCS;MCS): Southeastern Coastal Plain Emergent Ponds and Marshes (345-30; n/a)

Concept: This seasonally flooded, depressional wetland of the central Atlantic Coastal Plain occupies the lowest portion of the basin and is flooded for the longest period relative to adjacent vegetation zones. In years of high rainfall resulting in incomplete drawdown, many species of this association persist in the seedbank below standing water. The substrate is an organic layer over black clay loam. The vegetation is dominated by small-statured herbs, including *Eragrostis hypnoides, Hottonia inflata, Polygonum hydropiperoides, Polygonum amphibium, Ludwigia sphaerocarpa, Oldenlandia uniflora, Cyperus strigosus, Bidens frondosa, Bidens discoidea, Fimbristylis perpusilla, Fimbristylis autumnalis*, and *Juncus pelocarpus*. Other species of taller stature may be present, including seedlings or small saplings of *Cephalanthus occidentalis* and herbaceous species *Panicum rigidulum, Carex striata, Carex gigantea*, and *Torreyochloa* sp.
States/Provinces: MD:S?, VA:S?
TNC Ecoregions: 58:C
USFS Ecoregions: 232A:CC, 232B:CC
Synonymy: *Lindernia dubia - Eragrostis hypnoides - Panicum dichotomiflorum* Association (Rawinski 1997)
References: Berdine and Gould 1999, Coulling 2002, Fleming et al. 2001, Rawinski 1997
Authors: ECS **Confidence:** 2 **Identifier:** CEGL006608

VII. SPARSE VEGETATION

VII.A.1.N.a. Cliffs with sparse vascular vegetation

VII.A.1.N.a.2. ASPLENIUM RUTA-MURARIA - PELLAEA ATROPURPUREA SPARSELY VEGETATED ALLIANCE

Wall-rue - Purple Cliffbrake Sparsely Vegetated Alliance

Concept: This alliance includes dry to rather moist limestone and dolomite outcrops, usually shaded by trees rooted in adjacent forested communities. Vascular and nonvascular vegetation are sparse in stands of this alliance. Calciphilic herbs, such as *Asplenium ruta-muraria, Pellaea atropurpurea, Pellaea glabella ssp. glabella, Asplenium resiliens, Aquilegia canadensis*, and others occupy suitable crevices. Moister microhabitats of the crevice may have mosses such as *Anomodon rostratus* and *Anomodon attenuatus*.
Range: This alliance is found in Alabama, Kentucky, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia, and possibly Georgia (?).
States/Provinces: AL GA? KY MD NC NH NY PA SC TN VA VT WV
TNC Ecoregions: 48:P, 50:C, 51:C, 59:C, 60:P, 61:C, 63:C, 64:P
USFS Ecoregions: 212Ec:CCC, 221A:CC, 221B:CC, 221Hb:CCC, 221Hc:CCC, 221Ja:CCC, 222Eo:CCC, 231Ak:C??, 231Ca:CPP, 231Cb:CPP, 231Cc:CPP, 231Cd:CPP, 231Ce:CPP, 231Cf:CPP, 231Cg:CPP, 231Da:CPP, 231Db:CPP, 231Dc:CPP, 231Dd:CPP, 231De:CPP, M212B:CP, M212C:CC, M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Be:CCC, M221Dc:CCC
Federal Lands: NPS (Great Smoky Mountains); USFS (Pisgah)
Synonymy: Montane Calcareous Cliff, in part (Schafale and Weakley 1990)
References: Schafale and Weakley 1990
Authors: SCS/ECS, RW, Southeast **Identifier:** A.1832

ASPLENIUM RUTA-MURARIA - PELLAEA ATROPURPUREA SPARSE VEGETATION
Wall-rue - Purple Cliffbrake Sparse Vegetation
Montane Cliff (Calcareous Type) **G3G4 (97-08-11)**
Ecological Group (SCS;MCS): Eastern Dry Alkaline Cliffs (430-50; 2.4.3.1)

Concept: This community includes calcareous cliffs associated with limestone or dolomite geology in Alabama, Kentucky, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia, and may possibly range into South Carolina. It has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. Calciphilic herbs, such as *Asplenium ruta-muraria, Pellaea atropurpurea, Pellaea glabella ssp. glabella, Asplenium resiliens, Aquilegia canadensis*, are characteristic. Moister microhabitats of the crevice may have mosses such as *Anomodon rostratus* and *Anomodon attenuatus*. This community includes dry to rather moist limestone and dolomite outcrops, usually shaded by trees rooted in adjacent forested communities.
Comments: This community is extremely uncommon in the Southern Blue Ridge.
Range: This community occurs in areas of limestone or dolomite geology from Pennsylvania south to Alabama. It is found primarily in the Ridge and Valley and Cumberland Plateau, but ranges into scattered areas in the Blue Ridge.
States/Provinces: AL:S?, GA?, KY:S?, MD:S?, NC:S1, PA:S?, SC:S?, TN:S?, VA:S?, WV:S?
TNC Ecoregions: 50:C, 51:C, 59:C, 60:P
USFS Ecoregions: 221Hb:CCC, 221Hc:CCC, 221Ja:CCC, 222Eo:CCC, M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Be:CCC, M221Dc:CCC
Federal Lands: NPS (Great Smoky Mountains); USFS (Pisgah)
Synonymy: IE1a. Southern Appalachian Calcareous Cliff (Allard 1990), Montane Cliff (Calcareous Subtype) (Schafale 1998b), Spleenwort-cliffbrake calcareous cliff (CAP pers. comm. 1998)
References: Allard 1990, CAP pers. comm. 1998, Fike 1999, Fleming et al. 2001, Schafale 1998b, Schafale and Weakley 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL004476

VII.C.2.N.a. Sand flats

VII.C.2.N.a.2. CAKILE EDENTULA SPARSELY VEGETATED ALLIANCE

Sea-rocket Sparsely Vegetated Alliance

Concept: Annual-dominated sand flats on island end flats and upper ocean beaches, within the reach of storm tides and extreme lunar tides. This alliance has less perennial species than the related *Cakile constricta* Sparsely Vegetated Alliance (A.1860), since the Atlantic Coast shoreline is a higher-energy system, and the alliance is more dynamic and more frequently disturbed. Vegetative cover is variable, depending on the amount of exposure to wave and wind action, but on average is sparse; no species can be considered dominant. Annual or biennial species more or less restricted to beach habitats are characteristic of this alliance, including *Cakile edentula ssp. edentula*, as well as *Salsola kali ssp. kali (= Salsola caroliniana), Chamaesyce polygonifolia, Honckenya peploides, Cenchrus tribuloides, Amaranthus retroflexus, Chenopodium album, Erechtites hieraciifolia*, and *Atriplex cristata (= Atriplex arenaria)*. Associated species include *Ammophila breviligulata, Chamaesyce polygonifolia, Salsola kali ssp. kali*, and *Triplasis purpurea*. At Assateague Island National Seashore, this alliance is sparsely vegetated with *Cakile edentula ssp. edentula*, covering approximately 1% of the area. Other associated species in this alliance are just as sparse and generally adapted to a low growth form, given the exposed windy conditions of their environment. The South Atlantic Coast phase of this alliance occupies the upper portion of ocean beaches in the southern part (Cape Hatteras, North Carolina, to Cape Romain, South Carolina) of the microtidal region (barrier islands with coastal geomorphology dominated by hurricane overwash rather than tidal energy). Other characteristic species include mostly annual herbs, such as *Chamaesyce polygonifolia, Chamaesyce bombensis, Sesuvium portulacastrum, Salsola kali ssp. kali*, and the rare *Amaranthus pumilus*. In addition to the two associations in the Southeast, there is also an association in the Great Lakes; in this association the dominant plant is *Cakile edentula ssp. edentula var. lacustris*.
Range: This alliance is found in Florida (?), Georgia (?), North Carolina, South Carolina, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Virginia, Illinois, Indiana, Michigan, Ohio, and Wisconsin; and in Canada in Ontario.
States/Provinces: CT DE FL? GA? IL IN MA MD ME MI NB? NC NF? NH NJ NS? NY OH ON PA PE? RI SC VA WI
TNC Ecoregions: 48:C, 56:C, 57:C, 58:C, 62:C, 63:C, 64:C
USFS Ecoregions: 212Cb:CCC, 212Db:CCC, 212Dc:CCC, 212Ec:CPP, 212Hd:CCC, 212He:CCC, 212Hi:CCP, 212Hj:CCC, 212Hw:CCP, 212Ia:CPP, 212Ja:CPP, 212Oa:CCC, 212Ob:CCC, 221Aa:CCP, 221Ab:CCC, 221Ac:CCC, 221Ad:CCP, 221Ak:CCC, 222Ia:CCC, 222If:CCC, 222Jj:CCC, 222Kg:CCC, 222Qa:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, M411A:CC
Federal Lands: NPS (Acadia, Assateague Island, Cape Hatteras, Cape Lookout, Fire Island); USFWS (Cape Romain)
Synonymy: Upper Beach, in part (Schafale and Weakley 1990); Maritime Grassland, in part (Nelson 1986); Beach community (Hill 1986); Beach community (Johnson 1985b); beach community (Baumann 1978b); beach (Higgins et al. 1971); beach (Fender 1937); beach (McDonnell 1979); pioneer beach community (Boule 1979); dune-strand area (Clovis 1968); dune community (Jenkins 1974); middle beach (Shreve et al. 1910); middle beach (Nichols 1920); *Cakiletum edentula* (Conard 1935); sea-strand vegetation, beach formation (Harshberger 1900); embryo dune (Klotz 1986); maritime beach (Reschke 1990); beach vegetation (Moul 1973); marine sandy beach (Clancy 1993b); Marine intertidal gravel/sand beach community (Breden 1989); coastal beach strand (Sperduto 1994); Beach strand community (MENHP 1991); *Cakile edentula-Chenopodium album* community (Metzler and Barrett 1992); dune and swale community, in part (Stalter 1990); Maritime Beach Strand Community (Swain and Kearsley 2001); Great Lakes Region sparsely vegetated beach (Fike 1999); Eastern Great Lakes Beach (Smith 1991)
References: Baumann 1978b, Boule 1979, Breden 1989, Clancy 1993b, Clovis 1968, Conard 1935, Fender 1937, Fike 1999, Harshberger 1900, Higgins et al. 1971, Hill 1986, Jenkins 1974, Johnson 1985b, Klotz 1986, MENHP 1991, McDonnell 1979, Metzler and Barrett 1992, Moul 1973, Nelson 1986, Nichols 1920, Reschke 1990, Schafale and Weakley 1990, Shreve et al. 1910, Smith 1991, Sperduto 1994, Stalter 1990, Swain and Kearsley 2001
Authors: ECS, JT, East **Identifier:** A.1861

CAKILE EDENTULA SSP. EDENTULA - CHAMAESYCE POLYGONIFOLIA SPARSE VEGETATION
Sea-rocket - Northern Seaside Spurge Sparse Vegetation
North Atlantic Upper Ocean Beach **G4G5 (97-12-01)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Beach Vegetation (230-10; n/a)

Concept: This is a sparsely vegetated upper beach community occurring on unstable sands and often gravels and cobbles just above mean high tide on maritime beaches and foredunes along the middle and northern Atlantic coast. This association occurs at the wrack line; there is regular deposition of wave-deposited flotsam. They are irregularly flooded by spring or storm tides. Vegetation cover is variable, depending on the amount of exposure to wave and wind action, but is generally sparse and characterized by annuals and biennials. Species composition can change dramatically from year to year but frequently includes *Cakile edentula ssp. edentula*, as well as *Salsola kali ssp. kali (= Salsola caroliniana), Chamaesyce polygonifolia, Honckenya peploides, Cenchrus tribuloides, Amaranthus retroflexus, Chenopodium album, Erechtites hieraciifolia, Xanthium strumarium*, and *Atriplex cristata (= Atriplex arenaria)*. Globally rare species such as *Polygonum glaucum* and *Amaranthus pumilus* occur in this habitat. Sparse *Ammophila breviligulata* can occur sporadically as a common associate, colonizing from the adjacent beachgrass community. Diagnostic species are *Cakile edentula ssp. edentula, Salsola kali ssp. kali, Atriplex cristata (= Atriplex pentandra)*, and *Chamaesyce polygonifolia*. This community occurs in maritime coastal areas from southern Maine to Cape Hatteras, North Carolina.
Comments: This community is common on maritime dunes of the Northeast, but is vulnerable to development and shifting wave action due to jetties.
Range: This association ranges from southern Maine to Virginia.
States/Provinces: CT:S?, DE:S?, MA:S3, MD:S?, ME:S4, NC:S3, NH:S2, NJ:S1S2, NY:S5, RI:S?, VA:S?
TNC Ecoregions: 57:C, 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ak:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bz:CCC, 232Ch:CCC
Federal Lands: NPS (Assateague Island, Fire Island)
Synonymy: Beach community (Baumann 1978b) =. Virginia., Beach community (Hill 1986) =. Assateague Island., Beach community (Johnson 1985b), Beach (Fender 1937) =. New Jersey., Beach (Higgins et al. 1971) =. Assateague Island., Beach (McDonnell 1979) =. Massachusetts., Pioneer beach community (Boule 1979) =. Virginia., Dune-strand area (Clovis 1968) =. Virginia., Dune community (Jenkins 1974) =. Chesapeake Bay., Middle beach (Shreve et al. 1910) =. Maryland., Middle beach (Nichols 1920) =. Connecticut., *Cakiletum edentula* (Conard 1935) =. New York., Sea-strand vegetation, beach formation (Harshberger 1900) =. New Jersey., Embryo dune (Klotz 1986) =, Beach vegetation (Moul 1973) =. Massachusetts., Marine sandy beach (Clancy 1993b) =. Delaware., Marine intertidal gravel/sand beach community (Breden 1989) =. New Jersey., Coastal beach strand (Sperduto 1994) =. New Hampshire., Beach strand community (MENHP 1991) =. Maine., *Cakile edentula - Chenopodium album* community (Metzler and Barrett 1992) =. Connecticut., Dune and swale community (Stalter 1990) B. Virginia portion of Assateague., Coastal beach strand community (Rawinski 1984), Maritime beach (Reschke 1990) =. New York.
References: Baumann 1978b, Berdine 1998, Boule 1979, Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1993b, Clovis 1968, Conard 1935, Edinger et al. 2002, Enser 1999, Fender 1937, Fleming et al. 2001, Gawler 2001, Gawler 2002, Godfrey et al. 1978, Harshberger 1900, Higgins et al. 1971, Hill 1986, Jenkins 1974, Johnson 1985b, Klotz 1986, MENHP 1991, McDonnell 1979, Metzler and Barrett 1992, Metzler and Barrett 2001, Moul 1973, Nichols 1920, Rawinski 1984, Reschke 1990, Schafale and Weakley 1990, Shreve et al. 1910, Sperduto 1994, Sperduto 2000b, Stalter 1990, Swain and Kearsley 2001
Authors: S.L. Neid, ECS **Confidence:** 2 **Identifier:** CEGL004400

VII.C.2.N.d. Tidal sand flats

VII.C.2.N.d.3. SESUVIUM SPP. - ATRIPLEX SPP. - SUAEDA SPP. TIDAL SPARSELY VEGETATED ALLIANCE

Sea-purslane species - Saltbush species - Sea-blite species Tidal Sparsely Vegetated Alliance

Concept: This alliance tends to occur on the backside of the ends of barrier islands and is irregularly flooded but does not accumulate salt like *Salicornia* or *Distichlis* (maybe should be in separate formation). Physiognomy tends to be of scattered mound-like clumps of vegetation (mostly *Sesuvium portulacastrum*) in a wet sand flat.
Comments: This alliance will need revision, and possibly splitting, when more information is available.

Range: This alliance is found in North Carolina, South Carolina, and others to the south.
States/Provinces: AL FL? GA? MD MS? NC SC VA
TNC Ecoregions: 53:C, 56:P, 57:C, 58:C
USFS Ecoregions: 232Ci:CCC, 232Dd:CCC
Federal Lands: NPS (Assateague Island); USFWS (Bon Secour)
Synonymy: Upper Beach, in part (Schafale and Weakley 1990); Salt Flat, in part (Nelson 1986)
References: Nelson 1986, Schafale and Weakley 1990
Authors: A.S. WEAKLEY, JT, Southeast **Identifier:** A.1868

SESUVIUM PORTULACASTRUM - ATRIPLEX SPP. - SUAEDA SPP. SPARSE VEGETATION
Shoreline Sea-purslane - Saltbush species - Sea-blite species Sparse Vegetation
Coastal Bay Shore / Succulent Beach **G3 (97-08-11)**
Ecological Group (SCS;MCS): Atlantic and Gulf Coast Beach Vegetation (230-10; n/a)

Concept: This association represents irregularly flooded beach vegetation along the Atlantic and northern Gulf of Mexico coasts. Examples tend to occur on the back side of the ends of barrier islands; where they are only irregularly flooded. In contrast to *Salicornia*- or *Distichlis*-dominated areas they apparently accumulate less salt. Its physiognomy tends to be of scattered mound-like clumps of vegetation (mostly *Sesuvium portulacastrum*) in a wet sand flat.
Range: This community occurs along the Atlantic Ocean and portions of the northern Gulf of Mexico.
States/Provinces: AL:S?, FL?, GA?, MD:S?, MS?, NC:S3, SC:S?, VA:S?
TNC Ecoregions: 53:C, 56:P, 57:C, 58:C
USFS Ecoregions: 232Ci:CCC, 232Dd:CCC
Federal Lands: NPS (Assateague Island); USFWS (Bon Secour)
References: Fleming et al. 2001, Lea 2002b, Nelson 1986, Schafale and Weakley 1990
Authors: SCS **Confidence:** 2 **Identifier:** CEGL004406

REFERENCES CITED

Allard, D. J. 1990. Southeastern United States ecological community classification. Interim report, Version 1.2. The Nature Conservancy, Southeast Regional Office, Chapel Hill, N. C. 96 p.

Ambrose, J. 1990. Georgia's natural communities -- A preliminary list. Unpubl. doc. Ga. Nat. Heritage Inv. Social Circle, GA. 5 p.

Anderson, J. R., E. E. Hardy, and J. T. Roach. 1976. Land Use and Land Cover Classification System for Use with Remote Sensing Data. Geological Survey Professional Paper 964. A revision of the land use classification system as presented in U.S. Geological Circular 671. U.S. Government Printing Office, Washington, DC.

Anderson, M., P. Bourgeron, M. T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D. H. Grossman, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A. S. Weakley. 1998. Terrestrial vegetation of the United States. Volume II: List of vegetation types. The Nature Conservancy, Arlington, VA.

Bailey, R. G. 1994. Ecoregions of the United States (revised map). U.S. Department of Agriculture, Forest Service. Washington, D. C.

Bailey, R. G. 1981. Ecoregions of North America (map). U.S. Department of Agriculture, Forest Service. Washington, D. C.

Berdine, M.A. 1996. Maryland Vegetation Classification. Maryland Department of Natural Resources. Annapolis, MD.

Birks, H. J. B. 1996. Contributions of Quaternary palaeoecology to nature conservation. J. Veg. Sci. 7 :89-98.

Braun-Blanquet, J. 1965. Plant sociology: the study of plant communities. (English translation of 2nd ed.) (Trans. rev. and ed. by C. D. Fuller and H. S. Conard) Hafner, London. 439 p.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Dep. Inter., Fish Wildl. Serv., Biol. Serv. Prog. Washington, D. C. FWS/OBS-79/31. 103 p.

Daubenmire, R. 1952. Forest vegetation of northern Idaho and adjacent Washington and its bearing on concepts of vegetation classification. Ecol. Monogr. 22:301-330.

Diamond, D. D. 1993. Classification of the plant communities of Texas (series level). Unpubl. doc. Tex. Nat. Heritage Prog. Austin. 25 p.

Driscoll, R. S., D. L. Merkel, D. L. Radloff, D. E. Snyder, and J. S. Hagihara. 1984. An ecological land classification framework for the United States. U.S. Dep. Agric., For. Serv. Misc. Publ. No. 1439. Washington, D. C. 56 p.

Evans, M. 1991. Kentucky ecological communities. Unpubl. doc. Kent. Nat. Pres. Comm. Frankfort, KY. 19 p.

Eyre, F. H., ed. 1980. Forest cover types of the United States and Canada. Soc. Am. For. Washington, D. C. 148 p.

FGDC [Federal Geographic Data Committee]. 1997. Vegetation classification standard, FGDC-STD-005. Web address: http://www.fgdc.gov/Standards/Documents/Standards/Vegetation. DC 1996

Flahault, C., and C. Schroter. 1910. Raport sur la nomenclature phytogeographique. Proc. Third Internat. Bot. Congress. Brussels, Belgium. Vol.1:131-164.

Florida Natural Areas Inventory. 1992. Natural community classification. Unpubl. doc. The Nature Conservancy, Fla. Nat. Areas Inv. Tallahassee. 16 p.

Foti, T. 1994. Natural communities of Arkansas (terrestrial and palustrine). Unpubl. doc. Ark. Nat. Heritage Comm. Little Rock. 2 p.

Grossman, D. H., K. Lemon Goodin, and C. L. Reuss, eds. 1994. Rare plant communities of the conterminous United States: An initial survey. The Nature Conservancy. Arlington, Va. 620 p.

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 Standard. The Nature Conservancy. Arlington, VA.

Hoagland, B. W. 1997. Preliminary plant community classification for Oklahoma. Unpubl. draft doc. version 35629. Univ. of Okla., Okla. Nat. Heritage Inv. Norman, OK. 47 p.

Hunter, M. 1991. Coping with ignorance: the coarse-filter strategy for maintaining biodiversity. Pages 256-281 in K. A. Kohm, ed., Balancing on the Brink of Extinction-the Endangered Species Act and Lessons for the Future. Island Press, Washington, D. C.

Jenkins, R. E. 1976. Maintenance of natural diversity: approach and recommendations. Pages 441-451 in Transactions of the 41st North American Wildlife Conference, 4 March 1976, Washington, D.C. Wildlife Management Institute, Washington, D. C.

Keys, J. E., C. A. Carpenter, S. L. Hooks, F. G. Koenig, W. H. McNab, W. E. Russell and M.-L. Smith. 1995. Ecological units of the eastern United States - First approximation (map). Atlanta, GA. U. S. Dep. Agric., For. Serv.

Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York. 547 p.

Nelson, J. B. 1986. The natural communities of South Carolina: Initial classification and description. S.C. Wildl. Mar. Resour. Dep., Div. Wildl. Freshwater Fish. Columbia, SC. 55 p.

Oberholster, C. 1993. Preliminary list of natural communities of Alabama. Unpubl. doc. Ala. Dep. Conserv. and Nat. Resour., Nat. Heritage Section. Montgomery, AL. 6 p.

Pfister, R. D., and S. F. Arno. 1980. Classifying forest habitat types based on potential climax vegetation. Forest Science 26:52-70.

Pyne, M. 1994. Tennessee natural communities. Unpubl. doc. Tenn. Dep. Conserv., Ecol. Serv. Div. Nashville. 7 p.

Rawinski, T. J. 1992. A classification of Virginia's indigenous biotic communities: Vegetated terrestrial, palustrine, and estuarine community classes. Unpubl. doc. Va. Dep. Conserv. and Recreation, Div. Nat. Heritage. Nat. Heritage Tech. Rep. No. 92-21. Richmond, VA. 25 p.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina. Third approximation. N.C. Dep. Environ., Health, Nat. Resour., Div. Parks and Recreation, Nat. Heritage Prog. Raleigh. 325 p.

Schrader-Frechette, K. S., and E. D. McCoy. 1993. Methods in Ecology: Strategies for Conservation. Cambridge Univ. Press, NY. 328 p.

Smith, L. M., comp. 1996. Natural plant communities in Louisiana currently recognized by the Louisiana Natural Heritage Program. -- November 1996. Unpubl. doc. La. Dep. Wildl. and Fish., Nat. Heritage Prog. Baton Rouge. 3 p.

The Nature Conservancy. 1997. Designing a Geography of Hope: Guidelines for Ecoregion-Based Conservation in The Nature Conservancy. Ecoregional Planning Group. The Nature Conservancy, Arlington, VA. 84 p.

UNESCO. 1973. International classification and mapping of vegetation, Series 6, ecology and conservation. United Nations Educational, Scientific, and Cultural Organization. Paris. 93 p.

van der Maarel, E., and F. Klötzli. 1996. Community ecology and conservation biology: Introduction. Journal of Vegetation Science 7:6.

Weakley, A. S. 1997. International Classification of Ecological Communities: Vegetation of the West Indies (Cuba, the Greater Antilles, the Lesser Antilles, the Bahamas, and tropical Florida). Working draft of June 1997. The Nature Conservancy, Southeast Regional Office, Southern Conservation Science Department, Community Ecology Group, Chapel Hill, NC.

Weakley, A. S., K. D. Patterson, S. Landaal, M. Gallyoun, and others, compilers. 1996. International Classification of Ecological Communities: Terrestrial Vegetation of the southeastern United States. Working draft of April 1996. The Nature Conservancy, Southeast Regional Office, Southern Conservation Science Department, Community Ecology Group, Chapel Hill, NC.

Westhoff, V., and E. van der Maarel. 1973. The Braun-Blanquet approach. P. 618-725 in R. H. Whittaker, ed. Ordination and classification of communities. Dr. W. Junk Publishers, The Hague. 737 p.

Whittaker, R. H. 1962. Classification of natural communities. Bot. Rev. 28:1-239.

Wieland, R. G. 1994. Mississippi Natural Heritage Program: Ecological communities. Unpubl. doc. Miss. Dep. Wildl., Fish., and Parks, Mus. Nat. Sci., Nat. Heritage Prog. Jackson, Miss. 7 p.

APPENDIX 1-STATE AND GLOBAL RANKING DEFINITIONS

The following are definitions of the state and global rankings of rare species and communities 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.

APPENDIX 2 – GLOSSARY OF TERMS

alluvial
characterized by the deposition of sediment by a stream or other running water at any point along its course.

alpine
the zone on mountain tops between permanent snow and the cold limits of trees.

annual
plant species that complete their life-cycles within a single growing season.

annual vegetation
associations that persist for less than one year, or are dominated by annual species.

biennial
plant species that complete their life-cycles within two growing seasons.

boreal
northern biogeographical region typically referring to subpolar and cold temperate areas.

brackish
tidal water with a salinity of 0.5-30 parts per thousand.

broad-leaved
describes a plant with leaves that have well-defined leaf blades and are relatively wide in outline (shape) as opposed to needle-like or linear; leaf area is typically greater than 500 square millimeters or 1 square inch.

bryophyte
nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts.

bunch grass
multi-stemmed (caespitose) life form of grasses characterized by clumps of erect shoots that slowly spread horizontally by tillers, generally creating distinct individual plants spaced across the ground; often applied to sedges and other graminoids with similar life forms.

caespitose (cespitose)
describes a low branching pattern from near the base that forms a multi-stemmed or a bunched appearance.

cliff
any high, very steep to perpendicular, or overhanging face of a rock outcrop.

cloud forest
tropical and subtropical montane forest characterized by a high incidence of low-level cloud cover, usually at the canopy level, promoting development of an abundance of vascular epiphytes.

cold-deciduous
describes a plant that sheds its leaves as a strategy to avoid seasonal periods of low temperature, often initiated by photoperiod; applied to vegetation adapted to seasonal cold season influences (temperate).

conical-crowned
describes a needle-leaved evergreen tree with a pyramidal or cone-shaped canopy or life form; for example, Douglas fir and silver fir (*Pseudotsuga menziesii* and *Abies amabilis*).

creeping
describes the pattern of stems growing at or just beneath the surface of the ground and usually producing roots at nodes.

crustose lichen
lichen life form that grows in intimate contact with its substrate, lacks a lower cortex and rhizoids (root-like structures), and is impossible to separate from the substrate without destroying the thallus; lichen with an unlobed, flattened thallus, growing adnate to the substrate.

cushion plant
a low, woody, plant life form so densely branched that it forms a compact canopy that is pad- or bolster-like in appearance; usually with microphyllous foliage; characteristic of alpine and tundra plants.

cylindrical-crowned
describes a needle-leaved evergreen tree with a narrow, essentially cylinder-shaped canopy or life form; for example, subalpine fir and black spruce (*Abies lasiocarpa* and *Picea mariana*).

deciduous
describes a woody plant that seasonally loses all of its leaves and becomes temporarily bare-stemmed.

deciduous vegetation
associations in which deciduous woody plants generally contribute 75 percent or more to total dominant plant cover.

dominant
an organism, group of organisms, or taxon that by its size, abundance, or coverage exerts considerable influence upon an association's biotic (such as structure and function) and abiotic (such as shade and relative humidity) conditions.

drought-deciduous
describes a plant that sheds its leaves as a strategy to avoid seasonal periods of high transpiration demand; applied to vegetation adapted to climates with seasonal drought and little cold-season influence (tropical-subtropical).

dwarf-shrub
low-growing shrub life form usually under 0.5 meters or 1.5 feet tall (never exceeding 1 meter or 3 feet tall) at maturity.

dwarf-shrubland
vegetation dominated by low-growing shrubs and/or trees, usually under 0.5 meters or 1.5 feet tall; dwarf-shrubs generally form greater than 25 percent cover, although (rarely) may be less, and tree and taller shrubs generally form less than 25 percent cover.

ephemeral forb vegetation
annual associations or synusiae that, during favorable periods, dominate areas which are usually sparsely vegetated or unvegetated for most of the year.

epiphyte
vascular plant that grows by germinating and rooting on other plants or other perched structures; sometimes called "air plants."

episodic forb vegetation
herbaceous-dominated associations that occupy areas periodically denuded of vegetation.

ericoid
plants of the Heath Family or Family Eriaceae; for example, heaths, rhododendrons, and blueberries (*Erica*, *Rhododendron*, and *Vaccinium*).

evergreen
describes a plant that has green leaves all year round; or a plant that in xeric habitats has green stems or trunks and never produces leaves.

evergreen vegetation
associations in which evergreen woody plants generally contribute 75 percent or more to total dominant plant cover; vegetation canopy is never without photosynthetic tissue.

extremely xeromorphic
associations that are adapted primarily to growing in drought-persistent environments, and are only secondarily adapted to other environmental stresses; plants typically have several well-developed xeromorphic characteristics.

facultatively deciduous
describes evergreen species that shed leaves only under extreme conditions; this strategy is often associated with plants found in semiarid saline/alkaline environments; for example, *Atriplex-Kochia* saltbush in Australia and North America.

foliose lichen
lichen life form that is leafy in appearance and loosely attached to its substrate; lichen with a lobed, flattened thallus growing loosely attached to the substrate, the lobes flattened or inflated with distinctly differentiated upper and lower surfaces; umbilicate lichens are included.

forb
a broad-leaved herbaceous plant.

forest
vegetation dominated by trees with their crowns overlapping, generally forming 60 - 100 percent cover; includes reproductive stages or immature secondary growth stands that are temporarily less than 5 meters or 16.5 feet tall.

fresh water
water with a salinity of less than 0.5 parts per thousand.

fruticose lichen
lichen life form that is bunched, shrubby or "hairy" in appearance and loosely attached to its substrate; lichen with the thallus branched, the branches solid, or hollow and round, or flattened without distinctly differentiated upper and lower surfaces; squamulose lichens are included.

giant
describes mature forests in which the height of a typical canopy exceeds 50 meters or 165 feet.

graminoid
grasses, and grass-like plants including sedges and rushes.

grassland
vegetation dominated by perennial graminoid plants.

growth form
the shape or appearance of a plant.

hemi-sclerophyllous
describes a plant with stiff, firm, leathery leaves that partially retain their rigidity during wilting; for example, rhododendron and salal (*Rhododendron* and *Gaultheria*).

herb
a vascular plant without significant woody tissue above or at the ground; an annual, biennial, or perennial plant lacking significant thickening by secondary woody growth, with perennating buds borne at or below the ground surface (hemicryophytes, geophytes, helophytes, and therophytes of Raunkier).

herbaceous vegetation
vegetation in which herbs (mostly graminoids, forbs, and ferns) form at least 25 percent cover, and woody vegetation has generally less than 25 percent cover; herbaceous cover may be less than 25 percent in cases where the cover of each of the other life forms present is less than 25 percent and herbaceous cover exceeds the cover of the other life forms.

hygromorphous herbs
herbaceous plants structurally adapted for life in water-dominated or aquatic habitats.

intermittently flooded
substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not seasonally predictable and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used elsewhere when appropriate. This modifier can be applied to both wetland and non-wetland situations. Equivalent to Cowardin's Intermittently Flooded modifier.

irregularly exposed
land surface is exposed by tides less often than daily; the area from mean low tide to extreme low spring tide. Equivalent to Cowardin's Irregularly Exposed.

irregularly flooded
tidal water floods land surface less often than daily. The area must be flooded by tides at least once yearly as a result of extreme high spring tide plus wind plus flow. The area extends from mean high water inland to the maximum extent of tide plus the splash zone. Equivalent to Cowardin's Irregularly Flooded except in tidal Riverine, Lacustrine, and Palustrine areas where if an area is only irregularly flooded by fresh tidal waters, the appropriate non-tidal modifier, e.g., Temporarily Flooded, Seasonally Flooded, Semipermanently Flooded, will apply.

krummholz
growth form assumed by tree species at the upper treeline or in the alpine zone; characterized by a creeping and multi-stemmed growth pattern due to desiccation and physical damage caused by wind and blowing ice crystals near the upper treeline; the same species grows as an erect, single-stemmed tree at lower elevation.

lichen
an organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in symbiotic association.

lignified
describes a plant with woody tissue developed by secondary cell wall thickening by lignin and cellulose.

life form
the shape or appearance of a plant that mostly reflects inherited or genetic influences.

low forb
a broad-leaved herbaceous plant usually less than 1 meter or 3 feet tall when inflorescences are fully developed.

lowland
a large land area with vegetation reflecting limits set by regional climate and soil/site conditions; an area where elevation is not the primary gradient affecting vegetation zonation.

matted
describes a creeping plant that by reiterative growth has overlapping stems and forms a low, dense ground cover.

medium-tall grassland
graminoid-dominated vegetation usually between 0.5 to 1 meter or 1.5 to 3 feet tall when inflorescences are fully developed in temperate zones, and to 2 meters or 6 feet in tropical zones.

microphyllous
describes a plant with small leaves; individual leaf surface areas are less than 500 square millimeters or one square inch.

mixed evergreen-deciduous
describes vegetation in which evergreen and deciduous species each generally contribute 25-75 percent to the total canopy cover.

montane
describes the zone in mountainous regions where the influence of altitude (vertical relief) results in local climatic regimes that are sufficiently different from those in the adjacent lowlands as to cause a complex vertical climate-vegetation-soil zonation; includes vegetation at the base of a mountain when it is different from lowland vegetation.

natural/semi-natural
describes vegetation that has not been planted or treated with an annual management or manipulation regime.

needle-leaved
describes a plant with slender, elongated leaves; for example, pine and fir trees (*Pinus* and *Abies*).

nonvascular plant
a plant without specialized water or fluid conductive tissue (xylem and phloem); includes bryophytes, lichens, and algae.

nonvascular vegetation
vegetation that is dominated by bryophytes and lichens, generally forming at least 25 percent cover, with other vegetation forming less than 25 percent cover; nonvascular cover may be less than 25 percent in cases where the cover of each of the other life forms present is less than 25 percent and nonvascular cover exceeds the cover of other life forms.

pavement
a relatively flat surface of consolidated material, generally exposed bedrock.

perennial
plant species with a life-cycle that characteristically lasts more than two growing seasons and persists for several years.

perennial herbaceous vegetation
associations that persist for several years and are dominated by herbaceous species.

planted/cultivated
describes vegetation planted by humans and/or treated with annual management; usually dominated by plants not indigenous to the area.

polar
geographically, the areas within the Arctic and Antarctic circles in which the sun is entirely not visible for six months, and is constantly above the horizon for the next six months; climatically, polar regions are characterized by the lack of a period of warmth and by enduring cold; in polar climates the average temperature of each month is below 10º C (50º F).

pulvinate mosses
mosses growing in cushion-like mats or clumps.

rainforest
vegetation in frost-free areas dominated by trees that are always wet from rain.

regularly flooded
tidal water alternately floods and exposes the land surface daily, from mean low (lower low on West Coast) to mean high (higher high on West Coast). Equivalent to Cowardin's Regularly Flooded.

revolute
rolled toward the lower surface of a leaf.

rosulate
a plant with leaves arranged in rosettes (circular clusters).

rounded-crowned
describes a needle-leaved evergreen tree with a basically semi-circular canopy or life form; for example, whitebark pine and alligator juniper (*Pinus albicaulis* and *Juniperus deppeana*).

saltwater
water with a salinity of greater than 30 parts per thousand.

saturated
surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. Equivalent to Cowardin's Saturated modifier.

scale-leaved
describes a plant with small, overlapping leaves that usually lie flat on the stem; for example, eastern red-cedar and western red-cedar (*Juniperus virginiana* and *Thuja plicata*).

sclerophyllous
describes a plant with usually evergreen leaves that are stiff and firm and retain their stiffness even when wilted; they are common in, but not restricted to, regions with a long summer drought and predictable yet limited winter rain.

scree
a sheet of coarse rock debris covering a mountain slope without an adjacent cliff.

scrub
vegetation dominated by shrubs, including thickets.

seasonal
showing periodicity related to the seasons; applied to vegetation exhibiting pronounced seasonal periodicity marked by conspicuous physiognomic changes.

seasonal evergreen vegetation
associations in which most of the upper canopy plants retain leaves year-round and drop some leaves during unfavorable seasons.

seasonally flooded
surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. Includes Cowardin's Seasonal, Seasonal-Saturated, and Seasonal-Well Drained modifiers.

semi-arid
a climatic region having an annual precipitation, usually between 25.4 and 50.8 centimeters (10-20 inches) per year, this being greater than a truly arid climate; typically, the vegetation is composed of grasses with or without woody plant layers.

semi-deciduous vegetation
associations (usually tropical and subtropical) in which most of the upper canopy trees are drought-deciduous and many of the understory trees and shrubs are evergreen. The evergreen and deciduous woody plants are not always separated by layers.

semi-evergreen vegetation
associations in which evergreen and deciduous species each generally contribute 25-75 percent of total tree cover; specifically, this term refers to tropical and subtropical vegetation in which most of the upper canopy trees are evergreen mixed with drought-deciduous trees.

semipermanently flooded
surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. Includes Cowardin's Intermittently Exposed and Semipermanently Flooded modifiers.

short grassland
graminoid-dominated vegetation usually less than 0.5 meters or 1.5 feet tall when inflorescences are fully developed.

shrub
perennial woody species with a life form that is usually less than 4 to 5 meters or 13 to 16 feet in height; typically, plants have several stems arising from or near the ground, but this term includes short tuft-tree, bamboo, and woody vine species; length of vine may exceed 5 meters; shrub species growth form may be taller than 5 meters or single-stemmed under certain environmental conditions.

shrubland (scrub)
vegetation dominated by shrubs greater than 0.5 meters or 1.5 feet and typically less than 4 to 5 meters or 13 to 16 feet in height, forming greater than 25 percent cover, with trees forming less than 25 percent cover; shrub cover may be less than 25 percent in cases where the cover of each of the other life forms present is less than 25 percent and the shrub cover exceeds the cover of other life forms; does not include developing secondary associations dominated by tree species.

sod grass
a life form of graminoids that tends to develop a solid mat of grass, sedge, etc. over the ground by vegetative increase of rhizomes or stolons; resulting vegetation generally has few spaces between plants.

sparsely vegetated
describes vegetation with low total plant cover (generally less than 10 percent) that is scattered or nearly absent (less than 1 percent); areas with high cover of crustose lichen and no other vegetation are included here.

stomata
pores or openings for gas exchange that are generally concentrated on leaf surfaces.

subalpine
upper mountain vegetation immediately below the cold limits of tree and tall shrub growth.

subdesert
an area of xerophytic shrubby vegetation with a poorly-developed herbaceous layer.

submontane
an area where the influence of altitude (vertical relief) does not result in local climate regimes that are sufficiently different from the adjacent lowlands as to cause a complex vegetation-climate-soil zonation; generally includes the foothills of a mountain range; the lowland vegetation at the base of a mountain that displays vegetation zonation.

subpolar
geographically, the region immediately equatorward of the Arctic and Antarctic circles; climatically, winters are long and extremely cold, and summers are very short; only one month per year has a monthly average warmer than 10º C (50º F); as a rule, the ground is completely covered by snow for at least half a year; the region between the tundra and cold temperate forests or steppes.

subtropical
pertains to areas within tropical regions with variable (seasonal) temperature and moisture regimes; climatically, it has seasonal variation marked by dry/wet seasons rather than cold/hot seasons; parts of this region are subject to sub-0º C (32º F) temperatures but rarely have freezing periods of 24 hours or longer; in the United States this term includes southern Florida and the southern tip of Texas.

succulent
a plant with fleshy stems or leaves with specialized tissue for the conservation of water; a xeromorphic strategy for tolerating long periods of drought.

suffruticose
a somewhat shrubby plant in which the upper vegetative and flowering shoots die back to leave only the lower parts to survive unfavorable seasons.

synusia
an association of plant species with a similar life form and similar ecological requirements occurring together in the same habitat; sometimes called a "union"; most habitats are occupied by several synusiae, which may grow above each other in layers, beside each other, or in mixture; for example, an open tree synusia or layer over a grass-dominated synusia or layer.

tall grassland
graminoid-dominated vegetation usually over 1 meter or 3 feet tall when inflorescences are fully developed in temperate zones, and greater than 2 meters or 6 feet in tropical zones.

tall forb
broad-leaved herbaceous plants usually greater than 1 meter or 3 feet tall when inflorescences are fully developed.

talus
a sloping accumulation of coarse rock fragments at the base of a cliff.

temperate
geographically, the region between the polar and tropical regions; climatically, the region is moderate with distinct seasons of alternating long, warm summers and short, cold winters.

temporarily flooded
surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. Equivalent to Cowardin's Temporary modifier.

tree
perennial, woody species life form with a single stem (trunk), normally greater than 4 to 5 meters or 13 to 16 feet in height; under certain environmental conditions, some tree species may develop a multi-stemmed or short growth form (less than 4 meters or 13 feet in height).

treeline
a zone where the normal growth of trees is limited; cold temperatures often combined with drought form the upper or arctic treeline, and drought combined with hot temperatures form the lower or arid treeline.

tropical
geographically, the area between the Tropic of Cancer (23º 27' N) and the Tropic of Capricorn (23º 27' S), which includes tropical montane and alpine zones; climatically, the tropics are described as either the equatorial limits of freeze or, in temperate marine locations without freezing, the 65º F isotherm for the coldest month of the year; generally, tropical regions are characterized by high mean temperatures, small annual variation in temperature, and abundant rainfall throughout the year, although mountainous areas within the tropics are more variable.

tuft-tree
woody plant with large leaf-fronds or rosulate branches at the tips of major trunk(s); for example, palms and tree ferns.

tundra
the treeless region north of the Arctic Circle (arctic tundra) or above the treeline of high mountains (alpine tundra) and also on some sub-Antarctic islands; characterized by very low winter temperatures, short cool summers, permafrost below a surface layer subject to summer melt, short growing season, and low precipitation.

tussock
graminoid life form consisting of bunch-like tufts, sometimes more than 1 meter or 3 feet tall, in which the hard, old, withered leaves are intermingled with the fresh, young, green leaves.

vascular plant
a plant with water and fluid conductive tissue (xylem and phloem); includes seed plants, ferns, and fern allies.

winter-rain
a climatic regime characterized by precipitation that occurs mostly as rain during cool winters that alternate with dry, hot summers; often associated with sclerophyllous vegetation.

woody
containing lignified plant tissue.

woody plant
plant species life form with woody tissue and buds on that woody tissue near or at the ground surface or above; plants with limited to extensive thickening by secondary woody growth and with perennating buds; includes phanerophytes and chamaephytes of Raunkier.

xeromorphic
describes plants with morphological and physiological characters that tolerate persistently low water availability, such as succulence, specialized leaf surfaces for light reflectance or water retention, opportunistic leaf growth, leaf-size reduction with increased thickness and sunken stomata, revolute margins, or stem and leaf modification to form thorns or spines.

APPENDIX 3-HYDROLOGIC MODIFIERS

Tidal Habitats

irregularly exposed
land surface is exposed by tides less often then daily; the area from mean low tide to extreme low spring tide. *Equivalent to Cowardin's Irregularly Exposed.*

regularly flooded
tidal water alternately floods and exposes the land surface daily, from mean low (lower low on West Coast) to mean high (higher high on West Coast). *Equivalent to Cowardin's Regularly Flooded.*

irregularly flooded
tidal water floods land surface less often than daily. The area must be flooded by tides at least once yearly as a result of extreme high spring tide plus wind plus flow. The area extends from mean high water inland to the maximum extent of tide plus the splash zone. *Equivalent to Cowardin's Irregularly Flooded except in tidal Riverine, Lacustrine, and Palustrine areas where if an area is only irregularly flooded by fresh tidal waters, the appropriate non-tidal modifier, e.g., Temporarily Flooded, Seasonally Flooded, Semipermanently Flooded, will apply*.

Non-tidal Habitats

intermittently flooded
substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not seasonally predictable and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used elsewhere when appropriate. This modifier can be applied to both wetland and non-wetland situations. *Equivalent to Cowardin's Intermittently Flooded modifier.*

saturated
surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. *Equivalent to Cowardin's Saturated modifier.*

seasonally flooded
surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. *Includes Cowardin's Seasonal, Seasonal-Saturated, and Seasonal-Well Drained modifiers.*

semipermanently flooded
surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. *Includes Cowardin's Intermittently Exposed and Semipermanently Flooded modifiers.*

temporarily flooded
surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. *Equivalent to Cowardin's Temporary modifier.*

State of Maryland

Robert L. Ehrlich, Jr., Governor

Michael S. Steele, Lt. Governor

Department of Natural Resources

C. Ronald Franks, Secretary

W. P. Jensen, Deputy Secretary

Paul Peditto, Director of the
Wildlife & Heritage Service

Wildlife & Heritage Service
Tawes, State Office Building, E-1
580 Taylor Avenue
Annapolis, MD 21401
410-260-8540
FAX 410-260-8595
TTY 410-260-8835
http://www.dnr.state.md.us

---is a publication
of the Maryland Wildlife & Heritage Service.
Compiled by Jason W. Harrison