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Natural Resource Stewardship and Science

Vegetation Mapping at Cumberland Island National Seashore

Natural Resource Report NPS/SECN/NRR—2017/1511



ON THE COVER
Early morning on Cumberland Island.
Photograph courtesy of Rachel McManamay

Vegetation Mapping at Cumberland Island National Seashore

Natural Resource Report NPS/SECN/NRR—2017/1511

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Executive Summary

The Southeast Coast Network (SECN), with the support of the National Park Service (NPS) Vegetation Mapping Inventory Program, described and mapped vegetation at Cumberland Island National Seashore (CUIS). This mapping effort was accomplished through collaboration with the Southeast regional office of NatureServe (Raleigh/Durham, N.C.).

The mapping area was 15,163.4 hectares (ha), encompassing the entire boundary of the seashore plus an additional buffered area. NatureServe ecologists identified plant associations for the seashore and a remote sensing specialist from the Southeast Coast Network conducted the vegetation mapping using 1:12,000-scale, color-infrared aerial photography and digital orthophotography. NatureServe collected vegetation and environmental data from 85 vegetation classification plots, and the remote sensing specialist assessed 60 observation points. Interns from the Student Conservation Association (SCA) and consultants from the Atkins consulting firm conducted an accuracy assessment (AA), which entailed sampling 712 points. Fieldwork and mapping were completed between 2005 and 2015.

A total of 43 map classes were developed to map the vegetation and general land cover of Cumberland Island National Seashore and surroundings, including the following: 32 map classes representing natural/semi-natural vegetation at the association level in the National Vegetation Classification System (NVCS), 1 map class representing cultural vegetation (e.g., developed) in the NVCS, and 10 map classes representing non-vegetated units (e.g., open water bodies, buildings, roads). Features were interpreted using 1:12,000 scale digital color-infrared aerial photography (flown 01 May 2011) through heads-up-digitizing in ArcGIS (Version 10.0, © 2010 Environmental Systems Research Institute, Redlands, California). Polygons were mapped to a 0.5-hectare minimum mapping unit (MMU).

A geodatabase containing various feature class layers and tables was constructed to show the locations of vegetation types and general land cover (vegetation map), vegetation plot samples, AA sites, project boundary extent, and aerial photographic centers. The feature class layer for the CUIS vegetation map provides 1,005 polygons of detailed attribute data covering 15,163.4 hectares, with an average polygon size of 144.7 hectares. Of the area mapped, 816 polygons (81% of all polygons) represent natural/semi-natural vegetation types in the NVCS, encompassing 9,542.8 hectares (62.9%) of the total map extent.

Summary reports generated from the vegetation map layer indicate that the combined group Live Oak – (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock dominates the vegetated landscape (101 polygons covering 3,746.6 ha). The combined group Southern Atlantic Coast Salt Marsh / Salt Flat (Swampfire Type) also covers a considerable portion of the seashore (92 polygons totaling 3,678.8 ha).

A thematic accuracy assessment study was conducted on the nine map classes in the boundary of the seashore that represent floristic types within the NVCS. Results present an overall accuracy of 83.9% (Kappa statistic = 64.2%) based on data from 712 AA sites.

Products resulting from the CUIS vegetation mapping project include:

Available in this report:

- Project summary of methods and results
- Illustrated photo-interpretation guide
- Detailed descriptions of vegetation associations
- Samples of field forms

Available elsewhere[1]:

- Geodatabase containing map polygon attributes, aerial photography flight lines, plot data, and seashore and project boundaries
- Ground photography of vegetation plots, observation points, and accuracy assessment points in hard copy and digital formats
- All field data (plot, observation point, and accuracy assessment point) stored in the Microsoft Access PLOTS database
- Hard copy vegetation maps
- Hard copy orthophotographs in DOQQ format and stereo aerial photograph prints
- Metadata for all digital products

Geospatial products are in the Universal Transverse Mercator (UTM) projection, Zone 17, using the North American Datum of 1983.

[1] Products and additional information can be found at the Integrated Resource Management Applications portal (NPS 2015a), and the NPS Vegetation Mapping Inventory program page (https://science.nature.nps.gov/im/inventory/veg/products.cfm).

Acknowledgements

Funding for this project was provided by the National Park Service Vegetation Mapping Inventory (VMI) Program. The Southeast regional office of NatureServe (Raleigh/Durham, N.C.) completed the field survey and other tasks associated with the vegetation classification portion of the mapping project. The Southeast Coast Network completed the vegetation mapping. Interns from the Student Conservation Association (SCA) and ecologists from the Atkins consulting firm completed the accuracy assessment. Jennifer Asper, University of Georgia, created the study site map. Special thanks to the staff of Cumberland Island National Seashore for their cooperation with this project.

Introduction

Cumberland Island National Seashore Vegetation Mapping Project

The Cumberland Island National Seashore (CUIS) Vegetation Mapping project was organized and coordinated by the National Park Service (NPS) Southeast Coast Network (SECN) between 2005 and 2015, with assistance from the Southeast regional office of NatureServe for the vegetation classification portion of the project. The purpose of this project was to inventory and map existing plant associations on approximately 14,740 hectares (ha) of Cumberland Island and a buffered area surrounding the seashore. The mapping information is provided in written, tabular, digital, and spatial formats that are useful to resource managers, the Southeast Coast Network, and others. The mapping product will serve as a baseline of vegetation information that will assist park natural and cultural resource stewardship. The identification and description of plant communities also provides habitat information important to understanding associated organisms (reptiles, amphibians, mammals, etc.) and providing inference to the location and abundance of species that are characteristic of each community.

Vegetation Mapping Inventory Program

The Vegetation Mapping Inventory (VMI) Program is an effort by the National Park Service to classify, describe, inventory, and map vegetation communities in more than 280 national park units across the United States. The primary objective of the Vegetation Mapping Inventory Program is to produce high-quality, standardized maps and associated data sets of vegetation and other land-cover occurring within parks. Since vegetation species and communities are unique from park to park, the inventory of these resources assists park managers on a wide array of management issues. For more information about the Vegetation Mapping Inventory Program, visit the program website (see NPS 2015b).

Vegetation Mapping Inventory Program Standards

The National Park Service and the Vegetation Mapping Inventory Program established guidance and standards for all vegetation mapping projects in a series of documents, including both protocols and standards:

Protocols:

- National Vegetation Classification System (TNC and ESRI 1994a, NatureServe 2003)
- Field methods and mapping procedures (TNC and ESRI 1994b)
- Statistically rigorous and consistent accuracy assessment procedures (ESRI and TNC 1994, Lea and Curtis 2010)
- Guidelines for using existing vegetation data (TNC 1996)

Standards:

- The National Vegetation Classification Standard (FGDC 1997, FGDC 2008, NatureServe 2015)
- Spatial Data Transfer Standard (FGDC 1998b)

- Content Standard for Digital Geospatial Metadata (FGDC 1998a)
- United States National Map Accuracy Standards (USGS 1999)
- Integrated Taxonomic Information System (U.S. Department of Agriculture)
- Program-defined standards for map attribute accuracy and minimum mapping unit

National Vegetation Classification Standard

The National Vegetation Classification Standard (NVCS) is the mapping standard used in SECN vegetation mapping projects. The NVCS, adopted by the Federal Geographic Data Committee (FGDC), evolved from work conducted by The Nature Conservancy, NatureServe, and the Natural Heritage Program network over more than two decades (FGDC 1997). The NVCS standard supports the development and use of a consistent national vegetation classification throughout the National Park Service and other organizations. Such a standard facilitates the production of uniform statistics about vegetation resources across the nation and makes cooperation on vegetation management issues across jurisdictional boundaries possible (Grossman et al. 1998). The Vegetation Subcommittee of the Federal Geographic Data Committee works to keep the standard relevant and current. Revisions made to the upper levels of the NVCS hierarchy adopted by the Vegetation Subcommittee as Version 2 (FGDC 2008) were not used in this project since the crosswalks for vegetation associations were unavailable when this project began.

Vegetation classification systems attempt to recognize and describe repeating assemblages of plants in similar habitats. The NVCS is a hierarchical system that incorporates physiognomic characters and floristic data to define seven levels of terrestrial vegetation classification. The five upper levels (class, subclass, group, subgroup, and formation) are based on physiognomic features. The two lower levels (alliance and association) are distinguished by differences in floristic composition. The physiognomic units have a broad geographic perspective and the floristic units have utility in local and site-specific applications (Grossman et al. 1998). The physiognomic levels of the NVCS are based on physical, structural, and environmental characteristics identifiable from satellite imagery, aerial photography, or ground observations (Table 1). Specific criteria defining these physiognomic units are based on ecologic characteristics that vary among major vegetation groups (FGDC 1997).

The alliance and association levels form the base of the NVCS hierarchy and are determined by the most abundant or diagnostic species comprising the various layers of a homogenous vegetation community. An association is here defined as a plant community type with a consistent species composition, uniform physiognomy, and similar habitat conditions (Flahault and Schroter 1910). Species composition differentiates associations (TNC and ESRI 1994a). An alliance is "a physiognomically uniform group of plant associations sharing one or more dominant or diagnostic species which, as a rule, are found in the uppermost strata of the vegetation" (Reid and Comer 1998). NatureServe coordinates plant association data for the SECN vegetation mapping projects. Associations are added to the NVCS and older concepts are refined as new data become available.

For more information about the NVCS, see The U.S. National Vegetation Classification website at http://usnvc.org/.

Table 1.Example of National Vegetation Classification (NVCS) hierarchy for terrestrial vegetation (FGDC 1997).

Level	Criteria Delineating Level	Example
Class	Structure (height, cover) of dominant vegetation strata	Forest
Subclass	Growth form characteristics including leaf type (evergreen, deciduous) for woody plants and persistent (perennial, annual) herbaceous species	Evergreen forest
Group	Leaf morphology (broad leaf, microphyllous, xeromorphic), leaf phenology, and climatic conditions	Temperate or subpolar needle-leaved evergreen forest
Subgroup	Relative degree of human disturbance	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest
Formation	Additional physiognomic characteristics, general environmental conditions, relative landscape position, and hydrologic regimes	Rounded-crowned temperate or subpolar needle-leaved evergreen forest
Alliance	Dominant or diagnostic species of uppermost or dominant stratum	*Pinus taeda* Forest Alliance
Association	Other dominant or diagnostic species from any stratum	*Pinus taeda/Liquidambar styraciflua-Acer rubrum* var. *rubrum/Vaccinium stamineum* Forest

Federal Geographic Data Committee Standards

In addition to vegetation classification, the Federal Geographic Data Committee sets standards for map spatial accuracy and for metadata employed in NPS vegetation mapping projects. Standards for map products stipulate a map scale of 1:24,000 or finer and a minimum polygon size of 0.5 hectares (1.24 acres [ac]). Positional accuracy for vegetation maps must meet National Map Accuracy Standards, which specify horizontal errors of less than 10.2 meters (m; 33.5 feet [ft]) on the ground for 1:12,000-scale maps.

All digital vegetation products resulting from this project are accompanied by FGDC-compliant metadata. Metadata are "data about the data," and describe the content, quality, condition, and other characteristics of the spatial dataset. Metadata are critical elements that expedite the interpretation and exchange of information among users.

Methods

Study Area

Location

Cumberland Island, the largest and southernmost barrier island in Georgia, is located in Camden County, adjacent to the Georgia–Florida border (Figure 1).

History

Cumberland Island has a complex history of human occupation. Native Americans inhabited the island for multiple centuries, several colonial European nations occupied the island at different times, the island was used as a plantation in the early to mid-19th century, and wealthy American families used the island as their primary residence or as a winter retreat for a brief period in the late 19th century. The island is sparsely developed, and many structures on the island are located in five historic districts that are listed on the National Register of Historic Places. Historic land uses changed the vegetation communities of Cumberland Island over the past 150 years. For example, large live oaks from the island's interior maritime hammocks were harvested for the shipbuilding industry near the turn of the century, thus removing the largest and oldest trees from the island. The indigo, rice, and cotton plantations established during the 19th century influenced the vegetation composition and structure of forested areas and wetlands on the island. Further, loblolly pine (*Pinus taeda*) plantations were planted for silvicultural purposes. These stands replaced native maritime hammock forests, and some persist on the island (Byrne et al. 2012).

Vegetation

Vegetation communities across Cumberland Island are extremely diverse. A smooth cordgrass (*Spartina alterniflora*) dominated salt marsh occupies about 3,650 hectares of the estuary-side of Cumberland Island, providing habitat for a diverse assemblage of fish and wildlife species. The southern end of the island includes an extensive example of an intact salt panne community type, which is dominated by halophytic, succulent dwarf-shrubs (Figure 2). Much of the upland portion of Cumberland Island consists of live oak (*Quercus virginiana*)/palmetto (*Sabal palmetto*) maritime forests (Figure 3). Other terrestrial communities include extensive dune systems, interdunal wetlands, freshwater ponds and wetlands (Figure 4), mixed-pine/hardwood forests, and pine-dominated (*Pinus* sp.) flatwoods (Figure 5) (Byrne et al. 2012).

Much of the northern portion of Cumberland Island (about 4,000 ha [9,886 ac]) is designated as a Wilderness area. Despite such protection and the general pristine appearance of much of the island, threats to vegetation communities on Cumberland Island exist. One threat is anthropogenically influenced fire suppression. Such fire suppression has resulted in woody encroachment and drying freshwater wetlands, as well as a reduction in the diversity and composition of the herbaceous understory in the fire-adapted uplands. The island also hosts an actively controlled feral hog population and a currently uncontrolled feral horse population. Rooting from hogs is very destructive and can seriously impede seedling recruitment, damage groundcover, disturb soil, and serve as a vector for non-native plant species. Feral horses graze extensively in open areas, particularly influencing the salt marsh (Byrne et al. 2012).



Figure 1. Location of Cumberland Island National Seashore in southeastern Georgia.



Figure 2. Example of a large, intact salt panne community on the southern end of Cumberland Island.



Figure 3. The Live Oak – (Cabbage Palmetto) Forest Alliance covers a large percentage of area on Cumberland Island.



Figure 4. Several freshwater vegetation communities can be found surrounding Lake Whitney, including Southern Cattail Marsh, South Atlantic Coastal Pond, Sawgrass Head, and Water-hyacinth Aquatic Vegetation.



Figure 5. The Wet Longleaf Pine – Pond Pine Flatwood community, seen here just off of North Cut Road, contains a sparse canopy layer of pine species (*Pinus* spp.) and a dense understory of saw palmetto (*Serenoa repens*)

Climate and Weather

Summer months at Cumberland Island National Seashore are hot and humid but can be moderated somewhat by ocean breezes. The mean monthly maximum temperature in July ranges 31.1–32.0º C (88.0–89.6º F; 1961–1990). Winter months at the seashore are typically mild with brief cold spells. The mean monthly minimum temperate in January ranges 4.1–6.0º C (39.4–42.8º F; 1961–1990). Precipitation is primarily in the form of rain from storm fronts in winter and spring months, and from thunderstorms, tropical storms, and hurricanes in the summer and fall months. Cumberland Island receives an average precipitation amount of 1,201–1,400 millimeters per year (47.3–55.1 in/year; 1961–1990) (Davey et al. 2007).

Geology and Soils

Soils of Cumberland Island are mainly sandy and include eight main types. Mandarin soils are somewhat poorly drained and are on ridges and flats. These are typically fine soils with sand throughout. Pottsburg soils are somewhat poorly drained and are nearly level. These soils are sand throughout. The Cainhoy soils are somewhat excessively drained and are nearly level and gently sloping.The Fripp-Duckston unit consists of excessively drained soils on undulated and rolling dunes and poorly drained soils in shallow depressions between the dunes and on flats between the dunes and marshes. Albany soils are somewhat poorly drained sand that occurs on low ridgetops. Beaches are next to the ocean and are covered twice daily with the tide. Beaches are typically made up of fine sand, sand, and course sand, as well as varying amounts of shell sediment. Bohicket-Capers unit consists of very poorly drained soils in tidal marshes. These soils border the Atlantic Ocean and extend inland several miles along creeks and rivers. The unit contains numerous sounds and tidal streams that are flooded frequently by the tide (USDA-SCS 1980) (Figure 6).

Cumberland Island was greatly influenced by the rising and lowering of the sea during the Pleistocene and Holocene epochs of the Quaternary period. Each time sea level changed, it allowed for distinct Shoreline Complexes to develop. The older complexes are higher on the landscape while the younger are lower on the landscape. On Cumberland Island, the Princess Ann Complex is 10 to 15 feet above sea level, while the Silver Bluff Shoreline Complex is 6 to 10 feet above sea level. The Silver Bluff Complex is estimaged to be between 25,000 and 36,000 years old. The Holocene is the youngest Shoreline Complex that probably formed within the past 4,000 to 5,000 years and is located on the seaward side of Cumberland Island (USDA-SCS 1980) (Figure 7).

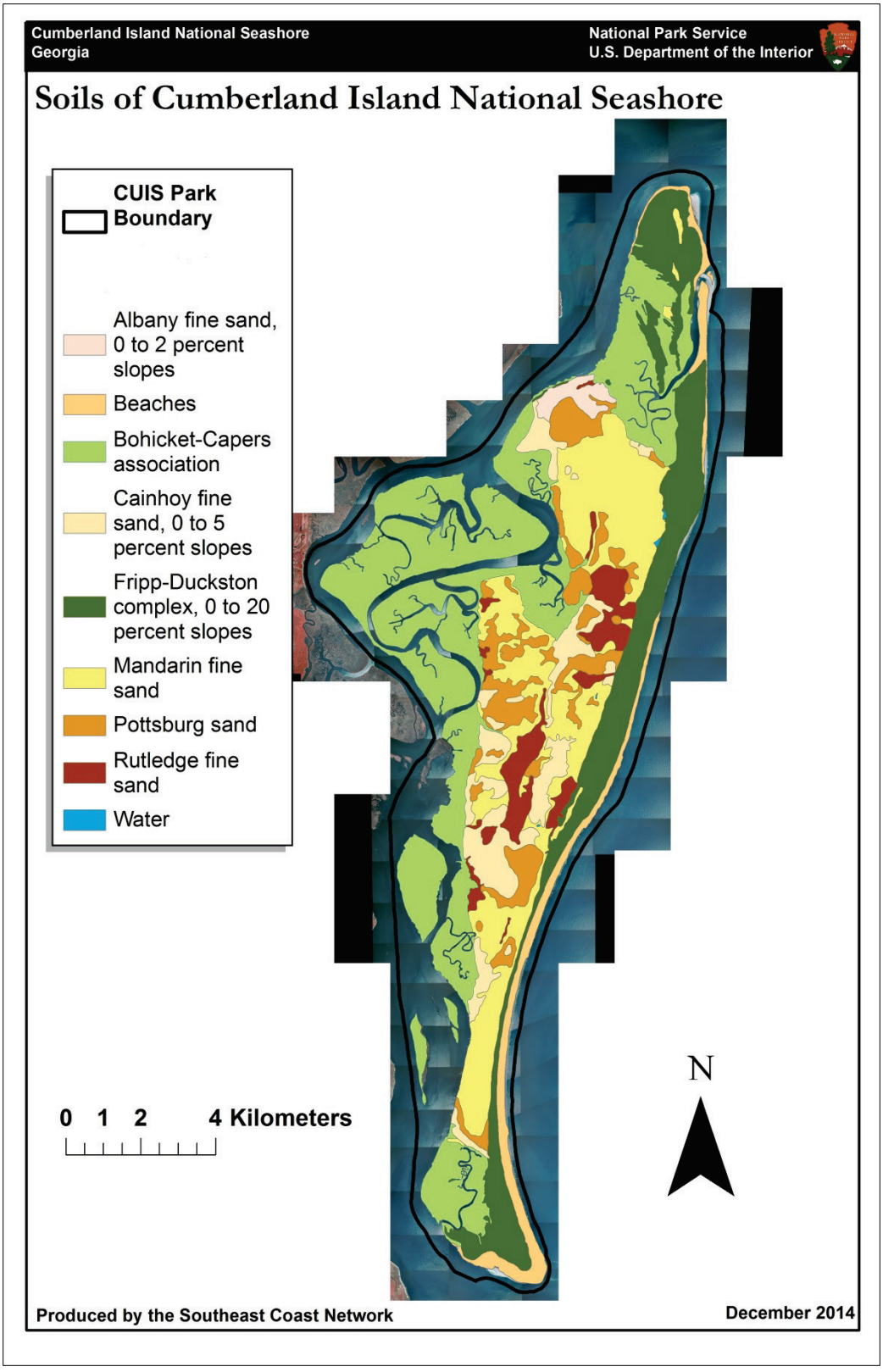


Figure 6. Soils of Cumberland Island National Seashore.

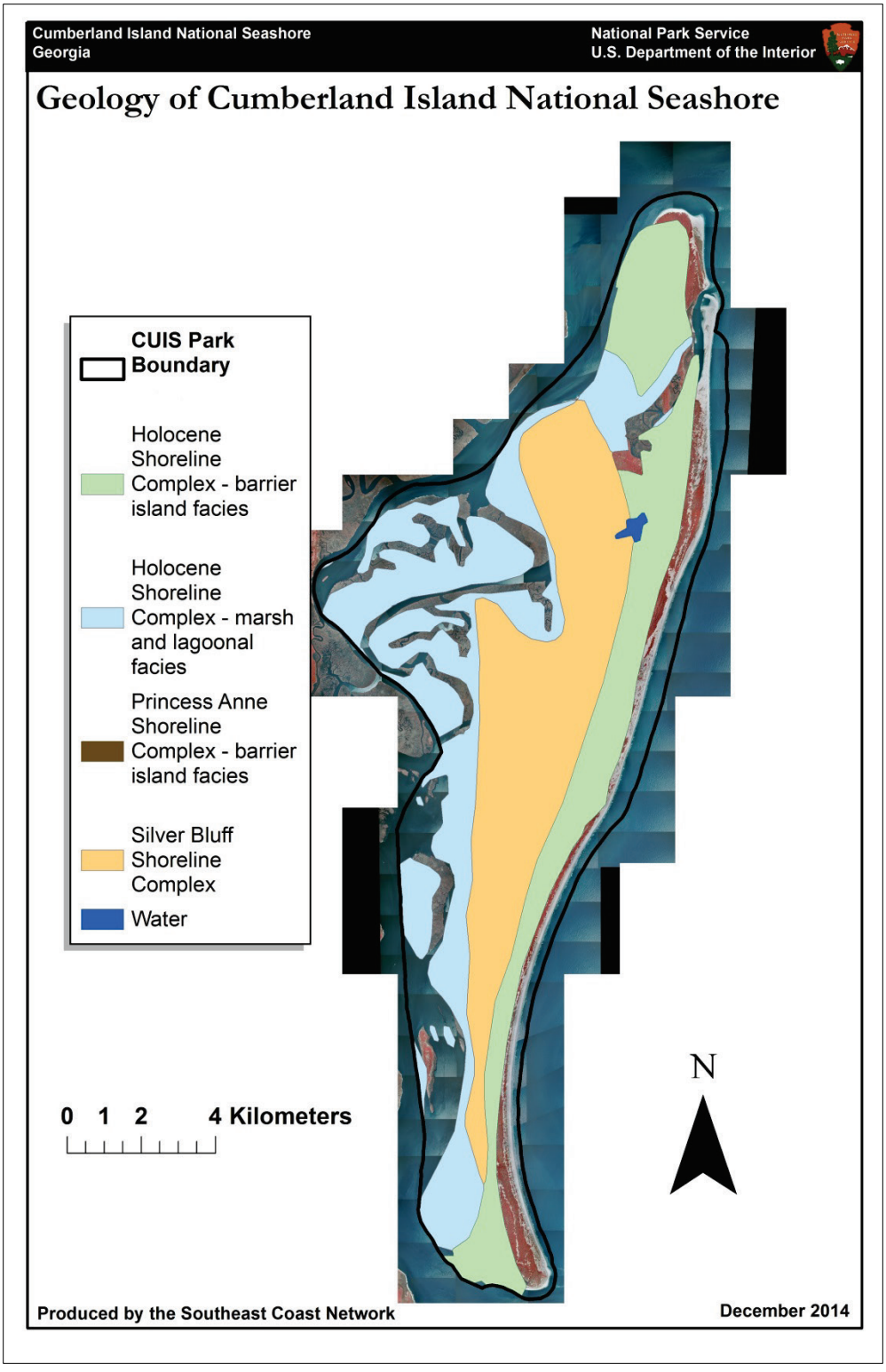


Figure 7. Geology of Cumberland Island National Seashore.

Project Scoping and Planning

In 2005, the Southeast Coast Network proposed to develop vegetation classification and maps for 16 parks: Cape Hatteras National Seashore, Cape Lookout National Seashore, Moores Creek National Battlefield, Fort Sumter National Monument, Fort Pulaski National Monument, Fort Frederica National Monument, Cumberland Island National Seashore, Fort Matanzas National Monument, Timucuan Ecological and Historic Preserve, Fort Caroline National Memorial, Castillo de San Marcos National Monument, Canaveral National Seashore, Ocmulgee National Monument, Horseshoe Bend National Military Park, Kennesaw Mountain National Battlefield Park, and Chattahoochee River National Recreation Area. The Southeast Coast Network teamed with the Southeast regional office of NatureServe to complete this project. NatureServe's role was to collect field data and develop the local association descriptions and the field key to map vegetation classes for each of the parks. The Southeast Coast Network agreed to complete the photographic interpretation/image analysis, digital map and database development, accuracy assessment, metadata, and final reports in-house.

Project Boundary Extent

The Southeast Coast Network determined that the CUIS vegetation mapping boundary extent should include the entire area within the seashore plus an additional buffer of 100 meters (328 ft) surrounding the seashore boundary. Therefore, the total map extent is 14,740 hectares, with 15,163.4 hectares occurring within seashore boundaries and the remaining 423.4 hectares occurring outside of seashore boundaries.

Field Survey

Prior to field work, NatureServe compiled a list of preliminary vegetation associations and alliances likely to occur in Cumberland Island National Seashore. Published floristic information, the plant-species list of Cumberland Island, and expert local knowledge, including NPS staff at the seashore, were used to refine the list. The preliminary list of associations was used for planning, estimating the amount of field work necessary, and assigning provisional names to vegetation plots and observation points.

Imagery (i.e., color-infrared and true color aerial photos) was reviewed extensively prior to fieldwork, and distinct areas were identified and targeted for vegetation plot placement.

Plots were deliberately placed non-randomly in such a manner as to maximize capturing the diversity of vegetation communities at the seashore given the minimum number of plots for the project (C. Nordman, pers. comm., 21 Feb. 2011). Plot size was variable (e.g., 10 × 30 m, 15 × 20 m, 20 × 20 m, 20 × 40 m, 20 × 50 m) and decided at the time of sampling based on which dimension would most adequately characterize the vegetation sampled in each plot. Eighty-one vegetation plots were sampled in the seashore at various times in 2006 and 2007(Figure 8).

In each plot, field staff estimated and recorded an array of vegetation and environmental data using the field form (Appendix A). The following four categories of data were collected for vegetation plots:

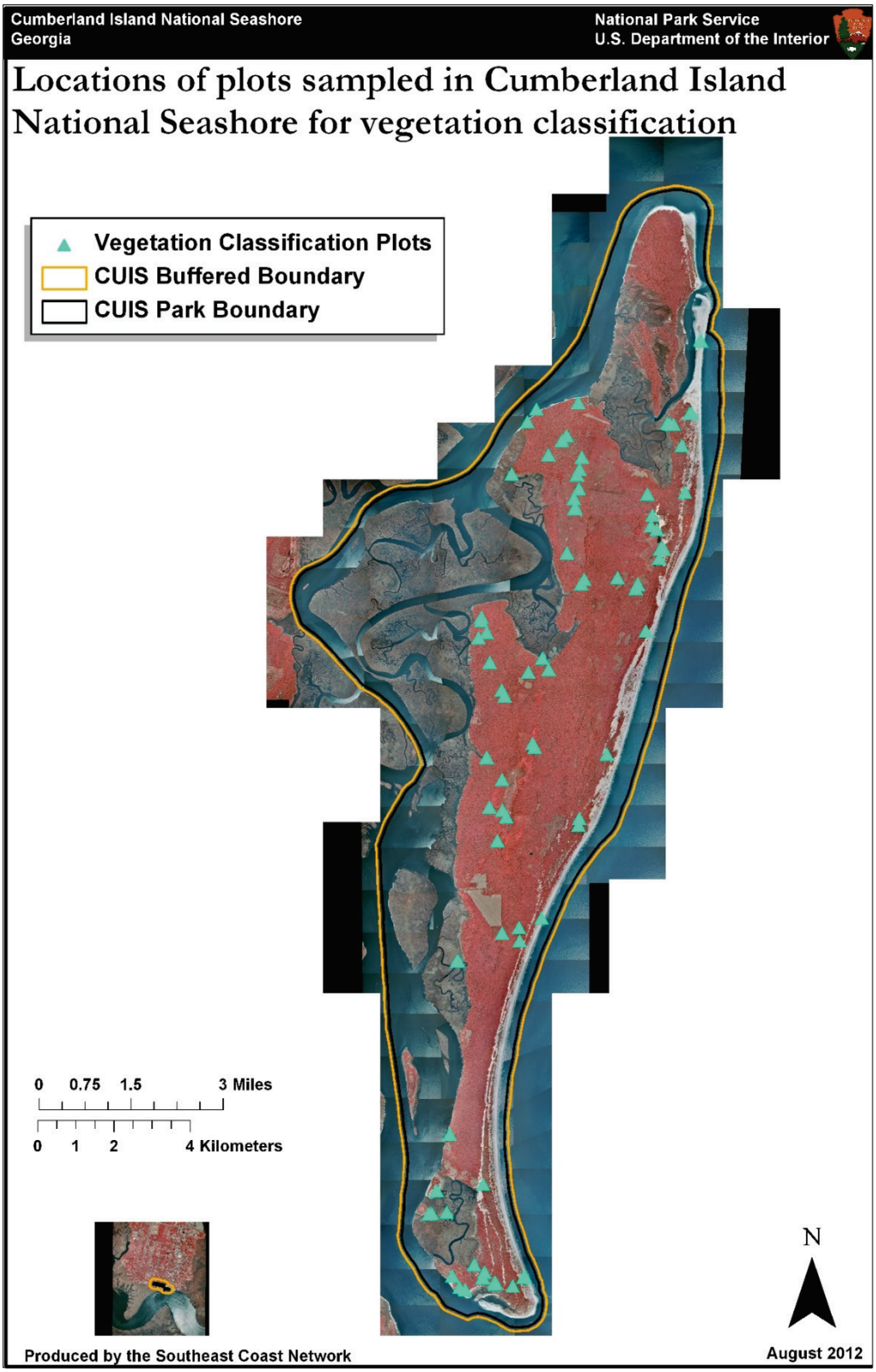


Figure 8. Locations of plots sampled by NatureServe in Cumberland Island National Seashore, used for vegetation classification.

Location and Plot Identifiers

The locations of the vegetation plots were not permanently marked. The bounds of each plot were marked temporarily using measuring tapes. The Universal Transverse Mercator (UTM) coordinates at the center of each plot were recorded (Zone 17, NAD83) on Garmin® hand-held Global Positioning System (GPS) receivers.

Environmental Description

The physical characteristics of each plot were documented in both categorical and narrative fields. These characteristics included physical site features (elevation, slope, aspect, topography), hydrology, geology, and soils. Description of the ground surface included an estimate of the cover of rocks, sand, litter, bare soil, biological soil crust, moss, and lichen. A narrative field was provided for a general description of the plot setting and the influence of disturbance and hydrology on the vegetation.

Vegetation Description

Every vascular plant species was assigned to one of eight physiognomic strata. Within each stratum, the investigator recorded the height class for the most abundant species (Table 2). Percent abundance, based on a cover class percentage, for each species present in the plot was also recorded (Table 2). Field crews also recorded percent canopy cover by species.

Table 2. Vegetation height and cover classes used in the Cumberland Island National Seashore Vegetation Mapping Project.

Code	Height scale (meters)	Cover Class %
1	< 0.5	Trace
2	0.5–1.0	0.1–1
3	1.0–2.0	1.0–2.0
4	2.0–5.0	2.0–5.0
5	5.0–10.0	5.0–10.0
6	10.0–15.0	10.0–25.0
7	15.0–20.0	25.0–50.0
8	20.0–35.0	50.0–75.0
9	35.0–50.0	75.0–95.0
10	> 50.0	> 95

Other Ancillary Information Useful to Classification

Field crews optionally recorded how well the plot represented the vegetation of the surrounding area, site disturbance history, and the overall character of the vegetation features of each plot.

Vegetation Classification

Plot data were manually entered into the NPS PLOTS Database Version 3.0, a Microsoft Access database.The NPS PLOTS database was designed specifically for the NPS vegetation and mapping program so that the electronic data entry fields mirror the standard field form. Data entry was facilitated by assigning each plant taxon a unique, standardized code and name based on the PLANTS database developed by the Natural Resources Conservation Service in cooperation with the Biota of North America Program (NRCS 2015). Data were thoroughly proofed after entry to minimize errors.

Cluster analysis techniques that have been traditionally used in other vegetation mapping projects to generate vegetation classifications were not used for Cumberland Island National Seashore. Instead, plots were assigned to an existing vegetation association based on a cursory overview of their best fit according to species composition (R.White, pers. comm., 25 March 2011). The vegetation associations and descriptions can be found in the NatureServe Explorer (see NatureServe 2015).

Final Map Classifications

Once the associations were finalized, a dichotomous key pertaining to Cumberland Island National Seashore, originally developed by NatureServe and later revised by the Southeast Coast Network (Appendix C), was finalized. The full NVCS hierarchical classification and global descriptions are available in Appendix B. Vegetation descriptions specific to Cumberland Island (i.e., local) were written based on CUIS plot data from this effort. In addition, the final vegetation associations were linked to map classes for use in the photo-interpretation and mapping portions of the project.

Vegetation that did not fall into the natural/semi-natural category (e.g., warm-season lawn) was assigned to the Cultural Vegetation of the NVCS at the Type Level (NVCS Version 2, FGDC 2008).

For non-vegetated features (e.g., open water bodies, structures), we derived map classes from Level II of the Land Use and Land Cover Classification System (Anderson et al. 1976).

We further classified vegetated wetlands (natural/semi-natural vegetation) to the System Level of the U.S. Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the United States (Table 3) (Cowardin et al. 1979).

Table 3. Map classification codes for wetlands derived from the U.S. Fish and Wildlife Service (USFWS) Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

Map Class Code from USFWS Wetland Classification	General Explanation of Wetland Systems
Upland	Non-Wetlands
Marine	Open ocean overlying the continental shelf and its associated high energy coastline
Estuarine	Deepwater tidal habitats and adjacent tidal wetlands in which ocean water is at least occasionally diluted by freshwater runoff from the land
Riverine	Wetlands and deepwater habitats contained within channels, except where wetlands are dominated by vegetation or where salinity exceeds 0.5%

Table 3 (continued). Map classification codes for wetlands derived from the U.S. Fish and Wildlife Service (USFWS) Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

Map Class Code from USFWS Wetland Classification	General Explanation of Wetland Systems
Lacustrine	Wetlands and deep water habitats situated in a topographic depression or dammed river channel, lacking vegetation with greater than 30% aerial coverage, total area exceeds 8 hectares
Palustrine	All non-tidal wetlands dominated by vegetation and all such wetlands that occur in tidal areas where salinity is below 0.5%

Digital Imagery and Interpretation

Aerial Photography Acquisition and Processing

The Southeast Coast Network contracted with Aero-Metric Inc., through the USGS Rolla, Missouri office to provide color-infrared (CIR) aerial photographs. Color-infrared imagery was chosen because healthy green vegetation is a very strong reflector of infrared radiation and appears bright red in color-infrared imagery, which helps tremendously in vegetation mapping efforts. This set of photography covered the full project boundary extent plus a 500 meter buffer surrounding the seashore boundary. The flight path and centers of the aerial photo mission were planned with 60% forward-lap and 30% side-lap to assure stereo viewing (Figure 9). Airborne GPS data and CIR images were provided by Richard Crouse & Associates, Inc. These images were scanned by HAS Images, Inc. Ground check point data was provided by Aero-Metric, Inc. The project was referenced horizontally to the North American Datum of 1983/2007 (NAD83/07), Universal Transverse Mercator Zone 17, and vertically to the North American Vertical Datum of 1988. The aerial photographs were taken on 1 May 2011 at a scale of 1:12,000. The calibration focal lengths for the photos were 153.557 millimeters and 153.384 millimeters. Contact prints of the CIR imagery were created for use in the field, and diapositives of the CIR set were created for photo-interpretation. Scanned images (14 micron) were processed to 0.3 meter (1.0 ft) resolution and provided in a digital orthophotograph mosaic. The scanned imagery was rectified through an aerotriangulation process.

The scanned images, Airborne Global Positioning System (ABGPS) data, ground check point data, and camera calibration data were used as inputs to the Zeiss/Intergraph ImageStationAutomatic Triangulation (ISAT) softcopy program. ISAT correlated image points are aerotriangulated in a block of images to create the exposure station exterior orientations. Three ground check points were manually measured on the imagery. All of these points had vertical and horizontal coordinates.

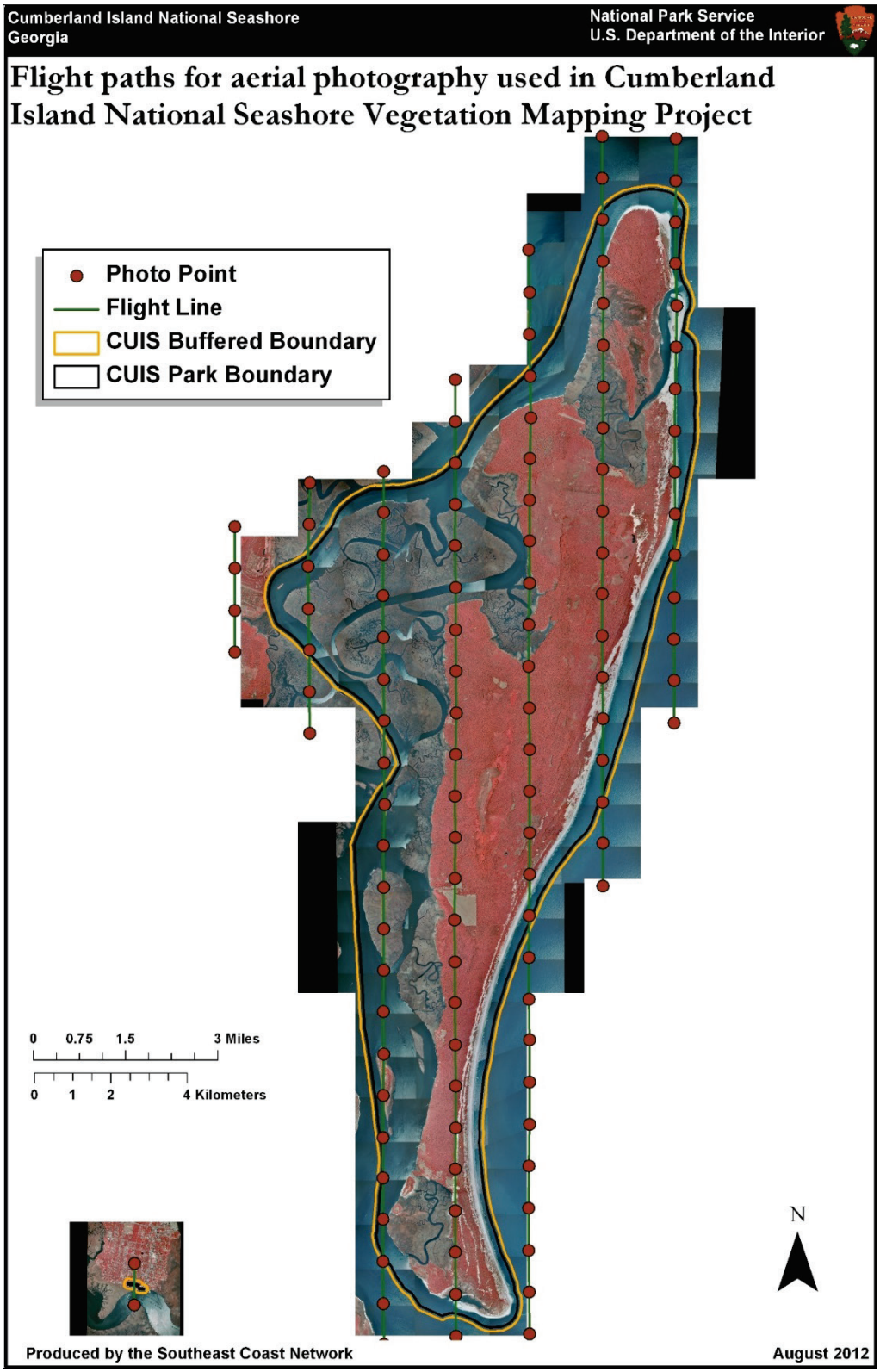


Figure 9. Flight lines for the 2011 color infrared stereo aerial photograph coverage of Cumberland Island National Seashore.

Statistics associated with the aerotriangulation bundle adjustment are as follows:

- 114 photographs
- 6,634 image points
- 5 horizontal and vertical ground control points
- Vertical ground points
- 5.0 microns image sigma
- 6,587 degrees of freedom
- Root mean square error of residuals for 14 ground control points:
    - 0.091 meters for horizontal-control eastings
    - 0.111 meters for horizontal-control northings
    - 0.531 meters for vertical control
- Root mean square error of residuals for 114 ABPGS exposure station control points:
    - 0.205 meters for horizontal-control eastings
    - 0.501 meters for horizontal-control northings
    - 0.287 meters for vertical control

Preliminary Photo-Interpretation

Prior to field reconnaissance, the individual interpreting the imagery became familiar with the project imagery as well as the vegetation types to be mapped. This early mapping step allowed the interpreter to identify particular areas of interest to visit during the field reconnaissance step. For this preliminary mapping, the SECN remote sensing specialist delineated vegetation polygons on the digital orthophoto mosaics to at least the Formation Level of the NVCS. Other features were mapped in addition to vegetation, such as non-vegetated surfaces that were classified according to the Anderson Land Use Level II mapping regime (Anderson et al. 1976). Polygons were digitized on-screen using Arc GIS (Version 10.0, © 2010 Environmental Systems Research Institute, Redlands, California).

Field Reconnaissance

The purpose of this step was to train the photo-interpreter on the correlation of photo-signatures with vegetation associations. A photo-signature is a set of diagnostic characteristics present on the imagery, such as color, tone, shape, and size, that represents a particular vegetation association (Philipson 1997). Field reconnaissance included exploration of a variety of locations representing various images, since color-infrared imagery is typically not consistent between photo sets. Even slight differences in sun angle, light intensity, shadow, and even the particular film batch and printing process can affect vegetation's appearance on imagery (Hershey and Befort 1995). The ability of the photo-interpreter to identify diagnostic characteristics on the imagery that can be tied directly to a vegetation association is a key component to successful, consistent, and accurate mapping. For some vegetation types, a set of diagnostic characteristics may not be visible on the imagery (i.e., the obscured understory species may be the ones that are diagnostic). In such cases, the photo-interpreter

may be able to rely on an informed understanding of the ecological and environmental settings of the particular vegetation types (e.g., the environmental setting where an association is likely to occur) to make a mapping decision.

A field reconnaissance trip was taken to Cumberland Island National Seashore in March 2012. During this trip, the SECN remote sensing specialist investigated ground conditions with copies of the aerial photographs in hand. The specialist made notes about observations directly on the copies of the aerial imagery. The remote sensing specialist used a Garmin® Rino GPS unit to navigate to a set of predetermined points of interest within the vegetation polygons mapped during the preliminary mapping step. These points of interest were chosen specifically to aid in the identification of vegetation photo-signatures. Vegetation at each point was keyed to its association using the key developed by NatureServe (NatureServe 2008). Difficulties in determining association, if any, were documented on the field sheet (Appendix E). Dominant species found in each vegetation strata were documented. Ground photographs of each point were taken.

Photo-Interpretation and Polygon Attribution

Based on the information gathered from the field reconnaissance trip, the SECN remote sensing specialist developed a photo-interpretation guide that aided the delineation of vegetation classes (see Appendix D). Standard photo-signature characteristics were applied during the photo-interpretation process, including texture, color, pattern, and position in the landscape (Philipson 1997). In addition to photo-signature characteristics, understanding the environmental distribution of the vegetation types helped the remote sensing specialist not only identify types, but also properly place polygon boundaries. Polygons were interpreted and digitized on-screen using Arc GIS (Version 10.0, © 2010 Environmental Systems Research Institute, Redlands, California). Features were mapped to a minimum mapping unit (MMU) of 0.5 hectares, which is the NPS The Vegetation Mapping Inventory Program standard. Exceptions for mapping below the MMU were allowed for map-class units with vegetation unique to the immediate surroundings. For each polygon, the appropriate map-class code along with its NVCS code, alliance, association, and association common name were entered into the fields of the associated attribute table (Table 4).

Table 4. Fields used in the attribute table of the vegetation polygon layer of the Cumberland Island National Seashore Vegetation Mapping Project.

Field in Attribute Table	Description	Polygon Types Field Applies to
Cultural Type	NVCS cultural vegetation type	Cultural vegetation
Alliance	NVCS Alliance scientific name	Natural/semi-natural vegetation
Association	NVCS Association scientific name	Natural/semi-natural vegetation
Common_Name	NVCS Association common name	Natural/semi-natural vegetation
LUC_II	Land Cover and Land Use Level II Codes (Anderson et al. 1976)	Natural/semi-natural vegetation, cultural vegetation, and non-vegetated Areas
ELCODE	NVCS Element Code	Natural/semi-natural vegetation

Table 4 (continued). Fields used in the attribute table of the vegetation polygon layer of the Cumberland Island National Seashore Vegetation Mapping Project.

Field in Attribute Table	Description	Polygon Types Field Applies to
Map Code	Abbreviated code used by photo-interpreter	Natural/semi-natural vegetation, cultural vegetation, and non-vegetated areas
Wetland	Type of wetland	Natural/semi-natural vegetation
Acres	Size of polygon in acres	Natural/semi-natural vegetation, cultural vegetation, and non-vegetated areas

Field Verification

Field verification allows the photo-interpreter to gauge how accurately the photo-signatures developed during the field reconnaissance step are with respect to consistently mapping vegetation associations on the ground. Specific issues with problem classes can be resolved during this step prior to submitting the map for Accuracy Assessment.

We used data from the Georgia Department of Natural Resources (GA DNR) vegetation map for field verification. In 2006–2007, GA DNR collected 82 full NVCS classification plots following the NatureServe protocol (Lisa Kruse, personal comm. 8 June 2012). In 2008, the department collected 54 Accuracy Assessment points for the vegetation map that they created. We were provided access to the classification plots as well as the accuracy assessment points from their project. We used this data to verify and edit, as necessary, our vegetation map of Cumberland Island National Seashore. Since GA DNR followed very similar protocol to the methods used in this project, utilizing their data was an efficient use of time and resources for the completion of this project.

Accuracy Assessment

The main goal of an accuracy assessment (AA) was to measure the probability that a particular location on the map created from the interpreted imagery was assigned to its correct vegetation class on the ground. A vegetation map is an abstract model of the distribution of vegetation on the ground, which entails the use of some generalizations. These generalizations contribute to errors in the map product. These map errors must be quantified so that the map user and the map producer understand the limitations of the map. A formalized accuracy assessment is a way to quantify these errors. In the AA, "producers' accuracy" is the probability that an AA point has been mapped correctly (also known as error of omission) and "users' accuracy" is the probability that the map actually represents what was found on the ground (also known as error of commission). Producers' accuracy and users' accuracy can be obtained from the same set of data using different analyses. Overall accuracy of the map is obtained by determining the fraction of accuracy assessment observations within all map classes that were mapped correctly. The Kappa Index is another measure of overall accuracy, which takes into account the probability that mapped polygons will be correct due to random chance.

Numerous factors may contribute to error on a vegetation map, some of which are listed below. The field investigator should be aware of these situations and act to minimize error when possible.

- Locational error (when it is not possible to acquire reliable UTM coordinates, the AA point data collected may look like it is in another polygon, or if the polygons are small, narrow, and the GPS receiver is not working well, it may be difficult to know which polygon should be sampled).
- Field key may be difficult to use, leading the investigator to assign the point to the wrong association.
- Field key may not include all the plant associations in the seashore, which may lead to confusion in which association to assign a point.
- Field data error—either by misidentifying diagnostic species, or by not reading the key carefully, resulting in a bad field call when the map attribute is accurate.
- AA point falls within an ecotone, which is impossible to classify but still has to be mapped to something.
- Relationship between plant associations and map units (modeling) are flawed.
- Polygon is heterogeneous, including patches of varying vegetation that are too small to map individually. The AA point may fall in a part of the polygon with a different community than observed by the photo interpreter in the bigger picture.

The formal accuracy assessment consists of several parts. First, a sampling design must be developed that follows scientifically sound, and ideally practical and cost-effective, methodology. The sampling design should cover all vegetation types mapped across the seashore. Sample sites must be visited to determine the vegetation type actually present at that particular ground location. The results of the sampling are used to create a contingency table (confusion matrix) that is used to calculate the per-class and over-all accuracy of the map.

Sampling Design

We used a stratified random sampling approach to select accuracy assessment sites in Cumberland Island National Seashore. We included all map classes representing natural/semi-natural vegetation types, as defined in the NVCS in sampling selection (FGDC 1997). Cultural vegetation (e.g., warm season lawn) and non-vegetated (e.g., Residential) polygons were excluded from the assessment. The accuracy assessment was restricted to points within seashore boundaries (i.e., no points were located in the buffered region outside of Cumberland Island boundaries).

We determined the necessary sample size for each map class following guidelines outlined in Thematic Accuracy Assessment Procedures (Lea and Curtis 2010) (Table 5). Based on these guidelines, 711 total accuracy assessment points were identified for Cumberland Island (Figure 10).

To account for positional error due to site location (GPS error), vegetation polygons were buffered internally by 10 meters prior to generation of the AA points. The AA points were generated randomly in ArcGIS using the Create Random Points tool in ArcToolbox (Version 10.0, © 2010 Environmental Systems Research Institute, Redlands, California).

Table 5. Standard sample size allocations for accuracy assessment, based on map class area (Lea and Curtis 2010).

Map Class Total Area (hectares)	Number of observations per map class
>50	30
8.33 to 50	0.6 per hectare
<8.33	5

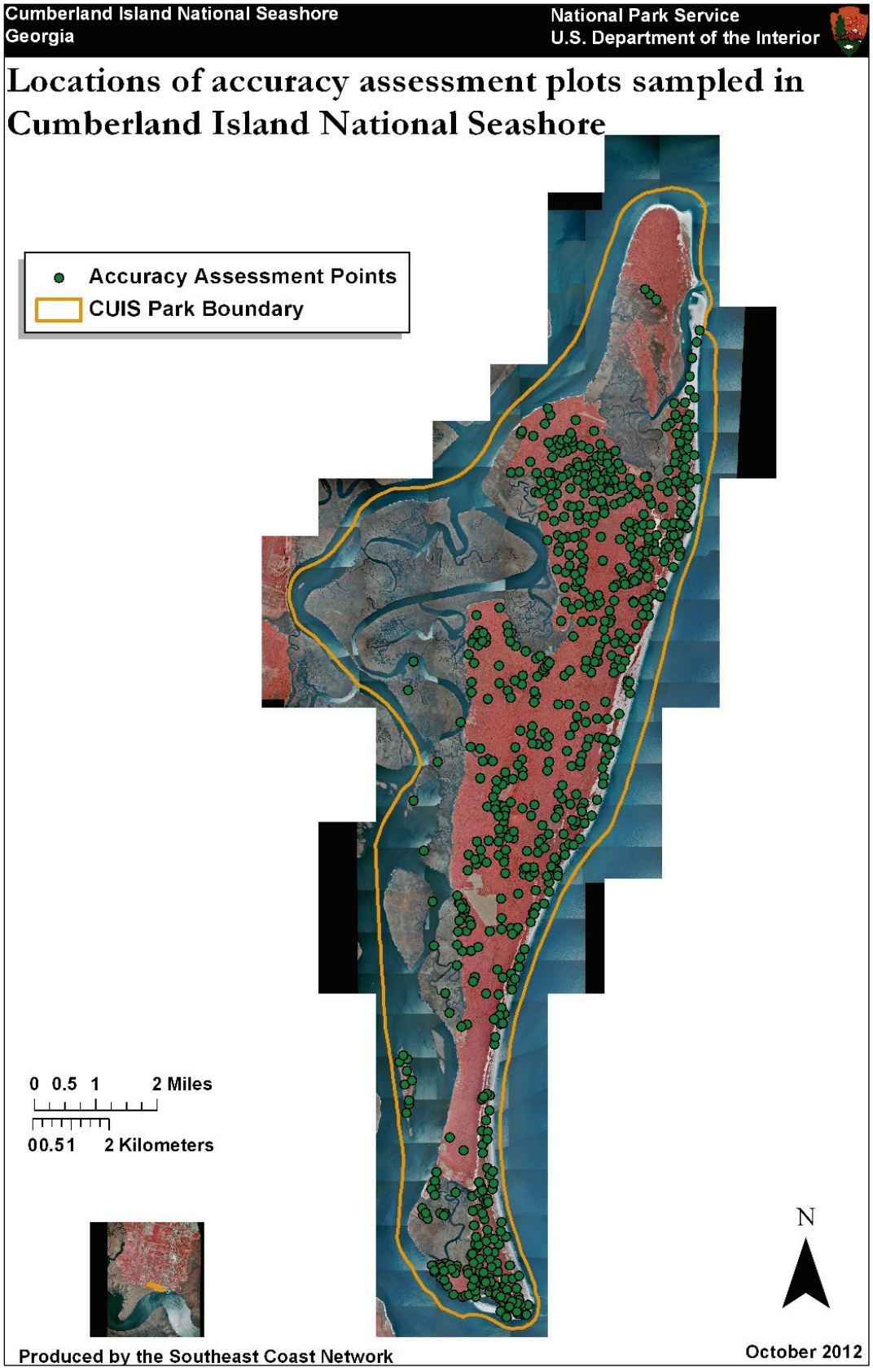


Figure 10. Locations of accuracy assessment points sampled in Cumberland Island National Seashore.

Field Data Collection

About half of the accuracy assessment points were sampled in October to December 2012 by a field crew of two Student Conservation Association (SCA) interns hired by the Southeast Coast Network. The remaining points were sampled by ecologists contracted by the Southeast Coast Network from the Atkins consulting firm in November through December 2013. To navigate to points in the field, crews loaded the AA points into a GPS receiver and used copies of the orthophotographs overlaid with the AA points (not including any of the lines from the mapped vegetation polygons). At each AA point, field crews assessed the site within an area equal in size to the minimum ha radius of the observation area, following methodology outlined by Lea and Curtis (2010). At each point, field crews collected applicable environmental data, such as hydrology and topography data. Vegetation data collected included leaf phenology, leaf type of the dominant stratum, physiognomic class, and vegetation composition in each stratum (see Appendix F for example AA form). A space was provided for the field crew to make general comments about the classification of each plot, including notes of any problems that were encountered. Photographs were taken of the canopy and in each cardinal direction to provide visual documentation of each AA site.

Data Analysis

The AA point data were manually entered into the NPS PLOTS database version 3.0. PLOTS Version 3.0 is a relational database in Microsoft Access designed to store vegetation inventory field data for taxonomy and accuracy assessment. The data were subjected to a thorough quality assessment/quality check prior to analysis. The analysis of the map accuracy included the following steps:

- Initial comparative analysis of the field and map data
- Review of all disagreements and correcting for false errors as necessary
- Final comparative analysis of the field and map data
- Individual map class analysis
- Final output of results into a contingency matrix
- Final output of the analyses and results into a spatial database for use in GIS

Initial Comparative Analysis

We used the ArcGIS Intersect Tool in Arc Toolbox to combine the AA point layer and the map vegetation polygon layer (ArcGIS Version 10.0, © 2010 Environmental Systems Research Institute, Redlands, California). The resulting layer allowed us to compare each AA field-site call (vegetation type) to the corresponding map-polygon call (map class representing vegetation type). We used Microsoft Excel 2007 (Microsoft Corporation) to compare and tabulate the field-site call to the map-polygon call.

Review of Disagreements

All mismatches (disagreements) were subsequently reviewed for false errors. A false error is a mismatch between the AA field-site call and the map-polygon call, if the error is caused by an accuracy error in the GPS field coordinates, a missing or misapplied field call, or a field site assessment of an area smaller than the minimum mapping unit. We reviewed the AA sites within the

context of their corresponding polygons in ArcGIS. We also reviewed the field data sheets to contextualize the ground data. From this process, we determined if an initial disagreement was either a true error or indeed a match.

Final Comparison

None of the mismatches were determined to be a result of a false error. However, some AA points were not visited due to issues with access (either dangerous terrain or the points fell on private property). Therefore, we used 659 of the original 711 AA field sites for the final comparative analysis of the vegetation map layer.

Individual Map-class Analysis

We looked at the accuracy for each map-class individually to determine if accuracy requirements of the NPS Vegetation Mapping Inventory Program were met. Based on the individual map class results, we determined if it would be better to merge the map classes to gain higher accuracy or to leave the map classes as they were, even if it resulted in lower accuracy. Initially, our total accuracy was less than the required 80%; therefore it was necessary for us to merge some of our map classes to improve overall accuracy. We made four merges, and all of of them were at a level higher than the Alliance. We felt these groupings were justifiable because the map classes we lumped had very similar (if not indistinguishable) photo signatures and shared similar habitat types and often similar species. The merges also made sense from a management standpoint. For example, the Live oak – (Cabbage Palmetto) Forest Alliance was merged with the Southeastern Florida Maritime Hammock because they both have oak species dominating the canopy and are upland forest types. The Maritime Southern Yellow Pine Forest is a name we developed to describe the combination of the Maritime Slash Pine – Longleaf Pine Upland Flatwoods association and the Mid- to Late- Successional Loblolly – Sweetgum Forest associations. During mapping, it was extremely difficult to distinguish between these two conifer-dominated upland forest types. We combined the Rush Marsh with the Sawgrass Head because they are both herbaceous dominated and both occur on temporarily or permanently flooded depressions with very poorly drained muck soils.The photo signatures for these two associations looked very similar as well, smooth, velvety texture interspersed that is gray, sometimes pink, in color. Finally, we merged the Southern Atlantic Coast Salt Marsh with the Salt Flat (Swampfire Type). The Southern Atlantic Coast Salt Marsh forms the dominant community type within the salt marsh along the eastern and southern sides of Cumberland Island, but the Salt Flat (Swampfire Type) would often occur adjacent to, or interspersed within the Southern Atlantic Coast Salt Marsh, making it difficult at times to determine where one started and the other ended.

Final Output

We generated two outputs for the AA results: a sample contingency table and a population contingency table. The sample contingency table provides an initial summary of the AA data by displaying counts of observations, with sample data values (vegetation map classes) as rows and reference data values (vegetation types as identified on the ground) as columns. The values in the shaded cells along the diagonal represent counts for correctly classified observations, where the reference data (column) matches the mapped vegetation type (row) (see Appendix G). User's accuracy was calculated by dividing the number of samples that agreed with their corresponding map

class by the total number of samples in that class. Producer's accuracy was calculated by dividing the number of samples that agreed with their corresponding map class by the total number of samples whose field call belonged to that category.

Previous NPS Vegetation Mapping Inventory Program guidance (TNC and ESRI 1994) suggested calculating user's, producer's, and overall accuracies from the sample contingency table of observation counts. However, this practice did not account for the unequal probability sampling imposed by the stratification by map classes. Thie practice is appropriate for user's accuracies but will give inaccurate results for producers' accuracies and overall accuracy. Therefore, measures of accuracy for the AA are defined by the population contingency table. Similar to the sample contingency table, rows in the population contingency table are defined by the sample data values, and columns are defined by the reference data values. Unlike the sample contingency table, the values in each cell are the proportion of the target area in the corresponding true and mapped vegetation classes, rather than the raw counts of observations. The population and sample contingency tables are reported together as a summary of between-class error relationships and class accuracy statistics (Lea and Curtis 2010) (see Appendix G).

AA Spatial Database

For use in GIS, we produced a feature-class layer of the AA site locations, along with supporting attribute tables, and incorporated them into the CUIS vegetation mapping project geodatabase.

Results

Vegetation Classification

The final classification for Cumberland Island National Seashore (developed by NatureServe and later revised by the SECN) resulted in a total of 45 vegetation associations in the NVCS (one of which was applied only outside of seashore boundaries; see Appendix B for full association descriptions).

Digital Imagery and Interpretation

For Cumberland Island National Seashore, 32 vegetation map units were developed. Most of these map units directly matched to the corresponding plant associations in the NVCS. Four map units

were a result of merges that were made to improve map accuracy.These merges were made at a level higher than the Alliance. (Table 6). One map class representing cultural vegetation in the NVCS (e.g., Open Field) was identified. Ten map classes representing non-vegetated units (e.g., open water bodies, buildings, roads) were identified (Table 7).

Table 6. Final vegetation associations of the NVCS used for vegetation mapping (with their assigned Map Codes) in Cumberland Island National Seashore.

Type	Association Common Name	NVCS Code(s)
Forest	Atlantic / East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest	CEGL004722
	Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock*	A.55/CEGL007020
	Maritime Southern Yellow Pine Forest*	CEGL004658/8462
	Outer Coastal Plain Sweetbay Swamp Forest	CEGL007049
	Red-cedar - Live Oak - Cabbage Palmetto Marsh Hammock	CEGL007813
	Red Maple - Tupelo Maritime Swamp Forest	CEGL004082
	Slash Pine - (Longleaf Pine) Managed Forest	CEGL007171
Woodland	Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland	CEGL004263
	South Atlantic Coastal Shell Midden Woodland	CEGL003525
	Wet Longleaf Pine - Pond Pine Flatwoods	CEGL004791
	Southern Atlantic Coastal Plain Carolina Willow Dune Swale	CEGL004272
Shrubland	Coastal Salt Shrub Thicket	CEGL003920
	Florida Coastal Strand (Temperate Palmetto Type)	CEGL003812
	Grapevine - Peppervine - Trumpetvine Thicket	CEGL004620
	Seaside-tansy Tidal Shrub Flat	CEGL003924

* Indicates map classes were combined to improve accuracy.

Table 6 (continued). Final vegetation associations of the NVCS used for vegetation mapping (with their assigned Map Codes) in Cumberland Island National Seashore.

Type	Association Common Name	NVCS Code(s)
Shrubland (continued)	Swamp-loosestrife Pond	CEGL003905
	Turtleweed - Swampfire Dwarf-shrubland	CEGL003956
	Xeric Oak Scrubland	CEGL003825
Herbaceous	Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation	CEGL004249
	Mid- and Southern Atlantic High Salt Marsh	CEGL004197
	Needlerush High Marsh	CEGL004197
	Outer Coastal Plain Maidencane Pond	CEGL007792
	Rush Marsh / Sawgrass Head*	CEGL004112/4949
	Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation	CEGL004254
	Sand Cordgrass - Seashore Mallow Herbaceous Vegetation	CEGL004194
	Sea-oats Temperate Herbaceous Alliance	A.1199
	South Atlantic Coastal Pond	CEGL007713
	South Atlantic Upper Ocean Beach	CEGL004401
	Southern Atlantic Coast Salt Marsh / Salt Flat (Swampfire Type)*	CEGL004191/2278
	Southern Cattail Marsh	CEGL004150
	Southern Hairgrass - Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation	CEGL004051
	Water-hyacinth Aquatic Vegetation	CEGL007671

* Indicates map classes were combined to improve accuracy.

Table 7. Map classification codes for non-vegetated areas in Cumberland Island National Seashore, following Land Use and Land Cover Level II (Anderson et al. 1976).

Map Class Code	Anderson Land Use and Land Cover Level II (1976)
74	Bare Exposed Rock
54	Bays and Estuaries
72	Beaches
12	Commercial and Services
78	Mud Flat
12	Open Marine
11	Residential

Table 7 (continued). Map classification codes for non-vegetated areas in Cumberland Island National Seashore, following Land Use and Land Cover Level II (Anderson et al. 1976).

Map Class Code	Anderson Land Use and Land Cover Level II (1976)
73	Sandy Areas other than Beaches
14	Transportation, Communications, and Utilities
50	Water

Ancillary data sources such as a digital raster graphic (DRG) and historical aerial photographs provided additional insight into ground conditions. Historical and current land management practices in the seashore provided details pertinent to classification issues.

Vegetation Map

Table 8 provides a summary report of the spatial-data layer (map) of Cumberland Island National Seashore and summarizes frequency, mean area (in ha), and the sum of areas (in ha) for each map class.

Table 8. Summary statistics for the map classes in the Cumberland Island National Seashore boundary and buffer. (ha—hectares)

Category	Map Class	Frequency (# Polygons)	Mean (ha)	Sum (ha)
Natural Vegetation	Atlantic / East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest	7	4.8	33.6
	Coastal Salt Shrub Thicket	6	0.5	3.2
	Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation	19	0.9	16.3
	Florida Coastal Strand (Temperate Palmetto Type)	16	3.2	50.6
	Grapevine - Peppervine - Trumpetvine Thicket	7	1.86	13.0
	Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock*	101	37.1	3,746.6
	Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland	3	8.27	24.8
	Maritime Southern Yellow Pine Forest*	73	7.08	517.1
	Mid- and Southern Atlantic High Salt Marsh	73	1.01	74.3
	Needlerush High Marsh	30	0.90	27.5
	Outer Coastal Plain Maidencane Pond	2	0.16	0.31
	Outer Coastal Plain Sweetbay Swamp Forest	14	8.64	121.1
	Red-cedar - Live Oak - Cabbage Palmetto Marsh Hammock	25	4.21	105.2

Table 8 (continued). Summary statistics for the map classes in the Cumberland Island National Seashore boundary and buffer. (ha—hectares)

Category	Map Class	Frequency (# Polygons)	Mean (ha)	Sum (ha)
Natural Vegetation (continued)	Red Maple - Tupelo Maritime Swamp Forest	13	6.17	80.2
	Rush Marsh / Sawgrass Head	17	2.23	37.8
	Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation	12	0.83	9.92
	Sand Cordgrass - Seashore Mallow Herbaceous Vegetation	8	1.79	14.3
	Sea-oats Temperate Herbaceous Alliance	44	6.81	299.7
	Seaside-tansy Tidal Shrub Flat	22	1.36	30.1
	Slash Pine - (Longleaf Pine) Managed Forest	1	5.96	5.96
	South Atlantic Coastal Pond	84	1.32	111.1
	South Atlantic Coastal Shell Midden Woodland	12	0.83	10.0
	South Atlantic Upper Ocean Beach	12	2.05	24.5
	Southern Atlantic Coast Salt Marsh / Salt Flat (Swampfire Type)*	92	40.0	3,678.8
	Southern Atlantic Coastal Plain Carolina Willow Dune Swale	17	4.91	83.4
	Southern Cattail Marsh	6	2.08	12.5
	Southern Hairgrass - Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation	66	1.21	80.2
	Swamp-loosestrife Pond	12	3.27	39.3
	Turtleweed - Swampfire Dwarf-shrubland	1	0.39	0.39
	Water-hyacinth Aquatic Vegetation	4	0.84	3.37
	Wet Longleaf Pine - Pond Pine Flatwoods	11	20.4	224.1
	Xeric Oak Scrubland	6	10.60	63.5
	Natural Vegetation subtotal:	**816**	**6.0**	**9,542.8**
Cultural Vegetation	Open Field	2	31.3	62.5
	Cultural Vegetation subtotal:	**2**	**31.3**	**62.5**
Non-Vegetated Areas	Bare Exposed Rock	1	0.17	0.17
	Bays and Estuaries	11	319.2	3,511.0
	Beaches	7	19.5	136.2
	Commercial and Services	56	1.75	98.0
	Mud Flat	1	2.0	2.0

Table 8 (continued). Summary statistics for the map classes in the Cumberland Island National Seashore boundary and buffer. (ha—hectares)

Category	Map Class	Frequency (# Polygons)	Mean (ha)	Sum (ha)
Non-Vegetated Areas (continued)	Open Marine	2	692.6	1,385.3
	Residential	4	0.18	0.72
	Sandy Areas other than Beaches	96	2.53	243.0
	Transportation, Communications, and Utilities	5	35.8	179.0
	Water	4	0.69	2.76
	Non-Vegetated Areas subtotal:	**187**	**107.4**	**5,558.2**
Grand Total:		**1,005**	**144.7**	**15,163.4**

Collectively, the CUIS spatial database layer is composed of 1,005 polygons covering 15,163.4 hectares, with an average polygon size of 144.7 hectares. Map classes representing natural/semi-natural types in the NVCS apply to 816 polygons (81.0% of all polygons) covering 9,542.8 hectares (62.9% of entire area) with an average polygon size of 6.0 hectares. Of these natural/semi-natural types, the combined map unit Live Oak – (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock, both in frequency of polygons (101), and in size (3,746.6 ha), covered the greatest area in the seashore. The combined map unit Southern Atlantic Coast Salt Marsh / Salt Flat (Swampfire Type) also covers a large amount of area in the seashore (3,678.8 ha).

The single cultural type in the NVCS (Open Field) consists of 2 polygons near Stafford (62.5 ha). Non-vegetated areas (including developed areas) consist of 187 polygons (18.6% of all polygons) and cover 5,558.2 hectares (36.7% of the entire area). Developed areas in the seashore include the NPS ranger stations, museum building, Dungeness Ruins, maintenance buildings, roads, and some private residences outside of seashore boundaries. Wetlands consist of 534 polygons (53.1% of all polygons) and cover 9,784.7 hectares (64.5% of the entire area).

A considerable number of additional analyses and deductions can be attained from even these simple summary reports. For example, a query could determine the average distance a certain vegetation association occurs from a road or another developed area. Additionally, more complex reports could be derived by introducing additional spatial-data layers (e.g., amphibian distributions, invasive species). Such analyses would provide greater insight into vegetation and its ecology.

Map Layer Presentation

Figure 11 presents the map layer produced for the CUIS vegetation mapping project. The map is shown at its finest level; therefore, vegetation classes are shown at the association level (except where associations were merged to improve accuracy) and are labeled by the association common name.



Figure 11. Vegetation (NVCS) and Land Use map classes for Cumberland Island National Seashore (Vegetation from FGDC 1997; Land Use from Anderson et al. 1976).

Accuracy Assessment

Overall accuracy was 83.9% (90% confidence interval [CI]: 80.1–87.7%) for primary map classes representing natural/semi-natural vegetation floristic types in the NVCS. The 83.9% accuracy was obtained after four classes were merged to improve accuracy (see section above for explanation about map class merges). A Kappa adjustment for chance agreements resulted in a final overall accuracy of 64.2% (90% CI: 61.2–67.3%). The sample and population contingency matrices for AA results are provided in Appendix G: Accuracy Assessment Contingency Tables. The population contingency matrix shows the accuracy of each map class (along with 90% CIs), with the user's accuracy reflecting errors of inclusion (commission errors) and the producer's accuracy reflecting errors of exclusion (omission errors) present in the mapping. The width of each CI is affected by the sample size used to derive the point estimate.

Map accuracy is assessed from two different standpoints, the user's accuracy, which indicates how confident a user can be that a particular map class is actually what is on the ground, and the the producer's accuracy, which reflects how well the vegetation was mapped (see Appendix G for further detail about how user's and producer's accuracies were calculated). The map classes with the highest user's accuracy (100%) were the Turtleweed-Swampfire Dwarf-Shrubland (I) (though only one point assessed, which was correct), the South Atlantic Upper Ocean Beach (U), and the Grapevine - Peppervine - Trumpetvine Thicket (V). The Turtlweed- Swampfire Dwarf Shrubland is a small map unit that was sampled once in the accuracy assessment, and did not occur on many locations on the island. The South Atlantic Upper Ocean Beach occupies the upper portion of the ocean beach and is easily identified both on the imagery and on the ground. The Grapevine – Peppervine – Trumpetvine Thicket occurs frequently throughout the island where gaps occur in the oak and oak-pine forests. This class is actually even more prominent than what was originally mapped, as reflected by the low producer's accuracy (7.7%) , meaning that there were omissions of this map unit in the original vegetation map. (Note that the final vegeation map reflects updates and edits from new field data obtained through the accuracy assessment, but the over-all accuracy and Kappa adjustments are values obtained from the original vegetation map.) Another high user accuracy map class was the Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock (HH) (95%), which is the ubiquitous forest map class which covers a large amount of area on the island.

The map classes with the lowest user's accuracy were the South Atlantic Coastal Shell Midden Woodland (B) (0%), the Swamp-loosestrife Pond (F) (5%), the Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation (R) (0%), the Outer Coastal Plain Sweetbay Swamp Forest (Z) (8%), the Slash Pine - (Longleaf Pine) Managed Forest (AA) (8%), the Water-hyacinth Aquatic Vegetation (BB) (0%), the Outer Coastal Plain Maidencane Pond (DD) (0%), the Salt Panne (Salicornia Type) (II) (0%), the Live Oak - Saw Palmetto- (Yaupon) Shrubland (JJ) (0%), the South Atlantic Coast Tidal River Shrubland (KK) (0%), and the Chestnut Fimbry – Common Threesquare Seasonally Flooded Herbaceous Vegetation (LL) (0%). Locations mapped as South Atlantic Coastal Shell Midden (BB) were determined on the ground to be either Coastal Salt Shrub Thicket, Seaside Tansy Tidal Flat, or Mid- and Southern Atlantic High Salt Marsh. These are similar community types that occur adjacent to the salt marsh and often share many species, but are lacking the canopy

codominance of southern red cedar and live oak required for classification as the South Atlantic Coastal Shell Midden. The Southern Loosestrife Pond (F), was confused the most times with the Grapevine - Peppervine - Trumpetvine Thicket (V), but also with Red Maple – Tupelo Swamp Forest, Rush Marsh / Sawgrass Head, and Southern Cattail Marsh, which are all freshwater wetland map classes. The Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation (R) is not a frequent map class and was only sampled in three locations. Of these three, R was confused with the Atlantic Coast Interdune Swale / Live Oak - Carolina Laurel Cherry - Hercule's Club Shrubland, Water hyacinth Aquatic Vegetation, and Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation. The largest mapping error for the Outer Coastal Plain Sweetbay Swamp Forest (Z) was its confusion with the Grapevine - Peppervine - Trumpetvine Thicket. We think this error occured because the both of these map classes are wetlands that occur frequently interspersed in openings of oak and oak-pine forests on the island. The Slash Pine - (Longleaf Pine) Managed Forest (AA) was confused with other conifer dominated map class, the combined map class Mid- to Late-Successional Loblolly Pine - Sweetgum Forest / Maritime Slash Pine- Longleaf Pine Upland Flatwoods. Both of these are upland pine-dominated map classes. The Water-hyacinth Aquatic Vegetation (BB) had low accuracy because out of five sites sampled, all five were confused with other wetland map classes including Rush Marsh/Sawgrass Head (1), Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation (2), Southern Atlantic Coastal Plain Carolina Willow Dune Swale (1), and Outer Coastal Plain Maidencane Pond (1). Similarly, the Outer Coastal Plain Maidencane Pond (DD) was sampled twice, and both of these sites were actually South Atlantic Coastal Pond. Many of these wetland herbaceous map classes were challenging to distinguish on the imagery and often did not cover large areas on the island, which would have provided more opportunities for developing a more accurate photo-signature. Finally, the last four map classes (II, JJ, KK, and LL), all non-prominent herbaceous map classes, were not mapped by the photo interpreter, but were classified on the ground during the accuracy assessment.

The map classes with highest producer's accuracy are as follows: The Salt Flat (Swampfire Type)/Southern Atlantic Coast Salt Marsh (A) (99.9%), the Red Maple - Tupelo Maritime Swamp Forest (K) (85.9%), the Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland (S) (100%), the Southern Atlantic Coastal Plain Carolina Willow Dune Swale (T) (98.5%), the South Atlantic Coastal Pond (CC) (96.5%), the Sea-oats Temperate Herbaceous Alliance (GG) (96.6%), and the Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock (HH) (94.4%). The combined The Salt Flat (Swampfire Type)/Southern Atlantic Coast Salt Marsh (A) map class was an easily mapped class because it forms the dominant community type within the salt marsh along the eastern and southern sides of Cumberland Island, and its photo signature is easily recognizable (a smooth texture and magenta color). We contribute the high accuracy of the Red Maple – Tupelo Maritime Swamp (K) forest to the dominance of Red Maple, which is distinct on the imagery (very symmetric crown and a bright red color). The Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland (S), was only sampled four times, but each one was correct. This community occurs in a specific location on Cumberland, on a slight rise to the south of North Cut Road. The location, along with a recognizable photo signature of an open, pine dominated canopy, lends to the high accuracy of this map class. The Southern Atlantic Coastal Plain Willow Dune Swale (T), tends to occur in interdunal swales just

inland from the ocean side of the island and typically adjacent to oak dominated canopy. Reliability of geographic location and photo signature were key for consistent identification. The South Atlantic Coastal Pond (CC) was one of the higher accuracy map classes for an herbaceous wetland. The consistent pattern of shape and texture of the photo signature, as well as a strong understanding of where this map class occured, enabled high accuacy. The Sea Oats Temperate Herbaceous Alliance (GG) was an easily mapped dunal vegetation type. There was not much confusion between it and other map classes. Finally, as discussed in the previous section where it also had a high user's accuracy, the Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock is a very common and visible oak dominated vegetation map class that covers much of the island. Many examples of this type were able to be visited during the field reconnaissance portion of the mapping project.

The map classes with some of the lowest producer's accuracy are as follows: the South Atlantic Coastal Shell Midden Woodland (B) (0%), the Turtleweed-Swampfire Dwarf-Shrubland (I) (1%), the Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation (R) (0%), the Grapevine - Peppervine - Trumpetvine Thicket (V) (7.7%), the Slash Pine - (Longleaf Pine) Managed Forest (AA) (0%), the Water-hyacinth Aquatic Vegetation (BB) (0%), the Outer Coastal Plain Maidencane Pond (DD) (0%), the Salt Panne (Salicornia Type) (II) (0%), the Live Oak - Saw Palmetto- (Yaupon) Shrubland (JJ) (0%), the South Atlantic Coast Tidal River Shrubland (KK) (0%), and the Chestnut Fimbry – Common Threesquare Seasonally Flooded Herbaceous Vegetation (LL) (0%). Several of these map classes also had low user's accuracies and the reason behind the low accuracy explained above also hold here for the low producer's accuracy (B, R, AA, BB, DD, II, JJ, KK, and LL). Most of these map classes covered only a small area; therefore, the opportunity to visit many locations during photo signature developement were not possible. For the Turtleweed – Swampfire Dwarf-Shrubland (I), confusions existed between it and the Seaside Tansy Tidal Flat and the Mid- and Southern Atlantic High Salt Marsh. Finally, the Grapevine - Peppervine - Trumpetvine Thicket (V) was under represented during the initial mapping due to the wide variations in the way this map class could appear on the imagery, due to a variety of species types and variety of locations were it could occur.

Discussion

One of the more difficult parts of mapping the vegetation of Cumberland Island was navigating the rough terrain of the island which includes numerous, and often expansive, wetland areas as well as thick, often impassable underbrush. Roads on the island are limited. Some areas were simple unable to be accessed during the photo interpreter's field reconnascience trip and during the accuracy assessment. In addition, the island has several inholdings of private land and residences that were not able to be accessed and had to be navigated around. Cumberland Island covers a wide area and encompasses many vegetation types, from salt marsh all the way to upland forest. One way we were able to more efficiently utitilize time and resources for visiting sites on the ground was to take advantage of some field work that was already completed by the Georgia Department of Natural Resources (GA DNR). In 2006–2007, GA DNR collected 82 full NVCS classification plots following the NatureServe protocol. Then in 2008, they department collected an additional 54 Accuracy Assessment points for the vegetation map they had created. Having access to these additional 136 points was a wonderful addition to the work we had already done and increased our efficiency in project completion.

Decisions to lump certain map classes to a level even higher than the Alliance were made within the SECN because 1) we noticed this had been done in other prior vegetation mapping projects when deemed necessary and 2) these map class merges made sense from a management standpoint (i.e. the merges would not adversly impact the way in which park managers would use the map for their management decisions).

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Appendix A: Field Survey Form

Fire Fuels n/a (plot 3)
PLOT# CUIS002

NPS SE COAST PROJECT: Plot Sampling Form Page 1

County: Camden Park: Cumberland Island National Seashore Plot Code: CUIS 003A **State: GA Location org: NPS**

Provisional community name Beach dune / Foredune

Classified community name Cakile edentula ssp. harperi Sparse Veg

Classifier LMK *Date* 6-30-08 *NVC ELCODE* CEGL004401

Survey date: 10/11/06 **time** 9:42 **Surveyors initials:** LK, AY, HS

Directions to plot (including any notes on best access route, and mile marker):

Beach Access by Stafford Road
head South

Time taken to walk to plot: < 1 min

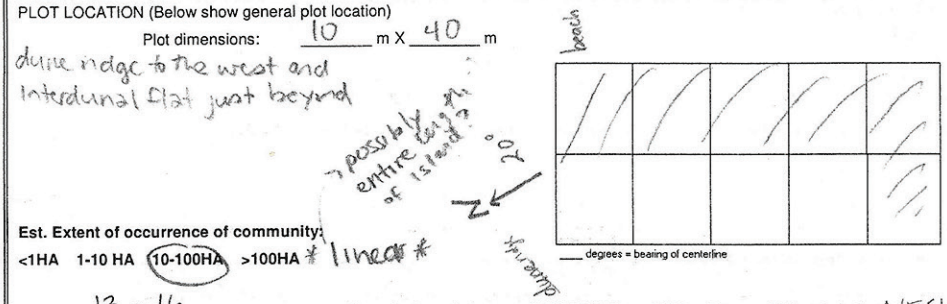
PLOT CONFIGURATION (Depict the plot layout on right with respect to the surrounding area and attempt to draw in points where GPS positions were collected, witness tree, bearing of centerline, locations of pictures taken, and communities near the plot.)

Plot representativeness -Is the surrounding area all the same? ___YES _X_ NO - If not, depict below)

PLOT LOCATION (Below show general plot location)

Plot dimensions: 10 m X 40 m

dune ridge to the west and interdunal flat just beyond



Est. Extent of occurrence of community:

<1HA 1-10 HA (10-100HA) >100HA * linear *

PIC # 13-16 **Description of pictures (N,E,S & W from GPS point at middle of plot) :** NESW

Select one: UTM / (Lat/long) (If lat/long, then values are 30.80867 N 081.44705 W

GPS Techniques/Equipment: Garmin V **Datum(pick one)** (WGS84) / NAD83 / NAD27 **UTM Zone:** 17

GPS Unit ID _____ **GPS file name** ~~CUIS 003A~~ CUIS 003 (standard = First letter(s) of park + # of plot (e.g. CH04, CL04, MO04)

Field UTM X _____ **m E Y** _____ **m N Elevation** 21 (m) / ft

Averaging performed (at least 120 observations)? 122 **Coordinate accuracy** _____ **m / ft DOP** _____ **# sats** _____

Community Survey
Page 1

NPS SE COAST PROJECT: Plot Sampling Form

County: Camden Park: Cumberland Island National Seashore Plot Code: CUIS 003A **State: GA Location org: NPS**

ENVIRONMENTAL / SITE INFORMATION

Measured Slope _____ ° _____ %

✓ Flat	0 °	0 %
__ Gentle	0-5 °	1-9%
__ Moderate	6-14 °	10-25%
__ Somewhat steep	15-25 °	26-49%
__ Steep	27-45 °	50-100%
__ Very steep	45-69 °	101-275%
__ Abrupt	70-100 °	276-300
__ ovrhng/shltrd	>100 °	>300%

Measured Aspect _____ ° (N=0 °)

✓ Flat		__ SE	113-157 °
__ Variable		__ S	158-202 °
__ N	338-22 °	__ SW	203-247 °
__ NE	23-67 °	__ W	248-292 °
__ E	68-112 °	__ NW	293-337 °

Topographic Position

__ Interfluve (Ridge/summit/crest) __ Toeslope
__ High Slope (upper/convex slope) __ Low level (terrace)
__ Midslope __ Channel bed
__ Lowslope (lower/footslope) beach dune

Cowardin System

✓ Upland __ Palustrine
__ Estuarine __ Lacustrine __ Riverine

Landform (check most applicable)

__ Alluvial flat	__ Bottomlands	__ Interdune Flat	__ Spit
__ Alluvial terrace	__ Carolina Bay	__ Lagoon	__ Streambed
__ Backslope Terrace	__ Channel	__ Lowland	__ Streamhead
__ Bank	__ Depression	__ Mound	__ Swale
__ Bar	__ Draw	__ Mudflat	__ Tidal Flat
__ Barrier Island	__ Dune	__ Ravine	__ Toe slope
✓ Beach	__ Estuary	__ Ridge	__ Washover Fan
__ Beach Ridge	__ Floodplain	__ Seep	__ _____
__ Bench	__ Gap	__ Slope	__ _____
	__ Gravel Bar	__ Slough	__ _____

Rock types present:

Hydrologic Regime:

✓ Not a wetland (Upland: XERIC : DRY - MESIC : MESIC)
__ Intermittently flooded __ Permanently flooded __ Semipermanently flooded __ Temporarily Flooded (e.g. floodplains) __ Tidally Flooded
__ Seasonally Flooded (e.g. seasonal ponds) __ Saturated (e.g. bogs, perennial seeps) __ Unknown __ Irregularly flooded __ Irrglrly exposed

QUALITATIVE ASSESSMENT:

A) HYDROLOGY:

B) LANDSCAPE AND LANDUSE HISTORY (including disturbance history and possible threats to sustainability):

Soil Texture:

✓ Sand __ Peat __ Silt loam __ Muck
__ Sandy loam __ Loam __ Clay loam __ Clay

Drainage:

✓ Rapidly drained __ Moderately well drained __ Somewhat poorly drained
__ Well drained __ Poorly drained __ Very poorly drained

Ground cover [Exclusive of living plants; adds to 100%]

_____% Bedrock	1 % Litter, duff	_____% Other _____
_____% Large rocks (cobbles, boulders >10cm)	_____% Wood (> 1 cm)	
_____% Small rocks (gravel, 0.2-10 cm)	_____% Water	
99 % Loose sand (0.1-2 mm)	_____% Bare soil	

Leaf type:

__ Broad-leaved __ Succulent
__ Needle-leaved __ Mixed
__ Microphyllous
__ Graminoid
✓ Broad-leaved herbaceous
__ Pteridophyte
__ Extremely xeromorphic

Leaf phenology (dominant stratum)

__ Evergreen
__ Cold-deciduous
__ Drought-deciduous
__ Mixed evergreen-cold-deciduous
__ Mixed evergreen drought deciduous
__ Herb - Annual
✓ Herb - Perennial

Physiognomic Class

__ Forest (closed tree canopy)
__ Woodland (open tree canopy)
__ Shrubland
__ Dwarf Shrubland
✓ Herbaceous (less than 25% woody layers)
__ Nonvascular
__ Sparse Vegetation

Natural and Anthropogenic Disturbance

_ logging	_ fire	_ Hydrologic
_ erosion	_ trails/roads	_ Agriculture
_ grazing/browsing	_ wind/ice damage	_ Old Growth
_ pine bark beetle	_ exotic plants	_ Fire Suppression
_ dogwood anthr	_ ORV	_ Redbay mortality

Disturbance and animal use comments:

Community Survey
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NPS SE COAST PROJECT: Plot Sampling Form Page 3

County: Camden Park: Cumberland Island National Seashore Plot Code: CUIS 003A **State: GA Location org: NPS**

QUANTITATIVE VEGETATION SAMPLE "DEFAULT" TAXONOMIC REFERENCE: USDA

STRATA	STRATA HEIGHT (1 only)	COVER CLASS	DOMINANT/DIAGNOSTIC SPECIES	Height scale (use tallest one for strata)	% cover for strata = top of cover class
Emergent – T1				< .5m 1	0-5% 1
Tree Canopy T2				.5-1m 2	5-10% 2
Subcanopy T3				1-2m 3	10-20% 3
Tall shrub S1				2-5m 4	20-30% 4
Short shrub S2				5-10m 5	30-40% 5
Herbaceous	1	30%	Ipomea pes-caprae - Croton	10-15m 6	40-50% 6
Non-vascular				15-20m 7	50-60% 7
Vine/liana				20-35m 8	60-70% 8
Other notable species (indicators of distinctive conditions, e.g. high pH soil, elevation, geographic region, other particularly abundant species):				35-50m 9	70-80% 9
				>50m 10	80-90% 10
					90-100% 11

T1: *Emergent* \ ***T2:*** *Tree Canopy* \ ***T3*** *Subcanopy* \ ***S1*** *Tall Shrub (>1m; to 5m)* \ ***S2*** *Short Shrub (< 1m)* \ ***H*** *Herbaceous* \ ***N*** *Nonvascular* \ ***V*** *Vines (lianas)* \ ***E*** *Epiphytes*

SPECIES COMPOSITION AND COVER/ABUNDANCE CLASS BY STRATUM (enter cover values for each stratum AND for Total cover)

T 1	T 2	T 3	S 1	S 2	H	N	V	E	Total Cover	Name (7 letter code or full name)	Collected? Spec #?	Discarded ?
					6				6	Ipomoea pes-caprae		
					5				5	Croton punctatus		
					5				5	Uniola paniculata		
					3				3	Salsola kali	Russian thistle	
					2				2	Ipomoea imperati		
					2				2	Cakile edentula		
					2				2	Distichlis spicata		
					2				2	Panicum amarum – refer to 184		
					1				1	Spartina patens		

Cover cls
1 trace
2 0.1-1%
3 1-2%
4 2-5%
5 5-10%
6 10-25%
7 25-50%
8 50-75%
9 75-95%
10 >95%

Community Survey
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Appendix B: Descriptions of Vegetation Types

This subset of the International Ecological Classification Standard covers associations and alliances attributed to Cumberland Island National Seashore and Fort Frederica National Monument. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC <mary_russo@natureserve.org> and Heather Summer, Regional Ecologist, Durham, NC <heather_summer@natureserve.org>. Some classifications were altered by SECN staff and are detailed in the descriptions below. In those instances, comments should be directed to the authors of this report.

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Forest (I.)

Lowland temperate seasonal evergreen forest (I.A.4.N.a.)

Quercus germinata Forest Alliance (A.52)

Alliance Concept

Summary: This alliance includes forests dominated by *Quercus geminata* (sand live oak). These occur on bayside shores of the mainland coast and inland on coarse sands. This alliance includes xeric maritime hammocks of the northeastern coast of Florida, south at least to Cape Canaveral, and of the panhandle. It also includes inland xeric hammocks dominated by *Quercus geminata* (sand live oak). These occur in north and central Florida, south Georgia, and perhaps south Alabama and South Carolina. Other characteristic species include *Quercus myrtifolia* (myrtle oak), *Lyonia ferruginea* (rusty staggerbush), *Osmanthus americanus var. americanus* (devilwood), *Persea borbonia* (redbay), and *Morella cerifera* (wax-myrtle). Characteristic shrubs may include *Ilex vomitoria* (yaupon), *Lyonia fruticosa* (coastalplain staggerbush), *Serenoa repens* (saw palmetto), and *Sideroxylon lanuginosum* (gum bully). An understory of *Sabal palmetto* (cabbage palmetto) may be present. The soils at sites where this alliance is found typically contain deep, infertile sands. Habitat for these forests is decreasing and many associations are now rare.

Related Concepts:

- Maritime Hammock (FNAI 1992a) I
- Xeric Hammock (FNAI 1992a) I
- Xeric Hammock, Mature Scrub Hammock subtype (FNAI 1992b)?

Alliance Description

Environment: These forests occur on bayside shores of the mainland coast and inland on coarse sands. This alliance includes xeric maritime hammocks of the northeastern coast of Florida, south at least to Cape Canaveral, and of the panhandle. It also includes inland xeric hammocks dominated by *Quercus geminata*. These are called oak domes. They occur in north and central Florida, south Georgia, and perhaps south Alabama and South Carolina.

Vegetation: Forests dominated by *Quercus geminata* (sand live oak). These occur primarily on bayside shores of the mainland coast. This alliance includes xeric maritime hammocks of the northeastern coast of Florida, south at least to Cape Canaveral, and of the panhandle. Other characteristic species include *Quercus myrtifolia* (myrtle oak), *Lyonia ferruginea* (rusty staggerbush), *Osmanthus americanus var. americanus* (devilwood), *Persea borbonia* (redbay), and *Morella cerifera* (wax-myrtle). Characteristic shrubs may include *Ilex vomitoria* (yaupon), *Lyonia fruticosa* (coastalplain staggerbush), *Serenoa repens* (saw palmetto), and *Sideroxylon lanuginosum* (gum bully). An understory of *Sabal palmetto* (cabbage palmetto) may be present. Inland xeric hammocks are dominated by *Quercus geminata* (sand live oak), and may have other *Quercus* (oak) spp. *Vaccinium stamineum* (deerberry), *Vaccinium arboreum* (farkleberry), *Serenoa repens* (saw palmetto), *Ilex opaca* (American holly), and *Smilax* (greenbrier) spp. are common in the understory. *Sabal etonia* (scrub palmetto) is a characteristic shrub on the Lake Wales Ridge.

Alliance Distribution

Range: This alliance is known from Florida and possibly Georgia, Alabama and South Carolina, but it is not found in Mississippi. This alliance includes xeric maritime hammocks of the northeastern coast of Florida, south at least to Cape Canaveral, and of the panhandle. It also includes inland xeric hammocks in Florida and southern Georgia.

Nations: US

SubNations: AL?, FL, GA, SC?

TNC Ecoregions: 53:C, 54:?, 55:C, 56:C

USFS Ecoregions: 232Bf:CCC, 232Bg:CCC, 232Ca:CCC, 232Cb:CCC, 232Ce:CCC, 232Db:CCP, 232Dc:CCC, 232De:CCP, 232Ga:CC?, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral, Eglin, Fort Stewart?); NPS (Canaveral, Cumberland Island, Fort Caroline, Timucuan); USFS (Apalachicola, Ocala); USFWS (Merritt Island?, St. Marks)

(CEGL007020) Southeastern Florida Maritime Hammock

Quercus geminata – (Quercus virginiana) / Serenoa repens – Lyonia fruticosa Forest

Southeastern Florida Maritime Hammock

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate broad-leaved seasonal evergreen forest (I.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved seasonal evergreen forest (I.A.4.N.)
Formation	Lowland temperate seasonal evergreen forest (I.A.4.N.a.)
Alliance	Quercus geminata Forest Alliance (A.52)
Alliance (English name)	Sand Live Oak Forest Alliance
Association	Quercus geminata - (Quercus virginiana) / Serenoa repens - Lyonia fruticosa Forest
Association (English name)	Sand Live Oak - (Live Oak) / Saw Palmetto - Rusty Fetterbush Forest
Association (Common name)	Southeastern Florida Maritime Hammock
Ecological System(s):	Southern Atlantic Coastal Plain Maritime Forest (CES203.537)

Element Concept

Global Summary: This association represents xeric maritime hammocks of the central eastern coast of Florida and adjacent areas in southern Georgia. The overstory is dominated by *Quercus geminata* (sand live oak); *Quercus virginiana* (live oak) may also be present, along with *Quercus myrtifolia* (myrtle oak). The dense shrub layer includes *Serenoa repens* (saw palmetto), *Lyonia fruticosa* (coastalplain staggerbush), *Lyonia ferruginea* (rusty staggerbush), *Osmanthus americanus var. americanus* (devilwood), *Persea borbonia* (redbay), and *Morella cerifera* (wax-myrtle). An

understory of *Sabal palmetto* (cabbage palmetto) may also be present. In northeastern Florida, at the Timucuan Ecological and Historic Preserve, dead and dying *Persea borbonia* (redbay) indicate that these maritime hammocks are being affected by laurel wilt, which is caused by a vascular wilt fungus that is transmitted to species in the Lauraceae family via the non-native redbay ambrosia beetle (*Xyleborus glabratus*).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This xeric maritime hammock forest was sampled once on the northern end of Cumberland Island on a flat with well-drained sand soil. The unvegetated surface is dominated by leaf litter (80% cover) with some wood (10%) and bare soil (5%). Evidence of disturbance includes some redbay twig dieback, a horse trail through the sampled plot, and fire suppression.

Global Environment: This association represents xeric maritime hammocks of the central eastern coast of Florida and adjacent areas of southern Georgia, occurring on deep, sandy soils.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderately dense (70% cover) tree canopy, 10-15 m tall, is dominated exclusively by *Quercus geminata* (sand live oak), while the very sparse (10%) subcanopy (5-10 m) is made up of *Osmanthus americanus* (devilwood), *Quercus myrtifolia* (myrtle oak) (state-vulnerable), and *Symplocos tinctoria* (common sweetleaf). The sparse (40%) tall-shrub layer (2-5 m) is dominated by *Lyonia ferruginea* (rusty staggerbush) which also dominates the moderately dense (70%) short-shrub layer (1-2 m) along with *Serenoa repens* (saw palmetto). Additional tall and short shrubs include *Morella cerifera* (wax-myrtle), *Symplocos tinctoria* (common sweetleaf), *Asimina parviflora* (smallflower pawpaw), *Galactia elliottii* (Elliott's milkpea), *Persea borbonia* (redbay), *Vaccinium corymbosum* (highbush blueberry), and *Vaccinium myrsinites* (shiny blueberry). The herbaceous layer is very sparse (5%) and made up mostly of oak seedlings. Vines of *Smilax auriculata* (earleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Vitis rotundifolia* (muscadine) climb into the tree and shrub layers. Epiphytes include *Tillandsia usneoides* (Spanish moss).

Global Vegetation: The overstory is dominated by *Quercus geminata* (sand live oak); *Quercus virginiana* (live oak) may also be present, along with *Quercus myrtifolia* (myrtle oak). The dense shrub layer includes *Serenoa repens* (saw palmetto), *Lyonia fruticosa* (coastalplain staggerbush), *Lyonia ferruginea* (rusty staggerbush), *Osmanthus americanus var. americanus* (devilwood), *Persea borbonia* (redbay), and *Morella cerifera* (wax-myrtle). An understory of *Sabal palmetto* (cabbage palmetto) may also be present.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Epiphyte	*Tillandsia usneoides* (Spanish moss)
Tree canopy	Broad-leaved evergreen tree	*Quercus geminata* (sand live oak)
Tree subcanopy	Broad-leaved evergreen tree	*Osmanthus americanus* (devilwood)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Lyonia ferruginea* (rusty staggerbush)
Short shrub/sapling	Broad-leaved evergreen shrub	*Serenoa repens* (saw palmetto)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Quercus geminata* (sand live oak), *Serenoa repens* (saw palmetto)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Quercus myrtifolia (myrtle oak)	G5	state-vulnerable

Global

Other Plant Species	GRank	Note
Lantana depressa (depressed shrubverbena)	G2	imperiled
Osmanthus americanus var. *megacarpus* (devilwood)	G5T3	vulnerable
Persea humilis (silk bay)	G3	vulnerable

Conservation Status Rank

Global Rank & Reasons: G2? (10-Jan-1998). This community is of very limited extent. It has been strongly affected by coastal development and fire suppression.

Classification

Status: Standard

Classification Confidence: 1 - Strong

Global Similar Associations:

- *Quercus geminata / Serenoa repens - Ilex vomitoria - (Sideroxylon lanuginosum)* Forest (CEGL007019)

Global Related Concepts:
Xeric Hammock, Mature Scrub Hammock subtype (FNAI 1992b) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This community was sampled on the northern end of Cumberland Island. It can be viewed along North Cut Road and lies in a transition zone between more mesic maritime live oak forest behind the dunes and the xeric sand live oak-myrtle oak scrub farther inland.

Global Range: This association occurs along the central eastern coast of Florida and southern Georgia.

Nations: US
States/Provinces: FL, GA
TNC Ecoregions: 54:?, 55:C, 56:C
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral); NPS (Canaveral, Cumberland Island, Fort Caroline, Timucuan); USFWS (Merritt Island?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.074.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley, mod. H. Summer
References: FNAI 1992a, FNAI 1992b, Johnson et al. 1990b, Southeastern Ecology Working Group n.d.

A.55–Quercus virginiana - (Sabal palmetto) Forest Alliance

Alliance Concept

Summary: This alliance includes communities of barrier islands, maritime hammocks, and some more inland coastal hammocks and other fire-protected situations, which are dominated and characterized by *Quercus virginiana* (live oak), and often containing *Sabal palmetto* (cabbage palmetto) and *Juniperus virginiana var. silicicola* (southern redcedar) within their ranges. Habitats for associations in this alliance range from xeric and subxeric to moist. Vegetation of this alliance most typically lies just landward of maritime shrub zones; it ranges from temperate to subtropical and often has a component of deciduous broad-leaved trees as well, particularly in the north. Some examples are affected by varying intensities of salt spray; these situations display more-or-less wind- and salt spray-sculpted vegetation. Other upland examples are not affected by salt spray and correspondingly differ in composition and stature. Composition varies along a latitudinal gradient. Examples occur on sand flats, lower slopes, and on stabilized dunes that are protected from saltwater flooding but which experience light to moderate salt spray. Some more protected examples have relatively closed and diverse canopies and well-developed shrub strata; vines are often conspicuous and abundant, but the herbaceous stratum is typically sparse and low in diversity. This community

occurs over moist, sandy soils, on low areas of the mainland coast, and stands are protected from the most extreme maritime influences (i.e., salt spray) but are susceptible to high winds and flooding during hurricanes. Extending south from the vicinity of Cape Fear, North Carolina, the canopy is dominated by *Quercus virginiana* (live oak) and *Pinus taeda* (loblolly pine) with some *Sabal palmetto* (cabbage palmetto). Farther south, *Pinus elliottii var. elliottii* (Honduras pine) replaces *Pinus taeda* (loblolly pine), and *Sabal palmetto* (cabbage palmetto) becomes more prominent. In mid-Florida, tropical species begin to dominate the understory while temperate species retain canopy dominance. South of Martin County, Florida, tropical species such as *Bursera simaruba* (gumbo limbo), *Sideroxylon foetidissimum* (false mastic), and *Ficus aurea* (Florida strangler fig) begin to dominate the forest canopy. The more tropically influenced examples may contain shrubs such as *Eugenia axillaris* (white stopper), *Myrsine floridana* (Guianese colicwood), and *Coccoloba uvifera* (seagrape) on the west coast of Florida, and *Myrcianthes fragrans* (twinberry), *Ardisia escallonoides* (island marlberry), and *Psychotria nervosa* (Seminole balsamo) on the east coast. The alliance also includes tropical/temperate maritime hammocks of the east coast of Florida, in mid-peninsula, characteristically with oak canopy and tropical subcanopy; as well as temperate maritime hammocks of the northeast and Panhandle coasts of Florida. Vegetation of this alliance may be found on xeric to mesic sites, often occurring as linear strands behind frontal dunes. The seaward edge is generally found on the leeward side of dune complexes which provide shelter from excessive salt spray and overwash; this vegetation is also found on top of relict dune ridges and other areas with xeric to mesic hydrology. While relatively protected, the vegetation frequently exhibits effects of wind-pruning and salt spray. The alliance also includes some dry hammocks, found from Florida to North Carolina; in these examples, *Quercus virginiana* (live oak) is dominant, and sometimes *Juniperus virginiana var. silicicola* (southern redcedar) is present in the canopy. Frequently small *Cladina* - *Cladonia*-dominated openings are present. On small hammocks in salt marshes, *Juniperus virginiana var. silicicola* (southern redcedar), *Baccharis halimifolia* (eastern baccharis), and *Morella cerifera* (wax-myrtle) are characteristic. Another type of xeric hammock contains *Serenoa repens* (saw palmetto) under a *Quercus virginiana* (live oak) canopy. On Amelia Island, Florida, *Magnolia grandiflora* (southern magnolia) is characteristically in the understory, increasing after cutting or with a greater shell content in the soil. Some Mississippi vegetation included here is found on coastal sand ridges along inlets of marsh channels.

Similar Alliances:

- *Quercus virginiana* - Carya illinoinensis Woodland Alliance (A.665)
- *Quercus virginiana* - Celtis laevigata Forest Alliance (A.374)
- *Quercus virginiana* - Juniperus virginiana - (Sabal palmetto) Woodland Alliance (A.479)--related vegetation which occurs under more severe conditions.
- *Quercus virginiana* - Quercus nigra Saturated Forest Alliance (A.379)
- *Quercus virginiana* - Quercus stellata Woodland Alliance (A.668)

Similar Alliance Comments: Also compare other West Gulf Coastal Plain *Quercus virginiana* alliances.

Related Concepts:

- Cabbage Palmetto: 74 (Eyre 1980) I
- IA9a. Mid-Atlantic Barrier Island Forest (Allard 1990) I
- IA9b. South Atlantic Inland Maritime Forest (Allard 1990) I
- IA9c. Mid-Atlantic Inland Maritime Forest (Allard 1990) I
- IA9d. South Atlantic Barrier Island Forest (Allard 1990) ?
- Interdune Forest (Ambrose 1990a) ?
- Live Oak: 89 (Eyre 1980) I
- Maritime Evergreen Forest (Schafale and Weakley 1990) I
- Maritime Forest (Nelson 1986) I
- Maritime Hammock (FNAI 1990) I
- Maritime Hammock (FNAI 1992a) I
- Maritime Strand Forest (Ambrose 1990a) ?
- Oak-bay forest (Sharitz 1975) ?
- Upland Maritime Forest (Ambrose 1990a) ?
- Xeric Hammock (FNAI 1992a) ?
- Xeric Hammock, Sandhill Hammock subtype (FNAI 1992b)?

Alliance Description

Environment: These forests occur on barrier islands or coastal hammocks, in situations ranging from xeric and subxeric to moist. Some examples are affected by varying intensities of salt spray; these situations display more-or-less wind- and salt spray-sculpted vegetation. Other upland examples are not affected by salt spray and correspondingly differ in composition and stature. This community occurs over moist, sandy soils, on low areas of the mainland coast, and stands are protected from the most extreme maritime influences (i.e., salt spray) but are susceptible to high winds and flooding during hurricanes. The alliance also includes tropical/temperate maritime hammocks of the east coast of Florida, in mid-peninsula, characteristically with oak canopy and tropical subcanopy; as well as temperate maritime hammocks of the northeast and Panhandle coasts of Florida. Vegetation of this alliance may be found on xeric to mesic sites, often occurring as linear strands behind frontal dunes. The seaward edge is generally found on the leeward side of dune complexes which provide shelter from excessive salt spray and overwash; this vegetation is also found on top of relict dune ridges and other areas with xeric to mesic hydrology. The alliance also includes some dry hammocks, found from Florida to North Carolina. Some Mississippi vegetation included here is found on coastal sand ridges along inlets of marsh channels.

Vegetation: These forest communities are dominated by *Quercus virginiana* (live oak), and often contain *Sabal palmetto* (cabbage palmetto) and *Juniperus virginiana var. silicicola* (southern redcedar) within their ranges. The northernmost examples, in Virginia and extreme northeastern

North Carolina, contain *Morella pensylvanica* (northern bayberry) as a shrub. Further south, stabilized dunes where salt spray is light to moderate display wind-sculpted vegetation dominated by *Quercus virginiana* (live oak) and *Quercus hemisphaerica* (Darlington oak) with lesser amounts of *Pinus taeda* (loblolly pine) and *Juniperus virginiana var. silicicola* (southern redcedar); typical understory components here include *Persea borbonia* (redbay), *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Juniperus virginiana var. silicicola* (southern redcedar), *Cornus florida* (flowering dogwood), *Osmanthus americanus var. americanus* (devilwood), *Ilex opaca var. opaca* (American holly), and *Zanthoxylum clava-herculis* (Hercules' club). Shrub species include *Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Sabal minor* (dwarf palmetto), and *Callicarpa americana* (American beautyberry). Dominant vines are *Toxicodendron radicans* (eastern poison-ivy), *Vitis rotundifolia* (muscadine), *Smilax* (greenbrier) spp., *Parthenocissus quinquefolia* (Virginia creeper), *Bignonia capreolata* (crossvine), *Berchemia scandens* (Alabama supplejack), *Ampelopsis arborea* (peppervine), and *Gelsemium sempervirens* (evening trumpetflower). Typical herbs are *Mitchella repens* (partridgeberry), *Asplenium platyneuron var. platyneuron* (ebony spleenwort), *Chasmanthium laxum* (slender woodoats), *Piptochaetium avenaceum* (blackseed speargrass), *Galium pilosum* (hairy bedstraw), *Dichanthelium commutatum* (variable panicgrass), *Elephantopus nudatus* (smooth elephantsfoot), and *Passiflora lutea* (yellow passionflower). Canopies in more protected examples are dominated by *Quercus virginiana* (live oak), *Quercus hemisphaerica* (Darlington oak), and *Pinus taeda* (loblolly pine) and may also contain *Quercus falcata* (southern red oak), *Carya glabra* (pignut hickory), *Quercus nigra* (water oak), and *Pinus palustris* (longleaf pine). Understory species include *Persea palustris* (swamp bay), *Magnolia virginiana* (sweetbay), *Osmanthus americanus var. americanus* (devilwood), *Ilex opaca var. opaca* (American holly), *Juniperus virginiana var. silicicola* (southern redcedar), and *Sassafras albidum* (sassafras). Typical shrubs in these examples include *Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Hamamelis virginiana* (American witch-hazel), and *Sabal minor* (dwarf palmetto). Vines include *Vitis rotundifolia* (muscadine), *Smilax bona-nox* (saw greenbrier), *Gelsemium sempervirens* (evening trumpetflower), and *Campsis radicans* (trumpet creeper). Common herbaceous species are *Mitchella repens* (partridgeberry) and *Asplenium platyneuron var. platyneuron* (ebony spleenwort). Extending south from the vicinity of Cape Fear, North Carolina, the canopy is dominated by *Quercus virginiana* (live oak) and *Pinus taeda* (loblolly pine) with some *Sabal palmetto* (cabbage palmetto). Farther south, *Pinus elliottii var. elliottii* (Honduras pine) replaces *Pinus taeda* (loblolly pine), and *Sabal palmetto* (cabbage palmetto) becomes more prominent. In mid-Florida, tropical species begin to dominate the understory while temperate species retain canopy dominance. South of Martin County, Florida, tropical species, such as *Bursera simaruba* (gumbo limbo), *Sideroxylon foetidissimum* (false mastic), and *Ficus aurea* (Florida strangler fig), begin to dominate the forest canopy. These more tropically influenced examples may contain shrubs such as *Eugenia axillaris* (white stopper), *Myrsine floridana* (Guianese colicwood), and *Coccoloba uvifera* (seagrape) on the west coast of Florida, and *Myrcianthes fragrans* (twinberry), *Ardisia escallonoides* (island marlberry), and *Psychotria nervosa* (Seminole balsamo) on the east coast. In some examples, small *Cladina* - *Cladonia*-dominated openings are present. Other characteristic species include *Scleria triglomerata* (whip nutrush), *Paronychia baldwinii* (Baldwin's nailwort), *Cladina evansii* (Evans' reindeer lichen), *Stipulicida setacea* (pineland scalypink), and *Hypericum hypericoides* (St. Andrew's cross). Some

examples (e.g., on Amelia Island, Florida), *Magnolia grandiflora* (southern magnolia) is characteristically in the understory, increasing after cutting or with a greater shell content in the soil.

Dynamics: Habitats for associations in this alliance range from xeric and subxeric to moist. Vegetation of this alliance lies just landward of maritime shrub zones; it ranges from temperate to subtropical and often has a component of deciduous broad-leaved trees as well, particularly in the north. Some examples are affected by varying intensities of salt spray; these situations display more-or-less wind- and salt spray-sculpted vegetation. Other upland examples are not affected by salt spray and correspondingly differ in composition and stature. Composition varies along a latitudinal gradient; the northernmost examples, in Virginia and extreme northeastern North Carolina, contain *Morella pensylvanica* as a shrub. Farther south, stabilized dunes where salt spray is light to moderate display variants of this vegetation as well. Some Mississippi vegetation included here is found on coastal sand ridges along inlets of marsh channels. This alliance occurs on sandy soils which are generally poorly developed and low in natural fertility and organic matter content. It is typically found on old dunes which have been stable for long enough to permit forest growth. While fire cycles are generally long (26-100 years), *Sabal palmetto* is fire-resistant and produces flammable litter. Under dry conditions, fires will burn in from adjoining pinelands and kill fire-sensitive species such as *Quercus hemisphaerica* and some tropical species. In the northern portion of this community's range, siliceous sands dominate in preference to carbonate ones; the siliceous sands are generally nutrient-poor while carbonate ones are richer. Farther south, the carbonate fraction increases. Carbonate sands begin to dominate in the Deep South, especially along the coast of Florida. Barrier island soils are derived from material carried onto the island by water and wave action and not from weathering of rock. The major nutrient input to the terrestrial vegetation is from salt spray and precipitation.

Alliance Distribution

Range: This alliance is found in the Coastal Plain from Virginia to Alabama and Florida, and possibly Mississippi.

Nations: US
SubNations: AL, FL, GA, MS?, NC, SC, VA
TNC Ecoregions: 53:C, 54:P, 55:C, 56:C, 57:C, 58:?
USFS Ecoregions: 232Bc:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCP, 232Bj:CCC, 232Bo:CC?, 232Bp:CCP, 232Ca:CCC, 232Cb:CCC, 232Cc:CCP, 232Ce:CCC, 232Cf:CC?, 232Ch:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Dd:CCC, 232De:CCC, 232Ga:CCP, 232Gb:CCC, 232Gc:CCP, 232Gd:CCP

Federal Lands: DOD (Cape Canaveral, Eglin, Fort Story, Tyndall?); NPS (Canaveral, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Caroline, Fort Frederica, Fort Matanzas, Fort Pulaski, Timucuan); USFS (Apalachicola, Croatan, De Soto, Francis Marion, Ocala, Osceola); USFWS (Back Bay, Blackbeard Island?, Bon Secour, Cape Romain, Currituck, Lake Woodruff?, Merritt Island?, Swanquarter?, Wassaw?, Wolf Island?)

Saturated temperate seasonal evergreen forest (I.A.4.N.g.)

Magnolia virginiana – Persea palustris Saturated Forest Alliance (A.60)

Alliance Concept

Summary: These are saturated forests of the Atlantic and Gulf coastal plains which have canopies typically dominated by *Magnolia virginiana* (sweetbay) and/or *Persea palustris* (swamp bay). Both species are generally present; one or the other may dominate. In some stands and associations now assigned here, dominance of these species may be shared with *Gordonia lasianthus* (loblolly bay), or this species may dominate. This alliance was originally described as lacking substantial dominance by *Gordonia lasianthus* (loblolly bay), this species being present only in small amounts, but the former *Gordonia lasianthus* (loblolly bay) Saturated Forest Alliance has been merged in here. In addition to these species, *Acer rubrum* (red maple), *Pinus serotina* (pond pine), and *Pinus elliottii var. elliottii* (Honduras pine) may also occur.

This alliance includes seepage-fed saturated forests found at the base of steepheads, with cool microclimates; also stream-associated flats and isolated peaty wetlands; as well as peaty soils only slightly above sea level, in swales and seepage-fed areas adjacent to sand dunes. Associated shrubs may include *Cyrilla racemiflora* (swamp titi), *Illicium floridanum* (Florida anisetree), *Ilex coriacea* (large gallberry), *Ilex glabra* (inkberry), *Viburnum nudum var. nudum* (possumhaw), *Clethra alnifolia* (coastal sweet-pepperbush), *Itea virginica* (Virginia sweetspire), *Pinckneya bracteata* (fevertree), and *Lyonia lucida* (fetterbush lyonia). In addition, *Cephalanthus occidentalis* (common buttonbush) may occur in wetter examples. Vines (*Smilax laurifolia* (laurel greenbrier), *Smilax glauca* (cat greenbrier), *Vitis rotundifolia* (muscadine)) may also occur. Herbs include *Rhynchospora* (beaksedge) spp., *Peltandra sagittifolia* (white arrow arum), *Peltandra virginica* (green arrow-arum), *Sarracenia purpurea* (purple pitcherplant), *Drosera intermedia* (spoonleaf sundew), *Pinguicula pumila* (small butterwort), *Viola X primulifolia* (primroseleaf violet), *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia areolata* (netted chainfern), and *Carex atlantica ssp. capillacea* (prickly bog sedge). *Sphagnum* (sphagnum) is common to scattered in examples of this alliance. Some examples occur in association with *Cliftonia monophylla* (buckwheat tree) forest, in slightly drier (though still saturated) situations. Canopy coverage can vary from closed to somewhat open, depending on disturbance; some maritime associations are subject to flooding, hurricanes, or storms which can create canopy openings. A maritime forest dominated by *Persea palustris* (swamp bay) is included here; in this example *Morella cerifera* (wax-myrtle) is common in the shrub layer. The herb layer has *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia virginica* (Virginia chainfern), and *Woodwardia areolata* (netted chainfern). This alliance is known from the Atlantic Coastal Plain from North Carolina south to Florida, and in the Florida Gulf Coastal Plain. Occurrences in subtropical Florida have subtropical components, such as *Chrysobalanus icaco* (icaco coco plum), *Ficus aurea* (Florida strangler fig), *Annona glabra* (pond apple), *Sambucus canadensis* (common elderberry), *Myrsine floridana* (Guianese colicwood), *Psychotria tenuifolia* (shortleaf wild coffee), *Dicliptera sexangularis* (sixangle foldwing), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Acrostichum danaeifolium* (inland leatherfern), *Blechnum serrulatum* (toothed midsorus fern), *Nephrolepis exaltata* (Boston swordfern), *Thelypteris*

kunthii (Kunth's maiden fern), *Rivina humilis* (rougeplant), *Habenaria odontopetala* (toothpetal bog orchid), and *Melothria pendula* (Guadeloupe cucumber).

Similar Alliances:

- *Cliftonia monophylla* Saturated Forest Alliance (A.58)
- *Cyrilla racemiflora - Ilex coriacea - (Cliftonia monophylla)* Saturated Shrubland Alliance (A.802)--related vegetation from the West Gulf Coastal Plain.
- *Magnolia virginiana - Nyssa biflora - (Quercus laurifolia)* Saturated Forest Alliance (A.378)--includes some related mixed broad-leaved evergreen - cold-deciduous vegetation.
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Taxodium distichum - Persea palustris - Chrysobalanus icaco* Seasonally Flooded Forest Alliance (A.366)

Similar Alliance Comments: Some examples occur in association with *Cliftonia monophylla* forest, in slightly drier (though still saturated) situations.

Related Concepts:

- Bay Forest (Schafale and Weakley 1990) I
- Baygall (FNAI 1992a) I
- Baygall, Loblolly Baygall subtype (FNAI 1992b) ?
- Baygall, Sweetbay Baygall subtype (FNAI 1992b) ?
- Bayhead (Olmsted and Loope 1984) ?
- Bayhead/Swamp Forests (Gunderson and Loftus 1993) ?
- Bog (FNAI 1992a) I
- Bog, Everglades Bayhead subtype (FNAI 1992b) I
- Floodplain Swamp (FNAI 1992a) I
- Floodplain Swamp, Sweet Bay Swamp subtype (FNAI 1992b) ?
- Forest, Carolina bay/Okefenokee swamp (Ambrose 1990a) ?
- IIA2d. Bay Forest (Allard 1990) I
- IIB2a. Bay Forest (Allard 1990) I
- Maritime Shrub Swamp, Red Bay Variant (Schafale and Weakley 1990) ?
- Shark Slough Bayhead Forest (Hilsenbeck et al. 1979) ?
- South Florida Bayhead Swamp Forest (Loope et al. 1994) ?
- Strand Swamp (FNAI 1992a) ?
- Strand Swamp, Everglades Bay Swamp subtype (FNAI 1992b) ?
- Sweetbay - Swamp Tupelo - Redbay: 104 (Eyre 1980) I
- Tropical Hardwoods: 105 (Eyre 1980) I

Alliance Description

Environment: This alliance includes seepage-fed saturated forests of the Atlantic and Gulf coastal plains with cool microclimates found at the base of steepheads and other slopes, also stream-associated flats and isolated peaty wetlands, as well as peaty soils only slightly above sea level, in swales and seepage-fed areas adjacent to sand dunes. This includes streamhead pocosins and other peaty streamhead situations such as large peat dome pocosins and peat-filled Carolina bays.

Vegetation: These are saturated forests of the Atlantic and Gulf coastal plains which have canopies typically dominated by *Magnolia virginiana* (sweetbay) and/or *Persea palustris* (swamp bay). Both species are generally present; one or the other may dominate. In some stands and associations now assigned here, dominance of these species may be shared with *Gordonia lasianthus* (loblolly bay), or this species may dominate. This alliance was originally described as lacking substantial dominance by *Gordonia lasianthus* (loblolly bay), this species being present only in small amounts, but the former *Gordonia lasianthus* (loblolly bay) Saturated Forest Alliance has been merged in here. In addition to these species, *Acer rubrum* (red maple), *Pinus serotina* (pond pine), and *Pinus elliottii var. elliottii* (Honduras pine) may also occur. Associated shrubs may include *Cyrilla racemiflora* (swamp titi), *Illicium floridanum* (Florida anisetree), *Ilex coriacea* (large gallberry), *Ilex glabra* (inkberry), *Viburnum nudum var. nudum* (possumhaw), *Clethra alnifolia* (coastal sweet-pepperbush), *Itea virginica* (Virginia sweetspire), *Pinckneya bracteata* (fevertree), and *Lyonia lucida* (fetterbush lyonia). In addition, *Cephalanthus occidentalis* (common buttonbush) may occur in wetter examples. Vines (*Smilax laurifolia* (laurel greenbrier), *Smilax glauca* (cat greenbrier), *Vitis rotundifolia* (muscadine)) may also occur. Herbs include *Rhynchospora* (beaksedge) spp., *Peltandra sagittifolia* (white arrow arum), *Peltandra virginica* (green arrow-arum), *Sarracenia purpurea* (purple pitcherplant), *Drosera intermedia* (spoonleaf sundew), *Pinguicula pumila* (small butterwort), *Viola X primulifolia* (primroseleaf violet), *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia areolata* (netted chainfern), and *Carex atlantica ssp. capillacea* (prickly bog sedge). *Sphagnum* (sphagnum) is common to scattered in examples of this alliance. A maritime forest dominated by *Persea palustris* (swamp bay) is included here; in this example *Morella cerifera* (wax-myrtle) is common in the shrub layer. The herb layer has *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia virginica* (Virginia chainfern), and *Woodwardia areolata* (netted chainfern). In a maritime forest example *Morella cerifera* (wax-myrtle) is common in the shrub layer. The herb layer in this type has *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia virginica* (Virginia chainfern), and *Woodwardia areolata* (netted chainfern). Occurrences in subtropical Florida have subtropical components, such as *Chrysobalanus icaco* (icaco coco plum), *Ficus aurea* (Florida strangler fig), *Annona glabra* (pond apple), *Sambucus canadensis* (common elderberry), *Myrsine floridana* (Guianese colicwood), *Psychotria tenuifolia* (shortleaf wild coffee), *Dicliptera sexangularis* (sixangle foldwing), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Acrostichum danaeifolium* (inland leatherfern), *Blechnum serrulatum* (toothed midsorus fern), *Nephrolepis exaltata* (Boston swordfern), *Thelypteris kunthii* (Kunth's maiden fern), *Rivina humilis* (rougeplant), *Habenaria odontopetala* (toothpetal bog orchid), and *Melothria pendula* (Guadeloupe cucumber).

Dynamics: Canopy coverage can vary, depending on disturbance; some maritime associations are subject to flooding, hurricanes, or storms which can create canopy openings. An example of this Alliance (CEGL007049) burned in a high-intensity wildfire in 1998 at Bradwell Bay, Apalachicola National Forest.

Alliance Distribution

Range: This alliance is found in the Atlantic and Gulf coastal plains of Mississippi, Florida, Georgia, North Carolina, and South Carolina, and may occur in Alabama and Louisiana.

Nations: US
SubNations: AL?, FL, GA, NC, SC
TNC Ecoregions: 53:C, 54:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCP, 232Bn:CC?, 232Bo:CC?, 232Bp:CC?, 232Bq:CC?, 232Br:CCC, 232Bs:CC?, 232Bu:CCC, 232Bv:CCP, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Cd:CCC, 232Ce:CCC, 232Cf:CCC, 232Cg:CC?, 232Ch:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Ga:CCP, 232Gb:CCC, 232Gc:CCP, 232Gd:CCP, 411Ab:CCC

Federal Lands: DOD (Eglin, Fort Gordon?, Fort Stewart?); NPS (Cape Hatteras, Cumberland Island, Everglades, Fort Caroline, Timucuan); USFS (Apalachicola, Croatan, Francis Marion?, Ocala, Osceola)

(CEGL007049) Outer Coastal Plain Sweetbay Swamp Forest
Magnolia virginiana - Persea palustris / Lyonia lucida Forest
Sweetbay - Swamp Bay / Shining Fetterbush Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate broad-leaved seasonal evergreen forest (I.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved seasonal evergreen forest (I.A.4.N.)
Formation	Saturated temperate seasonal evergreen forest (I.A.4.N.g.)
Alliance	*Magnolia virginiana - Persea palustris* Saturated Forest Alliance (A.60)
Alliance (English name)	Sweetbay - Swamp Bay Saturated Forest Alliance
Association	*Magnolia virginiana - Persea palustris / Lyonia lucida* Forest
Association (English name)	Sweetbay - Swamp Bay / Shining Fetterbush Forest
Association (Common name)	Outer Coastal Plain Sweetbay Swamp Forest

NVC Classification (continued)

Classification Level	Observed Classification
Ecological System(s):	Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
	Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)

Element Concept

Global Summary: This saturated forest of the Outer Coastal Plain of the southeastern United States has a low diversity of vascular plants. Sites include stream-associated flats, stringers and isolated peaty wetlands. The canopy is dominated by *Magnolia virginiana* (sweetbay) and *Persea palustris* (swamp bay), sometimes one or the other, and rarely also *Gordonia lasianthus* (loblolly bay). Additional possible components of the canopy are *Nyssa biflora* (swamp tupelo), *Taxodium ascendens* (pond-cypress), *Ilex cassine* (dahoon), *Acer rubrum* (red maple), and *Cliftonia monophylla* (buckwheat tree). Sometimes there is a very sparse emergent component of *Pinus elliottii* (slash pine) or *Pinus serotina* (pond pine). The shrub layer may be dominated by *Lyonia lucida* (fetterbush lyonia) and can also include *Ilex coriacea* (large gallberry), *Ilex opaca* (American holly), *Ilex cassine* (dahoon), *Morella cerifera* (wax-myrtle), *Clethra alnifolia* (coastal sweet-pepperbush), *Serenoa repens* (saw palmetto), and others. Vines are mainly *Smilax laurifolia* (laurel greenbrier) but also include *Vitis rotundifolia* (muscadine) and *Toxicodendron radicans* (eastern poison-ivy). Herbaceous flora is sparse to absent but can include *Osmunda cinnamomea* (cinnamon fern), *Woodwardia areolata* (netted chainfern), and *Woodwardia virginica* (Virginia chainfern). The epiphyte *Tillandsia usneoides* (Spanish moss) may be present. Scattered *Sphagnum* (sphagnum) patches occur. This community sometimes occurs in association with *Cliftonia monophylla* (buckwheat tree) forests, in which case it occurs in slightly drier (though still saturated) situations. In northeastern Florida, at the Timucuan Ecological and Historic Preserve (including Fort Caroline National Memorial), dead and dying *Persea palustris* (swamp bay) indicate that these sweetbay forests are being affected by laurel wilt, which is caused by a vascular wilt fungus that is transmitted to species in the Lauraceae family via the non-native redbay ambrosia beetle (*Xyleborus glabratus*).

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This sweetbay swamp forest was sampled once on Cumberland Island and occurs in a semipermanently flooded bottomland with very poorly drained clay loam soil. The unvegetated surface is dominated by leaf litter (86% cover) with some wood (3%), bare soil (1%), and standing water (10%). Evidence of disturbance includes some redbay twig dieback.

Global Environment: This community sometimes occurs in association with *Cliftonia monophylla* forests, in which case it occurs in slightly drier (though still saturated) situations. Sites include stream-associated flats, stringers and isolated peaty wetlands.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dense (80% cover) tree canopy, 15-20 m tall, is dominated by *Persea palustris* (swamp bay) and *Magnolia virginiana* (sweetbay). The very sparse (10%) subcanopy (5-10 m) is made up of *Morella cerifera* (wax-myrtle), *Persea palustris* (swamp bay), and *Pinus taeda* (loblolly pine), as is the sparse (20%) tall-shrub layer (2-5 m), along with *Vaccinium arboreum* (farkleberry) and *Vaccinium corymbosum* (highbush blueberry). The sparse (20%) short-shrub layer (1-2 m) is made up of saplings of the canopy species. The moderately sparse (40%) herbaceous layer is dominated by *Chasmanthium laxum* (slender woodoats); additional herbs found in lesser amounts include *Dichanthelium dichotomum* (cypress panicgrass), *Rhynchospora fascicularis* (fascicled beaksedge), *Rubus argutus* (sawtooth blackberry), *Saururus cernuus* (lizard's-tail), and *Woodwardia areolata* (netted chainfern). Vines (10%) of *Gelsemium sempervirens* (evening trumpetflower), *Smilax laurifolia* (laurel greenbrier), *Smilax glauca* (cat greenbrier), and *Vitis rotundifolia* (muscadine) cover the ground and climb into the tree and shrub layers. Epiphytes include *Pleopeltis polypodioides* (resurrection fern).

Global Vegetation: The canopy of stands is dominated by *Magnolia virginiana* (sweetbay) and/or *Persea palustris* (swamp bay) (and rarely also *Gordonia lasianthus* (loblolly bay)). Additional typically less important components of the canopy are *Nyssa biflora* (swamp tupelo), *Taxodium ascendens* (pond-cypress), *Ilex cassine* (dahoon), *Acer rubrum* (red maple), and *Cliftonia monophylla* (buckwheat tree). Sometimes there is a very sparse emergent component of *Pinus elliottii* (slash pine) or *Pinus serotina* (pond pine). The shrub layer may be dominated by *Lyonia lucida* (fetterbush lyonia), and can also include *Ilex coriacea* (large gallberry), *Ilex cassine* (dahoon), *Ilex opaca* (American holly), *Morella cerifera* (wax-myrtle), *Clethra alnifolia* (coastal sweet-pepperbush), *Serenoa repens* (saw palmetto), *Gaylussacia mosieri* (woolly huckleberry), *Rhododendron viscosum* (swamp azalea), *Ilex glabra* (inkberry), *Hamamelis virginiana* (American witch-hazel), and *Leucothoe racemosa* (swamp doghobble). Vines are mainly *Smilax laurifolia* (laurel greenbrier) but also include *Vitis rotundifolia* (muscadine) and *Toxicodendron radicans* (eastern poison-ivy). Herbaceous flora is sparse to absent, but can include *Osmunda cinnamomea* (cinnamon fern), *Woodwardia areolata* (netted chainfern), and *Woodwardia virginica* (Virginia chainfern). The epiphyte *Tillandsia usneoides* (Spanish moss) may be present. Scattered *Sphagnum* (sphagnum) patches occur. Stands of this forest typically have a low diversity of vascular plants. On Jekyll Island, Georgia, a stand dominated by large *Nyssa biflora* (swamp tupelo) has been assigned here. In this stand, *Persea palustris* (swamp bay) forms a distinct understory layer. *Persea palustris* (swamp bay) and *Lyonia ferruginea* (rusty staggerbush) make up a tall-shrub layer. *Ilex cassine* (dahoon) and *Ilex opaca* (American holly) may also be scattered in the tall-shrub layer. *Morella cerifera* (wax-myrtle) and *Persea palustris* (swamp bay) dominate the short-shrub layer. In some areas, the shrub layer becomes dense with *Serenoa repens* (saw palmetto) and *Lyonia lucida* (fetterbush lyonia). Few or no herbs are present, although *Woodwardia areolata* (netted chainfern) and *Woodwardia virginica* (Virginia chainfern) do occur where shrubs are less dense. A site in Bradwell Bay, Apalachicola National Forest, Florida, burned in a high-intensity wildfire in 1998. It is a regenerating stand of *Magnolia virginiana* (sweetbay) with some *Pinus elliottii* (slash pine) and *Pinus serotina* (pond

pine). *Lyonia lucida* (fetterbush lyonia) is a dominant shrub. The herbaceous flora is sparse but somewhat more diverse than other examples of this association.

A plot classified here from Fort Gordon, Georgia (232Bq; somewhat northerly and inland for this association), has a canopy dominated by a combination of *Pinus taeda* (loblolly pine) and *Quercus nigra* (water oak) with *Acer rubrum* (red maple) and *Liriodendron tulipifera* (tuliptree). The subcanopy is dominated by *Magnolia virginiana* (sweetbay) and *Gordonia lasianthus* (loblolly bay), with *Ilex opaca* (American holly) and *Oxydendrum arboreum* (sourwood); it lacks *Nyssa biflora* (swamp tupelo). The dominant shrub is *Ilex coriacea* (large gallberry), with *Kalmia latifolia* (mountain laurel), *Lyonia lucida* (fetterbush lyonia), *Persea palustris* (swamp bay), *Rhododendron viscosum* (swamp azalea), *Symplocos tinctoria* (common sweetleaf), and *Itea virginica* (Virginia sweetspire). Vines include *Bignonia capreolata* (crossvine), *Smilax laurifolia* (laurel greenbrier), and *Vitis rotundifolia* (muscadine). Herbs are few, including *Mitchella repens* (partridgeberry), *Osmunda cinnamomea* (cinnamon fern), and *Carex* (sedge) spp. Its proper placement is unclear, but the attributions of this association (CEGL007049) to Fort Gordon and 232Bq are based on this plot.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Persea palustris* (swamp bay)
Tree (canopy & subcanopy)	Epiphyte	*Pleopeltis polypodioides* (resurrection fern)
Tree canopy	Broad-leaved evergreen tree	*Magnolia virginiana* (sweetbay)
Tree subcanopy	Needle-leaved tree	*Pinus taeda* (loblolly pine)
Shrub/sapling (tall & short)	Needle-leaved shrub	*Pinus taeda* (loblolly pine)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Persea palustris* (swamp bay)
Short shrub/sapling	Broad-leaved deciduous shrub	*Nyssa biflora* (swamp tupelo)
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Herb (field)	Vine/Liana	*Smilax glauca* (cat greenbrier), *Smilax laurifolia* (laurel greenbrier), *Vitis rotundifolia* (muscadine)
Herb (field)	Graminoid	*Chasmanthium laxum* (slender woodoats)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Magnolia virginiana* (sweetbay), *Persea palustris* (swamp bay)

Conservation Status Rank

Global Rank & Reasons: G3? (31-Jan-2001). This bay forest type is limited to acidic peaty soils of the Outer Coastal Plain of the southeastern United States. It appears to be uncommon, though

additional information is needed on its extent and conservation status. Nearly all examples have been altered by timber harvest.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: Examples are found at Sandy Island, Georgetown County, South Carolina, and Fort Caroline (part of Timucuan Ecological and Historic Preserve), Jacksonville, Florida.

Global Related Concepts:

- Floodplain Swamp, Sweet Bay Swamp subtype (FNAI 1992b) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled west of an old agricultural-wetland complex near the center of Cumberland Island, within the wilderness area north of Stafford Field. Bands of the association exist with alternating bands of dense *Morella cerifera* shrubs.

Global Range: This bay forest is limited to acidic peaty soils of the Outer Coastal Plain of the southeastern United States from South Carolina to Florida and possibly Alabama.

Nations: US
States/Provinces: AL?, FL, GA, SC
TNC Ecoregions: 53:C, 55:P, 56:C, 57:C
USFS Ecoregions: 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bq:CC?, 232Br:CCC, 232Ca:CCC, 232Cc:CCC, 232Ce:CCC, 232Cf:CC?, 232Dc:CCC

Federal Lands: DOD (Eglin, Fort Gordon?); NPS (Cumberland Island, Fort Caroline, Timucuan); USFS (Apalachicola, Ocala, Osceola)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.044.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: C.W. Nordman, mod. M. Pyne and H. Summer
References: FNAI 1992a, FNAI 1992b, Schotz pers. comm., Southeastern Ecology Working Group n.d.

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

Pinus palustris – (Pinus elliottii) Forest Alliance (A.123)

Alliance Concept

Summary: This alliance accommodates flatwoods and other mesic Coastal Plain environments dominated by mixtures of *Pinus palustris* (longleaf pine) and *Pinus elliottii var. elliottii* (Honduras pine). This includes a variety of situations, for example dense, fire-suppressed *Pinus elliottii var. elliottii* (Honduras pine) plantations and old-field stands, on former *Pinus palustris* (longleaf pine) sites, with a remnant semi-natural ground layer; in addition to other silviculturally manipulated stands, such as forests resulting from planting or regeneration of *Pinus elliottii var. elliottii* (Honduras pine) from seed trees. Examples of this alliance are generally silviculturally managed, so some examples at particular times may exhibit canopy coverage below the 60% cover limit for a forest, but all examples are conceptually included here. Burning frequencies for management purposes are generally increased in older stands (greater than 15 years of age).

Examples of this alliance in the West Gulf Coastal Plain include stands which are old plantations planted outside the natural range of *Pinus elliottii var. elliottii* (Honduras pine), sometimes on former *Pinus palustris* (longleaf pine) sites. In this region, the local expression of this alliance depends on soil conditions. In mesic to dry-mesic uplands, the canopy may range from nearly pure *Pinus elliottii* (slash pine) (possibly with some *Pinus taeda* (loblolly pine) ingrowth) to a mixed canopy containing *Pinus elliottii var. elliottii* (Honduras pine) and *Pinus palustris* (longleaf pine) in combination. In the former case, soils are generally acidic silt loams and sandy loams; in the latter case they tend to be well-drained to moderately well-drained fine sandy loams and sands underlain by clay. The understory and herbaceous strata vary depending on management, site conditions, and canopy coverage; the tall-shrub stratum ranges from fairly dense to sparse, and may be patchy. In the Inner Coastal Plain of South Carolina (Savannah River Site), mature upland plantations in this alliance tend to develop an understory including *Nyssa sylvatica* (blackgum) and an herbaceous stratum dominated by *Rubus argutus* (sawtooth blackberry). In contrast, burned examples tend to have *Prunus serotina var. serotina* (black cherry) in the understory and *Andropogon virginicus* (broomsedge bluestem) in the herbaceous layer.

Classification Comments: Associations on the Kisatchie, Angelina, and Sabine national forests are former plantations that are out of the natural range of *Pinus elliottii var. elliottii*. This alliance contains managed forests which are manipulated through silvicultural techniques such as burning and thinning. Initially planted as a seedling/sapling phase, they progress relatively quickly (9-12 years) to a forest physiognomy. See also the *Pinus elliottii* Planted Forest Alliance (A.95), for these younger stands are likely to be cut before succeeding to other vegetation types.

Similar Alliances:

- *Pinus elliottii* Planted Forest Alliance (A.95)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)--natural saturated slash pine stands.
- *Pinus palustris - Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)

- *Pinus palustris* Woodland Alliance (A.520)--mesic natural longleaf pine stands.

Related Concepts:

- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) I
- Loamy Hills Longleaf - Slash Pine Forest (Wieland 1994b) I
- Longleaf - Slash Pine Forest (Wieland 1994b) I
- Longleaf Pine - Slash Pine: 83 (Eyre 1980) I

Alliance Description

Environment: West Gulf Coastal Plain stands which are placed here are old plantations planted outside the natural range of *Pinus elliottii var. elliottii*, sometimes on former *Pinus palustris* sites. In this region, the local expression of this alliance depends on soil conditions. In mesic to dry-mesic uplands, the canopy may range from nearly pure *Pinus elliottii* (possibly with some *Pinus taeda* ingrowth) to a mixed canopy containing *Pinus elliottii var. elliottii* and *Pinus palustris* in combination. In the former case, soils are generally acidic silt loams and sandy loams; in the latter case they tend to be well-drained to moderately well-drained fine sandy loams and sands underlain by clay. On dry to xeric former *Pinus palustris* sites, on silt loams, fine sandy loams, or silty clay loams underlain by clay of the Kisatchie Series, the soil is moderately deep with siltstone or sandstone occurring at 36-60 inches. This well-drained, very slowly permeable soil ranges from strongly to extremely acidic.

Vegetation: Stands of this alliance are dominated by mixtures of *Pinus palustris* (longleaf pine) and *Pinus elliottii var. elliottii* (Honduras pine). This includes a variety of situations, for example dense, fire-suppressed *Pinus elliottii var. elliottii* (Honduras pine) plantations and old-field stands, on former *Pinus palustris* (longleaf pine) sites, with a remnant semi-natural ground layer; in addition to other silviculturally manipulated stands, such as forests resulting from planting or regeneration of *Pinus elliottii var. elliottii* (Honduras pine) from seed trees. Examples of this alliance are generally silviculturally managed, so some examples at particular times may exhibit canopy coverage below the 60% cover limit for a forest, but all examples are included here. Burning frequencies for management purposes are generally increased in older stands (after 15 years).

Examples of this alliance in the West Gulf Coastal Plain include plantations which are planted outside the natural range of *Pinus elliottii var. elliottii* (Honduras pine), sometimes on former *Pinus palustris* (longleaf pine) sites. In mesic to dry-mesic uplands, the canopy may range from nearly pure *Pinus elliottii* (slash pine) (possibly with some *Pinus taeda* (loblolly pine) ingrowth) to a mixed canopy containing *Pinus elliottii var. elliottii* (Honduras pine) and *Pinus palustris* (longleaf pine) in combination. The understory and herbaceous strata vary depending on management, site conditions, and canopy coverage; the tall-shrub stratum ranges from fairly dense to sparse, and may be patchy. The herbaceous layer also varies; in younger stands, the canopy may often be too dense for the herbaceous layer to become well-developed. However, *Schizachyrium scoparium* (little bluestem)-dominated groundcover may be extensive in older stands (60 years or greater in age) that have been burned and thinned. On dry to xeric former *Pinus palustris* (longleaf pine) sites, the alliance is expressed as a fairly open forest is dominated by *Pinus elliottii* (slash pine) ranging from 60-80%

cover. Ingrowths of *Pinus echinata* (shortleaf pine), *Pinus taeda* (loblolly pine), and *Pinus palustris* (longleaf pine) may occur here, and there is a patchy subcanopy of scrubby *Quercus incana* (bluejack oak) and/or *Quercus margarettiae* (runner oak); the shrub and herbaceous strata are sparse. In the Inner Coastal Plain of South Carolina (Savannah River Site), mature upland plantations in this alliance tend to develop an understory including *Nyssa sylvatica* (blackgum) and an herbaceous stratum dominated by *Rubus argutus* (sawtooth blackberry). In contrast, burned examples tend to have *Prunus serotina var. serotina* (black cherry) in the understory and *Andropogon virginicus* (broomsedge bluestem) in the herbaceous layer.

Alliance Distribution

Range: This alliance is found in the southeastern Coastal Plain of the United States from North Carolina to Florida and west to Texas.

Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, TX
TNC Ecoregions: 41:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Ba:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bk:CCC, 232Bn:CC?, 232Bo:CCP, 232Bp:CCP, 232Bq:CCP, 232Br:CCC, 232Bu:CC?, 232Bv:CC?, 232Ca:CCP, 232Cb:CCP, 232Cc:CCP, 232Cd:CCP, 232Ce:CCC, 232Cf:CCP, 232Db:CCC, 232Dc:CCC, 232Dd:CCP, 232Fa:CCC, 232Fb:CCC, 232Fe:CCC, 232Ga:CC?, 232Gb:CCC

Federal Lands: DOD (Eglin, Fort Bragg); DOE (Savannah River Site); NPS (Big Thicket, Canaveral, Cumberland Island, Fort Frederica, Timucuan?); USFS (Angelina, Apalachicola, Conecuh, Croatan, Davy Crockett, De Soto, Francis Marion, Kisatchie, Sabine, Tuskegee?); USFWS (St. Marks)

(CEGL007171) Mid- to Late-Successional Slash Pine Managed Forest

Pinus elliottii var. elliottii - (Pinus palustris) Managed Forest
Slash Pine - (Longleaf Pine) Managed Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	*Pinus palustris - (Pinus elliottii)* Forest Alliance (A.123)

NVC Classification (continued)

Classification Level	Observed Classification
Alliance (English name)	Longleaf Pine - (Slash Pine) Forest Alliance
Association	*Pinus elliottii var. elliottii - (Pinus palustris)* Managed Forest
Association (English name)	Slash Pine - (Longleaf Pine) Managed Forest
Association (Common name)	Mid- to Late-Successional Slash Pine Managed Forest

Element Concept

Global Summary: This association describes *Pinus elliottii var. elliottii* (Honduras pine) stands which were either planted or naturally regenerated on old-field, former *Pinus palustris* (longleaf pine) sites. Ground layer composition is highly variable and may range from substantially natural to highly altered, or very sparse, depending on management, canopy closure, and other factors. Sites representing this association can also be considered as altered versions of more natural associations; these are placed in needle-leaved evergreen woodland (II.A).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This successional slash pine forest was sampled once on Cumberland Island and once at Fort Frederica. It occurs in dry flat areas with well-drained sandy soil. The unvegetated surface is made up almost entirely of leaf litter (99% cover) with some wood (1%). These sites were historically pine plantations or cleared for other anthropogenic uses. Additional evidence of disturbance includes the presence of exotic plant species.

Global Environment: West Gulf Coastal Plain stands which are placed here are old plantations planted outside the natural range of *Pinus elliottii var. elliottii*, sometimes on former *Pinus palustris* sites. In this region, the local expression of this association depends on soil conditions. In mesic to dry-mesic uplands, the canopy may range from nearly pure *Pinus elliottii* (possibly with some *Pinus taeda* ingrowth) to a mixed canopy containing *Pinus elliottii var. elliottii* and *Pinus palustris* in combination. In the former case, soils are generally acidic silt loams and sandy loams; in the latter case they tend to be well-drained to moderately well-drained, fine sandy loams and sands underlain by clay. On dry to xeric former *Pinus palustris* sites, on silt loams, fine sandy loams, or silty clay loams underlain by clay of the Kisatchie Series, the soil is moderately deep with siltstone or sandstone occurring at 36-60 inches. This well-drained, very slowly permeable soil ranges from strongly to extremely acidic.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate to dense (60-80% cover) tree canopy, 15-35 m tall, is dominated exclusively by *Pinus elliottii* (slash pine) in the Cumberland Island stand and codominates with *Liquidambar styraciflua* (sweetgum) at Fort Frederica. The very sparse (5-10%) subcanopy (5-20 m) has the same make up and also includes *Quercus nigra* (water oak) at Fort Frederica. The sparse (10-40%) tall-shrub layer (2-5 m) and the very sparse (0-10%) short-shrub layer (1-2 m), when present, include *Ilex glabra*

(inkberry), *Magnolia grandiflora* (southern magnolia), *Morella cerifera* (wax-myrtle), *Persea borbonia* (redbay), *Sabal palmetto* (cabbage palmetto), *Serenoa repens* (saw palmetto), and *Vaccinium arboreum* (farkleberry). The herbaceous layer at Cumberland Island is moderately sparse (40%) and dominated by *Eupatorium* (thoroughwort) spp. (*Eupatorium capillifolium* (dogfennel), *Eupatorium compositifolium* (yankeeweed), *Eupatorium serotinum* (lateflowering thoroughwort)) and *Scleria triglomerata* (whip nutrush); additional herbs include *Andropogon* (bluestem) spp., *Chasmanthium laxum* (slender woodoats), *Cnidoscolus stimulosus* (finger rot), *Dichanthelium* (rosette grass) spp., *Helianthemum corymbosum* (pinebarren frostweed), *Panicum anceps* (beaked panicgrass), *Paspalum setaceum* (thin paspalum), *Pityopsis graminifolia* (narrowleaf silkgrass), *Tridens flavus* (purpletop tridens), and others. At Fort Frederica, the sparse (10%) herbaceous layer is made up of ferns and vines including *Osmunda cinnamomea* (cinnamon fern), *Woodwardia areolata* (netted chainfern), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron* (poison-oak) sp., and *Vitis rotundifolia* (muscadine). Vines of *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), and *Vitis rotundifolia* (muscadine) climb into the tree and shrub layers on Cumberland Island. Exotic species include *Crotalaria pallida* (smooth rattlebox) and *Eremochloa ophiuroides* (centipede grass).

Global Vegetation: This broadly conceived association accommodates flatwoods and a variety of other mesic Coastal Plain environments which are dominated by mixtures of *Pinus palustris* (longleaf pine) and *Pinus elliottii var. elliottii* (Honduras pine). This includes a variety of situations. In the West Gulf Coastal Plain, which is outside the natural range of *Pinus elliottii* (slash pine), the understory and herbaceous strata vary depending on management, site conditions, and canopy coverage; the tall-shrub stratum ranges from fairly dense to sparse and may be patchy. The herbaceous layer also varies; in younger stands, the canopy may often be too dense for the herbaceous layer to become well-developed, which is exemplified at Fort Frederica, a suburban barrier island in Georgia. However, *Schizachyrium scoparium* (little bluestem)-dominated ground cover may be extensive in older stands (60 years or greater in age) that have been burned and thinned. On some dry to xeric former *Pinus palustris* (longleaf pine) sites, this vegetation is expressed as a fairly open forest dominated by *Pinus elliottii* (slash pine) ranging from 60-80% cover. Ingrowths of *Pinus echinata* (shortleaf pine), *Pinus taeda* (loblolly pine), and *Pinus palustris* (longleaf pine) may occur here, and there is a patchy subcanopy of scrubby *Quercus incana* (bluejack oak) and/or *Quercus margarettiae* (runner oak); the shrub and herbaceous strata are sparse. In the Inner Coastal Plain of South Carolina (Savannah River Site), mature upland plantations placed here tend to develop an understory including *Nyssa sylvatica* (blackgum) and an herbaceous stratum dominated by *Rubus argutus* (sawtooth blackberry). In contrast, burned examples tend to have *Prunus serotina var. serotina* (black cherry) in the understory and *Andropogon virginicus* (broomsedge bluestem) in the herbaceous layer. At Canaveral National Seashore, the exotic *Urochloa maxima* (guineagrass) may dominate the herbaceous layer, with traces of many other species, including other exotics such as *Hyptis mutabilis* (tropical bushmint), *Urena lobata* (Caesarweed), and *Paspalum notatum* (bahiagrass) and native species *Physalis walteri* (Walter's groundcherry) (state-vulnerable). Vines may include *Smilax auriculata* (earleaf greenbrier) and *Vitis rotundifolia* (muscadine). On Cumberland Island, another Georgia barrier island, the herb layer is relatively rich and has become dominated by a suite of early-successional grasses and composites.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus elliottii* (slash pine)
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum)
Tree subcanopy	Broad-leaved deciduous tree	*Quercus nigra* (water oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Ilex glabra* (inkberry)
Short shrub/sapling	Broad-leaved evergreen shrub	*Persea borbonia* (redbay), *Serenoa repens* (saw palmetto)
Herb (field)	Vine/Liana	*Vitis rotundifolia* (muscadine)
Herb (field)	Forb	*Eupatorium compositifolium* (yankeeweed)
Herb (field)	Graminoid	*Eremochloa ophiuroides* (centipede grass), *Scleria triglomerata* (whip nutrush)

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus elliottii* (slash pine), *Pinus palustris* (longleaf pine)
Tall shrub/sapling	Broad-leaved deciduous tree	*Cornus florida* (flowering dogwood)
Tall shrub/sapling	Broad-leaved evergreen tree	*Vaccinium arboreum* (farkleberry)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Callicarpa americana* (American beautyberry), *Rhus copallinum* (flameleaf sumac), *Vaccinium elliottii* (Elliott's blueberry)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Pinus elliottii* (slash pine)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Crotalaria pallida (smooth rattlebox)	–	exotic
Eremochloa ophiuroides (centipede grass)	–	exotic

Global

Exotic and Invasive Species	I-Rank	Note
Ligustrum sinense (Chinese privet)	High/ Medium	invasive exotic
Lonicera japonica (Japanese honeysuckle)	High/ Medium	invasive exotic
Microstegium vimineum (Nepalese browntop)	High/ Medium	invasive exotic

Animal Species	I-Rank	Note
Blarina brevicauda (northern short-tailed shrew)	G5	–
Colaptes auratus (northern flicker)	G5	–
Dendroctonus frontalis (southern pine beetle)	GNR	–
Dryocopus pileatus (pileated woodpecker)	G5	–
Glaucomys volans (southern flying squirrel)	G5	–
Melanerpes carolinus (red-bellied woodpecker)	G5	–
Microtus pinetorum (woodland vole)	G5	–
Ochrotomys nuttalli (golden mouse)	G5	–
Oryzomys palustris (marsh oryzomys)	G5	–
Peromyscus gossypinus (cotton deermouse)	G5	–
Picoides borealis (red-cockaded woodpecker)	G3	Federally listed endangered
Picoides pubescens (downy woodpecker)	G5	–
Picoides villosus (hairy woodpecker)	G5	–

Animal Species	I-Rank	Note
Reithrodontomys fulvescens (fulvous harvest mouse)	G5	–
Sciurus niger (eastern fox squirrel)	G5	*Sciurus niger ludovicianus*
Sphyrapicus varius (yellow-bellied sapsucker)	G5	–

Conservation Status Rank

Global Rank & Reasons: GNA (modified/managed) (15-May-2002). These are managed or manipulated stands, whose composition has been altered by management or affected by the site history. Despite this, they may either have some conservation value (as habitat for longleaf pine-related animals, or because they have a more-or-less intact ground layer), or which may be restorable to higher-quality *Pinus palustris*-dominated stands.

Classification

Status: Standard
Classification Confidence: 3 - Weak
Cumberland Island National Seashore and Fort Frederica National Monument Comments: At Fort Frederica, this community type is codominated by *Liquidambar styraciflua*.

Global Comments: In particular, this broadly conceived association includes various pine stands in the West Gulf Coastal Plain, which contain *Pinus elliottii*. This region is outside of the natural range of this species.

Global Related Concepts:

- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B
- Longleaf Pine (21) (USFS 1988) B
- Longleaf Pine - Slash Pine: 83 (Eyre 1980) ?
- Slash Pine (22) (USFS 1988) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is found on Cumberland Island within pine plantations south of Stafford Field, but it could be located in other old pasture or upland pine plantation sites across the island. It is also found at Fort Frederica.

Global Range: This association is found in the southeastern Coastal Plain of the United States.
Nations: US
States/Provinces: AL, FL, GA, LA, MS, NC, SC, TX
TNC Ecoregions: 41:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Ba:CCC, 232Ce:CCC, 232Dc:CCC, 232F:CC, 232Gb:CCC

Federal Lands: DOD (Eglin, Fort Bragg); DOE (Savannah River Site); NPS (Big Thicket, Canaveral, Cumberland Island, Fort Frederica, Timucuan?); USFS (Angelina, Apalachicola, Conecuh, Croatan, Davy Crockett, De Soto, Francis Marion, Kisatchie, Sabine, Tuskegee?); USFWS (St. Marks)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.084, FOFR.04.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: J.E. Mohan, mod. M. Pyne
References: Allard 1990, Burns and Honkala 1990a, Eyre 1980, Hatchell 1964, Jones et al. 1981a, Schotz pers. comm., Smith pers. comm., Southeastern Ecology Working Group n.d., USFS 1988, Wieland 1994b, Wieland 2000b

Pinus taeda Forest Alliance (A.130)

Alliance Concept

Summary: This alliance includes both successional forests of *Pinus taeda* (loblolly pine), which develop following cropping or site conversion, as well as 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* (tuliptree), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Pinus virginiana* (Virginia pine), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus stellata* (post oak), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Ulmus alata* (winged elm), *Cornus florida* (flowering dogwood), *Prunus serotina var. serotina* (black cherry), and *Carya* (hickory) spp. *Vaccinium* (blueberry) spp., especially *Vaccinium stamineum* (deerberry), 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* (loblolly pine), canopy associates often include *Quercus falcata* (southern red oak), *Acer rubrum* (red maple), *Prunus serotina var. serotina* (black cherry), and *Sassafras albidum* (sassafras). The tall-shrub layer is comprised of *Morella cerifera* (wax-myrtle) and *Vaccinium formosum* (southern blueberry). Vines and lianas are always present in abundance; *Vitis rotundifolia* (muscadine) is most commonly present, but *Toxicodendron radicans* (eastern poison-ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Parthenocissus quinquefolia* (Virginia creeper) are usually present in abundance as well. The herbaceous layer may be sparse, particularly if shrubs and vines are dense, but *Chasmanthium laxum* (slender woodoats) may be fairly abundant in this community. Other herbs include *Panicum amarum var. amarulum* (bitter panicgrass), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort), and *Elephantopus nudatus* (smooth elephantsfoot). In southern Virginia and North Carolina, *Quercus virginiana* (live oak) and *Gelsemium sempervirens* (evening trumpetflower) may also be present, but *Quercus virginiana* (live oak) is never abundant and when present is usually restricted to the understory. *Pinus taeda* (loblolly pine) 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* (loblolly pine) forest association is not recognized for the Ozark or Ouachita region.

Classification 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).

Similar Alliances:

- *Pinus echinata - Quercus (alba, falcata, stellata, velutina)* Forest Alliance (A.394)
- *Pinus taeda - Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)--mixed, temporarily flooded.
- *Pinus taeda - Quercus nigra* Forest Alliance (A.406)
- *Pinus taeda* Planted Forest Alliance (A.99)--includes monospecific, dense, plantation stands only.
- *Pinus taeda* Woodland Alliance (A.526)

Related Concepts:

- Loblolly Pine: 81 (Eyre 1980) I
- Lowland Pine - Oak Forest (Foti 1994b) ?
- T1A9bII2a. *Pinus taeda* (Foti et al. 1994) ?
- Upland Mixed Forest (FNAI 1992a) ?
- Upland Mixed Forest, Gumbo Loblolly Forest subtype (FNAI 1992b) ?

Alliance Description

Environment: 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.

Vegetation: Canopy and subcanopy species that may be present in successional stands are *Liriodendron tulipifera* (tuliptree), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Pinus virginiana* (Virginia pine), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Quercus stellata* (post oak), *Quercus velutina* (black oak), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Ulmus alata* (winged elm), *Cornus florida* (flowering dogwood), *Prunus serotina var. serotina* (black cherry), and *Carya* (hickory) spp. *Vaccinium* (blueberry) spp., especially *Vaccinium stamineum* (deerberry), 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* (loblolly pine), canopy associates often include *Quercus falcata* (southern red oak), *Acer rubrum* (red maple), *Prunus serotina var. serotina* (black cherry), and *Sassafras albidum* (sassafras). The tall-shrub layer is comprised of *Morella cerifera* (wax-myrtle) and *Vaccinium formosum* (southern blueberry). Vines and lianas are always present in abundance; *Vitis rotundifolia* (muscadine) is most commonly present, but *Toxicodendron radicans* (eastern poison-ivy), *Smilax*

rotundifolia (roundleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Parthenocissus quinquefolia* (Virginia creeper) are usually present in abundance as well. The herbaceous layer may be sparse, particularly if shrubs and vines are dense, but *Chasmanthium laxum* (slender woodoats) may be fairly abundant in this community. Other herbs include *Panicum amarum var. amarulum* (bitter panicgrass), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort), and *Elephantopus nudatus* (smooth elephantsfoot). In southern Virginia and North Carolina, *Quercus virginiana* (live oak) and *Gelsemium sempervirens* (evening trumpetflower) may also be present, but *Quercus virginiana* (live oak) is never abundant and when present is usually restricted to the understory. *Pinus taeda* (loblolly pine) forests 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).

Dynamics: The understory of the heavily disturbed examples of this alliance is often dominated by exotic species, to the exclusion of natives. Common invasives are *Lonicera japonica* and *Microstegium vimineum*. Due to the dominance of these species, stand dynamics often shift so that there are less seedlings and saplings in the understory.

Alliance Distribution

Range: This alliance is found in the Cumberland Plateau, Piedmont, Interior Low Plateau, 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.

Nations: US
SubNations: 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, 222Ef: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:CCC, 231Bc:CCP, 231Bd:CCC, 231Be:CCC, 231Bf:CCP, 231Bg:CCC, 231Bh:CCC, 231Bi:CCC, 231Bj:CCC, 231Bk:CCC, 231Bl:CCC, 231Ca:CCP, 231Cb:CCP, 231Cc:CCC, 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, 232Ad:CCC, 232Ba:CCC, 232Bb:CCC, 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:CCC, 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, Colonial, Cowpens, Cumberland Island, Fort Donelson, Fort

Frederica?, George Washington Birthplace, Guilford Courthouse, Horseshoe Bend, Kennesaw Mountain, Kings Mountain, Little River Canyon, Moores Creek, Natchez Trace, Ninety Six, Petersburg, Richmond, Shiloh); TVA (Tellico); USFS (Angelina, Apalachicola, Bankhead, Bienville, Chattahoochee, Conecuh?, Croatan, Davy Crockett, Kisatchie, Land Between the Lakes?, Oconee, Ouachita, Sabine, Sam Houston, Sumter, Talladega, Tuskegee, Uwharrie); USFWS (Back Bay?, Blackwater, Chesapeake Marshlands, Chincoteague, Prime Hook)

(CEGL008462) Mid- to Late-Successional Loblolly Pine - Sweetgum Forest

Pinus taeda - Liquidambar styraciflua Semi-natural Forest

Loblolly Pine - Sweetgum Semi-natural Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	*Pinus taeda* Forest Alliance (A.130)
Alliance (English name)	Loblolly Pine Forest Alliance
Association	*Pinus taeda - Liquidambar styraciflua* Semi-natural Forest
Association (English name)	Loblolly Pine - Sweetgum Semi-natural Forest
Association (Common name)	Mid- to Late-Successional Loblolly Pine - Sweetgum Forest
Ecological System(s):	East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
	Semi-natural / Altered Vegetation and Conifer Plantations (CES203.074)

Element Concept

Global Summary: This community type is broadly defined to accommodate mid- to late-successional upland forests strongly codominated by *Pinus taeda* (loblolly pine) and *Liquidambar styraciflua* (sweetgum), resulting from past disturbance (such as agricultural or other land clearing). Understory composition differs based on edaphic site and on age and history. This broadly defined type occupies a variety of edaphic sites, ranging from mesic through dry-mesic sites on a wide variety of (generally acidic) soils. If left unmanaged or undisturbed, this can be a short-lived forest type, which is likely to succeed with greater age into various oak- and oak-pine-dominated forests.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This successional loblolly pine forest was sampled once on Cumberland Island and occurs on a xeric, gentle south-facing slope with moderately well-drained sand soil. The unvegetated surface is

dominated by leaf litter (95% cover) with some wood (5%). This site was probably cleared for agriculture in the past. Today it shows signs of being fire-suppressed.

Global Environment: Stands of this community type are strongly codominated by *Pinus taeda* and *Liquidambar styraciflua*, resulting from past disturbance followed by forest succession. This community type is more influenced by past land-use history than by specific soil differences. However, this community type tends to occur on poorly drained and low-nutrient soils, especially in areas that were farmed heavily in the past. Stands on poorly drained sites have often been subjected to ditching activities.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderately dense (70% cover) tree canopy, 10-15 m tall, and very sparse (5%) subcanopy (5-10 m) are dominated exclusively by *Pinus taeda* (loblolly pine). These stands lack *Liquidambar styraciflua* (sweetgum). The sparse (20%) tall-shrub (1-2 m) and sparse (30%) short-shrub (0.5-1 m) layers include *Lyonia ferruginea* (rusty staggerbush), *Morella cerifera* (wax-myrtle), and *Pinus taeda* (loblolly pine). The herbaceous layer is very sparse (5%) and includes *Dichanthelium commutatum* (variable panicgrass). Epiphytes include *Tillandsia usneoides* (Spanish moss).

Global Vegetation: Stands of this community type are strongly codominated by *Pinus taeda* (loblolly pine) and *Liquidambar styraciflua* (sweetgum). Some other species which may be present in stands of this association include *Quercus phellos* (willow oak), *Quercus nigra* (water oak), *Ulmus alata* (winged elm), *Acer rubrum* (red maple), *Quercus michauxii* (swamp chestnut oak), *Nyssa sylvatica* (blackgum), and *Prunus serotina* (black cherry), along with *Vitis rotundifolia* (muscadine), *Toxicodendron radicans* (eastern poison-ivy), *Rubus argutus* (sawtooth blackberry), *Smilax rotundifolia* (roundleaf greenbrier), *Eupatorium capillifolium* (dogfennel), *Eupatorium hyssopifolium* (hyssopleaf thoroughwort), *Erigeron strigosus* (prairie fleabane), *Solidago gigantea* (giant goldenrod), *Ambrosia artemisiifolia* (annual ragweed), *Juncus effusus* (common rush), *Juncus subcaudatus* (woodland rush), and the exotics *Lespedeza cuneata* (Chinese lespedeza) and *Ligustrum sinense* (Chinese privet). Examples of this association in low-lying areas may also have a dense herbaceous layer of *Microstegium vimineum* (Nepalese browntop).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus taeda* (loblolly pine)
Shrub/sapling (tall & short)	Needle-leaved shrub	*Pinus taeda* (loblolly pine)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Lyonia ferruginea* (rusty staggerbush)
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Herb (field)	Graminoid	*Dichanthelium commutatum* (variable panicgrass)

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus taeda* (loblolly pine)
Tree canopy	Broad-leaved deciduous tree	*Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Pinus taeda* (loblolly pine)

Conservation Status Rank

Global Rank & Reasons: GNA (modified/managed) (20-Oct-2000). This forest represents early successional or silviculturally managed vegetation and is thus not of conservation concern and does not receive a conservation status rank.

Classification

Status: Standard

Classification Confidence: 1 - Strong

Global Comments: This community likely occurs along the northern periphery of the Gulf Coast Prairies and Marshes Ecoregion of eastern Texas. The similarity of this association with *Pinus taeda / Liquidambar styraciflua - Acer rubrum var. rubrum / Vaccinium stamineum* Forest (CEGL006011) suggests that a merge with that type should be considered.

Global Similar Associations:

- *Liriodendron tulipifera - Pinus taeda* Forest (CEGL007521)--with greater dominance by *Liriodendron*.
- *Pinus echinata* Early-Successional Forest (CEGL006327)
- *Pinus taeda - (Pinus echinata) - Quercus falcata - Carya texana / Vaccinium arboreum* Forest (CEGL007528)--overlaps only in the western part of the range of this type.
- *Pinus taeda / Liquidambar styraciflua - Acer rubrum var. rubrum / Vaccinium stamineum* Forest (CEGL006011)--is an earlier successional stage of this association and is distinguished by a lack of *Liquidambar styraciflua* in the canopy and a well-developed hardwood understory.
- *Pinus taeda / Saccharum alopecuroidum - (Andropogon* spp.) Forest (CEGL007109)--a related *Pinus taeda*-dominated type placed in evergreen.
- *Pinus virginiana* Successional Forest (CEGL002591)

Global Related Concepts:

- IF3a. Recently Harvested Timber Land (Allard 1990) B
- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B
- Loblolly Pine - Hardwood (13) (USFS 1988) ?
- Loblolly Pine - Hardwood: 82 (Eyre 1980) B
- T1B3aIII6a. *Pinus taeda - Liquidambar styraciflua* (Foti et al. 1994) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This early-successional loblolly stand is found within an open gap in the live oak-pine forest on Table Point on Cumberland Island. Other open gaps likely include additional examples of this association. Other gaps instead are dominated by vines and blackberry shrubs, while others are dominated by *Spartina bakeri*; it is possible that differences in soil moisture have influenced the successional process within these gaps.

Global Range: This altered forest type is widespread in the lowland portions of the southeastern to mid-Atlantic United States, particularly on the Coastal Plain, but also on adjacent inland provinces.

Nations: US
States/Provinces: AL, AR, DE, GA, LA, MD, MS, NC, OK, SC, TN, TX, VA
TNC Ecoregions: 31:P, 39:C, 40:C, 41:C, 43:C, 44:C, 50:C, 52:C, 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 222Ef:CCC, 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Bd:CCC, 231Bg:CCC, 231Bi:CCC, 231Bk:CCC, 231Cc:CCC, 231Fa:CPP, 232Ac:CCC, 232Bm:CCC, 232Bx:CCC, 232Cb:CCC, 232Ce:CCC, 232F:CC, 255Da:PPP

Federal Lands: DOD (Fort Benning?); NPS (Chickamauga-Chattanooga, Cumberland Island, George Washington Birthplace, Guilford Courthouse, Horseshoe Bend, Kings Mountain, Little River Canyon, Natchez Trace, Ninety Six, Petersburg, Richmond, Shiloh); USFS (Angelina, Bienville, Conecuh?, Croatan, Davy Crockett, Kisatchie, Oconee, Ouachita, Ouachita (Coastal Plain), Ouachita (Mountains), Sabine, Sam Houston, Talladega, Talladega (Oakmulgee), Talladega (Talladega), Tuskegee?, Uwharrie); USFWS (Blackwater, Chesapeake Marshlands, Prime Hook)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.156.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley, mod. R. White and E. Largay
References: Allard 1990, Eyre 1980, Foti 1994b, Foti et al. 1994, Harcombe and Neaville 1977, Hoagland 2000, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data 2002, Schotz pers. comm., Southeastern Ecology Working Group n.d., USFS 1988, Zanoni et al. 1979

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

Liquidambar styraciflua – (Acer rubrum) Seasonally Flooded Forest Alliance (A.321)

Alliance Concept

Summary: This alliance encompasses forests dominated by *Liquidambar styraciflua* (sweetgum) with seasonally flooded hydrology. Known examples occur in seasonally flooded depressions and not on floodplains. Some stands may be dominated or codominated by *Acer rubrum* (red maple). Other woody species that may be present include *Planera aquatica* (planertree), *Salix nigra* (black willow), *Quercus palustris* (pin oak), *Quercus lyrata* (overcup oak), *Fraxinus pennsylvanica* (green ash), *Quercus phellos* (willow oak), and *Cornus foemina* (stiff dogwood). Shrubs that may be present include *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Cephalanthus occidentalis* (common buttonbush), *Clethra alnifolia* (coastal sweet-pepperbush), *Leucothoe racemosa* (swamp doghobble), and *Vaccinium corymbosum* (highbush blueberry). *Sphagnum* (sphagnum) spp. are common in the herbaceous layer.

Classification 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).

Similar Alliances:

- *Liquidambar styraciflua - (Liriodendron tulipifera, Acer rubrum)* Temporarily Flooded Forest Alliance (A.287)
- *Liquidambar styraciflua* Saturated Forest Alliance (A.350)
- *Quercus alba - (Nyssa sylvatica)* Seasonally Flooded Forest Alliance (A.1996)

Related Concepts:

- Coastal Plain Forest (Smith 1991) ?
- Red maple - magnolia Coastal Plain palustrine forest (Fike 1999) ?

Alliance Description

Environment: Known examples of this alliance occur in seasonally flooded depressions and not on floodplains.

Vegetation: Stands of these forests are dominated by *Liquidambar styraciflua* (sweetgum) with seasonally flooded hydrology. Some stands may be dominated or co-dominated by *Acer rubrum* (red maple). Other woody species that may be present include *Planera aquatica* (planertree), *Salix nigra* (black willow), *Quercus palustris* (pin oak), *Quercus lyrata* (overcup oak), *Fraxinus pennsylvanica* (green ash), *Quercus phellos* (willow oak), and *Cornus foemina* (stiff dogwood). Shrubs that may be

present include *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Cephalanthus occidentalis* (common buttonbush), *Clethra alnifolia* (coastal sweet-pepperbush), *Leucothoe racemosa* (swamp doghobble), and *Vaccinium corymbosum* (highbush blueberry). *Sphagnum* (sphagnum) spp. are common in the herbaceous layer.

Alliance Distribution

Range: This alliance is found in the southeastern United States from New York to Florida, west to Tennessee and possibly Louisiana, and elsewhere.

Nations: US
SubNations: AL, AR, DC, DE, FL, GA, LA?, 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:C, 58:C, 59:C, 61:C, 62:C
USFS Ecoregions: 221Ae:CCC, 221Dc:CCC, 221Eb:C??, 221F:C?, 231Ad:CCC, 231Ae:CCC, 231Af:CCC, 231Ak:CCC, 231An:CCC, 231Cc:CCC, 231Cd:CCC, 231E:CC, 231Ga:CC?, 231Gb:CC?, 231Gc:CC?, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bj:CCC, 232Bq:CCC, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Cj:CCC, 232F:CC, 234Ac:PPP, 234An:PPP, 255A:PP, M221B:C?, M221C:C?, M221Dd:CCC

Federal Lands: DOD (Fort Belvoir, Fort Gordon, Yorktown); NPS (Colonial, Cumberland Island, Fredericksburg-Spotsylvania, Great Smoky Mountains, Little River Canyon, National Capital-East, Thomas Stone, Timucuan); USFS (Bankhead, Chattahoochee, Uwharrie); USFWS (Back Bay?, Chesapeake Marshlands, Prime Hook)

(CEGL004082) Red Maple - Tupelo Maritime Swamp Forest

Acer rubrum - Nyssa biflora - (Liquidambar styraciflua, Fraxinus sp.) Maritime Swamp Forest
Red Maple - Swamp Tupelo - (Sweetgum, Ash species) Maritime Swamp Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Seasonally flooded cold-deciduous forest (I.B.2.N.e.)
Alliance	*Liquidambar styraciflua - (Acer rubrum)* Seasonally Flooded Forest Alliance (A.321)
Alliance (English name)	Sweetgum - (Red Maple) Seasonally Flooded Forest Alliance
Association	*Acer rubrum - Nyssa biflora - (Liquidambar styraciflua, Fraxinus* sp.) Maritime Swamp Forest
Association (English name)	Red Maple - Swamp Tupelo - (Sweetgum, Ash species) Maritime Swamp Forest

NVC Classification (continued)

Classification Level	Observed Classification
Association (Common name)	Red Maple - Tupelo Maritime Swamp Forest
Ecological System(s):	Central Atlantic Coastal Plain Maritime Forest (CES203.261)

Element Concept

Global Summary: These are forested basin swamps of dune swales on barrier islands of North Carolina and possibly adjacent states, dominated by *Acer rubrum* (red maple), *Nyssa biflora* (swamp tupelo), or sometimes *Liquidambar styraciflua* (sweetgum) or *Fraxinus* (ash) sp. Lower vegetational strata are variable but generally fairly low in diversity, consisting of characteristic wetland species tolerant of sheltered maritime conditions and long hydroperiods.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This red maple - tupelo maritime swamp forest was sampled twice on Cumberland Island. Sites are a flat, saturated bottomland with poorly drained muck soil and a gently sloping, saturated swale with poorly drained muck and sand soil. The unvegetated surface is dominated by leaf litter (70-75% cover) with some wood (5-10%) and bare soil (20-25%). Evidence of disturbance includes heavy trampling and soil disturbance from horse traffic to and from salt marsh grazing areas.

Global Environment: This association occurs in dune swales or depressions on barrier islands (and potentially other similar maritime settings), flooded for much of the growing season. Water levels presumably reflect the local water table. Settings are on more sheltered portions of the barrier islands, generally surrounded by other maritime forests, with light but not severe salt spray. Sea water overwash occurs seldom or never.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate (50% cover) tree canopy, 20-35 m tall, is codominated by *Acer rubrum* (red maple) and *Nyssa biflora* (swamp tupelo) and may include *Magnolia virginiana* (sweetbay) and *Persea palustris* (swamp bay). The sparse (20-30%) subcanopy (15-20 m) includes canopy species as well as *Ilex cassine* (dahoon). The moderate (40-50%) tall-shrub layer (5-15 m) is codominated by *Morella cerifera* (wax-myrtle) and *Vaccinium corymbosum* (highbush blueberry), and the sparse to moderate (20-50%) short-shrub layer (1-2 m) is codominated by *Lyonia lucida* (fetterbush lyonia) and *Morella cerifera* (wax-myrtle). *Vaccinium corymbosum* (highbush blueberry) is also a common short shrub. The herbaceous layer is sparse to moderate (20-40%) and dominated by *Saururus cernuus* (lizard's-tail); other common and/or dominant herbs include *Boehmeria cylindrica* (small-spike false nettle), *Carex atlantica ssp. capillacea* (prickly bog sedge), *Chasmanthium laxum* (slender woodoats), *Gratiola virginiana* (roundfruit hedgehyssop), *Hydrocotyle umbellata* (manyflower marshpennywort), *Panicum anceps* (beaked panicgrass), *Rhynchospora corniculata* (shortbristle horned beaksedge), *Toxicodendron radicans* (eastern poison-ivy), and *Woodwardia areolata* (netted

chainfern). Vines (up to 20% cover) of *Smilax glauca* (cat greenbrier), *Smilax laurifolia* (laurel greenbrier), and *Vitis rotundifolia* (muscadine) are also present. Epiphytes include *Pleopeltis polypodioides* (resurrection fern) and *Tillandsia usneoides* (Spanish moss).

Global Vegetation: These are closed or nearly closed forests dominated by varying mixtures of *Acer rubrum* (red maple), *Nyssa biflora* (swamp tupelo), and occasionally *Liquidambar styraciflua* (sweetgum) or *Fraxinus* (ash) sp. Other canopy species may occasionally include *Salix nigra* (black willow), *Quercus nigra* (water oak), *Quercus phellos* (willow oak), *Pinus taeda* (loblolly pine), and *Taxodium distichum* (bald-cypress). The understory is generally very open, or confined to the shallower edges of the basins. *Persea palustris* , *Carpinus caroliniana* (American hornbeam), or canopy species generally dominate. The shrub layer is variable, of low to fairly high cover, depending on local water depth. *Morella cerifera* (wax-myrtle), *Cornus foemina* (stiff dogwood), or occasionally *Arundinaria gigantea ssp. tecta* (switch cane) (?) may dominate. Other shrubs may include *Lyonia lucida* (fetterbush lyonia), *Ilex vomitoria* (yaupon), *Vaccinium fuscatum* (black highbush blueberry), *Vaccinium formosum* (southern blueberry), and *Rosa palustris* (swamp rose). Woody vines, including *Berchemia scandens* (Alabama supplejack), *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax* (greenbrier) spp., and *Vitis rotundifolia* (muscadine), are usually present and may be fairly abundant. Herbs are usually sparse, but may be fairly dense locally in shallow water. Species most often most abundant are *Woodwardia virginica* (Virginia chainfern) and *Saururus cernuus* (lizard's-tail). Species with fairly high constancy (50-60% in 10 plots) include these species plus *Osmunda regalis* (royal fern) and *Woodwardia areolata* (netted chainfern). Other herbs fairly abundant locally include *Osmunda cinnamomea* (cinnamon fern), *Centella erecta* (erect centella), *Leersia virginica* (whitegrass), and *Dryopteris ludoviciana* (southern woodfern).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum* (red maple)
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Persea palustris* (swamp bay)
Tree (canopy & subcanopy)	Epiphyte	*Pleopeltis polypodioides* (resurrection fern), *Tillandsia usneoides* (Spanish moss)
Tree canopy	Broad-leaved deciduous tree	*Nyssa biflora* (swamp tupelo)
Tree subcanopy	Broad-leaved evergreen tree	*Magnolia virginiana* (sweetbay)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium corymbosum* (highbush blueberry)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Short shrub/sapling	Broad-leaved evergreen shrub	*Lyonia lucida* (fetterbush lyonia)
Herb (field)	Vine/Liana	*Smilax laurifolia* (laurel greenbrier), *Vitis rotundifolia* (muscadine)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Herb (field)	Forb	*Hydrocotyle umbellata* (manyflower marshpennywort), *Saururus cernuus* (lizard's-tail)
Herb (field)	Graminoid	*Chasmanthium laxum* (slender woodoats)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Acer rubrum* (red maple), *Nyssa biflora* (swamp tupelo)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Cardamine hirsuta (hairy bittercress)	–	exotic

Conservation Status Rank

Global Rank & Reasons: G2 (25-Feb-2004). This community is thought to be globally rare, with only seven known occurrences, most of them stable. It has probably declined from its historic abundance due to land-use changes (e.g., housing development, timber removal).

Classification

Status: Standard

Classification Confidence: –

Global Comments: This community type is somewhat heterogeneous, in that the dominant trees can vary substantially among examples. They are unified by their flora that, though mostly of widespread wetland species, includes characteristic maritime species and lacks species not found in maritime settings. The most distinct examples, which could perhaps be justified as a different association, are those dominated by *Fraxinus*. However, the overall flora of this example has substantial overlap with other examples and the environment seems to be similar.

Wentworth et al. (1993) divided associations more finely, based on Twinspan analysis of North Carolina Vegetation Survey data. The *Taxodium* type, recognized as a separate association, was the most distinct of the group. The *Fraxinus* type was the most distinct of the plots included here. Some of the other distinctions appear to be based on varying admixture of upland species in the plots.

Global Similar Associations:

- *Liquidambar styraciflua - Acer rubrum - (Nyssa biflora) / Woodwardia virginica* Forest (CEGL007848)--is a more inland Coastal Plain depression swamp community with similar dominants but somewhat different flora.

- *Liquidambar styraciflua - Acer rubrum - Nyssa biflora / Carex joorii* Forest (CEGL006223)--is a more inland Coastal Plain depression swamp community with similar dominants but somewhat different flora.
- *Taxodium ascendens / Magnolia virginiana / Cladium mariscus ssp. jamaicense* Forest (CEGL004914)--is another wetter maritime swamp of the eastern Gulf Coast.
- *Taxodium distichum / Cephalanthus occidentalis / Boehmeria cylindrica - Ceratophyllum muricatum* Maritime Swamp Forest (CEGL004079)--is a wetter community of similar barrier island depressions in North Carolina.

Global Related Concepts:

- Maritime Swamp Forest (Typic Subtype) (Schafale 2003b) =

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled twice on Cumberland Island, but has the potential to occur in association with freshwater springs or depressions on geologically older portions of the island.

Global Range: This maritime swamp forest is currently known from the Outer Banks of North Carolina and Cumberland Island, Georgia. It could potentially occur in other mid-Atlantic states.

Nations: US
States/Provinces: GA, NC, VA?
TNC Ecoregions: 56:C, 57:C
USFS Ecoregions: 232Ce:CCC, 232Ci:CCC
Federal Lands: NPS (Cumberland Island); USFWS (Back Bay?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.039, CUIS.092.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: M.P. Schafale
References: Schafale 2003b, Southeastern Ecology Working Group n.d.

Mixed broad-leaved evergreen-cold-deciduous forest (I.C.2.N.a.)

Quercus hemisphaerica – Carya glabra Forest Alliance (A.372)

Alliance Concept

Summary: This alliance includes Coastal Plain dry-mesic to subxeric sandy forests, with mixed broad-leaved evergreen-deciduous composition. Typical species include *Quercus hemisphaerica* (Darlington oak), *Carya glabra* (pignut hickory), *Carya pallida* (sand hickory), *Quercus virginiana* (live oak), *Pinus taeda* (loblolly pine), *Pinus glabra* (spruce pine), *Magnolia grandiflora* (southern magnolia), and *Osmanthus americanus var. americanus* (devilwood). *Fagus grandifolia* (American beech) may be present within its range (which includes Florida Panhandle but not extreme southeastern Georgia). *Sabal palmetto* (cabbage palmetto) may also be present. Dominance by *Quercus hemisphaerica* (Darlington oak) indicates that fire has been excluded from these forests for a period of many years; *Quercus hemisphaerica* (Darlington oak) is probably more widespread than in pre-settlement times. In Florida, this vegetation is partly described as well-developed xeric forest dominated by *Quercus hemisphaerica* (Darlington oak), *Quercus virginiana* (live oak), and *Magnolia grandiflora* (southern magnolia) in the canopy, and *Persea borbonia* (redbay), *Ilex opaca* (American holly), and *Carya glabra* (pignut hickory) in the understory.

Classification Comments: In many references (e.g., Sharitz 1975), the evergreen *Quercus hemisphaerica* of dry, sandy habitats has been mistakenly referred to as *Quercus laurifolia*, a (tardily) deciduous tree of floodplain forests (Weakley 1997).

Similar Alliances:

- *Quercus hemisphaerica* Forest Alliance (A.53)--related evergreen-dominated forests, often with greater than 50% cover by *Quercus hemisphaerica.*

Related Concepts:

- Southern Scrub Oak: 72 (Eyre 1980) I
- Upland Hardwood Forest (FNAI 1992a) ?
- Xeric Hammock (FNAI 1992a) I
- Xeric Hammock, Advanced Xeric Forest subtype (FNAI 1992b) ?

Alliance Description

Environment: This alliance includes coastal plain dry-mesic to sub-xeric sandy forests, with mixed broad-leaved evergreen-deciduous composition.

Vegetation: Typical species include *Quercus hemisphaerica* (Darlington oak), *Carya glabra* (pignut hickory), *Carya pallida* (sand hickory), *Quercus virginiana* (live oak), *Pinus taeda* (loblolly pine), *Pinus glabra* (spruce pine), *Magnolia grandiflora* (southern magnolia), and *Osmanthus americanus var. americanus* (devilwood). *Fagus grandifolia* (American beech) may be present within its range (which includes Florida Panhandle but not extreme southeastern Georgia). *Sabal palmetto* (cabbage palmetto) may also be present. Dominance by *Quercus hemisphaerica* (Darlington oak) indicates that fire has been excluded from these forests for a period of many years; *Quercus hemisphaerica* (Darlington oak) is probably more widespread than in pre-settlement times. In Florida, this

vegetation is partly described as well-developed xeric forest dominated by *Quercus hemisphaerica* (Darlington oak), *Quercus virginiana* (live oak), and *Magnolia grandiflora* (southern magnolia) in the canopy, and *Persea borbonia* (redbay), *Ilex opaca* (American holly), and *Carya glabra* (pignut hickory) in the understory.

Alliance Distribution
Range: This alliance is found in Florida, Georgia, Mississippi, and possibly Alabama and South Carolina.

Nations: US
SubNations: AL?, FL, GA, MS, SC?
TNC Ecoregions: 52:P, 53:C, 55:C, 56:C, 58:P
USFS Ecoregions: 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Be:CCP, 232Bf:CCC, 232Bg:CCC, 232Bh:CCP, 232Bi:CCP, 232Bj:CCC, 232Bk:CCP, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCP, 232Br:CCC, 232Bu:CCP, 232Bv:CCP, 232Ca:CCC, 232Cb:CCC, 232Cc:CCP, 232Ce:CCC, 232Cf:CCP, 232Dc:CCC, 232Ga:CCC

Federal Lands: DOD (Eglin, Tyndall); NPS (Cumberland Island, Timucuan?); USFS (Apalachicola, Conecuh?, Francis Marion?, Ocala, Osceola?)

(CEGL004788) Sand Laurel Oak - Mixed Hardwood Upland Forest
Quercus hemisphaerica - Magnolia grandiflora - Carya (glabra, pallida) / Vaccinium arboreum / Chasmanthium sessiliflorum Forest

Sand Laurel Oak - Southern Magnolia - (Pignut Hickory, Sand Hickory) / Farkleberry / Longleaf Woodoats Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.)
Physiognomic Subgroup	Natural/Semi-natural mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.N.)
Formation	Mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.N.a.)
Alliance	*Quercus hemisphaerica - Carya glabra* Forest Alliance (A.372)
Alliance (English name)	Sand Laurel Oak - Pignut Hickory Forest Alliance
Association	*Quercus hemisphaerica - Magnolia grandiflora - Carya (glabra, pallida) / Vaccinium arboreum / Chasmanthium sessiliflorum* Forest
Association (English name)	Sand Laurel Oak - Southern Magnolia - (Pignut Hickory, Sand Hickory) / Farkleberry / Longleaf Woodoats Forest

NVC Classificationn (continued)

Classification Level	Observed Classification
Association (Common name)	Sand Laurel Oak - Mixed Hardwood Upland Forest
Ecological System(s):	Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241)
	Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)

Element Concept

Global Summary: This association represents upland forests with diverse overstory composition found in fire-protected areas of the Coastal Plain of Georgia and Florida, and possibly adjacent areas. Stands have been documented on gentle slopes on stream and river bluffs and near sinkholes. A number of different species may be encountered in the overstory of these stands; *Quercus hemisphaerica* (Darlington oak) is possibly the most constant and differential species. Other tree species may include *Pinus taeda* (loblolly pine), *Magnolia grandiflora* (southern magnolia), *Carya glabra* (pignut hickory), *Carya pallida* (sand hickory), and *Quercus nigra* (water oak). In addition, *Quercus hemisphaerica* (Darlington oak) is common in all strata. Typical shrubs and small trees include *Persea borbonia* (redbay), *Persea palustris* (swamp bay), *Symplocos tinctoria* (common sweetleaf), and *Vaccinium arboreum* (farkleberry). Common shrubs are *Vaccinium arboreum* (farkleberry), *Vaccinium stamineum* (deerberry), and *Serenoa repens* (saw palmetto). Typical herbs include *Chasmanthium laxum* (slender woodoats), *Mitchella repens* (partridgeberry), *Elephantopus elatus* (tall elephantsfoot), and *Dichanthelium commutatum* (variable panicgrass).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This oak-hickory forest was sampled once on Cumberland Island on an upland flat with somewhat poorly drained (depression) to well-drained sand soil. The unvegetated surface is dominated by leaf litter (97% cover) with some wood (3%). No evidence of disturbance is apparent.

Global Environment: This association covers slope forests associated with stream bluffs and related habitats in the Coastal Plain of Georgia and Florida. This community is associated with sand ridges along major rivers and on slopes along small streams. It is often found in intermediate positions on upper slopes between upland communities characterized by *Pinus palustris* and lower slope communities dominated by mesic hardwood forests. At Little Ocmulgee State Park, Georgia, this forest occurs downslope and in slightly more protected sites than the exposed sandhills habitat (T. Govus pers. comm.).

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderately sparse (40% cover) tree canopy, 20-35 m tall, includes *Carya glabra* (pignut hickory), *Quercus hemisphaerica* (Darlington oak), and *Quercus virginiana* (live oak); the sparse (10%) subcanopy (15-20 m) includes *Carya glabra* (pignut hickory) and *Quercus nigra* (water oak). The sparse (30%) tall-shrub layer (5-10 m) and moderate (60%) short-shrub layer (1-2 m) are comprised of *Lyonia ferruginea* (rusty staggerbush) and *Vaccinium arboreum* (farkleberry); however,

Serenoa repens (saw palmetto) is the dominant short shrub. The herbaceous layer is very sparse (5%) and made up mostly of tree and shrub seedlings but may include *Bignonia capreolata* (crossvine), *Dichanthelium commutatum* (variable panicgrass), and *Scleria triglomerata* (whip nutrush). Vines include *Vitis rotundifolia* (muscadine) and *Smilax* (greenbrier) spp., and epiphytes include *Pleopeltis polypodioides* (resurrection fern) and *Tillandsia usneoides* (Spanish moss).

Global Vegetation: Stands of this association are often dominated by *Quercus hemisphaerica* (Darlington oak), but a number of other species may be present in the diverse canopy, including *Pinus taeda* (loblolly pine), *Magnolia grandiflora* (southern magnolia), *Carya alba* (mockernut hickory), *Carya pallida* (sand hickory), *Carya glabra* (pignut hickory), *Liquidambar styraciflua* (sweetgum), *Pinus glabra* (spruce pine), and *Quercus nigra* (water oak) (NatureServe Ecology unpubl. data). In addition, *Quercus hemisphaerica* (Darlington oak) is common in all strata. Typical shrubs and small trees include *Persea borbonia* (redbay), *Persea palustris* (swamp bay), *Symplocos tinctoria* (common sweetleaf), and *Vaccinium arboreum* (farkleberry). Common shrubs are *Vaccinium arboreum* (farkleberry), *Vaccinium stamineum* (deerberry), and *Serenoa repens* (saw palmetto). Typical herbs include *Chasmanthium laxum* (slender woodoats), *Mitchella repens* (partridgeberry), *Elephantopus elatus* (tall elephantsfoot), and *Dichanthelium commutatum* (variable panicgrass). Some additional species in this association at Apalachicola National Forest are *Quercus alba* (white oak), *Ilex opaca* (American holly), *Cornus florida* (flowering dogwood), *Osmanthus americanus* (devilwood), *Asimina parviflora* (smallflower pawpaw), *Hamamelis virginiana* (American witch-hazel), *Sabal palmetto* (cabbage palmetto), *Ilex vomitoria* (yaupon), *Vaccinium elliottii* (Elliott's blueberry), *Smilax pumila* (sarsparilla vine), *Ostrya virginiana* (hophornbeam), *Aristolochia serpentaria* (Virginia snakeroot), and *Morus rubra* (red mulberry) (NatureServe Ecology unpubl. data). At Little Ocmulgee State Park, Georgia, the canopy is dominated by a nearly even mixture of *Quercus hemisphaerica* (Darlington oak) and *Carya pallida* (sand hickory) but also includes *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Magnolia grandiflora* (southern magnolia), and *Pinus taeda* (loblolly pine). The shrub and understory strata are generally well-developed and somewhat dense, including *Osmanthus americanus* (devilwood), *Ostrya virginiana* (hophornbeam), *Vaccinium arboreum* (farkleberry), *Hamamelis virginiana* (American witch-hazel), *Ilex opaca* (American holly), *Asimina parviflora* (smallflower pawpaw), *Gaylussacia frondosa* (blue huckleberry), *Vaccinium stamineum* (deerberry), *Vaccinium pallidum* (Blue Ridge blueberry), *Hypericum hypericoides* (St. Andrew's cross), *Lyonia mariana* (piedmont staggerbush), and *Vaccinium tenellum* (small black blueberry). The herbaceous layer is very poorly developed in large part due to the dense, primarily evergreen canopy that reduces light resources for these plants. *Smilax pumila* (sarsparilla vine), *Mitchella repens* (partridgeberry), and *Vitis rotundifolia* (muscadine) are the only frequently encountered herbaceous or vine species occurring within this community type.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya glabra* (pignut hickory)
Tree (canopy & subcanopy)	Epiphyte	*Tillandsia usneoides* (Spanish moss)
Tree canopy	Broad-leaved evergreen tree	*Quercus hemisphaerica* (Darlington oak), *Quercus virginiana* (live oak)
Tree subcanopy	Broad-leaved deciduous tree	*Quercus nigra* (water oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Lyonia ferruginea* (rusty staggerbush), *Vaccinium arboreum* (farkleberry)
Short shrub/sapling	Broad-leaved evergreen shrub	*Serenoa repens* (saw palmetto)
Herb (field)	Vine/Liana	*Vitis rotundifolia* (muscadine)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Carya glabra* (pignut hickory), *Vaccinium arboreum* (farkleberry)

Conservation Status Rank

Global Rank & Reasons: G3G4 (10-Oct-1997). This community is found in the Coastal Plain of Florida and Georgia on certain fire-protected slopes. The number of Element Occurrences is not known, but some examples are represented on the Apalachicola National Forest (Florida) and Little Ocmulgee State Park (Georgia), where it appears to be the second most frequently encountered plant community (T. Govus pers. comm.). More information is needed to determine the occurrence of this community in South Carolina and Alabama. If confirmed in these states, the rank may be revised.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Related Concepts:

- Coastal Plain Submesic Ravine Forest (Ambrose 1990a) ?
- Laurel Oak - Sand Hickory Dry Forest (Govus pers. comm.) ?

Element Distribution

Global Range: This association is found in the Coastal Plain of Georgia and Florida, and it may occur in South Carolina and Alabama.

Nations: US
States/Provinces: AL?, FL, GA, SC?
TNC Ecoregions: 53:C, 56:C
USFS Ecoregions: 232Bg:CCC, 232Bh:CC?, 232Bj:CC?, 232Br:CCC, 232Ca:CCC, 232Cb:CCC, 232Ce:CCC, 232Dc:CCC

Federal Lands: NPS (Cumberland Island, Timucuan?); USFS (Apalachicola, Conecuh?, Francis Marion?, Osceola?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.048.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: R.E. Evans
References: Ambrose 1990a, FNAI 1992a, FNAI 1992b, Govus pers. comm., NatureServe **Ecology -** Southeastern U.S. unpubl. data, Schotz pers. comm., Southeastern Ecology Working Group n.d.

Saturated mixed broad-leaved evergreen – cold-deciduous forest (I.C.2.N.d.)

Magnolia virginiana - Nyssa biflora - (Quercus laurifolia) Saturated Forest Alliance (A.378)

Alliance Concept

Summary: This alliance comprises forests of floodplain flats and small blackwater stream headwaters, primarily in the southern coastal plains from Georgia and the northern Florida peninsula west to Texas. In the West Gulf Coastal Plain, this alliance occurs on deep, very acidic silt loams, fine sandy loam, and loamy fine sand soils with high organic content, primarily on floodplain flats and along small blackwater streams of low velocity. Canopies are diverse, but various combinations of *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), and *Quercus laurifolia* (laurel oak) often strongly dominate the canopy stratum. In the East Gulf Coastal Plain of Louisiana and Mississippi, this alliance includes *Quercus laurifolia* (laurel oak) bayheads over sticky clay soils, which are less acidic and shrubby than most other bayhead types, as well as small ravine-bottom bayheads with seepage. In the former, the canopy is dominated by *Quercus laurifolia* (laurel oak), *Nyssa biflora* (swamp tupelo), *Magnolia virginiana* (sweetbay), and *Acer rubrum var. rubrum* (red maple). In the southern parts of the alliance's range, some stands may contain *Pinus elliottii var. elliottii* (Honduras pine) and/or *Taxodium ascendens.* In addition, the subcanopy contains *Fraxinus caroliniana* (Carolina ash). The open shrub stratum may contain *Cyrilla racemiflora* (swamp titi), *Vaccinium elliottii* (Elliott's blueberry), *Leucothoe racemosa* (swamp doghobble), *Rhododendron viscosum* (swamp azalea), *Viburnum nudum var. nudum* (possumhaw), *Toxicodendron radicans* (eastern poison-ivy), *Chionanthus virginicus* (white fringetree), and *Lyonia lucida* (fetterbush lyonia). In the latter case, the canopy is dominated by *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), *Magnolia grandiflora* (southern magnolia), and *Liriodendron tulipifera* (tuliptree). The shrub layer is dominated by *Ilex coriacea* (large gallberry) and *Viburnum nudum var. nudum* (possumhaw); also *Illicium floridanum* (Florida anisetree), *Morella cerifera* (wax-myrtle), *Morella caroliniensis* (southern bayberry), *Leucothoe racemosa* (swamp doghobble), and *Lyonia lucida* (fetterbush lyonia). In the West Gulf Coastal Plain of Louisiana and Texas (and possibly Arkansas and Oklahoma), this alliance is expressed in at least two broad types which vary geographically along a north-south gradient. These broad-leaved mixed evergreen-deciduous forests are dominated by *Magnolia virginiana* (sweetbay) and *Nyssa biflora* (swamp tupelo), with *Liquidambar styraciflua* (sweetgum) codominant in some occurrences. Associated canopy species may include *Quercus laurifolia* (laurel oak), *Magnolia grandiflora* (southern magnolia), *Quercus alba* (white oak), *Quercus nigra* (water oak), *Fagus grandifolia* (American beech), *Taxodium distichum* (bald-cypress), *Pinus palustris* (longleaf pine), and *Pinus taeda* (loblolly pine). The subcanopy may include *Persea palustris* (swamp bay), *Acer rubrum* (red maple), *Ilex opaca var. opaca* (American holly), and occasionally *Chionanthus virginicus* (white fringetree) and *Fraxinus pennsylvanica* (green ash). Tall shrubs include *Viburnum nudum var. nudum* (possumhaw), *Morella caroliniensis* (southern bayberry), *Rhododendron canescens* (mountain azalea), *Persea palustris* (swamp bay), *Morella cerifera* (wax-myrtle), *Ilex coriacea* (large gallberry), *Alnus serrulata* (hazel alder), *Photinia pyrifolia* (red chokeberry), *Styrax americanus* (American snowbell), and *Rhododendron oblongifolium* (Texas azalea). The short-shrub stratum includes seedlings of overstory and tall-shrub species, plus *Itea virginica* (Virginia sweetspire), *Berchemia scandens* (Alabama supplejack), *Rubus* (blackberry) spp., and *Hypericum* (St. Johnswort) spp.

Classification Comments: Compare to "Swamp Tupelo-Sweetbay Type" of Beckett and Golden (1982) of the Reed Brake RNA, Talladega National Forest, Alabama. Vegetation related to this alliance (with *Pinus elliottii*) is reported from the Osceola RNA of the Osceola National Forest.

Similar Alliances:

- *Acer rubrum - Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Magnolia virginiana - Nyssa (biflora, ogeche)* Seasonally Flooded Forest Alliance (A.377)
- *Magnolia virginiana - Persea palustris* Saturated Forest Alliance (A.60)
- *Nyssa biflora - Acer rubrum - (Liriodendron tulipifera)* Saturated Forest Alliance (A.351)
- *Quercus laurifolia - Nyssa biflora* Saturated Forest Alliance (A.352)

Related Concepts:

- Bayhead Swamp (Smith 1996a) I
- IIA2a. Bay Forest (Allard 1990) I
- Mill Creek Bayhead (Martin and Smith 1991) ?
- Semi-Evergreen Broad-leaved Acid Seep Forest (Bridges and Orzell 1989a) ?
- Sweetbay - Swamp Tupelo - Redbay: 104 (Eyre 1980) I
- Sweetbay - Swamp Tupelo / *Osmunda* Loamy Wet Forested Seeps (Turner et al. 1999) ?
- Sweetbay Magnolia Series (Diamond 1993) I
- Upper Prairie Creek/Upper Wet Community (Nixon et al. 1983a) ?

Alliance Description

Environment: These communities occur in fire-protected situations in a pine flatwoods landscape. They have saturated hydrology, with infrequent ponding of water following heavy rains. They are forests of floodplain flats and small blackwater stream headwaters. In the West Gulf Coastal Plain, the alliance occurs on deep, very acidic silt loams, fine sandy loam, and loamy fine sand soils with high organic content, primarily on floodplain flats and along small blackwater streams of low velocity. In the East Gulf Coastal Plain of Louisiana and Mississippi, this alliance includes *Quercus laurifolia* bayheads, over sticky clay soils, which are less acid and shrubby than most other bayhead types; as well as small ravine-bottom bayheads with seepage. Examples are also known from the northern Florida Peninsula and the Piedmont of Alabama.

Vegetation: The canopies of most associations are dominated by *Magnolia virginiana* (sweetbay) and *Nyssa* (tupelo) spp. *Nyssa biflora* (swamp tupelo) is most characteristic, but *Nyssa sylvatica* (blackgum) may occur in some stands. *Quercus laurifolia* (laurel oak) is a codominant in one association. In addition, canopy species may include *Acer rubrum var. rubrum* (red maple), *Magnolia grandiflora* (southern magnolia), *Quercus alba* (white oak), *Quercus nigra* (water oak), *Fagus grandifolia* (American beech), *Liriodendron tulipifera* (tuliptree), *Taxodium distichum* (bald-cypress), *Pinus palustris* (longleaf pine), and *Pinus taeda* (loblolly pine). In the southern parts of the alliance's range, some stands may contain *Pinus elliottii var. elliottii* (Honduras pine) and/or *Taxodium ascendens.* In addition, the subcanopy may contain *Acer rubrum* (red maple), *Liquidambar*

styraciflua (sweetgum), *Fraxinus caroliniana* (Carolina ash), *Persea palustris* (swamp bay), *Acer rubrum* (red maple), *Ilex opaca var. opaca* (American holly), and occasionally *Chionanthus virginicus* (white fringetree) and *Fraxinus pennsylvanica* (green ash). The open to dense shrub stratum may contain *Cyrilla racemiflora* (swamp titi), *Vaccinium elliottii* (Elliott's blueberry), *Leucothoe racemosa* (swamp doghobble), *Lyonia lucida* (fetterbush lyonia), *Rhododendron viscosum* (swamp azalea), *Viburnum nudum var. nudum* (possumhaw), *Toxicodendron radicans ssp. radicans* (eastern poison-ivy), *Chionanthus virginicus* (white fringetree), *Morella cerifera* (wax-myrtle), *Morella caroliniensis* (southern bayberry), *Rhododendron canescens* (mountain azalea), *Persea palustris* (swamp bay), *Ilex coriacea* (large gallberry), *Ilex cassine* (dahoon), *Ilex glabra* (inkberry), *Ilex opaca* (American holly), *Lyonia lucida* (fetterbush lyonia), *Alnus serrulata* (hazel alder), *Photinia pyrifolia* (red chokeberry), *Styrax americanus* (American snowbell), and *Rhododendron oblongifolium* (Texas azalea) or *Illicium floridanum* (Florida anisetree) (within their ranges). The short-shrub stratum includes seedlings of overstory and tall-shrub species, plus *Itea virginica* (Virginia sweetspire), *Berchemia scandens* (Alabama supplejack), *Rubus* (blackberry) spp., and *Hypericum* (St. Johnswort) spp. (including *Hypericum galioides* (bedstraw St. Johnswort)). *Smilax laurifolia* (laurel greenbrier) and *Decumaria barbara* (woodvamp) are conspicuous vines. Herb species (which may be sparse) may include *Woodwardia areolata* (netted chainfern), *Woodwardia virginica* (Virginia chainfern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Osmunda cinnamomea* (cinnamon fern), *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Chasmanthium latifolium* (Indian woodoats), *Chasmanthium laxum* (slender woodoats), *Carex leptalea* (bristlystalked sedge), *Carex atlantica* (prickly bog sedge), *Carex lonchocarpa* (southern long sedge), *Carex glaucescens* (southern waxy sedge), *Eleocharis tortilis* (twisted spikerush), *Saururus cernuus* (lizard's-tail), *Elephantopus carolinianus* (Carolina elephantsfoot), *Boehmeria cylindrica* (small-spike false nettle), *Juncus* (rush) spp., *Polygala cymosa*, *Eriocaulon compressum* (flattened pipewort), *Xyris fimbriata* (fringed yelloweyed grass), *Viola X primulifolia* (primroseleaf violet), and *Fimbristylis* (fimbry) spp. In the southern parts of the alliance's range, some stands may contain *Arundinaria gigantea ssp. tecta* (switch cane), *Gaylussacia mosieri* (woolly huckleberry), *Gelsemium rankinii* (Rankin's trumpetflower), and *Gordonia lasianthus.* In addition, *Sphagnum* (sphagnum) spp. are abundant.

Alliance Distribution

Range: This alliance is found in the southeastern United States, primarily in the southern coastal plains from Georgia and the northern Florida peninsula west to Texas, but also in the Piedmont of Alabama.

Nations: US
SubNations: AL, AR, FL, GA, LA, MS, TX
TNC Ecoregions: 40:C, 41:C, 43:C, 50:P, 52:C, 53:C, 55:C, 56:C, 57:P, 58:P
USFS Ecoregions: 231Ab:CCC, 231Bc:CCC, 231Bd:CCC, 231Dd:CPP, 231Ed:CCC, 231Ef:CC?, 231Eh:CCC, 232Ba:CCC, 232Bb:CCC, 232Bc:CCC, 232Bd:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCP, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bk:CCC, 232Bm:CCC, 232Bn:CCC, 232Bp:CCC, 232Bq:CCC, 232Br:CCC, 232Bs:CC?, 232Ca:CCC, 232Cb:CCP, 232Cc:CCP,

232Cd:CCC, 232Ce:CCC, 232Cf:CCP, 232Dc:CCC, 232Dd:CCP, 232Ea:CCC, 232Eb:CCC, 232Fa:CCC, 232Fb:CCP, 232Fe:CCC

Federal Lands: DOD (Eglin, Fort Benning?, Fort Gordon, Hurlburt Field, Tyndall); NPS (Cumberland Island, Horseshoe Bend); USFS (Angelina, Apalachicola, Conecuh, De Soto, Kisatchie, Ocala, Osceola, Sabine, Sam Houston, Talladega, Tuskegee); USFWS (Bon Secour?)

(CEGL004722) Atlantic/East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest

Magnolia virginiana - Nyssa biflora / Carpinus caroliniana / Thelypteris noveboracensis - Athyrium filix-femina Forest

Sweetbay - Swamp Tupelo / American Hornbeam / New York Fern - Common Ladyfern Forest

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.)
Physiognomic Subgroup	Natural/Semi-natural mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.N.)
Formation	Saturated mixed broad-leaved evergreen - cold-deciduous forest (I.C.2.N.d.)
Alliance	*Magnolia virginiana - Nyssa biflora - (Quercus laurifolia)* Saturated Forest Alliance (A.378)
Alliance (English name)	Sweetbay - Swamp Tupelo - (Diamondleaf Oak) Saturated Forest Alliance
Association	*Magnolia virginiana - Nyssa biflora / Carpinus caroliniana / Thelypteris noveboracensis - Athyrium filix-femina* Forest
Association (English name)	Sweetbay - Swamp Tupelo / American Hornbeam / New York Fern - Common Ladyfern Forest
Association (Common name)	Atlantic/East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest
Ecological System(s):	Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
	Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)
	Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)

Element Concept

Global Summary: This saturated streamhead forest community occurs in the East Gulf Coastal Plain and South Atlantic Coastal Plain in streamheads and downstream along the margins of small acid streams, where groundwater seepage rather than overbank flooding controls the vegetation. The canopy is dominated by the nominal species, *Magnolia virginiana* (sweetbay) and *Nyssa biflora* (swamp tupelo); *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum var. trilobum* (red maple) are often also prominent. Other canopy species can include *Pinus*

taeda (loblolly pine), *Quercus nigra* (water oak), and *Quercus laurifolia* (laurel oak). Stands in Florida may contain *Nyssa ogeche* (Ogeechee tupelo). The subcanopy typically contains canopy species (especially *Magnolia virginiana* (sweetbay) and *Acer rubrum var. trilobum* (red maple)) and *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Persea palustris* (swamp bay), *Cyrilla racemiflora* (swamp titi), and *Ilex opaca var. opaca* (American holly). These species may also occur in the shrub stratum, along with *Arundinaria gigantea ssp. tecta* (switch cane), *Decumaria barbara* (woodvamp), *Illicium floridanum* (Florida anisetree), *Itea virginica* (Virginia sweetspire), *Sebastiania fruticosa* (Gulf Sebastian-bush), *Smilax laurifolia* (laurel greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vaccinium elliottii* (Elliott's blueberry), *Vaccinium formosum* (southern blueberry), *Viburnum nudum* (possumhaw), and *Vitis rotundifolia* (muscadine). Within its range, *Pieris phillyreifolia* (climbing fetterbush) may be found climbing on the bark of trees. Herbs are generally fairly sparse, consisting primarily of *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Boehmeria cylindrica* (small-spike false nettle), *Carex leptalea* (bristlystalked sedge), *Carex venusta* (darkgreen sedge), *Chasmanthium laxum* (slender woodoats), *Chasmanthium sessiliflorum* (longleaf woodoats), *Elephantopus carolinianus* (Carolina elephantsfoot), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Peltandra virginica* (green arrow-arum), *Thelypteris noveboracensis* (New York fern), and *Woodwardia areolata* (netted chainfern). *Sphagnum* (sphagnum) spp. may be patchily common.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This sweetbay - tupelo streamhead forest was sampled once on Cumberland Island. The site is a semipermanently flooded bottomland with poorly drained sandy loam soil and standing water present in the lowest places. The unvegetated surface is dominated by leaf litter (93% cover) with some wood (2%), bare soil (2%), and standing water (5%). Evidence of disturbance includes animal grazing/browsing.

Global Environment: This saturated streamhead forest community occurs in the East Gulf Coastal Plain and South Atlantic Coastal Plain in streamheads and downstream along the margins of small acid streams. Some of these stands occur in floodplains of small creeks, but their flora is primarily influenced by seepage hydrology, not by overbank flooding, even though this may occur. They are assigned to saturated rather than seasonally flooded because of their floristics and operative hydrology.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate (60% cover) tree canopy, 20-35 m tall, is codominated by old-growth *Magnolia virginiana* (sweetbay) and *Nyssa biflora* (swamp tupelo) along with lesser amounts of *Acer rubrum* (red maple), while the sparse (20%) subcanopy (15-20 m) is dominated by *Persea palustris* (swamp bay) along with *Acer rubrum* (red maple) and *Magnolia virginiana* (sweetbay). The sparse (20%) tall-shrub layer (5-10 m) is codominated by *Morella cerifera* (wax-myrtle) and *Persea palustris* (swamp bay), which also occur in the very sparse (10%) short-shrub layer (2-5 m) along with small

amounts *Magnolia virginiana* (sweetbay) and *Serenoa repens* (saw palmetto). The herbaceous layer is moderately sparse (40%) and dominated by *Saururus cernuus* (lizard's-tail); it may also include *Andropogon glaucopsis* (purple bluestem), *Axonopus furcatus* (big carpetgrass) (exotic), *Chasmanthium laxum* (slender woodoats), *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), *Hydrocotyle verticillata* (whorled marshpennywort), *Rhynchospora* (beaksedge) sp., and *Woodwardia areolata* (netted chainfern).

Global Vegetation: The canopy is dominated by the nominal species, *Magnolia virginiana* (sweetbay) and *Nyssa biflora* (swamp tupelo); *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum var. trilobum* (red maple) are often also prominent. Other canopy species can include *Pinus taeda* (loblolly pine), *Quercus nigra* (water oak), and *Quercus laurifolia* (laurel oak). The subcanopy typically contains canopy species (especially *Magnolia virginiana* (sweetbay) and *Acer rubrum var. trilobum* (red maple)) and *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Persea palustris* (swamp bay), *Cyrilla racemiflora* (swamp titi), and *Ilex opaca var. opaca* (American holly). These species may also occur in the shrub stratum, along with *Arundinaria gigantea ssp. tecta* (switch cane), *Decumaria barbara* (woodvamp), *Illicium floridanum* (Florida anisetree), *Itea virginica* (Virginia sweetspire), *Sebastiania fruticosa* (Gulf Sebastian-bush), *Smilax laurifolia* (laurel greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Vaccinium elliottii* (Elliott's blueberry), *Vaccinium formosum* (southern blueberry), and *Vitis rotundifolia* (muscadine). Within its range, *Pieris phillyreifolia* (climbing fetterbush) may be found climbing on the bark of trees. Herbs are generally fairly sparse, consisting primarily of *Athyrium filix-femina ssp. asplenioides* (asplenium ladyfern), *Boehmeria cylindrica* (small-spike false nettle), *Carex leptalea* (bristlystalked sedge), *Carex venusta* (darkgreen sedge), *Chasmanthium laxum* (slender woodoats), *Chasmanthium sessiliflorum* (longleaf woodoats), *Elephantopus carolinianus* (Carolina elephantsfoot), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis var. spectabilis* (royal fern), *Peltandra virginica* (green arrow-arum), *Thelypteris noveboracensis* (New York fern), and *Woodwardia areolata* (netted chainfern). *Sphagnum* (sphagnum) spp. may be patchily common.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Magnolia virginiana* (sweetbay)
Tree canopy	Broad-leaved deciduous tree	*Nyssa biflora* (swamp tupelo)
Tree subcanopy	Broad-leaved evergreen tree	*Persea palustris* (swamp bay)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Persea palustris* (swamp bay)
Herb (field)	Forb	*Saururus cernuus* (lizard's-tail)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon glaucopsis* (purple bluestem), *Axonopus furcatus* (big carpetgrass), *Dichanthelium dichotomum* var. *dichotomum* (cypress panicgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo)

Other Noteworthy Species

Global

Other Plant Species	GRank	Note
Pieris phillyreifolia (climbing fetterbush)	G3	–

Conservation Status Rank

Global Rank & Reasons: G3G4 (18-Dec-2000). While this community is naturally restricted to wetland streamheads and floodplains of small perennial streams, it is not an inherently rare forest type. It is presumably distributed across various parts of the South Atlantic and East Gulf coastal plains in the appropriate habitat. Some examples are protected, or at least not likely to be exploited or eliminated, on various Federal land units, including national forests, military bases, and national wildlife refuges. Threats to this community include alteration of hydrological patterns by road construction, seismic surveying or well-drilling, inundation by pond and reservoir construction, off-road vehicle use, increased windthrow and microclimate modification caused by intensive silvicultural practices on adjacent uplands, herbicide use, and vegetation damage by feral hogs.

Classification

Status: Standard

Classification Confidence: 3 - Weak

Global Comments: At Fort Benning, Georgia, there seems to be one seepage forest type with varying dominance among *Nyssa biflora, Acer rubrum*, and *Magnolia virginiana*. It is simpler to place these in *Nyssa biflora - Acer rubrum var. trilobum - Liriodendron tulipifera / Ilex coriacea - Lyonia lucida* Forest (CEGL004645), but this calls into question the relationship between these two types (CEGL004645 and CEGL004722).

Global Similar Associations:

- *Magnolia virginiana - Nyssa biflora - Magnolia grandiflora / Ilex coriacea - Viburnum nudum var. nudum / Solidago patula var. strictula* Forest (CEGL007473)--is a related type with a range to the west.
- *Magnolia virginiana - Nyssa biflora / Oxydendrum arboreum / Viburnum nudum var. nudum* Forest (CEGL008552)--related type occurs more in seepage and is more acid and peaty, with

more *Oxydendrum arboreum, Photinia pyrifolia, Morella caroliniensis, Vaccinium fuscatum, Viburnum nudum var. nudum, Mitchella repens, Sphagnum* spp.

- *Nyssa biflora - Acer rubrum var. trilobum - Liriodendron tulipifera / Ilex coriacea - Lyonia lucida* Forest (CEGL004645)--is ecologically related, but dominated by *Nyssa biflora* and *Acer rubrum* rather than *Magnolia virginiana*.

Global Related Concepts:

- IIA2a. Bay Forest (Allard 1990) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is found in a depression near a tidal creek off of the western side of South Cut Road on Cumberland Island. It has remarkably old *Magnolia virginiana* and *Nyssa biflora*, indicating it has not been cut for some time, if at all. This association is likely to occur along other bottomland freshwater seepage areas or streams on Cumberland Island.

Global Range: This community is found across various parts of the South Atlantic and East Gulf coastal plains of Alabama, Florida, and Georgia.

Nations: US
States/Provinces: AL:S2, FL, GA
TNC Ecoregions: 43:C, 50:P, 53:C, 56:C
USFS Ecoregions: 231Bc:CCC, 231Bd:CCC, 231Dd:CPP, 232Bf:CCC, 232Bh:CCC, 232Bi:CC?, 232Bm:CCC, 232Bn:CCC, 232Bp:CCC, 232Bq:CCC, 232Br:CCC, 232Cd:CCC, 232Ce:CCC, 232Dc:CCC, 232Dd:CCP

Federal Lands: DOD (Fort Gordon); NPS (Cumberland Island); USFS (Apalachicola, Conecuh, Osceola, Talladega, Talladega (Oakmulgee), Talladega (Talladega)?, Tuskegee); USFWS (Bon Secour?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.161.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: M. Pyne and S. Landaal
References: Allard 1990, NatureServe n.d., Schotz pers. comm., Southeastern Ecology Working Group n.d.

Woodland (II.)

Temperate broad-leaved evergreen woodland (II.A.2.N.a.)

Quercus virginiana - Juniperus virginiana - (Sabal palmetto) Woodland Alliance (A.479)

Alliance Concept

Summary: This alliance accommodates calciphilic communities occurring on coastal sands, Amerindian shell middens, and natural shell deposits of the Outer Coastal Plain. Composition varies along a latitudinal gradient; associations have been defined for two separate geographic zones, one of the Atlantic Coast from northern Florida north to Virginia, and another in the Gulf Coast from Florida west to Texas. This vegetation occurs under more severe and unstable conditions than related forests, which are found in the *Quercus virginiana - (Sabal palmetto)* Forest Alliance (A.55).

Similar Alliances: *Quercus virginiana - (Sabal palmetto)* Forest Alliance (A.55)
Similar Alliance Comments: This vegetation occurs under more severe conditions than related forests, which are found in the *Quercus virginiana - (Sabal palmetto)* Forest Alliance (A.55).

Related Concepts: Live Oak: 89 (Eyre 1980) I

Alliance Description

Environment: This alliance accommodates calciphilic communities occurring on coastal sands, on Amerindian shell middens, and natural shell deposits of the Outer Coastal Plain.

Dynamics: This vegetation occurs under more severe and unstable conditions than related forests.

Alliance Distribution

Range: Associations have been defined for two separate geographic zones, one of the Atlantic Coast from northern Florida north to southeastern Virginia, and another in the Gulf Coast from Florida west to Texas.

Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, TX?, VA
TNC Ecoregions: 31:C, 53:C, 54:P, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231Fb:PPP, 232Ce:CCC, 232Ch:CCC, 232Ci:CCP, 232Dc:CCC, 232Eb:CCC, 232Ec:CCC, 232Gb:CCC, 255Dc:PPP, 411Ad:PPP, 411Ae:PPP, 411Af:PPP, 411Ag:PPP

Federal Lands: DOD (Fort Story); NPS (Canaveral, Cumberland Island, Fort Pulaski, Timucuan); USFS (Francis Marion); USFWS (Back Bay?)

(CEGL003525) South Atlantic Coastal Shell Midden Woodland

*Juniperus virginiana var. silicicola - Zanthoxylum clava-herculis - Quercus virginiana - (*Sabal palmetto*) / Sageretia minutiflora - (Sideroxylon tenax)* Woodland

Southern Red-cedar - Hercules'-club - Live Oak - (Cabbage Palmetto) / Small-flower Mock Buckthorn - (Tough Bully) Woodland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate broad-leaved evergreen woodland (II.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen woodland (II.A.2.N.)
Formation	Temperate broad-leaved evergreen woodland (II.A.2.N.a.)
Alliance	*Quercus virginiana - Juniperus virginiana - (Sabal palmetto)* Woodland Alliance (A.479)
Alliance (English name)	Live Oak - Eastern Red-cedar - (Cabbage Palmetto) Woodland Alliance
Association	*Juniperus virginiana var. silicicola - Zanthoxylum clava-herculis - Quercus virginiana - (Sabal palmetto) / Sageretia minutiflora - (Sideroxylon tenax)* Woodland
Association (English name)	Southern Red-cedar - Hercules'-club - Live Oak - (Cabbage Palmetto) / Small-flower Mock Buckthorn - (Tough Bully) Woodland
Association (Common name)	South Atlantic Coastal Shell Midden Woodland
Ecological System(s):	Southern Atlantic Coastal Plain Maritime Forest (CES203.537)

Element Concept

Global Summary: This calciphilic community occurs on calcareous coastal sands, shell hashes, Amerindian shell middens, and natural shell deposits, from mid-peninsular Florida (Cape Canaveral) north to South Carolina (southern Atlantic Coast), in maritime-influenced landscapes. The canopy consists of *Juniperus virginiana var. silicicola* (southern redcedar), *Sabal palmetto* (cabbage palmetto), *Celtis laevigata var. laevigata* (sugarberry), *Zanthoxylum clava-herculis* (Hercules' club), *Quercus virginiana* (live oak), *Osmanthus americanus* (devilwood), and other species. Shrubs are prominent and may include *Ilex vomitoria* (yaupon), *Yucca aloifolia* (aloe yucca), *Sageretia minutiflora* (smallflower mock buckthorn), *Forestiera segregata* (Florida swamp-privet), *Frangula caroliniana* (Carolina buckthorn), *Opuntia humifusa var. austrina* (devil's-tongue), and others. Composition is very variable from site to site, depending on environmental conditions and accidents of establishment and persistence.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This coastal shell midden woodland was sampled at three locations on Cumberland Island. The sites are flat to gently rolling with moderately well- to well-drained sandy loam soil that contains oyster shells, either on narrow spits within the marsh or on. The unvegetated surface is dominated by leaf litter (89-90% cover) with some wood (2-5%), bare soil/sand (2-7%), and oyster shells (0-2%). Evidence of disturbance includes heavy aboriginal use (seasonal) in the distant past (shell middens), some sweetbay twig dieback, large mammal burrows, and the presence of exotic plants.

Global Environment: This calciphilic community occurs on Amerindian shell middens and natural shell deposits, from mid-peninsular Florida (Cape Canaveral) north to South Carolina (southern Atlantic Coast), and occurs along the ecotone between tidal marshes and upland maritime forests (C. Nordman pers. obs.).

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The sparse to moderately dense (30-70% cover) tree canopy, 5-20 m tall, is codominated exclusively by *Juniperus virginiana var. silicicola* (southern redcedar) and *Quercus virginiana* (live oak) and may also include substantial amounts of *Celtis laevigata* (sugarberry) or *Sabal palmetto* (cabbage palmetto). The very sparse (0-10%) subcanopy (10-15 m), when present, is made up of canopy species. The sparse (20-40%) tall-shrub layer (2-10 m) is dominated by *Juniperus virginiana var. silicicola* (southern redcedar) and may include *Ilex vomitoria* (yaupon), *Lycium carolinianum* (Carolina desert-thorn), *Magnolia grandiflora* (southern magnolia), *Prunus caroliniana* (Carolina laurelcherry), *Quercus virginiana* (live oak), *Sabal palmetto* (cabbage palmetto), and/or *Sapindus saponaria var. saponaria* (wingleaf soapberry). The sparse to moderately dense (40-70%) short-shrub layer (0.5-2 m) is dominated by *Serenoa repens* (saw palmetto) and may include *Amorpha fruticosa* (desert false indigo), *Borrichia frutescens* (bushy seaside-tansy), *Forestiera segregata* (Florida swamp-privet), *Ilex vomitoria* (yaupon), *Sabal palmetto* (cabbage palmetto), *Yucca aloifolia* (aloe yucca), and others. The herbaceous layer is very sparse to sparse (5-40%) and is made up of tree and shrub seedlings as well as *Andropogon glomeratus* (bushy bluestem), *Chasmanthium sessiliflorum* (longleaf woodoats), *Cyperus tetragonus* (fourangle flatsedge), *Ruellia caroliniensis* (Carolina wild petunia), and *Sporobolus indicus* (smut grass). Vines (5%) include *Passiflora lutea* (yellow passionflower), *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), *Smilax rotundifolia* (roundleaf greenbrier), and *Vitis rotundifolia* (muscadine). *Tillandsia usneoides* (Spanish moss) is the dominant epiphyte. In addition, this community supports many state-rare species, including state-critically imperiled *Eragrostis secundiflora* (red lovegrass), *Lycium carolinianum* (Carolina desert-thorn), *Sageretia minutiflora* (smallflower mock buckthorn), and *Tillandsia recurvata* (small ballmoss), state-imperiled *Forestiera segregata* (Florida swamp-privet), and state-vulnerable *Cyperus tetragonus* (fourangle flatsedge) and *Sideroxylon tenax* (tough bully).

Global Vegetation: The canopy of this calciphilic community consists of *Juniperus virginiana var. silicicola* (southern redcedar), *Sabal palmetto* (cabbage palmetto), *Celtis laevigata var. laevigata* (sugarberry), *Zanthoxylum clava-herculis* (Hercules' club), *Quercus virginiana* (live oak), *Osmanthus americanus* (devilwood), and other species. Shrubs are prominent and may include *Ilex vomitoria* (yaupon), *Yucca aloifolia* (aloe yucca), *Sageretia minutiflora* (smallflower mock buckthorn), *Forestiera segregata* (Florida swamp-privet), *Frangula caroliniana* (Carolina buckthorn), *Opuntia humifusa var. austrina* (devil's-tongue), and others. Composition is very variable from site to site, depending on environmental conditions and accidents of establishment and persistence.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Juniperus virginiana* var. *silicicola* (southern redcedar)
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Celtis laevigata* (sugarberry)
Tree (canopy & subcanopy)	Epiphyte	*Tillandsia usneoides* (Spanish moss)
Tree canopy	Broad-leaved evergreen tree	*Quercus virginiana* (live oak), *Sabal palmetto* (cabbage palmetto)
Tall shrub/sapling	Needle-leaved shrub	*Juniperus virginiana* var. *silicicola* (southern redcedar)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Forestiera segregata* (Florida swamp-privet), *Sabal palmetto* (cabbage palmetto)
Short shrub/sapling	Broad-leaved evergreen shrub	*Serenoa repens* (saw palmetto)
Herb (field)	Vine/Liana	*Smilax auriculata* (earleaf greenbrier), *Vitis rotundifolia* (muscadine)
Herb (field)	Graminoid	*Andropogon glomeratus* (bushy bluestem)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Juniperus virginiana* var. *silicicola* (southern redcedar), *Quercus virginiana* (live oak), *Sabal palmetto* (cabbage palmetto)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Eremochloa ophiuroides (centipede grass)	–	exotic
Opuntia ficus-indica (tuna cactus)	–	exotic

Other Plant Species	GRank	Note
Cyperus tetragonus (fourangle flatsedge)	G4?	state-vulnerable
Eragrostis secundiflora (red lovegrass)	G5	state-critically imperiled
Forestiera segregata (Florida swamp-privet)	G4	state-imperiled
Lycium carolinianum (Carolina desert-thorn)	G4	state-critically imperiled

Other Plant Species	GRank	Note
Sageretia minutiflora (smallflower mock buckthorn)	G4	state-critically imperiled
Sideroxylon tenax (tough bully)	G3?	state-vulnerable
Tillandsia recurvata (small ballmoss)	G5	state-critically imperiled

Global

Other Plant Species	GRank	Note
Harrisia simpsonii (Simpson's applecactus)	G2	imperiled
Lantana depressa var. *floridana* (Florida shrubverbena)	G2T1	critically imperiled
Sideroxylon tenax (tough bully)	G3?	–

Conservation Status Rank

Global Rank & Reasons: G2? (16-Jan-2001). This community is naturally rare because of the relative rarity of the edaphic conditions on which it depends. Examples on isolated islands remain in excellent to good condition (they may have had *Quercus virginiana* removed for ship-building or *Juniperus virginiana var. silicicola* removed for pencil manufacture). Other examples on larger and more accessible barrier islands, spits, or peninsulas have in some cases been destroyed by coastal development. Some examples have been altered by exotics, such as *Triadica sebifera*.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: *Sideroxylon tenax* is included in the name as a geographic indicator of the southern Atlantic Coast and distinguishing the type from temperate shell middens on the Gulf Coast. *Zanthoxylum clava-herculis* is an environmental indicator of the high calcium substrate.

Global Similar Associations:

- *Juniperus virginiana var. silicicola - (Quercus virginiana, Sabal palmetto)* Forest (CEGL007813)
- *Quercus virginiana - (Sabal palmetto)* Tropical Shell Midden Woodland (CEGL008411)--occurs farther south, is codominated by tropical species, and lacks *Juniperus virginiana var. silicicola*.

Global Related Concepts:

- IB8b. Temperate Shell Midden Woodland (Allard 1990) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This community was documented from Raccoon Keys on the southern end of Cumberland Island and from Abrams Point (the sheltered marsh on the south side of Terrapin Point) on the northern end.

Global Range: This calciphilic community occurs on calcareous coastal sands, shell hashes, Amerindian shell middens, and natural shell deposits, from mid-peninsular Florida (Cape Canaveral) north to South Carolina (southern Atlantic Coast).

Nations: US
States/Provinces: FL, GA, NC, SC
TNC Ecoregions: 55:C, 56:C, 57:C
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC

Federal Lands: NPS (Canaveral, Cumberland Island, Fort Pulaski, Timucuan); USFS (Francis Marion)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.095, CUIS.102, CUIS.195.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: D.J. Allard, mod. A.S. Weakley and H. Summer
References: Allard 1990, Dorroh 1971, Govus 1998, Krakow 2007, Nelson 1986, Nordman pers. comm., Peet et al. unpubl. data 2002, Southeastern Ecology Working Group n.d.

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

Pinus palustris / Quercus spp. Woodland Alliance (A.499)

Alliance Concept

Summary: This alliance includes all *Pinus palustris* (longleaf pine)-dominated vegetation on dry to xeric sites in the southeastern United States. These types include "longleaf pine sandhills" of the Atlantic and Gulf coastal plains; other dry to xeric substrates of the East Gulf and West Gulf coastal plains; as well as "montane longleaf" on rocky substrates of the Piedmont, Cumberland Plateau, and Ridge and Valley. Soils of this alliance include sandy Entisols, plinthic and aquic Ultisols, Alfisols and occasionally Spodosols. Soils vary in texture from deep sands to well-drained loams with a strong clay component. Montane examples occur on rocky ridges comprised of various rock types including sandstone, quartzite, phyllite, mica schists, and gneiss. Longleaf pine sandhills include a variety of xeric to dry-mesic *Pinus palustris* (longleaf pine) communities, characterized by the presence of one or more scrub oaks, most characteristically including *Quercus incana* (bluejack oak), *Quercus laevis* (turkey oak), *Quercus margarettiae* (runner oak), *Quercus myrtifolia* (myrtle oak), *Quercus geminata* (sand live oak), *Quercus minima* (dwarf live oak), *Quercus arkansana* (Arkansas oak), *Quercus chapmanii* (Chapman oak), *Quercus stellata* (post oak), and *Quercus marilandica* (blackjack oak), sometimes in combination with the more mesic oaks *Quercus virginiana* (live oak), *Quercus falcata* (southern red oak), *Quercus pumila* (running oak), and *Quercus nigra* (water oak). The more montane examples may contain *Quercus prinus* (chestnut oak), *Quercus coccinea* (scarlet oak), *Quercus falcata* (southern red oak), *Pinus echinata* (shortleaf pine), and *Pinus virginiana* (Virginia pine). The structure of examples of these communities is highly variable, depending on fire frequency. Generally, appropriately fire-managed examples of these communities have an open canopy of *Pinus palustris* (longleaf pine), with scattered tree-sized individuals of the *Quercus* (oak) spp.; the oaks are otherwise reduced to sprouts. Under lower fire frequency, these communities often develop a dense subcanopy, shrub layer, or even canopy of scrub oaks. In addition, fire suppression may promote ingrowth of other pines, particularly *Pinus clausa* (sand pine), *Pinus echinata* (shortleaf pine), and/or *Pinus taeda* (loblolly pine). Where a well-developed shrub stratum is present, common shrubs include *Vaccinium stamineum* (deerberry), *Vaccinium arboreum* (farkleberry), *Vaccinium virgatum* (smallflower blueberry), *Vaccinium tenellum* (small black blueberry), *Gaylussacia dumosa* (dwarf huckleberry), *Gaylussacia frondosa* (blue huckleberry), *Gaylussacia nana* (Confederate huckleberry), *Gaylussacia tomentosa* (hairytwig huckleberry), *Ilex vomitoria* (yaupon), *Rhus copallinum* (flameleaf sumac), *Asimina parviflora* (smallflower pawpaw), and *Morella cerifera* (wax-myrtle). *Aristida stricta* (pineland threeawn) or *Aristida beyrichiana* (Beyrich threeawn) are also dominant or at least present within their ranges in the herbaceous layer of many associations. Other characteristic grasses include *Sporobolus junceus* (pineywoods dropseed), *Aristida purpurascens* (arrowfeather threeawn), *Schizachyrium scoparium* (little bluestem), *Andropogon gyrans* (Elliott's bluestem), and *Andropogon ternarius* (splitbeard bluestem).

Classification Comments: This alliance includes vegetation referred to as `longleaf pine sandhills' of the Atlantic and Gulf coastal plains; other dry to xeric substrates of the East Gulf and West Gulf coastal plains; as well as `montane longleaf' on rocky substrates of the Piedmont, Cumberland Plateau, and Ridge and Valley. Some of these associations, because of their inland geography and/or

a history of disturbance and/or fire suppression, contain other pine species (*Pinus echinata* and/or *Pinus taeda*) or oaks in their canopies. Depending on fire interval, the canopy closure may temporarily exceed 60%. Despite this, all are now placed here. Some examples of this condition include fire-suppressed or otherwise ecologically disturbed longleaf pine woodlands from the coastal plains with tall and dense scrub oaks that enter the canopy, or mixed pine woodlands within the natural range of *Pinus palustris* and at least partially dominated by it. The pine canopy component is typically a mixture of pine species; this usually arises from ingrowth of the less fire-tolerant pines (*Pinus echinata, Pinus taeda*) into natural, planted, or managed stands of *Pinus palustris*. In addition, included here are naturally mixed pine - oak stands which have a canopy containing *Pinus palustris* with a mixture of other pines and oaks, in the Piedmont and Ridge and Valley of Georgia, in the Ridge and Valley of Alabama, and possibly other areas outside of the Coastal Plain. In some of these associations, the original composition and canopy closure are speculative; a higher canopy closure (greater than 60%) may be the result of fire suppression in woodlands more typically dominated by *Pinus palustris*. Oaks present may include *Quercus stellata, Quercus marilandica, Quercus prinus, Quercus margarettiae, Quercus incana*, and *Quercus falcata*, which will frequently be present in the understory or also scattered in the overstory, depending on the moisture regime. *Quercus coccinea* and *Quercus georgiana* are more rarely found. The woodland structure may be wholly 'natural,' or it may have been created and maintained by silvicultural techniques designed to replicate this natural condition. At many sites, both forest and woodland communities may be present, grading into one another depending on aspect, surface geology, or fire history.

Similar Alliances:

- *Pinus palustris* Planted Forest Alliance (A.96)
- *Pinus palustris* Woodland Alliance (A.520)--includes longleaf pine communities which lack a substantial scrub oak component.

Similar Alliance Comments: This alliance is differentiated from the *Pinus palustris* Woodland Alliance (A.520) by the presence of xeric scrub oaks (*Quercus laevis, Quercus incana, Quercus margarettiae*) and xeric edaphic conditions, typically with coarse-textured soils.

Related Concepts:

- Bluejack Oak-Pine Series (Diamond 1993) I
- Coastal Fringe Sandhill (Schafale and Weakley 1990) ?
- IB6a. Western Xeric Sandhill (Allard 1990) ?
- IB6b. Southeastern Coastal Plain Xeric Sandhill (Allard 1990) ?
- IB6c. Southeastern Coastal Plain Subxeric Pine - Oak Sandhill (Allard 1990) I
- IB6d. Southeastern Coastal Plain Subxeric Longleaf Pine - Saw Palmetto Woodland (Allard 1990) ?
- Longleaf Pine - Bluejack Oak / *Tragia* Grossarenic Dry Uplands (Turner et al. 1999) I
- Longleaf Pine: 70 (Eyre 1980) I
- Mesic Pine Flatwoods (Schafale and Weakley 1990) ?

- Pine/Scrub Oak Sandhill, Mesic Transition Variant (Schafale 1994) ?
- Pine/Scrub Oak Sandhill, Mixed Oak Variant (Schafale 1994) ?
- Pine/Scrub Oak Sandhill, Northern Variant (Schafale 1994) ?
- Sandhill (FNAI 1992a) I
- Western Wet/Mesic Longleaf Pine Savannah/Flatwoods (Smith 1996a) I
- Xeric Sandhill Scrub, Coastal Fringe Variant (Schafale 1994) ?
- Xeric Sandhill Scrub, Coastal Plain Variant (Schafale 1994) ?
- Xeric Sandhill Scrub, Sand Barren Variant (Schafale 1994) ?

Alliance Description

Environment: Soils on which this alliance has been documented to occur in North Carolina (and some other states) include Dothan (Plinthic Paleudult), Fuquay (Plinthic Paleudult), Gilead (Aquic Hapludult), Kureb (Typic Quartzipsamment), Lakeland (Typic Quartzipsamment), Mandarin (Typic Haplohumod), and Vaucluse (Typic Hapludult); some more mesic examples occur on the Wagram series (Arenic Paleudult). In the East Gulf Coastal Plain, it has been found on Troup, Lucy, and Eustis-Lakeland complex; in the West Gulf Coastal Plain, it has been documented on the Messer soil series (Haplic Glossudalf) and Kisatchie silt clay (Montmorillonitic Hapludalf). One unusual association in Georgia is known from Broxton Rocks (Coffee County), where it is associated with sandstone outcrops of the Altamaha Grit. In addition, one rare Louisiana association is known from the Dough Hills member of the Fleming Formation and is thought to occur primarily on Anacoco and Kisatchie-Anacoco soils which are very strongly acidic silt loams over clay; Anacoco soils are underlain by siltstone. A Mississippi association placed here is found on well-drained upland soils with a strong clay component, including McLaurin loamy sand, Benndale sandy loam, and Heidel sandy loam.

Vegetation: This alliance includes xeric to dry-mesic *Pinus palustris* (longleaf pine) communities, characterized by the presence of one or more scrub oaks, most characteristically including *Quercus incana* (bluejack oak), *Quercus laevis* (turkey oak), *Quercus margarettiae* (runner oak), *Quercus myrtifolia* (myrtle oak), *Quercus geminata* (sand live oak), *Quercus minima* (dwarf live oak), *Quercus arkansana* (Arkansas oak), *Quercus chapmanii* (Chapman oak), *Quercus stellata* (post oak), and *Quercus marilandica* (blackjack oak), sometimes in combination with the more mesic oaks *Quercus virginiana* (live oak), *Quercus pumila* (running oak), *Quercus falcata* (southern red oak), and *Quercus nigra* (water oak). Where a well-developed shrub stratum is present, common shrubs include *Ilex vomitoria* (yaupon), *Vaccinium arboreum* (farkleberry), *Vaccinium stamineum* (deerberry), and *Rhus copallinum* (flameleaf sumac); in addition, *Asimina parviflora* (smallflower pawpaw), *Gaylussacia dumosa* (dwarf huckleberry), *Gaylussacia frondosa* (blue huckleberry), *Morella cerifera* (wax-myrtle), *Vaccinium virgatum* (smallflower blueberry), *Vaccinium elliottii* (Elliott's blueberry), and *Vaccinium tenellum* (small black blueberry) may occur in some associations. *Aristida stricta* (pineland threeawn) or *Aristida beyrichiana* (Beyrich threeawn) are also dominant or at least present within their ranges in the herbaceous layer of many associations. Other characteristic grasses include *Sporobolus junceus* (pineywoods dropseed), *Aristida purpurascens*

(arrowfeather threeawn), *Schizachyrium scoparium* (little bluestem), *Andropogon gyrans* (Elliott's bluestem), and *Andropogon ternarius* (splitbeard bluestem). Xeric examples on coarser sands are likely to have a sparse canopy with *Pinus palustris* (longleaf pine) and *Quercus laevis* (turkey oak) at low frequencies. These may include a low-shrub layer with *Gaylussacia dumosa* (dwarf huckleberry) and *Toxicodendron pubescens* (Atlantic poison-oak). Herbs which may be present in these examples include *Aristida lanosa* (woollysheath threeawn), *Cnidoscolus stimulosus* (finger rot), *Licania michauxii* (gopher apple), *Opuntia humifusa var. humifusa* (devil's-tongue), *Pityopsis graminifolia* (narrowleaf silkgrass), *Pteridium aquilinum* (western brackenfern), and *Tephrosia virginiana* (Virginia tephrosia). The herb layer frequently includes fruticose lichens such as *Cladonia* (cup lichen) spp. and *Cladina* (reindeer lichen) spp.

Dynamics: In the Piedmont and Ridge and Valley of Georgia, in the Ridge and Valley of Alabama, and possibly other areas outside of the Coastal Plain, naturally mixed pine - oak stands have a canopy containing longleaf pine, *Pinus palustris*, with a mixture of other pines and oaks. In these associations, the original composition and canopy closure are speculative; a higher canopy closure (greater than 60%) may be the result of fire suppression in woodlands more typically dominated by *Pinus palustris*. Oaks present may include *Quercus stellata, Quercus marilandica, Quercus prinus, Quercus margarettiae, Quercus incana*, and *Quercus falcata*, which will frequently be present in the understory or also scattered in the overstory, depending on the moisture regime. *Quercus coccinea* and *Quercus georgiana* are more rarely found. The woodland structure may be wholly 'natural,' or it may have been created and maintained by silvicultural techniques designed to replicate this natural condition. At many sites, both forest and woodland communities may be present, grading into one another depending on aspect, surface geology, or fire history.

Alliance Distribution

Range: This alliance is found in the Coastal Plain province from Virginia south to south-central Florida, and west to eastern Texas. It also extends inland to "hard rock" provinces (Piedmont, Cumberland Plateau, Ridge and Valley) of Alabama, Georgia, and North Carolina.

Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, TX, VA
TNC Ecoregions: 31:C, 40:C, 41:C, 43:C, 50:C, 52:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Af:CCC, 231Ai:CCP, 231Aj:CCC, 231Ao:CC?, 231Bc:CCC, 231Bd:CCC, 231Bj:CCP, 231Ca:CCC, 231Da:CC?, 231Db:CCC, 231Dc:CCC, 231Dd:CCC, 231De:CC?, 231Ea:CCC, 231Eg:CCP, 231Fa:CCC, 232Ba:CCC, 232Bb:CCC, 232Bc:CCP, 232Be:CCP, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bj:CCC, 232Bk:CCC, 232Bl:CCC, 232Bm:CCC, 232Bn:CCC, 232Bo:CCP, 232Bp:CCP, 232Bq:CCC, 232Br:CCC, 232Bu:CCP, 232Bv:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCP, 232Ce:CCC, 232Cf:CCP, 232Ch:CCC, 232Da:CCP, 232Db:CCC, 232Dc:CCC, 232Ea:CCC, 232Eb:CCP, 232Fa:CCC, 232Fb:CCC, 232Fe:CCC, 232Ga:CP?, 232Gb:CPP, 232Gc:CPP

Federal Lands: DOD (Camp Lejeune, Camp Shelby, Eglin, Fort Benning, Fort Bragg, Fort Gordon, Fort Jackson, Fort McClellan, Fort Stewart, Sunny Point); NPS (Big Thicket, Cumberland Island, Fort Caroline, Horseshoe Bend, Timucuan); USFS (Angelina, Apalachicola, Bankhead, Bienville,

Chattahoochee, Conecuh, Croatan, Davy Crockett, De Soto, Francis Marion, Homochitto?, Kisatchie, Ocala, Osceola, Sabine, Sam Houston, Talladega, Tuskegee, Uwharrie); USFWS (Eufaula)

(CEGL004263) Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland
Pinus palustris / Quercus (hemisphaerica, laevis) / Morella cerifera / Aristida beyrichiana Woodland [Provisional]

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	*Pinus palustris / Quercus* spp. Woodland Alliance (A.499)
Alliance (English name)	Longleaf Pine / Oak species Woodland Alliance
Association	*Pinus palustris / Quercus (hemisphaerica, laevis) / Morella cerifera / Aristida beyrichiana* Woodland [Provisional]
Association (English name)	Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland

Element Concept

Global Summary: This association includes *Pinus palustris* (longleaf pine)-dominated woodlands in coastal areas of Georgia and Florida on dry to xeric sandy soils with a sparse to dense scrub oak subcanopy/shrub layer. This type can be considered a southern version of *Pinus palustris - Pinus taeda / Quercus geminata - Quercus hemisphaerica - Osmanthus americanus var. americanus / Aristida stricta* Woodland (CEGL003577), with *Aristida beyrichiana* (Beyrich threeawn) present instead of *Aristida stricta* (pineland threeawn).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This longleaf pine / oak woodland was sampled once on Cumberland Island in a xeric flat with well-drained sandy soil. The unvegetated surface is dominated by leaf litter (98% cover) with some wood (2%). Evidence of disturbance includes some redbay twig dieback and extreme fire suppression.

Global Environment: This community occurs on xeric sands near the coast in Georgia. It is documented from Cumberland Island but likely occurs elsewhere in Georgia and possibly northeast Florida.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The sparse (20% cover) tree canopy, 20-35 m tall, is dominated exclusively by *Pinus palustris* (longleaf pine), while the moderate (50%) subcanopy (15-20 m) is made up of *Prunus serotina* (black cherry), *Quercus hemisphaerica* (Darlington oak), and *Quercus laevis* (turkey oak). The very sparse (10%) tall-shrub layer (10-15 m) is made up of sapling oak species. The sparse (20%) short-shrub layer (1-2 m) includes *Morella cerifera* (wax-myrtle), *Vaccinium arboreum* (farkleberry), and *Vaccinium stamineum* (deerberry). The herbaceous layer is very sparse (10%), dominated by pine and other tree seedlings along with *Andropogon ternarius* (splitbeard bluestem), *Cnidoscolus stimulosus* (finger rot), *Dichanthelium sabulorum* (hemlock rosette grass), *Scleria triglomerata* (whip nutrush), *Stillingia sylvatica* (queen's-delight), *Tragia urens* (wavyleaf noseburn), and others. Epiphytes include *Tillandsia usneoides* (Spanish moss). In addition, this community supports state-vulnerable *Quercus myrtifolia* (myrtle oak).

Global Vegetation: The canopy is sparse and is dominated by *Pinus palustris* (longleaf pine). The sparse to dense scrub oak subcanopy/shrub layer is dominated by *Quercus hemisphaerica* (Darlington oak), *Quercus laevis* (turkey oak), *Quercus myrtifolia* (myrtle oak), and *Morella cerifera* (wax-myrtle). The herbaceous layer is sparse and consists of *Andropogon ternarius* (splitbeard bluestem), *Cnidoscolus stimulosus* (finger rot), *Dichanthelium sabulorum* (hemlock rosette grass), *Scleria triglomerata* (whip nutrush), *Stillingia sylvatica* (queen's-delight), *Tragia urens* (wavyleaf noseburn), and others. Epiphytes include *Tillandsia usneoides* (Spanish moss).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Pinus palustris* (longleaf pine)
Tree subcanopy	Broad-leaved deciduous tree	*Prunus serotina* (black cherry), *Quercus laevis* (turkey oak)
Tree subcanopy	Broad-leaved evergreen tree	*Quercus hemisphaerica* (Darlington oak)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus laevis* (turkey oak)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Quercus hemisphaerica* (Darlington oak)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum* (deerberry)
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle), *Quercus myrtifolia* (myrtle oak)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Morella cerifera* (wax-myrtle), *Pinus palustris* (longleaf pine), *Quercus hemisphaerica* (Darlington oak), *Quercus laevis* (turkey oak)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
myrtifolia (myrtle oak)	G5	state-vulnerable

Conservation Status Rank

Global Rank & Reasons: GNR (25-Jul-2008).

Classification

Status: Provisional

Classification Confidence:

Cumberland Island National Seashore and Fort Frederica National Monument Comments: This association was created based on data from one plot on Cumberland Island (CUIS.266), and it should be re-examined when additional data are available. This type represents a southern version of Carolina Coastal Longleaf Pine Sandhill (CEGL003577).

Global Comments: This association was created based on data from one plot on Cumberland Island (CUIS.266), and it should be re-examined when additional data are available. This type represents a southern version of *Pinus palustris - Pinus taeda / Quercus geminata - Quercus hemisphaerica - Osmanthus americanus var. americanus / Aristida stricta* Woodland (CEGL003577).

Global Similar Associations:

- *Pinus palustris - Pinus taeda / Quercus geminata - Quercus hemisphaerica - Osmanthus americanus var. americanus / Aristida stricta* Woodland (CEGL003577)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association occurs along a slight rise to the south of North Cut Road on Cumberland Island, where it enters into the longleaf pine-dominated forest on the western side of Cumberland Island. The surrounding longleaf forest, classified as Maritime Slash Pine Upland Flatwoods (CEGL004658), does not include *Quercus laevis*.

Global Range: This longleaf pine / oak woodland is currently only known from Cumberland Island, Georgia.

Nations: US
States/Provinces: GA
TNC Ecoregions: 56:C
USFS Ecoregions: 232Ce:CCC
Federal Lands: NPS (Cumberland Island)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.266.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: H. Summer
References: Southeastern Ecology Working Group n.d.

Pinus palustris Woodland Alliance (A.520)

Alliance Concept

Summary: This alliance includes mesic to dry-mesic upland *Pinus palustris* (longleaf pine) woodlands and savannas, on rolling hills or on flats, with an open to sparse canopy of *Pinus palustris* (longleaf pine), and lacking scrub oaks and the extreme xeric conditions that typically support these species. If oaks are present, they are generally of more mesic species, such as *Quercus falcata* (southern red oak), *Quercus nigra* (water oak), *Quercus virginiana* (live oak), or *Quercus pumila* (running oak); examples may contain more xeric species, such as *Quercus marilandica* (blackjack oak) or *Quercus stellata* (post oak), in combination with the more mesic oaks. Other pines, particularly *Pinus echinata* (shortleaf pine), *Pinus elliottii var. elliottii* (Honduras pine), and *Pinus taeda* (loblolly pine), may be present. While not dominant, they may form part of the canopy, increasing with fire suppression. When fire-suppressed, *Quercus falcata* (southern red oak), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Quercus nigra* (water oak), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Callicarpa americana* (American beautyberry), and/or *Rhus copallinum* (flameleaf sumac) may invade or increase. Overall floristic composition is primarily composed of upland species typical of mesic to dry-mesic conditions but may include an admixture of species characteristic of wetland sites and those characteristic of xeric sites as well. Some typical mesic to dry-mesic herbaceous species include *Andropogon ternarius* (splitbeard bluestem), *Andropogon gyrans var. gyrans* (Elliott's bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass). *Aristida stricta* (pineland threeawn) or *Aristida beyrichiana* (Beyrich threeawn) are also dominant or at least present in the herbaceous layer of many associations within their respective ranges. Variation in floristic composition of this wide-ranging alliance is related to site conditions, fire interval, and local or regional floristics. Upland *Pinus elliottii - Pinus palustris* woodlands occurring on barrier islands and other near-coastal areas in the East Gulf Coastal Plain and the South Atlantic Coastal Plain are included here. The structure may be variable. Associated species of these coastal flatwoods can include *Pinus palustris* (longleaf pine), *Ilex vomitoria* (yaupon), *Serenoa repens* (saw palmetto), and *Morella cerifera* (wax-myrtle). The herbaceous layer typically becomes much less diverse with increased fire interval. This alliance typically occurs on finer-textured soils, such as clays and clay loams.

Classification Comments: This alliance includes a variety of associations characterized by the presence of *Pinus palustris* occurring on a variety of mesic to dry-mesic substrates, most commonly on loamy and clayey soils in the Atlantic and Gulf coastal plains. It is differentiated from the *Pinus palustris / Quercus* spp. Woodland Alliance (A.499) by the dearth of xeric oaks (*Quercus laevis, Quercus incana, Quercus margarettiae*) and its occurrence in the Coastal Plain in mesic to dry-mesic situations on finer-textured soils. There is some floristic overlap between these two alliances and therefore substrate and physiographic differences help to differentiate them. This alliance includes a variety of associations previously placed in related other alliances which have now been merged with

this one. These related alliances include the former I.C.3.N.a *Pinus palustris - Pinus (echinata, taeda) - Quercus (incana, margarettiae, falcata, laevis)* Forest Alliance (A.397) and former II.A.4.N.a *Pinus palustris - Pinus (echinata, taeda)* Woodland Alliance (A.519). Some of these associations, because of their inland geography and/or a history of disturbance and/or fire suppression, contain other pine species (*Pinus echinata* and/or *Pinus taeda*) or oaks in their canopies. Depending on fire interval, the canopy closure may temporarily exceed 60%. Despite this, all are now placed here. Some examples of this condition include fire-suppressed or otherwise ecologically disturbed longleaf pine woodlands from the coastal plains with tall and dense oaks that enter the canopy, or mixed pine woodlands within the natural range of *Pinus palustris* and at least partially dominated by it. The pine canopy component is sometimes a mixture of pine species; this usually arises from ingrowth of the less fire-tolerant pines (*Pinus echinata, Pinus taeda*) into natural, planted, or managed stands of *Pinus palustris*. Oaks present may include *Quercus stellata, Quercus falcata, Quercus marilandica, Quercus alba, Quercus nigra, Quercus hemisphaerica*, and *Quercus prinus*, which will frequently be present in the understory or also scattered in the overstory, depending on the moisture regime. *Oxydendrum arboreum* is commonly present, and *Liquidambar styraciflua, Carya alba, Carya pallida, Diospyros virginiana, Nyssa sylvatica*, and *Cornus florida* could be as well. The woodland structure may be wholly 'natural,' or it may have been created and maintained by silvicultural techniques designed to replicate this natural condition. At many sites, both forest and woodland communities may be present, grading into one another depending on aspect, surface geology, or fire history. This alliance also includes silviculturally managed forests of planted or seed tree/shelterwood-regenerated *Pinus palustris* with *Pinus echinata* and/or *Pinus taeda* invading due to fire suppression.

Similar Alliances:

- *Pinus palustris - (Pinus elliottii)* Forest Alliance (A.123)
- *Pinus palustris / Quercus* spp. Woodland Alliance (A.499)--xeric and dry-mesic *Pinus palustris* woodlands with oak subcanopy, often referred to as sandhills and montane longleaf pine woodlands, distinguished by occurrence on sandhills or other sites which exhibit excessively drought conditions.
- *Pinus palustris* Planted Forest Alliance (A.96)

Similar Alliance Comments: This alliance (A.520) is differentiated from the *Pinus palustris / Quercus* spp. Woodland Alliance (A.499) by the dearth of xeric scrub oaks (*Quercus laevis, Quercus incana, Quercus margarettiae*) and its occurrence in the Coastal Plain in mesic to dry-mesic situations on finer-textured soils. There is some floristic overlap between these two alliances and therefore substrate and physiographic differences help to differentiate them.

Related Concepts:

- IB6i. Atlantic Coastal Plain Mesic Longleaf Pine Forest (Allard 1990) ?
- IB6k. West Gulf Coastal Plain Upland Longleaf Pine Forest (Allard 1990) I
- IB6l. East Gulf Coastal Plain Upland Longleaf Pine Forest (Allard 1990) I
- Loamy Hills Longleaf - Slash Pine Forest (Wieland 1994b) ?

- Longleaf Pine - Mixed Hardwood Woodland (Moore pers. comm.) ?
- Longleaf Pine - Scrub Oak: 71 (Eyre 1980) I
- Longleaf Pine-Little Bluestem Series (Diamond 1993) I
- Longleaf Pine: 70 (Eyre 1980) I
- Mesic Pine Flatwoods (Schafale and Weakley 1990) I
- Mesic Pine Flatwoods, Coastal Plain Variant (Schafale 1994) ?
- Mesic Pine Flatwoods, Little River Variant (Schafale 1994) ?
- Mesic Pine Flatwoods, Sandhills Variant (Schafale 1994) ?
- Southern Mesic Longleaf Pine Woodland (Peet and Allard 1993) ?
- Western Upland Longleaf Pine Forest (Smith 1996a) I

Alliance Description

Environment: This alliance typically occurs on finer-textured soils, such as clays and clay loams. Some soils at North Carolina examples of this alliance include Baymeade (Arenic Hapludult), Craven (Aquic Hapludult), Foreston (Aquic Paleudult), Gilead (Aquic Hapludult), Goldsboro (Aquic Paleudult), Kalmia (Typic Hapludult), Kenansville (Arenic Hapludult), Leaf (Typic Albaquult), Norfolk (Typic Paleudult), Pactolus (Aquic Quartzipsamment), Rains (Typic Paleudult), Stallings (Xeric Paleaquult), and Tarboro (Typic Udipsamment). West of the Mississippi River, it may be found on the Catahoula, Fleming, Sparta, Vicksburg, or Willis formations.

Vegetation: Members of this alliance lack xerophytic scrub oaks and the extreme xeric conditions that typically support these species. When hardwoods are present, they are generally of more mesic species, such as *Quercus falcata* (southern red oak), *Quercus nigra* (water oak), *Quercus virginiana* (live oak), or *Quercus pumila* (running oak); examples may contain more xeric species such as *Quercus marilandica* (blackjack oak) or *Quercus stellata* (post oak), in combination with the more mesic oaks. Other pines, particularly *Pinus echinata* (shortleaf pine), *Pinus elliottii var. elliottii* (Honduras pine), and *Pinus taeda* (loblolly pine), may be present. While not dominant, they may form part of the canopy, increasing with fire suppression. When fire-suppressed, *Quercus falcata* (southern red oak), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Quercus nigra* (water oak), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Callicarpa americana* (American beautyberry), and/or *Rhus copallinum* (flameleaf sumac) may invade or increase. Overall floristic composition is primarily composed of upland species typical of mesic to dry-mesic conditions, but may include an admixture of species characteristic of wetland sites and those characteristic of xeric sites as well. Some typical mesic to dry-mesic herbaceous species include *Andropogon ternarius* (splitbeard bluestem), *Andropogon gyrans var. gyrans* (Elliott's bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass). *Aristida stricta* (pineland threeawn) or *Aristida beyrichiana* (Beyrich threeawn) are also dominant or at least present in the herbaceous layer of many associations within their respective ranges. Variation in floristic composition of this wide-ranging alliance is related to site conditions, fire interval, and local or regional floristics. The herbaceous layer typically becomes much less diverse with increased fire interval.

Alliance Distribution

Range: This alliance is found in the southeastern Coastal Plain from Texas to Florida and north to Virginia.

Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, TX
TNC Ecoregions: 31:C, 40:C, 41:C, 43:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 231Ac:CCC, 231Bd:CCC, 231Bj:CCP, 231Dd:CCC, 231Ea:CCC, 231Ef:CCC, 231Eg:CCP, 231Eh:CCC, 231Fa:CPP, 232Ba:CCC, 232Bb:CCC, 232Bc:CCP, 232Be:CCP, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bj:CCC, 232Bk:CCC, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bp:CCP, 232Bq:CCC, 232Br:CCC, 232Bs:CCC, 232Bu:CCP, 232Bv:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCP, 232Ce:CCC, 232Cf:CCC, 232Da:CCP, 232Db:CCC, 232Dc:CCC, 232Ea:CCC, 232Eb:CCP, 232Fa:CCC, 232Fb:CCC, 232Fe:CCC, 232Ga:CCP, 232Gb:CCC, 232Gc:CCP

Federal Lands: DOD (Camp Lejeune, Eglin, Fort Benning, Fort Bragg, Fort Gordon, Fort McClellan, Fort Stewart, Sunny Point); NPS (Canaveral, Congaree Swamp, Cumberland Island, Timucuan); USFS (Angelina, Apalachicola, Bienville, Conecuh, Croatan, Davy Crockett, De Soto, Francis Marion, Homochitto, Kisatchie, Ocala, Osceola, Sabine, Sam Houston, Talladega, Tuskegee); USFWS (Bon Secour, Okefenokee)

(CEGL004658) Maritime Slash Pine - Longleaf Pine Upland Flatwoods

Pinus elliottii var. elliottii - (Pinus palustris) / Ilex vomitoria - Serenoa repens - Morella cerifera Woodland

Slash Pine - (Longleaf Pine) / Yaupon - Saw Palmetto - Wax-myrtle Woodland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	*Pinus palustris* Woodland Alliance (A.520)
Alliance (English name)	Longleaf Pine Woodland Alliance
Association	*Pinus elliottii var. elliottii - (Pinus palustris) / Ilex vomitoria - Serenoa repens - Morella cerifera* Woodland

NVC Classification (continued)

Classification Level	Observed Classification
Association (English name)	Slash Pine - (Longleaf Pine) / Yaupon - Saw Palmetto - Wax-myrtle Woodland
Association (Common name)	Maritime Slash Pine - Longleaf Pine Upland Flatwoods
Ecological System(s):	Southern Atlantic Coastal Plain Maritime Forest (CES203.537)
	East Gulf Coastal Plain Maritime Forest (CES203.503)

Element Concept

Global Summary: This maritime-influenced, upland *Pinus elliottii var. elliottii* (Honduras pine) woodland occurs on barrier islands and near-coastal areas of the East Gulf Coastal Plain and adjacent South Atlantic region. In addition to *Pinus elliottii var. elliottii* (Honduras pine), stands sometimes contain an admixture of *Pinus palustris* (longleaf pine). In the past, canopy structure in natural stands was open, but now it varies to a more closed structure. A subcanopy is sometimes present and can include *Quercus virginiana* (live oak), *Quercus geminata* (sand live oak), *Quercus hemisphaerica* (Darlington oak), and *Magnolia grandiflora* (southern magnolia). Typical understory species include *Ilex vomitoria* (yaupon), *Serenoa repens* (saw palmetto), and *Morella cerifera* (wax-myrtle). Other common shrubs and woody vines are *Smilax bona-nox* (saw greenbrier), *Smilax auriculata* (earleaf greenbrier), *Smilax laurifolia* (laurel greenbrier), *Rhus copallinum var. leucantha* (winged sumac), *Vitis rotundifolia* (muscadine), *Vaccinium arboreum* (farkleberry), and *Persea borbonia* (redbay). The herb stratum is typically poorly developed but may include *Solidago odora var. odora* (anisescented goldenrod) and *Tragia urens* (wavyleaf noseburn). On a southern Georgia barrier island, at the Cumberland Island National Seashore, the sparse herb layer contains occasional species expected from more open longleaf pine uplands, including *Aristida lanosa* (woollysheath threeawn), *Liatris* (blazing star) sp., and *Sorghastrum secundum* (lopsided Indiangrass). In northeastern Florida, at the Timucuan Ecological and Historic Preserve, dead and dying *Persea borbonia* (redbay) indicate that these maritime flatwoods are being affected by laurel wilt, which is caused by a vascular wilt fungus that is transmitted to species in the Lauraceae family via the non-native redbay ambrosia beetle (*Xyleborus glabratus*).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This maritime slash pine - longleaf pine upland flatwoods was sampled at three locations on Cumberland Island on dry flats with moderately well- to well-drained sand and sandy loam soils. The unvegetated surface is dominated by leaf litter (95-99% cover, with litter and duff depths between 1 and 2 inches) with some wood (1-5%). Evidence of disturbance includes some redbay twig dieback, grazing, logging in the past (old settlement area), and extreme fire suppression.

Global Environment: This maritime upland woodland occurs on stabilized upland dunes on barrier islands and near-coastal mainland areas on the East Gulf Coastal Plain and adjacent South Atlantic region.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate (50-60% cover) tree canopy, 20-35 m tall, is dominated by *Pinus elliottii* (slash pine), *Pinus palustris* (longleaf pine), and/or *Pinus taeda* (loblolly pine), while the sparse (10-30%) subcanopy (15-20 m) is dominated by *Quercus hemisphaerica* (Darlington oak) or *Quercus virginiana* (live oak). The very sparse (5-20%) tall-shrub layer (2-5 m) may include canopy species as well as *Ilex opaca* (American holly), *Morella cerifera* (wax-myrtle), *Persea borbonia* (redbay), *Prunus serotina* (black cherry), *Quercus myrtifolia* (myrtle oak) (state-vulnerable), and *Sabal palmetto* (cabbage palmetto). The sparse (10-40%) short-shrub layer (1-2 m) is dominated by *Morella cerifera* (wax-myrtle), *Serenoa repens* (saw palmetto), and *Vaccinium stamineum* (deerberry). The herbaceous layer is very sparse (10-20%); common species include *Andropogon* (bluestem) spp., *Chasmanthium laxum* (slender woodoats), *Cnidoscolus stimulosus* (finger rot), *Dichanthelium commutatum* (variable panicgrass), *Dichanthelium sabulorum var. thinium* (hemlock rosette grass), *Eupatorium* (thoroughwort) spp., *Pityopsis graminifolia* (narrowleaf silkgrass), *Scleria triglomerata* (whip nutrush), and many others. Vines (up to 10% cover) include *Gelsemium sempervirens* (evening trumpetflower), *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), *Toxicodendron radicans* (eastern poison-ivy), and *Vitis rotundifolia* (muscadine), which climbs into the canopy and shrub layers. Epiphytes include *Pleopeltis polypodioides* (resurrection fern) and *Tillandsia usneoides* (Spanish moss). In addition, this community supports state-critically imperiled *Tridens carolinianus* (Carolina fluffgrass) and state-vulnerable *Aristida lanosa* (woollysheath threeawn) and *Quercus myrtifolia* (myrtle oak).

Global Vegetation: *Pinus elliottii var. elliottii* (Honduras pine) dominates, sometimes with an admixture of *Pinus palustris* (longleaf pine). In the past, canopy structure in natural stands was open, but now it varies to a more closed structure. At Cumberland Island National Seashore, a barrier island in southeastern Georgia, even-aged old-growth *Pinus palustris* (longleaf pine) is the exclusive canopy species. A subcanopy is sometimes present and can include *Quercus* (oak) *virginiana*, *Quercus geminata* (sand live oak), *Quercus hemisphaerica* (Darlington oak), and *Magnolia grandiflora* (southern magnolia). Typical understory species include *Ilex vomitoria* (yaupon), *Serenoa repens* (saw palmetto), and *Morella cerifera* (wax-myrtle). Other common shrubs and woody vines are *Smilax bona-nox* (saw greenbrier), *Smilax auriculata* (earleaf greenbrier), *Smilax laurifolia* (laurel greenbrier), *Rhus copallinum var. leucantha* (winged sumac), *Vitis rotundifolia* (muscadine), *Vaccinium arboreum* (farkleberry), and *Persea borbonia* (redbay). The herb stratum is typically poorly developed but may include *Solidago odora var. odora* (anisescented goldenrod) and *Tragia urens* (wavyleaf noseburn).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus elliottii* (slash pine)
Tree canopy	Needle-leaved tree	*Pinus palustris* (longleaf pine), *Pinus taeda* (loblolly pine)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Tree subcanopy	Broad-leaved evergreen tree	*Quercus hemisphaerica* (Darlington oak), *Quercus virginiana* (live oak)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle), *Quercus myrtifolia* (myrtle oak)
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium stamineum* (deerberry)
Herb (field)	Vine/Liana	*Vitis rotundifolia* (muscadine)
Herb (field)	Forb	*Cnidoscolus stimulosus* (finger rot), *Stillingia sylvatica* (queen's-delight)
Herb (field)	Graminoid	*Chasmanthium laxum* (slender woodoats), *Scleria triglomerata* (whip nutrush)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Morella cerifera* (wax-myrtle), *Pinus elliottii* (slash pine), *Pinus palustris* (longleaf pine)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Aristida lanosa (woollysheath threeawn)	G5	state-vulnerable
Quercus myrtifolia (myrtle oak)	G5	state-vulnerable
Tridens carolinianus (Carolina fluffgrass)	G3G4	state-critically imperiled

Conservation Status Rank

Global Rank & Reasons: G2G3 (25-Jun-1997). This upland barrier island slash pine woodland association is found in a restricted range and specific set of habitat conditions. This association is restricted to the East Gulf Coastal Plain (and adjacent South Atlantic region) and is only found on barrier islands and near-coastal mainland areas. The canopy may contain some longleaf pine; the canopy structure of natural stands would be more open, but now usually manifests a more closed structure. This vegetation depends on frequent, low-intensity, growing-season fires to control understory vegetation and for the reproduction of the canopy pines. This native fire-dependent, pine-dominated woodland is susceptible to the effects of fire suppression, over-grazing, or conversion to commercial forest plantations or agriculture. Remaining examples are highly threatened by development, conversion, and alteration of fire regimes. Nearly all remaining examples have been altered or fragmented by coastal and near-coastal development, as well as by resultant fire exclusion.

Classification

Status: Standard
Classification Confidence: 1 - Strong
Global Comments: This association is described from the eastern end of Dauphin Island, Mobile County, Alabama, where it occurs on the Audubon preserve. There is a report from the Louisiana Gulf Coast Prairies and Marshes (TNC Ecoregion 31) of a community dominated by *Pinus elliottii* with *Quercus stellata* and *Quercus virginiana* (L. Smith pers. comm.).

Global Similar Associations:
Pinus elliottii var. elliottii / Serenoa repens - Ilex glabra - Morella cerifera - Ilex vomitoria Woodland (CEGL004680)--- is found along the western peninsula of Florida and along the Gulf Coast of Alabama.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association occurs in a large stand at the northwestern side of Cumberland Island, where old-growth *Pinus palustris* forms the sole canopy dominant. *Pinus elliottii var. elliottii* is the canopy dominant on sandy flats behind old dunes on the northern side of the island, in the area of Duck House Trail.

Global Range: This association is restricted to the East Gulf Coastal Plain and adjacent South Atlantic region.

Nations: US
States/Provinces: AL, FL, GA, LA, MS, SC
TNC Ecoregions: 53:C, 55:C, 56:C
USFS Ecoregions: 232Ce:CCC, 232Dc:CCC, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island, Timucuan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.049, CUIS.069, CUIS.168.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: C.W. Nordman, mod. H. Summer and L. Kruse
References: Peet et al. unpubl. data 2002, Schotz pers. comm., Smith pers. comm., Southeastern Ecology Working Group n.d.

Saturated temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.f.)

Pinus palustris - Pinus (elliottii, serotina) Saturated Woodland Alliance (A.578)

Alliance Concept

Summary: This alliance consists of wet pinelands (often termed pine flatwoods, wet pine flatwoods, and pine savannas) of the Outer Coastal Plain or "coastal flatlands" typically dominated by *Pinus palustris* (longleaf pine), with or without the presence of the other nominals. *Pinus elliottii var. elliottii* (Honduras pine) and *Pinus serotina* (pond pine) are more restricted geographically and edaphically than is *Pinus palustris* (longleaf pine). *Pinus serotina* (pond pine) may be present within its natural range (from southeastern Virginia south to panhandle Florida) but tends to be codominant only on the wettest, often organic soils. *Pinus elliottii var. elliottii* (Honduras pine) may be present or codominant within its natural range from South Carolina to eastern Louisiana, as well as in limited areas of the West Gulf Coastal Plain (which are outside the natural range of *Pinus elliottii var. elliottii* (Honduras pine). Both *Pinus elliottii* (slash pine) and *Pinus serotina* (pond pine) may replace *Pinus palustris* (longleaf pine) on wetter sites. Both species are less tolerant of frequent fire than is *Pinus palustris* (longleaf pine). While *Pinus elliottii* (slash pine) can survive reasonably frequent fire, it has been estimated that natural fire frequencies are less than half that of longleaf pine, while typical regimes for *Pinus serotina* (pond pine) may be less than one-third as frequent. Thus, it is often believed that these species were confined historically to wetter flatwoods sites with lower burn frequencies than those typical of *Pinus palustris* (longleaf pine)-dominated communities. With fire suppression, alteration of fire regimes, and widespread logging of *Pinus palustris* (longleaf pine), *Pinus elliottii* (slash pine) has invaded many flatwoods sites historically dominated almost exclusively by *Pinus palustris* (longleaf pine). To a lesser extent this phenomenon may also have occurred with *Pinus serotina* (pond pine). As presently defined, this alliance includes both naturally mixed *Pinus palustris - Pinus elliottii* stands, as well as those originally dominated by *Pinus palustris* (longleaf pine) into which *Pinus elliottii* (slash pine) has invaded, as well as silviculturally managed stands outside of the natural range of *Pinus elliottii var. elliottii* (Honduras pine) in Louisiana and Texas. Across the range of this alliance, pine densities vary from low with widely spaced trees giving an open savanna-like aspect, to high with dense, nearly closed canopies. Nevertheless, even the densest stands have discontinuous canopies which allow considerable light to penetrate to the forest floor. Probably the most significant factor affecting community composition is fire. In fire-suppressed examples, an understory of *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Morella cerifera* (wax-myrtle) is likely to develop. Understory composition is variable, and includes both shrub- and shrub/graminoid-dominated systems. Heavily shrubby examples may be indicative of lower fire frequencies than are more herbaceous-dominated examples. Appreciable herb layers typically exist only where the canopy and shrub layers are relatively open, and where there has been relatively frequent fire history. Grasses usually make up the majority of total cover. This alliance also includes silviculturally managed stands from the West Gulf Coastal Plain of Louisiana and Texas.

Classification Comments: More information needs to be integrated on the expression of vegetation of this alliance in Texas (e.g., in the Big Thicket); existing associations as of November 2000 may not be entirely adequate, although one is positively attributed to Texas (MP 2000-12-04). REE 2000-

12-01: "the so called wet savannas or flatwoods which may or may not have pitcher plants present are crudely covered by associations. These are the ones which basically come from LA and haven't been worked up enough to specifically incorporate examples in TX . The types from the WGCP were all defined by Latimore Smith from LA examples; their occurrence and distribution are poorly understood west of the Sabine River." There are some stands at Fort Benning, Georgia, which contain *Pinus serotina* with *Pinus palustris* over either *Arundinaria gigantea* or a mix of other evergreen shrubs. This is near the northern limit of the distribution of *Pinus serotina*, and these stands have been placed either as *Arundinaria gigantea* Saturated Shrubland Alliance (A.801) or *Lyonia lucida - Ilex glabra* Saturated Wooded Shrubland Alliance (A.805) with scattered, stunted *Pinus serotina*.

Similar Alliances:

- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris - (Pinus elliottii)* Forest Alliance (A.123)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

Similar Alliance Comments: Defining the differences between this alliance and the II.A.4.N.f *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574) will require additional work. Silviculturally managed *Pinus palustris - Pinus elliottii* forests, including those outside of the natural range of *Pinus elliottii*, are treated in the I.A.8.N.b *Pinus palustris - (Pinus elliottii)* Forest Alliance (A.123).

Related Concepts:

- IIB1b. Wet Longleaf Pine Flatwoods (Allard 1990) ?
- IIB1c. Wet Longleaf Pine - Slash Pine Flatwoods (Allard 1990) ?
- IIB1d. Atlantic Coastal Plain Wet Longleaf Pine Savanna (Allard 1990) ?
- IIB1g. Atlantic Coastal Plain Wet-Mesic Longleaf Pine Savanna (Allard 1990) ?
- IIB1h. East Gulf Coastal Plain Wet Longleaf Pine Savanna (Allard 1990) I
- IIB1i. West Gulf Coastal Plain Wet Longleaf Pine Savanna (Allard 1990) I
- Longleaf Pine - Slash Pine: 83 (Eyre 1980) ?
- Longleaf Pine / *Schizachyrium - Drosera* Fine-Sandy Wet Flatwoods (Turner et al. 1999) I
- Longleaf Pine-Beakrush Series (Diamond 1993) I
- Longleaf Pine: 70 (Eyre 1980) I
- Mesic Flatwoods (FNAI 1992a) I
- Piedmont Longleaf Pine Forest, Wet Variant (Schafale 1994) ?
- Pine Savanna (Schafale and Weakley 1990) I
- Pine Savanna, Lumbee Variant (Schafale 1994) ?
- Pine Savanna, Very Wet Clay Variant (Schafale 1994) ?
- Pine Savanna, Wet Spodosol Variant (Schafale 1994) ?

- Pine Savanna, Wet Ultisol Variant (Schafale 1994) ?
- Pond Pine: 98 (Eyre 1980) I
- Western Wet/Mesic Longleaf Pine Savannah/Flatwoods (Smith 1996a) I
- Western Wet/Mesic Longleaf Pine Savannah/Flatwoods, saline variant (Smith 1996a) ?
- Wet Pine Flatwoods (Schafale and Weakley 1990) I
- Wet Pine Flatwoods, Leiophyllum Variant (Schafale 1994) ?
- Wet Pine Flatwoods, Wet Spodosol Variant (Schafale 1994) ?
- Wet Slash Pine Savannah (Wieland 1994b) ?

Alliance Description

Environment: Stands of this alliance consist of wet pinelands (often termed "pine flatwoods," "wet pine flatwoods," and "pine savannas") of the Outer Coastal Plain or "coastal flatlands." Many soils contain a spodic horizon occasionally underlain by a clay hardpan, which additionally restricts drainage. Soils include Alfisols, Spodosols, and Ultisols. Sites vary in the presence or absence of a hardpan, in soil pH (range from 3.1-7.8), and in drainage. *Pinus serotina* may be present within its natural range (from southeastern Virginia south to panhandle Florida) but tends to be codominant only on the wettest, often organic soils.

Vegetation: This alliance consists of wet pinelands typically dominated by *Pinus palustris* (longleaf pine), with a geographically and edaphically determined admixture of *Pinus elliottii var. elliottii* (Honduras pine) and *Pinus serotina* (pond pine) with or without another pine. *Pinus serotina* (pond pine) may be present or codominant from southeastern Virginia south to panhandle Florida. *Pinus elliottii var. elliottii* (Honduras pine) may be present or codominant from South Carolina south to Florida, and west to eastern Louisiana. *Pinus elliottii* (slash pine) is less tolerant of fire than *Pinus palustris* (longleaf pine) and may originally have been confined to wet flatwoods sites with lower burn frequencies than those typical of *Pinus palustris* (longleaf pine)-dominated communities. With fire suppression and widespread logging of *Pinus palustris* (longleaf pine), *Pinus elliottii* (slash pine) has probably invaded flatwoods sites historically dominated by *Pinus palustris* (longleaf pine). In addition, in parts of the range, *Pinus taeda* (loblolly pine) may also be present, and may represent a substantial component of the stand. This species is presumed to be a natural component of this vegetation type (Glitzenstein and Streng 2004). As presently defined, this alliance includes both naturally mixed *Pinus palustris - Pinus elliottii* stands, as well as those originally dominated by *Pinus palustris* (longleaf pine) into which *Pinus elliottii* (slash pine) has invaded. Pine densities vary from low with widely spaced trees giving an open savanna-like aspect, to high with dense, nearly closed canopies. Nevertheless, even the densest stands have discontinuous canopies which allow considerable light to penetrate to the forest floor. Probably the most significant factor affecting community composition is fire. In areas protected from fire, an understory of *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Morella cerifera* (wax-myrtle) is likely to develop. Understory composition is variable, and includes both shrub- and shrub/graminoid-dominated systems. Typical shrubs may include *Gaylussacia* (huckleberry) spp., *Ilex coriacea* (large gallberry), *Ilex glabra* (inkberry), *Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Osmanthus americanus var. americanus* (devilwood), *Serenoa repens* (saw palmetto), *Symplocos tinctoria*

(common sweetleaf), and *Vaccinium* (blueberry) spp. Appreciable herb layers typically exist only where the canopy and shrub layers are relatively open. Grasses usually make up the majority of total cover. Graminoids typical in various associations of this alliance include *Aristida beyrichiana* (Beyrich threeawn), *Aristida palustris* (longleaf threeawn), *Aristida stricta* (pineland threeawn), *Ctenium aromaticum* (toothache grass), *Muhlenbergia expansa* (cutover muhly), *Sporobolus curtissii* (Curtiss' dropseed), *Sporobolus floridanus* (Florida dropseed), *Sporobolus pinetorum*, *Sporobolus silveanus* (Silveus' dropseed), *Sporobolus teretifolius* (wireleaf dropseed), *Andropogon capillipes* (chalky bluestem), *Andropogon glaucopsis* (purple bluestem), *Andropogon glomeratus* (bushy bluestem), *Rhynchospora* (beaksedge) spp., *Dichanthelium* (rosette grass) spp., *Fimbristylis puberula* (hairy fimbry), *Gymnopogon chapmanianus* (Chapman's skeletongrass), *Panicum* (panicgrass) spp., *Schizachyrium* (little bluestem) spp., *Scleria* (nutrush) spp., and *Sorghastrum* (indiangrass) spp. Forbs typical of this alliance include *Carphephorus odoratissimus* (vanillaleaf), *Chaptalia tomentosa* (woolly sunbonnets), *Eupatorium* (thoroughwort) spp., *Helianthus* (sunflower) spp., *Lachnanthes caroliana* (Carolina redroot), *Lachnocaulon* (bogbutton) spp., *Liatris* (blazing star) spp., *Lobelia* (lobelia) spp., *Pinguicula* (butterwort) spp., *Pityopsis* (silkgrass) spp., *Polygala* (milkwort) spp., *Sabatia* (rose gentian) spp., and *Solidago* (goldenrod) spp.

Dynamics: Both *Pinus elliottii* and *Pinus serotina* are less tolerant of frequent fire than is *Pinus palustris*. While *Pinus elliottii* can survive reasonably frequent fire, it has been estimated that natural fire frequencies are less than half that of longleaf pine, while typical regimes for *Pinus serotina* may be less than one-third as frequent (Landers 1989). Thus, it is often believed that these species were confined historically to wetter flatwoods sites with lower burn frequencies than those typical of *Pinus palustris*-dominated communities. With fire suppression, alteration of fire regimes, and widespread logging of *Pinus palustris, Pinus elliottii* has invaded many flatwoods sites historically dominated almost exclusively by *Pinus palustris*. To a lesser extent this phenomenon may also have occurred with *Pinus serotina*. Across the range of this alliance, pine densities vary from low with widely spaced trees giving an open savanna-like aspect, to high with dense, nearly closed canopies. Nevertheless, even the densest stands have discontinuous canopies which allow considerable light to penetrate to the forest floor. Probably the most significant factor affecting community composition is fire.

Alliance Distribution

Range: This alliance is found in the southeastern U.S. from Virginia to Florida and west to Texas.
Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, TX, VA
TNC Ecoregions: 41:C, 43:?, 52:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 231Ao:CCC, 231Bd:C??, 232Ba:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bp:CCP, 232Bq:CCC, 232Br:CCC, 232Bv:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Cd:CCC, 232Ce:CCC, 232Cf:CCC, 232Ch:CCC, 232Db:CCC, 232Dc:CCC, 232Dd:CCC, 232Ea:CPP, 232Fa:CCC, 232Fb:CCC, 232Fe:CCP, 232Ga:CCC, 232Gb:CCC, 232Gc:CCC, 232Gd:CCP

Federal Lands: DOD (Avon Park, Camp Lejeune, Eglin, Fort Benning, Fort Bragg, Fort Jackson, Fort Stewart); NPS (Big Thicket, Canaveral, Cumberland Island, Timucuan?); USFS (Angelina, Apalachicola, Conecuh?, Croatan, De Soto, Francis Marion, Kisatchie, Ocala, Osceola, Uwharrie); USFWS (Carolina Sandhills, Grand Bay, Mississippi Sandhill Crane, Pee Dee)

(CEGL004791) Wet Longleaf Pine - Pond Pine Flatwoods

Pinus palustris - Pinus serotina / Ilex glabra - Lyonia lucida - (Serenoa repens) Woodland
Longleaf Pine - Pond Pine / Inkberry - Shining Fetterbush - (Saw Palmetto) Woodland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Saturated temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.f.)
Alliance	*Pinus palustris - Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
Alliance (English name)	Longleaf Pine - (Slash Pine, Pond Pine) Saturated Woodland Alliance
Association	*Pinus palustris - Pinus serotina / Ilex glabra - Lyonia lucida - (Serenoa repens)* Woodland
Association (English name)	Longleaf Pine - Pond Pine / Inkberry - Shining Fetterbush - (Saw Palmetto) Woodland
Association (Common name)	Wet Longleaf Pine - Pond Pine Flatwoods
Ecological System(s):	East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)
	Central Florida Pine Flatwoods (CES203.382)
	Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

Element Concept

Global Summary: This saturated longleaf pine - pond pine woodland community occurs in the South Atlantic Coastal Plain of Florida, Georgia, and South Carolina, and the East Gulf Coastal Plain in Florida. Stands are dominated by *Pinus palustris* (longleaf pine) and *Pinus serotina* (pond pine). In central Florida, *Pinus elliottii* (slash pine) can be codominant with *Pinus serotina* (pond pine). *Serenoa repens* (saw palmetto) is also important in central Florida and Georgia. The shrub layer is characterized by the presence or partial dominance of *Ilex glabra* (inkberry) and *Lyonia lucida* (fetterbush lyonia). Other characteristic species are *Morella cerifera* (wax-myrtle), *Morella caroliniensis* (southern bayberry), *Persea palustris* (swamp bay), *Magnolia virginiana* (sweetbay), *Ilex coriacea* (large gallberry), *Serenoa repens* (saw palmetto) (in southern portions), *Lyonia ferruginea* (rusty staggerbush), and *Gordonia lasianthus* (loblolly bay). This community occurs in organic soils on interstream flats.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This wet pond pine flatwoods association was sampled at five locations on Cumberland Island. The sites are mesic flats with somewhat poorly drained to well-drained sand and sandy loam soils. The unvegetated surface is dominated by leaf litter (90-99% cover) with some wood (1-10%) and bare soil (0-1%). Evidence of disturbance includes past logging and grazing, some swamp bay twig dieback, and extreme fire suppression (heavy fuel accumulation).

Global Environment: This saturated longleaf pine - pond pine woodland community occurs in organic soils on interstream flats.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The very sparse to moderate (10-50% cover) tree canopy, 10-20 m tall, is dominated by *Pinus serotina* (pond pine) and may include *Persea palustris* (swamp bay), *Pinus elliottii* (slash pine), or *Pinus taeda* (loblolly pine). The very sparse (5-20%) subcanopy (5-15 m) is made up of *Lyonia ferruginea* (rusty staggerbush), *Persea palustris* (swamp bay), *Pinus serotina* (pond pine), and/or *Quercus virginiana* (live oak). The sparse to moderate (20-60%) tall-shrub layer (2-5 m) is dominated by *Ilex glabra* (inkberry), *Lyonia ferruginea* (rusty staggerbush), *Lyonia lucida* (fetterbush lyonia), *Morella cerifera* (wax-myrtle), and *Persea palustris* (swamp bay). *Serenoa repens* (saw palmetto) dominates the moderate to dense (40-80%) short-shrub layer (1-2 m) along with most tall-shrub species, *Osmanthus americanus* (devilwood), and *Vaccinium* (blueberry) spp. The herbaceous layer is very sparse (5-10%) and made up shrub seedlings as well as small amounts of *Andropogon glaucopsis* (purple bluestem), *Andropogon virginicus* (broomsedge bluestem), *Dichanthelium* (rosette grass) spp., *Osmunda cinnamomea* (cinnamon fern), *Pteridium aquilinum* (western brackenfern), and *Woodwardia virginica* (Virginia chainfern). Vines include *Smilax auriculata* (earleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Vitis rotundifolia* (muscadine). Epiphytes include *Tillandsia usneoides* (Spanish moss). *Befaria racemosa* (tarflower) was seen on roadsides adjacent to this association.

Global Vegetation: Stands are dominated by *Pinus palustris* (longleaf pine) and *Pinus serotina* (pond pine). In central Florida, *Pinus elliottii* (slash pine) can be codominant with *Pinus serotina* (pond pine). *Serenoa repens* (saw palmetto) is also important in central Florida. The shrub layer is characterized by the presence or partial dominance of *Ilex glabra* (inkberry) and *Lyonia lucida* (fetterbush lyonia). Other characteristic species are *Morella cerifera* (wax-myrtle), *Morella caroliniensis* (southern bayberry), *Persea palustris* (swamp bay), *Magnolia virginiana* (sweetbay), *Ilex coriacea* (large gallberry), *Serenoa repens* (saw palmetto) (in southern portions), *Lyonia ferruginea* (rusty staggerbush), and *Gordonia lasianthus* (loblolly bay). *Smilax laurifolia* (laurel greenbrier) is a common vine. Two plots from central Florida (Ocala National Forest) were dominated by sparse *Pinus elliottii* (slash pine) with *Pinus serotina* (pond pine) on sites which may have had *Pinus palustris* (longleaf pine) in the past. The dominant shrubs were *Serenoa repens* (saw palmetto), *Ilex glabra* (inkberry), and *Lyonia lucida* (fetterbush lyonia). Other important shrubs were

Quercus pumila (running oak), *Quercus minima* (dwarf live oak), *Befaria racemosa* (tarflower), and *Vaccinium myrsinites* (shiny blueberry). Additional shrubs were *Lyonia fruticosa* (coastalplain staggerbush), *Gaylussacia dumosa* (dwarf huckleberry), *Morella cerifera* (wax-myrtle), *Hypericum brachyphyllum* (coastalplain St. Johnswort), *Kalmia hirsuta* (hairy laurel), *Asimina pygmea* (dwarf pawpaw), and *Persea palustris* (swamp bay). The herbaceous component was generally patchy to sparse and included *Aristida beyrichiana* (Beyrich threeawn), *Aristida spiciformis* (bottlebrush threeawn), *Pityopsis graminifolia* (narrowleaf silkgrass), *Pterocaulon pycnostachyum* (wand blackroot), *Sabatia brevifolia* (shortleaf rose gentian), *Galactia elliottii* (Elliott's milkpea), *Lachnocaulon anceps* (whitehead bogbutton), *Xyris caroliniana* (Carolina yelloweyed grass), *Polygala nana* (candyroot), *Bulbostylis ciliatifolia* (capillary hairsedge), *Andropogon* (bluestem) spp., and *Scleria* (nutrush) sp. The wiregrass in stands of this association would be *Aristida beyrichiana* (Beyrich threeawn) (*sensu* Peet 1993), not *Aristida stricta* (pineland threeawn).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Persea palustris* (swamp bay)
Tree canopy	Needle-leaved tree	*Pinus elliottii* (slash pine), *Pinus serotina* (pond pine)
Tree subcanopy	Broad-leaved evergreen tree	*Lyonia ferruginea* (rusty staggerbush)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Ilex glabra* (inkberry), *Lyonia ferruginea* (rusty staggerbush), *Lyonia lucida* (fetterbush lyonia), *Morella cerifera* (wax-myrtle)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Persea palustris* (swamp bay)
Short shrub/sapling	Broad-leaved evergreen shrub	*Serenoa repens* (saw palmetto)
Herb (field)	Graminoid	*Andropogon glaucopsis* (purple bluestem)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Ilex glabra* (inkberry), *Lyonia lucida* (fetterbush lyonia), *Pinus serotina* (pond pine), *Serenoa repens* (saw palmetto)

Conservation Status Rank

Global Rank & Reasons: G3G4 (23-Oct-2002). This saturated longleaf pine - pond pine woodland association is restricted both in range and in the substrate on which it occurs. It is limited to organic soils on interstream flats in the in the Atlantic and East Gulf coastal plains from South Carolina to Florida. It is part of the endangered Longleaf Pine Ecosystem, which once dominated the Coastal Plain landscape of the southeastern United States, and depends on frequent to infrequent, variable-intensity, growing-season fires to control understory vegetation and for the reproduction of *Pinus palustris* and *Pinus serotina*. Saturated pine woodlands are susceptible to the effects of fire

suppression, over-grazing, hydrologic alteration, or conversion to commercial forest plantations or agriculture. Remaining examples are highly threatened by development, conversion, and alteration of fire regimes. Most of those occurrences which have not been destroyed are severely degraded. The codominance of *Pinus elliottii* may be a result of logging of *Pinus palustris* and altered fire regimes.

Classification

Status: Standard
Classification Confidence: 1 - Strong

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: On Cumberland Island, this association dominates the wetter pine flatwoods areas on the northern end of the island, south of North Cut Road and east of Bunkley Trail, and also on Table Point. It is interspersed with *Spartina bakeri* marsh openings.

Global Range: This association ranges from South Carolina to Florida in the Atlantic and East Gulf coastal plains.

Nations: US
States/Provinces: FL, GA, SC
TNC Ecoregions: 53:C, 55:C, 56:C
USFS Ecoregions: 232Bf:CCC, 232Ca:CCC, 232Cb:CCC, 232Ce:CCC, 232Dc:CCC, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island); USFS (Apalachicola, Ocala, Osceola)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.076, CUIS.077, CUIS.078, CUIS.079, CUIS.175.
Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: C.W. Nordman, mod. M. Pyne
References: FNAI 1992a, FNAI 1992b, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet 1993, Southeastern Ecology Working Group n.d.

(CEGL004272) Southern Atlantic Coastal Plain Carolina Willow Dune Swale
Salix caroliniana / Hibiscus grandiflorus / Polygonum punctatum Woodland
Carolina Willow / Swamp Rosemallow / Dotted Smartweed Woodland

NVC Classification

Classification Level	Observed Classification
Class	Forest to Open Woodland (1)
Subclass	Temperate & Boreal Forest (1.B.)
Formation	Temperate Flooded & Swamp Forest (II.A.2.)
Division	Natural/Semi-natural temperate broad-leaved evergreen woodland (II.A.2.N.)
Macrogroup	Temperate broad-leaved evergreen woodland (II.A.2.N.a.)

NVC Classification (continued)

Classification Level	Observed Classification
Group	*Quercus virginiana - Juniperus virginiana - (Sabal palmetto)* Woodland Alliance (A.479)
Alliance	Alliances are under review
Association	*Salix caroliniana / Hibiscus grandiflorus / Polygonum punctatum* Woodland
Association (English name)	Carolina Willow / Swamp Rosemallow / Dotted Smartweed Woodland
Association (Common name)	Southern Atlantic Coastal Plain Carolina Willow Dune Swale
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Summary

These seasonally flooded wetlands are found imbedded in live oak-dominated maritime forests in swales between coastal dunes in coastal Georgia and northern Florida. They are characterized by a short (5-10 m) *Salix caroliniana*-dominated overstory with *Hibiscus grandiflorus* in the shrub layer. *Morella cerifera* may also be found scattered in the shrub layer. The herbaceous cover depends on season and water levels in the stand. *Polygonum punctatum, Boehmeria cylindrica*, and *Teucrium canadense* are dominant herbs; *Ptilimnium capillaceum, Saururus cernuus, Hydrocotyle bonariensis*, and others may also be present in the herb layer. *Ampelopsis arborea* and *Mikania scandens* are common vines. *Quercus virginiana* and *Sabal palmetto* may be overhanging but are not typically rooted in the community.

Conservation Status

Global Status: G3G4 (11Sep2008)
Rounded Global Status: G3 - Vulnerable
Reasons: This community is apparently limited in its range and extent, but additional information is needed to solidify its taxonomy and circumscription. This additional information may change its conservation status. It is threatened by coastal development and land-use change. These are small-scale stands that are not necessarily protected by any wetland legislation.

Distribution

United States Distribution: FL, GA
Global Distribution: United States
Global Range: These seasonally flooded wetlands are found in coastal Georgia and northern Florida

Vegetation

Vegetation Summary: Stands of this seasonally flooded wetland are characterized by a short overstory dominated by *Salix caroliniana* with a shrub layer containing *Hibiscus grandiflorus* and *Morella cerifera*. The content of the herbaceous cover depends on season and water levels in the stand. *Polygonum punctatum, Boehmeria cylindrica, Teucrium canadense, Ptilimnium capillaceum, Saururus cernuus, Hydrocotyle bonariensis*, and others may be present in the herb layer. *Ampelopsis arborea* and *Mikania scandens* are common vines. *Quercus virginiana* and *Sabal palmetto* may be overhanging but are not typically rooted in the community.

Authors/Contributors

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Element Description Edition Date: 11Sep2008
Element Description Author(s): M. Pyne
NatureServe Conservation Status Factors Edition Date: 11Sep2008
NatureServe Conservation Status Factors Author(s): M. Pyne

References

Southeastern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Durham, NC.

Shrubland (III.)

Hemi-sclerophyllous temperate broad-leaved evergreen shrubland

Serenoa repens Temperate Shrubland Alliance (A.750)

Alliance Concept

Summary: Shrublands dominated or codominated by *Serenoa repens* (saw palmetto). This alliance includes coastal strand communities of the east coast of Florida and possibly adjacent Georgia. There is considerable floristic variation from north to south, with the more northern examples being codominated by *Serenoa repens* (saw palmetto) and *Ilex vomitoria* (yaupon) and lacking more southern (subtropical) floristic elements. These relatively northern examples contain *Sideroxylon tenax* (tough bully), *Persea borbonia* (redbay), *Sabal palmetto* (cabbage palmetto) (dwarfed), *Zanthoxylum clava-herculis* (Hercules' club), *Smilax auriculata* (earleaf greenbrier), *Monarda punctata* (spotted beebalm), *Erythrina herbacea* (redcardinal), and *Juniperus virginiana var. silicicola* (southern redcedar). The more southern examples contain a great variety of shrubs, including *Serenoa repens* (saw palmetto), *Coccoloba uvifera* (seagrape), *Sideroxylon tenax* (tough bully), *Persea borbonia* (redbay), and *Myrsine floridana* (Guianese colicwood), as well as *Quercus virginiana* (live oak) and *Myrcianthes fragrans* (twinberry), but few truly tropical components. Other characteristic species in the southern examples include *Quercus virginiana* (live oak) (dwarfed), *Myrcianthes fragrans* (twinberry), *Forestiera segregata* (Florida swamp-privet), *Sabal palmetto* (cabbage palmetto) (dwarfed), *Morella cerifera* (wax-myrtle), *Schinus terebinthifolius* (Brazilian peppertree) (exotic), and *Zanthoxylum clava-herculis* (Hercules' club).

Similar Alliances:

- *Coccoloba uvifera* Shrubland Alliance (A.715)

Similar Alliance Comments: This alliance (A.750) lacks the more tropical components of *Serenoa repens*-dominated vegetation in the *Coccoloba uvifera* Shrubland Alliance (A.715).

Related Concepts:

- Cabbage Palmetto: 74 (Eyre 1980) I
- Coastal Strand (FNAI 1990) I

Alliance Description

Vegetation: Shrublands dominated or codominated by *Serenoa repens* (saw palmetto). There is considerable floristic variation from north to south, with the more northern examples being codominated by *Serenoa repens* (saw palmetto) and *Ilex vomitoria* (yaupon) and lacking more southern (subtropical) floristic elements. These relatively northern examples contain *Sideroxylon tenax* (tough bully), *Persea borbonia* (redbay), *Sabal palmetto* (cabbage palmetto) (dwarfed), *Zanthoxylum clava-herculis* (Hercules' club), *Smilax auriculata* (earleaf greenbrier), *Monarda punctata* (spotted beebalm), *Erythrina herbacea* (redcardinal), and *Juniperus virginiana var. silicicola* (southern redcedar). The more southern examples contain a great variety of shrubs, including *Serenoa repens* (saw palmetto), *Coccoloba uvifera* (seagrape), *Sideroxylon tenax* (tough bully), *Persea borbonia* (redbay), and *Myrsine floridana* (Guianese colicwood), as well as *Quercus virginiana* (live oak) and *Myrcianthes fragrans* (twinberry), but few truly tropical components. Other

characteristic species in the southern examples include *Quercus virginiana* (live oak) (dwarfed), *Myrcianthes fragrans* (twinberry), *Forestiera segregata* (Florida swamp-privet), *Sabal palmetto* (cabbage palmetto) (dwarfed), *Morella cerifera* (wax-myrtle), *Schinus terebinthifolius* (Brazilian peppertree) (exotic), and *Zanthoxylum clava-herculis* (Hercules' club).

Alliance Distribution

Range: This alliance includes coastal strand communities of the east coast of Florida and adjacent Georgia.

Nations: US
SubNations: FL, GA
TNC Ecoregions: 54:P, 55:C, 56:C, 57:P
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC
Federal Lands: DOD (Cape Canaveral); NPS (Canaveral, Cumberland Island, Fort Matanzas, Timucuan?); USFWS (Merritt Island)

(CEGL003812) Florida Coastal Strand (Temperate Palmetto Type)

Serenoa repens - Sabal palmetto - Ilex vomitoria - Sideroxylon tenax Shrubland
Saw Palmetto - Cabbage Palmetto - Yaupon - Tough Bully Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Hemi-sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.b.)
Alliance	*Serenoa repens* Temperate Shrubland Alliance (A.750)
Alliance (English name)	Saw Palmetto Temperate Shrubland Alliance
Association	*Serenoa repens - Sabal palmetto - Ilex vomitoria - Sideroxylon tenax* Shrubland
Association (English name)	Saw Palmetto - Cabbage Palmetto - Yaupon - Tough Bully Shrubland
Association (Common name)	Florida Coastal Strand (Temperate Palmetto Type)
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Element Concept

Global Summary: This association represents a "coastal strand" community dominated by *Serenoa repens* (saw palmetto) and *Ilex vomitoria* (yaupon). This type ranges from Volusia County, Florida, to southern Georgia. Other characteristic species include *Sabal palmetto* (cabbage palmetto) and *Sideroxylon tenax* (tough bully). It differs from coastal strand vegetation to the south in its characteristic codominance of *Ilex vomitoria* (yaupon) and the rarity or absence of more southern (subtropical) floristic elements such as *Coccoloba uvifera* (seagrape), *Myrsine floridana* (Guianese

colicwood), *Forestiera segregata* (Florida swamp-privet), and *Myrcianthes fragrans* (twinberry). The presence of *Sideroxylon tenax* (tough bully) and *Serenoa repens* (saw palmetto) and the absence of vines differentiate it from the dune "shrub/vine" thickets on barrier islands of North and South Carolina, i.e., *Smilax auriculata - Toxicodendron radicans* Vine-Shrubland (CEGL003885).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This palmetto coastal strand shrubland was sampled once on Cumberland Island on a dry, gently sloping interdunal flat with rapidly drained loose and shifting sand soil. The unvegetated surface is made up of leaf litter (60% cover) and bare sand (40%). Evidence of disturbance includes the natural dynamics of wind shifting sand.

Global Environment: This community occurs as a continuous strip behind the sea-oats dunes from St. Johns to southern Volusia counties, Florida. From St. Johns County, Florida, north to Cumberland Island, Georgia, this association may occur as isolated stands, either in an herbaceous matrix behind the foredunes or fronting maritime hammocks.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The sparse (30% cover) tall-shrub layer (2-5 m) and very sparse (10%) short-shrub layer (1-2 m) are comprised of *Morella cerifera* (wax-myrtle), *Persea borbonia* (redbay), *Quercus virginiana* (live oak), and *Sideroxylon tenax* (tough bully) (state-vulnerable). In addition, *Sideroxylon tenax* (tough bully) forms a very sparse (10%) emergent tree layer (5-10 m). *Zanthoxylum clava-herculis* (Hercules' club) is occasionally seen with sparse cover. The sparse (30%) herbaceous layer is dominated by *Andropogon virginicus* (broomsedge bluestem) and *Eremochloa ophiuroides* (centipede grass) (exotic) and includes *Cirsium horridulum* (yellow thistle), *Dichanthelium aciculare* (needleleaf rosette grass), *Dichanthelium sabulorum var. thinium* (hemlock rosette grass), *Diodia teres* (poorjoe), *Eragrostis elliottii*, *Eupatorium capillifolium* (dogfennel), *Heterotheca subaxillaris* (camphorweed), *Hypericum gentianoides* (orangegrass), *Oenothera humifusa* (seabeach evening-primrose), *Tradescantia ohiensis* (bluejacket), and many others. Vines (5%) of *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), and *Vitis rotundifolia* (muscadine) cover parts of the ground and climb into the shrub layers. *Smilax auriculata* (earleaf greenbrier) particularly often forms thick mats over the shrubs.

Global Vegetation: The most abundant species in this strand community are *Serenoa repens* (saw palmetto) and *Ilex vomitoria* (yaupon), followed by occasional dwarfed individuals of *Sabal palmetto* (cabbage palmetto) and *Sideroxylon tenax* (tough bully) (Johnson and Muller 1993a). Other species include *Persea borbonia* (redbay), *Magnolia grandiflora* (southern magnolia) (dwarfed), *Zanthoxylum clava-herculis* (Hercules' club), *Quercus virginiana* (live oak), *Smilax auriculata* (earleaf greenbrier), *Monarda punctata* (spotted beebalm), *Erythrina herbacea* (redcardinal), and, less frequently, *Juniperus virginiana var. silicicola* (southern redcedar). The presence of *Sideroxylon tenax* (tough bully) and *Serenoa repens* (saw palmetto) and the absence of vines differentiate it from the dune "shrub/vine" thickets on barrier islands of North and South Carolina (Sandifer et al. 1980 [p.

119]). This strand type is distinguished from more southerly ranging types by the frequent presence of *Ilex vomitoria* (yaupon) (Johnson and Muller 1993a).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree canopy	Broad-leaved evergreen tree	*Sideroxylon tenax* (tough bully)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle), *Persea borbonia* (redbay), *Quercus virginiana* (live oak), *Sideroxylon tenax* (tough bully)
Herb (field)	Vine/Liana	*Smilax auriculata* (earleaf greenbrier)
Herb (field)	Graminoid	*Andropogon virginicus* (broomsedge bluestem), *Eremochloa ophiuroides* (centipede grass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Sideroxylon tenax* (tough bully)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Chenopodium ambrosioides (Mexican tea)	–	exotic
Eremochloa ophiuroides (centipede grass)	–	exotic

Other Plant Species	GRank	Note
Sideroxylon tenax (tough bully)	G3?	state-vulnerable

Global

Other Plant Species	GRank	Note
Sideroxylon tenax (tough bully)	G3?	–

Conservation Status Rank

Global Rank & Reasons: G1 (29-Dec-1999). Area of a naturally restricted community further diminished by coastal development.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: *Sabal palmetto* and *Sideroxylon tenax* are not community dominants, but are encountered less frequently in this association (Johnson and Muller 1993a). Kurz (1942) was probably the first to describe the range of saw palmetto scrub in Florida. He mapped many coastal profiles in Florida, including zones analogous to this association. Austin and Coleman-Marios (1977) may have been the first to use the term strand. See Johnson and Muller (1993a, 1993b).

Global Similar Associations:

- *Serenoa repens - Sabal palmetto - Coccoloba uvifera - Sideroxylon tenax - Myrcianthes fragrans - Myrsine floridana* Shrubland (CEGL003811)--has species with tropical affinities and lacks *Ilex vomitoria*.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is found in very dry sands on rolling topography behind the foredunes and interdune flats, along the entire north to south range of Cumberland Island.

Global Range: This community occurs in coastal dune environments as a continuous strip behind the sea-oats dunes from southern Volusia County, Florida, north to Cumberland Island, Georgia.

Nations: US
States/Provinces: FL, GA
TNC Ecoregions: 55:C, 56:C
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island, Fort Matanzas, Timucuan?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.106.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: R.E. Evans, mod. M. Pyne
References: Austin and Coleman-Marois 1977, FNAI 1990, FNAI 1992b, Johnson and Muller 1993a, Johnson and Muller 1993b, Kurz 1942, Peet et al. unpubl. data 2002, Sandifer et al. 1980, Southeastern Ecology Working Group n.d.

Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)

Quercus geminata - Quercus myrtifolia - Quercus chapmanii Shrubland Alliance (A.779)

Alliance Concept

Summary: Summary: This alliance encompasses much of the oak-dominated scrub communities of coarse, dry sands of Florida and is only rarely found in adjacent states. On the Gulf Coast, this alliance is especially represented where coastal terraces reach the Gulf of Mexico, with no barrier island. It includes both coastal and interior oak scrub vegetation, with scrub oaks over and among other smaller shrubs. Associations affiliated with this alliance are found in three different areas: inland on the Florida peninsula; along the Atlantic Coast of Florida; and along the Gulf Coast of Panhandle Florida and a small portion of Georgia and possibly Alabama. This includes examples which are generally referred to as "coastal scrub" as well as those called "Florida scrub." This alliance occurs on various kinds of deep sands: recent coastal or near-coastal dunes, or inland sand ridges and ancient dune systems. The Florida Central Ridge is composed of a variety of eolian, alluvial, and marine deposits of Miocene to early Pleistocene age. These soils are excessively well-drained Quartzipsamments which lack silt, clay, or organic matter and are very low in nutrients. While often associated with deep white sands ("sugar sands"), not all examples of scrub occur on these particular sands. It is inferred that whiter sands are associated with more ancient scrub vegetation. Early-successional scrub vegetation occurs on younger, more exposed dune ridges; more protected examples may eventually develop a characteristic open pine overstory. The exposed occurrences tend to have much larger areas of open sand than do their more protected counterparts. Communities in this alliance generally have several scrub oak species, primarily *Quercus geminata* (sand live oak), *Quercus myrtifolia* (myrtle oak), *Quercus chapmanii* (Chapman oak), and *Quercus inopina* (sandhill oak) (in Lake Wales Ridge examples). Other sclerophyllous or microphyllous shrubs are often also present, such as *Ceratiola ericoides* (sand-heath), *Serenoa repens* (saw palmetto), *Sabal etonia* (scrub palmetto), *Lyonia ferruginea* (rusty staggerbush), and others. This phase of Florida scrub vegetation either lacks pines, or has them at very low densities. Scattered individuals of *Pinus clausa* (sand pine) or *Pinus elliottii* (slash pine) could be present. Some characteristic species in Gulf Coast examples include *Conradina canescens* (false rosemary), *Chrysoma pauciflosculosa* (woody goldenrod), *Lupinus westianus* (Gulf Coast lupine), *Chrysopsis gossypina ssp. cruiseana* (cottony goldenaster), and *Chrysopsis godfreyi* (Godfrey's goldenaster). The ground cover frequently includes fruticose lichens such as *Cladonia leporina* (cup lichen) and *Cladina evansii* (Evans' reindeer lichen). These may form 100% cover in some places.

Classification Comments: Remaining examples of this alliance are highly threatened by development and alteration of natural fire regimes.

Similar Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Pinus clausa* Woodland Alliance (A.511)--related communities with an open pine canopy.

Related Concepts:

- IB7b. Chapman Oak - Myrtle Oak Woodland (Allard 1990) ?

- IB8h. Gulf Coastal Scrub (Allard 1990) I
- Oak Scrub (Wolfe 1990) ?
- Scrub (FNAI 1992a) I
- Southern Scrub Oak: 72 (Eyre 1980) I

Alliance Description

Environment: This alliance encompasses much of the oak-dominated scrub communities of coarse, dry sands of Florida and is only rarely found in adjacent states. On the Gulf Coast, this alliance is especially represented where coastal terraces reach the Gulf of Mexico, with no barrier island. This alliance occurs on various kinds of deep sands; recent coastal or near-coastal dunes, or inland sand ridges and ancient dune systems. The Florida Central Ridge is composed of a variety of eolian, alluvial, and marine deposits of Miocene to early Pleistocene age. These soils are excessively well-drained Quartzipsamments which lack silt, clay, or organic matter and are very low in nutrients. While often associated with deep white sands ("sugar sands"), not all examples of scrub occur on these particular sands. It is inferred that whiter sands are associated with more ancient scrub vegetation. Early successional scrub vegetation occurs on younger, more exposed dune ridges; more protected examples may eventually develop a characteristic open pine overstory. The exposed occurrences tend to have much larger areas of open sand than do their more protected counterparts.

Vegetation: Communities in this alliance generally have several scrub oak species, primarily *Quercus geminata* (sand live oak), *Quercus myrtifolia* (myrtle oak), *Quercus chapmanii* (Chapman oak), and *Quercus inopina* (sandhill oak) (in Lake Wales Ridge examples). Other sclerophyllous or microphyllous shrubs are often also present, such as *Ceratiola ericoides* (sand-heath), *Serenoa repens* (saw palmetto), *Sabal etonia* (scrub palmetto), *Lyonia ferruginea* (rusty staggerbush), and others. This phase of Florida scrub vegetation either lacks pines, or has them at very low densities. Scattered individuals of *Pinus clausa* (sand pine) or *Pinus elliottii* (slash pine) could be present. Some characteristic species in Gulf Coast examples include *Conradina canescens* (false rosemary), *Chrysoma pauciflosculosa* (woody goldenrod), *Lupinus westianus* (Gulf Coast lupine), *Chrysopsis gossypina ssp. cruiseana* (cottony goldenaster), and *Chrysopsis godfreyi* (Godfrey's goldenaster). The groundcover frequently includes fruticose lichens such as *Cladonia leporina* (cup lichen) and *Cladina evansii* (Evans' reindeer lichen). These may form 100% cover in some places.

Alliance Distribution

Range: Associations affiliated with this alliance are found in three different areas: inland on the Florida peninsula; along the Atlantic Coast of Florida; and along the Gulf Coast of Panhandle Florida and a small portion of Georgia and Alabama. This includes examples which are generally referred to as "coastal scrub" as well as those called "Florida scrub."

Nations: US
SubNations: AL, FL, GA
TNC Ecoregions: 53:C, 54:P, 55:C, 56:C
USFS Ecoregions: 232Be:CCP, 232Bf:CCC, 232Bg:CCP, 232Br:CCC, 232Ca:CCP, 232Cb:CCP, 232Ce:CCC, 232Db:CCP, 232Dc:CCC, 232Ga:CCP, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral, Eglin); NPS (Canaveral, Cumberland Island, Fort Caroline, Timucuan); USFS (Apalachicola, Ocala); USFWS (Bon Secour, Lake Wales Ridge Ecosystem, Merritt Island, Okefenokee, St. Vincent)

(CEGL003821) Northeast Florida Coastal Scrub

Quercus geminata - Quercus myrtifolia - Serenoa repens - Persea borbonia Shrubland
Sand Live Oak - Myrtle Oak - Saw Palmetto - Redbay Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
Alliance	*Quercus geminata - Quercus myrtifolia - Quercus chapmanii* Shrubland Alliance (A.779)
Alliance (English name)	Sand Live Oak - Myrtle Oak - Chapman Oak Shrubland Alliance
Association	*Quercus geminata - Quercus myrtifolia - Serenoa repens - Persea borbonia* Shrubland
Association (English name)	Sand Live Oak - Myrtle Oak - Saw Palmetto - Redbay Shrubland
Association (Common name)	Northeast Florida Coastal Scrub
Ecological System(s):	Southern Atlantic Coastal Plain Maritime Forest (CES203.537)

Element Concept

Global Summary: This "coastal scrub" community occurs in northeastern Florida, from Duval County south to Cape Canaveral in northern Brevard County. This community occurs in a narrow strip near the coast on acidic sands. *Quercus geminata* (sand live oak), *Quercus myrtifolia* (myrtle oak), *Serenoa repens* (saw palmetto), and *Persea borbonia* (redbay) dominate. Other characteristic species include *Morella cerifera* (wax-myrtle), *Quercus chapmanii* (Chapman oak), *Osmanthus americanus* (devilwood), *Lyonia ferruginea* (rusty staggerbush), *Erythrina herbacea* (redcardinal), *Juniperus virginiana var. silicicola* (southern redcedar), and *Ilex vomitoria* (yaupon). Stands in northern Volusia County and on Cape Canaveral have dwarfed *Quercus virginiana* (live oak) present along with the usual scrub oaks. Salt spray blown off the Atlantic Ocean by the prevailing easterly winds probably prevents the formation of a *Pinus clausa* (sand pine) canopy characteristic of more inland scrubs.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This community occurs in a narrow strip near the coast on acidic sands.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: *Quercus geminata* (sand live oak), *Quercus myrtifolia* (myrtle oak), *Serenoa repens* (saw palmetto), and *Persea borbonia* (redbay) dominate. Other characteristic species include *Morella cerifera* (wax-myrtle), *Quercus chapmanii* (Chapman oak), *Osmanthus americanus* (devilwood), *Lyonia ferruginea* (rusty staggerbush), *Erythrina herbacea* (redcardinal), *Juniperus virginiana var. silicicola* (southern redcedar), and *Ilex vomitoria* (yaupon). Stands in northern Volusia County and on Cape Canaveral have dwarfed *Quercus virginiana* (live oak) present along with the usual scrub oaks.

Other Noteworthy Species

Global

Other Plant Species	GRank	Note
Osmanthus americanus var. *megacarpus* (devilwood)	G5T3	vulnerable

Conservation Status Rank

Global Rank & Reasons: G2 (30-Dec-1999). Community has a naturally limited range and area and is being rapidly developed due to its upland coastal location in Florida.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: See Johnson and Muller (1993a, 1993b).

Global Similar Associations:

- *Quercus geminata - Quercus myrtifolia - Serenoa repens - Sideroxylon tenax - Ximenia americana* Shrubland (CEGL003822)--is a similar coastal scrub community that occurs farther south and is codominated by tropical species such as *Ximenia americana*.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This community is naturally rare, occurring primarily as a narrow coastal strip in southern St. Johns, Flagler, and northern Volusia counties, Florida. It also occurs on ridges on Merritt Island (Schmalzer and Hinkle 1992a) and Cape Canaveral in northern Brevard County, and possibly on Cumberland Island, Georgia.

Nations: US
States/Provinces: FL, GA?
TNC Ecoregions: 55:C, 56:P
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC
Federal Lands: DOD (Cape Canaveral); NPS (Canaveral, Cumberland Island?, Timucuan?); USFWS (Merritt Island)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: A.S. Weakley
References: Johnson and Muller 1993a, Johnson and Muller 1993b, Johnson et al. 1992b, Schmalzer and Hinkle 1992a, Southeastern Ecology Working Group n.d.

Quercus virginiana - Ilex vomitoria - (Morella cerifera) Shrubland Alliance (A.785)

Alliance Concept

Summary: This alliance consists of upland maritime dune shrublands of southeastern Coastal Plain (southern, mid-Atlantic, and Gulf coasts). Vegetation of this alliance is characteristically 0.5-3 m tall, typically with a single, extremely dense stratum, with *Quercus virginiana* (live oak) dominant or codominant, and often also with species such as *Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Quercus geminata* (sand live oak) (in range), *Serenoa repens* (saw palmetto) (in range), *Smilax auriculata* (earleaf greenbrier), *Prunus caroliniana* (Carolina laurelcherry), *Juniperus virginiana var. silicicola* (southern redcedar), *Smilax bona-nox* (saw greenbrier), *Persea borbonia* (redbay), and *Zanthoxylum clava-herculis* (Hercules' club). It occupies linear strands on frontal dune ridges and on the leeward sides and tops of rear dunes, where it is protected from salt-water flooding and extreme salt spray. It also occurs on low dunes and rises on the back sides of barrier islands, as upland rises associated with *Juncus roemerianus* (needlegrass rush) marshes. Examples of this vegetation in Mississippi contain *Baccharis halimifolia* (eastern baccharis).

Classification Comments: This alliance apparently occurs on Cat Island, Mississippi, as scrub thickets with *Ilex vomitoria* dominant and an admixture of *Quercus virginiana* and/or *Quercus geminata*. Occurrences of this (or a closely related alliance) in Louisiana may be better classified as a dwarf forest (*Quercus virginiana / Ilex vomitoria*). In Florida, this alliance is best developed on the Atlantic Coast.

Similar Alliances:

- *Morella cerifera* Saturated Shrubland Alliance (A.1906)--includes related vegetation north of the distribution of *Ilex vomitoria*.

Related Concepts:

- Barrier Island Relict Dune Shrubland/Scrub Oak (Wieland 1994b) ?
- Live Oak: 89 (Eyre 1980) I
- Maritime Shrub (Schafale and Weakley 1990) I

- Maritime dune scrub forest (Ambrose 1990a) ?
- Maritime dune shrub vegetation (Ambrose 1990a) ?
- Maritime interdune shrub vegetation (Ambrose 1990a) ?

Alliance Description

Vegetation: Vegetation of this alliance is characteristically 0.5-3 m tall, typically with a single, extremely dense stratum, with *Quercus virginiana* (live oak) dominant or codominant, and often also with species such as *Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Quercus geminata* (sand live oak) (in range), *Serenoa repens* (saw palmetto) (in range), *Smilax auriculata* (earleaf greenbrier), *Prunus caroliniana* (Carolina laurelcherry), *Juniperus virginiana var. silicicola* (southern redcedar), *Smilax bona-nox* (saw greenbrier), *Persea borbonia* (redbay), and *Zanthoxylum clava-herculis* (Hercules' club). It occupies linear strands on frontal dune ridges and on the leeward sides and tops of rear dunes, where it is protected from salt-water flooding and extreme salt spray. It also occurs on low dunes and rises on the back sides of barrier islands, as upland rises associated with *Juncus roemerianus* (needlegrass rush) marshes. Examples of this vegetation in Mississippi contain *Baccharis halimifolia* (eastern baccharis).

Alliance Distribution

Range: This alliance consists of upland maritime dune shrublands of southeastern Coastal Plain (southern, mid-Atlantic, and Gulf coasts).

Nations: US
SubNations: AL, FL, GA, LA?, MS, NC, SC, VA
TNC Ecoregions: 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Cb:CCC, 232Ce:CCC, 232Ci:CCC, 232Dc:CCC, 232Dd:CCC, 232Gb:CCC

Federal Lands: DOD (Camp Lejeune?); NPS (Canaveral, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Pulaski, Fort Sumter, Gulf Islands); USFWS (Back Bay?, Bon Secour, Cape Romain?, Pea Island?)

(CEGL004784) Wax-myrtle - Carolina Laurel Cherry - Hercules'-club Shrubland
Morella cerifera - Prunus caroliniana - Zanthoxylum clava-herculis Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
Alliance	*Quercus virginiana - Ilex vomitoria - (Morella cerifera)* Shrubland Alliance (A.785)

NVC Classification (continued)

Classification Level	Observed Classification
Alliance (English name)	Live Oak - Yaupon - (Wax-myrtle) Shrubland Alliance
Association	*Morella cerifera* - *Prunus caroliniana* - *Zanthoxylum clava-herculis* Shrubland
Association (English name)	Wax-myrtle - Carolina Laurel Cherry - Hercules'-club Shrubland
Ecological System(s):	Central Atlantic Coastal Plain Maritime Forest (CES203.261)

Element Concept

Global Summary: These maritime shrublands of South Carolina and Georgia are dominated by *Morella cerifera* (wax-myrtle), *Prunus caroliniana* (Carolina laurelcherry), and *Zanthoxylum clava-herculis* (Hercules' club). This shrub vegetation occurs on the backside of maritime dunes.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This wax-myrtle shrubland was sampled once on Cumberland Island on an interdunal flat with well-drained sand soil. The unvegetated surface is dominated by leaf litter (85% cover) with some wood (15%). Evidence of disturbance includes armadillo grazing.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dense (80% cover) tree canopy, 10-15 m tall, is dominated by *Morella cerifera* (wax-myrtle) along with lesser amounts of *Quercus virginiana* (live oak), *Sabal palmetto* (cabbage palmetto), and *Zanthoxylum clava-herculis* (Hercules' club), while the moderate (50%) subcanopy (5-10 m) is made up of *Morella cerifera* (wax-myrtle) and *Sabal palmetto* (cabbage palmetto). *Celtis laevigata* (sugarberry) is occasional. The sparse (20%) tall-shrub layer (2-5 m) and very sparse (10%) short-shrub layer (1-2 m) are dominated almost exclusively by *Morella cerifera* (wax-myrtle). The herbaceous layer is very sparse (5%) and includes *Bidens bipinnata* (Spanish needles), *Centrosema virginianum* (spurred butterfly pea), *Galium pilosum* (hairy bedstraw), *Oplismenus hirtellus ssp. setarius* (bristle basketgrass), and *Paspalum setaceum* (thin paspalum). Vines (5%) include *Parthenocissus quinquefolia* (Virginia creeper), *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), and *Vitis rotundifolia* (muscadine). In addition, this community supports state-imperiled *Quercus chapmanii* (Chapman oak).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Morella cerifera* (wax-myrtle), *Sabal palmetto* (cabbage palmetto)
Tree canopy	Broad-leaved deciduous tree	*Zanthoxylum clava-herculis* (Hercules' club)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia* (Virginia creeper), *Smilax auriculata* (earleaf greenbrier)
Herb (field)	Graminoid	*Oplismenus hirtellus* ssp. *setarius* (bristle basketgrass), *Paspalum setaceum* (thin paspalum)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Morella cerifera* (wax-myrtle), *Zanthoxylum clava-herculis* (Hercules' club)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
uercus chapmanii (Chapman oak)	G4G5	state-imperiled

Conservation Status Rank

Global Rank & Reasons: G2? (8-Oct-1997).

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: This sounds like the understory of maritime forest, possibly disturbed by hurricane killed overstory (M. Schafale pers. comm.). More information is available in the ACE data for Otter Island (South end).

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is located along the backdunes, on the south side of Cumberland Island near Carriage House Road.

Global Range: This maritime shrubland occurs in South Carolina and Georgia.
Nations: US
States/Provinces: GA, SC
TNC Ecoregions: 56:C
USFS Ecoregions: 232Ce:CCC
Federal Lands: NPS (Cumberland Island, Fort Pulaski, Fort Sumter)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.042.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: K. Tassin and C. Smith
References: Schafale pers. comm., Southeastern Ecology Working Group n.d.

(CEGL004241) Live Oak - Saw Palmetto - (Yaupon) Shrubland
Quercus virginiana - Serenoa repens - (Ilex vomitoria) Shrubland [Provisional]

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
Alliance	*Quercus virginiana - Ilex vomitoria - (Morella cerifera)* Shrubland Alliance (A.785)
Alliance (English name)	Live Oak - Yaupon - (Wax-myrtle) Shrubland Alliance
Association	*Quercus virginiana - Serenoa repens - (Ilex vomitoria)* Shrubland [Provisional]
Association (English name)	Live Oak - Saw Palmetto - (Yaupon) Shrubland

Element Concept
Global Summary: This maritime shrubland association represents a more southern version of *Quercus virginiana - (Ilex vomitoria)* Shrubland (CEGL003833) found in the Southern Atlantic Coastal Plain and dominated by *Serenoa repens* (saw palmetto). It is described from a single plot at Canaveral National Seashore, and thus, its status is provisional until additional data are acquired.

Environmental Description
Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Vegetation Description
Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Conservation Status Rank
Global Rank & Reasons: GNR (15-Aug-2007).

Classification
Status: Provisional
Classification Confidence: –

Global Comments: The creation of this provisional association is based on data from one plot at Canaveral. Additional data are needed to fully quantify and describe this community.

Global Similar Associations:

- *Quercus virginiana - (Ilex vomitoria)* Shrubland (CEGL003833)--occurs farther north in the Mid-Atlantic Coastal Plain.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This association is currently known from central Florida.
Nations: US
States/Provinces: FL, GA?
TNC Ecoregions: 55:C, 56:P
USFS Ecoregions: 232Ce:CPP, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: H. Summer
References: Southeastern Ecology Working Group n.d.

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

Morella cerifera Saturated Shrubland Alliance (A.1906)

Alliance Concept

Summary: This alliance includes wetland dune swales and other wetland shrubland situations dominated by *Morella cerifera* (wax-myrtle), including sheltered backdunes, wetland flats, and interdune swales. Associated shrubs may include *Baccharis halimifolia* (eastern baccharis), *Acer rubrum* (red maple), *Vaccinium formosum* (southern blueberry), *Rosa palustris* (swamp rose), *Ilex opaca var. opaca* (American holly), *Juniperus virginiana var. silicicola* (southern redcedar), and *Morella pensylvanica* (northern bayberry). 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* (eastern poison-ivy), *Smilax* (greenbrier) spp., *Vitis* (grape) spp., and *Parthenocissus quinquefolia* (Virginia creeper). Associated herbaceous species can include *Boehmeria cylindrica* (small-spike false nettle), *Calystegia sepium* (hedge false bindweed), *Carex albolutescens* (greenwhite sedge), *Carex hormathodes* (marsh straw sedge), *Chasmanthium laxum* (slender woodoats), *Festuca rubra* (red fescue), *Galium obtusum* (bluntleaf bedstraw), *Hydrocotyle* (marsh-pennywort) spp., *Juncus dichotomus* (forked rush), *Juncus scirpoides* (needlepod rush), *Leersia virginica* (whitegrass), *Osmunda regalis var. spectabilis* (royal fern), *Panicum* (panicgrass) spp., *Polygonum pensylvanicum* (Pennsylvania smartweed), and *Woodwardia areolata* (netted chainfern) (in the northern part of the range); and *Andropogon glomeratus var. pumilus* (bushy bluestem), *Fimbristylis castanea* (marsh fimbry), *Hydrocotyle bonariensis* (largeleaf pennywort), *Juncus roemerianus* (needlegrass rush), *Muhlenbergia filipes* (gulfhairawn muhly), as well as *Spartina patens* (saltmeadow cordgrass) and *Sabatia stellaris* (rose of Plymouth) (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* (live oak). 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.

Similar Alliances:

- *Juncus dichotomus* Seasonally Flooded Herbaceous Alliance (A.1427)
- *Quercus virginiana - Ilex vomitoria - (Morella cerifera)* Shrubland Alliance (A.785)--generally occurs in drier and more exposed sites.

Similar Alliance Comments: Older stands of maritime shrub vegetation ultimately become dominated by stunted and salt-pruned *Quercus virginiana*.

Related Concepts:

- Coastal Interdunal Swale (FNAI 1992a) ?
- Maritime Shrub (Schafale and Weakley 1990) I
- Maritime interdune shrub vegetation (Ambrose 1990a) ?

- Shrub succession community (Hill 1986) I
- mesic shrub zone (Higgins et al. 1971) I
- swamp thicket (Klotz 1986) I
- thicket community (Boule 1979) I

Alliance Description

Environment: 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*. Soils are deep sands of stabilized dunes, with limited if any horizon development. An overlying layer of 'muck' is reported in northern examples.

Vegetation: This alliance includes wetland dune swales and other wetland shrubland situations dominated by *Morella cerifera* (wax-myrtle), including sheltered backdunes, wetland flats, and interdune swales. Associated shrubs may include *Baccharis halimifolia* (eastern baccharis), *Acer rubrum* (red maple), *Vaccinium formosum* (southern blueberry), *Rosa palustris* (swamp rose), *Ilex opaca* (American holly), *Juniperus virginiana var. silicicola* (southern redcedar), and *Morella pensylvanica* (northern bayberry). 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* (eastern poison-ivy), *Smilax* (greenbrier) spp., *Vitis* (grape) spp., and *Parthenocissus quinquefolia* (Virginia creeper). Associated herbaceous species can include *Boehmeria cylindrica* (small-spike false nettle), *Calystegia sepium* (hedge false bindweed), *Carex albolutescens* (greenwhite sedge), *Carex hormathodes* (marsh straw sedge), *Chasmanthium laxum* (slender woodoats), *Festuca rubra* (red fescue), *Galium obtusum* (bluntleaf bedstraw), *Hydrocotyle* (marsh-pennywort) spp., *Juncus dichotomus* (forked rush), *Juncus scirpoides* (needlepod rush), *Leersia virginica* (whitegrass), *Osmunda regalis var. spectabilis* (royal fern), *Panicum* (panicgrass) spp., *Polygonum pensylvanicum* (Pennsylvania smartweed), and *Woodwardia areolata* (netted chainfern) (in the northern part of the range); and *Andropogon glomeratus var. pumilus* (bushy bluestem), *Fimbristylis castanea* (marsh fimbry), *Hydrocotyle bonariensis* (largeleaf pennywort), *Juncus roemerianus* (needlegrass rush), *Muhlenbergia filipes* (gulfhairawn muhly), as well as *Spartina patens* (saltmeadow cordgrass) and *Sabatia stellaris* (rose of Plymouth) (in southern examples).

Dynamics: Older stands of maritime shrub vegetation ultimately become dominated by stunted and salt-pruned *Quercus virginiana*.

Alliance Distribution

Range: This alliance is found in coastal areas from Louisiana and Florida north to New Jersey.
Nations: US
SubNations: DE, FL, GA, LA, MD, NC, NJ, SC, VA
TNC Ecoregions: 31:C, 54:P, 55:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Ac:CCC, 232Ad:CCP, 232Bx:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCP, 232Ci:CCC, 232E:CC, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral); NPS (Assateague Island, Canaveral?, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Pulaski, Timucuan?); USFWS (Back Bay?, Cape Romain?, Chincoteague, Merritt Island?, Pea Island, Prime Hook)

(CEGL003839) Atlantic Coast Interdune Swale
Morella cerifera / Spartina patens Shrubland
Wax-myrtle / Saltmeadow Cordgrass Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Saturated temperate broad-leaved evergreen shrubland (III.A.2.N.i.)
Alliance	*Morella cerifera* Saturated Shrubland Alliance (A.1906)
Alliance (English name)	Wax-myrtle Saturated Shrubland Alliance
Association	*Morella cerifera / Spartina patens* Shrubland
Association (English name)	Wax-myrtle / Saltmeadow Cordgrass Shrubland
Association (Common name)	Atlantic Coast Interdune Swale
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)
	Northern Atlantic Coastal Plain Dune and Swale (CES203.264)
	Central Atlantic Coastal Plain Maritime Forest (CES203.261)
	Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)

Element Concept

Global Summary: This association occurs in wetland flats, backdunes and interdune swales along the Atlantic Coast from New Jersey to Florida. The substrate may be sand or loamy sand, sometimes with a thin layer of organic matter. It occurs beyond the reach of most storm tides but may be impacted by salt spray. The water table may often be less than half a meter below the surface. Canopy closure varies from densely closed to moderately open. This vegetation is dominated by *Morella cerifera* (wax-myrtle), sometimes intermixed with *Juniperus virginiana var. silicicola* (southern redcedar) (from North Carolina and possibly southern Virginia southward), *Morella pensylvanica* (northern bayberry) (from northern North Carolina northward), *Rhus copallinum* (flameleaf sumac), *Baccharis halimifolia* (eastern baccharis), or *Ilex vomitoria* (yaupon). The shrub layer can vary from 2-8 m in height. Occasionally, a sparse emergent canopy of trees (such as *Juniperus virginiana var. silicicola* (southern redcedar) or *Sabal palmetto* (cabbage palmetto) in the southern parts of the range) may be present. The herbaceous layer is characterized by *Spartina patens* (saltmeadow cordgrass). Other ground flora associates include *Toxicodendron radicans* (eastern

poison-ivy), *Panicum virgatum* (switchgrass), *Andropogon virginicus* (broomsedge bluestem), *Juncus dichotomus* (forked rush), *Solidago sempervirens* (seaside goldenrod), *Smilax* (greenbrier) spp., *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* (grape) spp., and *Schoenoplectus pungens* (common threesquare). Small openings may have wetland graminoids, such as *Juncus roemerianus* (needlegrass rush), *Spartina patens* (saltmeadow cordgrass), *Fimbristylis castanea* (marsh fimbry), *Andropogon glomeratus var. pumilus* (bushy bluestem), *Muhlenbergia filipes* (gulfhairawn muhly), etc., and forbs, such as *Hydrocotyle bonariensis* (largeleaf pennywort), *Sabatia stellaris* (rose of Plymouth), *Polygonum hydropiperoides* (swamp smartweed), *Eleocharis* (spikerush) spp., etc. In other cases, few herbs are present, because of the dense, thicket-like shrub layer.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This interdunal swale shrubland was sampled at four locations on Cumberland Island. The sites are dry-mesic to mesic interdunal flats with somewhat poorly drained to well-drained sand or sandy loam, often with a high content of organic material. The unvegetated surface is made up of leaf litter (10-98% cover), wood (1-5%) and bare soil (1-88%). Evidence of disturbance includes heavy grazing by horses and the presence of exotic plants.

Global Environment: This association occurs on maritime barrier islands and spits, usually on more protected backdunes, barrier flats, islands within salt marshes, and interdunal swales. It is not tidally flooded and occurs beyond the reach of most storm tides, but it is impacted by salt spray. The substrate may be sand or loamy sand, sometimes with a thin layer of organic matter. The water table is often less than half a meter below the surface.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The very sparse (0-20% cover) tree canopy, 10-15 m tall, and very sparse (0-20%) subcanopy (15-20 m), when present, may include *Celtis laevigata* (sugarberry), *Ilex vomitoria* (yaupon), *Juniperus virginiana var. silicicola* (southern redcedar), *Morella cerifera* (wax-myrtle), and/or *Sabal palmetto* (cabbage palmetto). The very sparse to moderately dense (10-70%) tall-shrub layer (2-5 m) and very sparse (10%) short-shrub layer (1-2 m) share the same composition as the canopy and subcanopy. The herbaceous layer cover is highly variable (20-90%) depending on the density of the upper layers; dominants may include *Ampelopsis arborea* (peppervine), *Andropogon glomeratus* (bushy bluestem), *Andropogon virginicus* (broomsedge bluestem), *Eupatorium capillifolium* (dogfennel), *Hydrocotyle umbellata* (manyflower marshpennywort), *Juncus effusus* (common rush), *Phyla nodiflora* (turkey tangle fogfruit), and *Teucrium canadense* (Canada germander). Vines (up to 20% cover) of *Parthenocissus quinquefolia* (Virginia creeper), *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), and *Vitis rotundifolia* (muscadine) climb into the tree and shrub layers. *Eremochloa ophiuroides* (centipede grass) is a common exotic.

Global Vegetation: This vegetation is characterized by a moderately open to densely closed canopy of *Morella cerifera* (wax-myrtle). Other canopy associates include *Baccharis halimifolia* (eastern baccharis), *Morella pensylvanica* (northern bayberry) (from northern NC northward), *Juniperus*

virginiana var. silicicola (southern redcedar) (from NC and possibly southern VA southward), *Sabal palmetto* (cabbage palmetto), and *Rhus copallinum* (flameleaf sumac). The herbaceous layer is characterized by *Spartina patens* (saltmeadow cordgrass). Other ground flora associates include *Toxicodendron radicans* (eastern poison-ivy), *Panicum virgatum* (switchgrass), *Andropogon virginicus* (broomsedge bluestem), *Juncus dichotomus* (forked rush), *Solidago sempervirens* (seaside goldenrod), *Smilax* (greenbrier) spp., *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* (grape) spp., and *Schoenoplectus pungens* (common threesquare). Small openings may have wetland graminoids, such as *Juncus roemerianus* (needlegrass rush), *Spartina patens* (saltmeadow cordgrass), *Fimbristylis castanea* (marsh fimbry), *Andropogon glomeratus var. pumilus* (bushy bluestem), *Muhlenbergia filipes* (gulfhairawn muhly), etc., and forbs, such as *Hydrocotyle bonariensis* (largeleaf pennywort), *Sabatia stellaris* (rose of Plymouth), *Polygonum hydropiperoides* (swamp smartweed), *Phyla nodiflora* (turkey tangle fogfruit), *Eleocharis* (spikerush) spp., etc. In other cases, few herbs are present, because of the dense, thicket-like shrub layer.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved evergreen tree	*Sabal palmetto* (cabbage palmetto)
Tree subcanopy	Broad-leaved evergreen tree	*Morella cerifera* (wax-myrtle)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Sabal palmetto* (cabbage palmetto)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Herb (field)	Vine/Liana	*Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), *Vitis rotundifolia* (muscadine)
Herb (field)	Forb	*Eupatorium capillifolium* (dogfennel), *Hydrocotyle umbellata* (manyflower marshpennywort), *Phyla nodiflora* (turkey tangle fogfruit)
Herb (field)	Graminoid	*Andropogon glomeratus* (bushy bluestem), *Andropogon virginicus* (broomsedge bluestem)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Morella cerifera* (wax-myrtle)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Chenopodium ambrosioides (Mexican tea)	–	exotic
Eremochloa ophiuroides (centipede grass)	–	exotic

Conservation Status Rank

Global Rank & Reasons: G3G4 (1-Feb-2005). This association occurs in interdune flats on barrier islands and barrier spits from New Jersey south to Florida. Many occurrences have been destroyed by coastal development, as these soils are sandy enough and dry enough that they are often not considered "jurisdictional wetlands" and are therefore destroyed for development. Other occurrences have been left undeveloped but now occur as isolated areas fragmented by development. Fairly extensive occurrences are protected on Cape Hatteras National Seashore and Cape Lookout National Seashore, North Carolina.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: This association now encompasses two previous associations, one more northerly ranging and the other more southerly ranging along the Atlantic Coast. Where the ranges of these two types overlapped, they were difficult to distinguish floristically and were thus combined.

Global Similar Associations:

- *(Morella cerifera) - Panicum virgatum - Spartina patens* Herbaceous Vegetation (CEGL004129)
- *Morella cerifera - Vaccinium corymbosum* Shrubland (CEGL003906)
- *Morella cerifera / Hydrocotyle verticillata* Shrubland (CEGL003840)

Global Related Concepts:

- Maritime Interdune Shrub Vegetation (Ambrose 1990a) ?
- Mesic shrub community (Higgins et al. 1971) B
- Salt grass sea myrtle red cedar savanna (Martin 1959b) ?
- Salt grass sea myrtle savanna (Martin 1959b) ?
- Shrub succession community (Hill 1986) B
- Thicket community (Boule 1979) =
- Upland thicket (Klotz 1986) =

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association occurs in interdune swales behind the foredunes from the south to north ends of Cumberland Island, and also on the margins of the dredge spoil islands adjacent to the salt marsh.

Global Range: This type occurs along the Atlantic Coast from New Jersey south to Florida.
Nations: US
States/Provinces: DE, FL, GA, MD, NC, NJ, SC, VA
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ab:CCP, 232Ac:CCC, 232Bz:CCC, 232Cb:CCP, 232Ce:CCC, 232Ch:CCP, 232Ci:CCC, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral); NPS (Assateague Island, Canaveral?, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Pulaski, Timucuan?); USFWS (Back Bay?, Cape Romain?, Chincoteague, Merritt Island?, Pea Island, Prime Hook)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.051, CUIS.054, CUIS.098, CUIS.117.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley, mod. J. Teague
References: Ambrose 1990a, Berdine 1998, Boule 1979, Bowman 2000, Breden et al. 2001, FNAI 1992a, Fleming 2001a, Govus 1998, Harrison 2004, Higgins et al. 1971, Hill 1986, Klotz 1986, Martin 1959b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

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

Morella cerifera - Rosa palustris Tidal Shrubland Alliance (A.806)

Alliance Concept

Summary: This alliance includes tidally flooded shrublands of the middle Atlantic Coastal Plain, occurring in association with freshwater tidal marshes and tidally flooded forests. *Morella cerifera* (wax-myrtle) is the characteristic dominant species, with *Rosa palustris* (swamp rose) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy) as characteristic and constant companion species. Other woody species include *Persea palustris* (swamp bay), *Magnolia virginiana* (sweetbay), *Salix caroliniana* (coastal plain willow), *Vaccinium formosum* (southern blueberry), *Smilax walteri* (coral greenbrier), *Smilax walteri* (coral greenbrier), and saplings of *Acer rubrum* (red maple), *Pinus taeda* (loblolly pine), *Taxodium distichum* (bald-cypress), and *Liquidambar styraciflua* (sweetgum). Herbaceous composition is diverse and varied, with many species recruited from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* (eastern marsh fern) is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), and *Decodon verticillatus* (swamp-loosestrife). *Murdannia keisak* (wartremoving herb) 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* (loblolly pine) and *Sabal palmetto* (cabbage palmetto) may be present. *Morella cerifera* (wax-myrtle) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy) dominate the dense shrub stratum, and *Baccharis angustifolia* (saltwater false willow) can be a major component. *Spartina bakeri* (sand cordgrass) is the dominant herb; other herbs include *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Cynanchum angustifolium* (gulf coast swallow-wort), and *Ipomoea sagittata* (saltmarsh morning-glory). Occurrences can exceed 50 acres in size. This latter, more southerly example of this alliance is placed here for now; the hydrology is ambiguous.

Alliance Description

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.

Vegetation: *Morella cerifera* (wax-myrtle) is the characteristic dominant species, with *Rosa palustris* (swamp rose) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy) as characteristic and constant companion species. Other woody species include *Persea palustris* (swamp bay), *Magnolia virginiana* (sweetbay), *Salix caroliniana* (coastal plain willow), *Vaccinium formosum* (southern blueberry), *Smilax walteri* (coral greenbrier), *Smilax walteri* (coral greenbrier), and saplings of *Acer rubrum* (red maple), *Pinus taeda* (loblolly pine), *Taxodium distichum* (bald-cypress), and *Liquidambar styraciflua* (sweetgum). Herbaceous composition is diverse and varied, with many species recruited from adjacent marshes and swamps. *Thelypteris palustris var. pubescens*

(eastern marsh fern) is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), and *Decodon verticillatus* (swamp-loosestrife). *Murdannia keisak* (wartremoving herb) is an aggressive alien weed in these communities. Farther south, scattered trees of *Pinus taeda* (loblolly pine) and *Sabal palmetto* (cabbage palmetto) may be present. *Morella cerifera* (wax-myrtle) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy) dominate the dense shrub stratum, and *Baccharis angustifolia* (saltwater false willow) can be a major component. *Spartina bakeri* (sand cordgrass) is the dominant herb; other herbs include *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Cynanchum angustifolium* (gulf coast swallow-wort), and *Ipomoea sagittata* (saltmarsh morning-glory).

Alliance Distribution
Range: This alliance is found along the coast from Delaware to Florida.
Nations: US
SubNations: DE, FL, GA, MD, NC, SC, VA
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Ac:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Cb:CC?, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC

Federal Lands: NPS (Colonial, Cumberland Island?, Timucuan); USFWS (Back Bay, Chesapeake Marshlands, Prime Hook)

(CEGL004789) South Atlantic Coast Tidal River Shrubland
Morella cerifera - Toxicodendron radicans / Spartina bakeri Shrubland
Wax-myrtle - Eastern Poison-ivy / Sand Cordgrass Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Temperate broad-leaved evergreen shrubland (III.A.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
Formation	Tidal broad-leaved evergreen temperate shrubland (III.A.2.N.l.)
Alliance	*Morella cerifera - Rosa palustris* Tidal Shrubland Alliance (A.806)
Alliance (English name)	Wax-myrtle - Swamp Rose Tidal Shrubland Alliance
Association	*Morella cerifera - Toxicodendron radicans / Spartina bakeri* Shrubland
Association (English name)	Wax-myrtle - Eastern Poison-ivy / Sand Cordgrass Shrubland
Association (Common name)	South Atlantic Coast Tidal River Shrubland
Ecological System(s):	Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Element Concept

Global Summary: This association occurs on flats adjacent to tidal reaches of rivers in the South Atlantic Coastal Plain. It receives 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* (loblolly pine) and *Sabal palmetto* (cabbage palmetto) may be present. *Morella cerifera* (wax-myrtle) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy) dominate the dense shrub stratum, and *Baccharis angustifolia* (saltwater false willow) can be a major component. *Spartina bakeri* (sand cordgrass) is the dominant herb; other herbs include *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Cynanchum angustifolium* (gulf coast swallow-wort), and *Ipomoea sagittata* (saltmarsh morning-glory). Occurrences can exceed 50 acres in size.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This tidal shrubland occurs on flats adjacent to tidal reaches of rivers in the South Atlantic Coastal Plain, from northern South Carolina south to Florida.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: This tidal shrubland is dominated by *Morella cerifera* (wax-myrtle) and *Toxicodendron radicans ssp. radicans* (eastern poison-ivy), with other species including *Baccharis angustifolia* (saltwater false willow), *Spartina bakeri* (sand cordgrass), *Juncus roemerianus* (needlegrass rush), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Cynanchum angustifolium* (gulf coast swallow-wort), and *Ipomoea sagittata* (saltmarsh morning-glory). Scattered trees of *Pinus taeda* (loblolly pine) and *Sabal palmetto* (cabbage palmetto) may be present. At Timucuan Ecological and Historic Preserve in northeastern Florida, *Baccharis halimifolia* (eastern baccharis) also occurs at high cover.

Conservation Status Rank

Global Rank & Reasons: G3? (10-Oct-1997).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: Placed in the *Morella cerifera - Rosa palustris* Tidal Shrubland Alliance (A.806) for now; the hydrology is ambiguous. This association is distinguished from *Morella cerifera - Rosa palustris / Thelypteris palustris var. pubescens* Shrubland (CEGL004656) by the presence and abundance of many more southern species, such as *Spartina bakeri, Baccharis angustifolia, Cynanchum angustifolium, Ipomoea sagittata, Sabal palmetto*, and others.

Global Similar Associations:

- *Morella cerifera - Rosa palustris / Thelypteris palustris var. pubescens* Shrubland (CEGL004656)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This association occurs on flats adjacent to tidal reaches of rivers in the South Atlantic Coastal Plain from South Carolina to Florida.

Nations: US
States/Provinces: FL, GA, SC
TNC Ecoregions: 56:C, 57:?
USFS Ecoregions: 232Cb:CC?, 232Ce:CCC
Federal Lands: NPS (Cumberland Island?, Timucuan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: C. Smith and K. Tassin, mod. H. Summer
References: Peet et al. unpubl. data 2002, Southeastern Ecology Working Group n.d.

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

Decodon verticillatus Seasonally Flooded Shrubland Alliance (A.990)

Alliance Concept

Summary: This alliance contains wetland vegetation dominated by *Decodon verticillatus* (swamp-loosestrife), generally in peaty situations. Few other species are present because the *Decodon* (decodon) is extremely dense; the only other species that are common are *Cephalanthus occidentalis* (common buttonbush) and possibly *Itea virginica* (Virginia sweetspire). Some examples occur in depression ponds (these at least primarily Interior Highlands), while others may be found in floodplain pools and lakeshores (e.g., the Coastal Plain and related examples).

Classification Comments: This alliance has been moved to seasonally flooded to better reflect hydrology of the best known *Decodon* communities. There will need to be a number of associations to reflect the disparate hydrologic and floristic situations in which *Decodon* dominates. In many areas, *Decodon* codominates with other shrubs such as *Cephalanthus* or *Itea*; is a pure *Decodon* alliance really needed, or could these situations be handled as associations under a mixed alliance? Examples of *Decodon*-dominated vegetation are known from Paynes Prairie State Park, Florida, Reelfoot Lake, Tennessee, waterfowl impoundments in South Carolina, swamps on Fort Benning, Georgia, as well as from Arkansas.

Similar Alliances:

- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)

Alliance Description

Environment: Some examples of this alliance occur in depression ponds, while others may be found in floodplain pools and lakeshores. At Reelfoot Lake, Tennessee (a natural earthquake-formed lake in the Mississippi River Alluvial Plain), dense stands of *Decodon* occupy the margins of open water basins, as well as sloughs and ditches. These areas may be essentially linear, or they may be wider and more extensive.

Vegetation: This alliance contains wetland vegetation dominated by *Decodon verticillatus* (swamp-loosestrife). Few other species are present because the *Decodon* (decodon) is extremely dense; the only species that are common are *Cephalanthus occidentalis* (common buttonbush) and possibly *Itea virginica* (Virginia sweetspire). At Reelfoot Lake, Tennessee, extensive *Decodon* (decodon) beds occur with *Typha latifolia* (broadleaf cattail) and *Apios americana* (groundnut).

Alliance Distribution

Range: This alliance is known in the outer Atlantic Coastal Plain of Massachusetts, Rhode Island, Connecticut, New York, North and South Carolina, Georgia, peninsular Florida, and the northern Mississippi River Alluvial Plain. It is also found Alabama, Arkansas, Indiana, Tennessee, Kentucky, and possibly New Jersey and others.

Nations: US
SubNations: AL, AR, CT, DE, FL, GA, IN, KY, MA, NC, NJ, NY, RI, SC, TN
TNC Ecoregions: 38:P, 42:C, 43:C, 44:P, 53:C, 55:C, 56:C, 57:C, 62:C

USFS Ecoregions: 221Ab:CCC, 222E:PP, 231B:CC, 232Bf:CCC, 232Cb:CCC, 232Ce:CCC, 234Ag:CCC, 234An:CCC

Federal Lands: DOD (Fort Benning); NPS (Cape Cod, Cumberland Island); USFS (Osceola); USFWS (Monomoy?, Nomans Land Island?, Reelfoot)

(CEGL003905) Swamp-loosestrife Pond
Decodon verticillatus Seasonally Flooded Shrubland
Swamp-loosestrife Seasonally Flooded Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	*Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
Alliance (English name)	Swamp-loosestrife Seasonally Flooded Shrubland Alliance
Association	*Decodon verticillatus* Seasonally Flooded Shrubland
Association (English name)	Swamp-loosestrife Seasonally Flooded Shrubland
Association (Common name)	Swamp-loosestrife Pond
Ecological System(s):	Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
	East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)
	East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
	Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
	Mississippi River Bottomland Depression (CES203.490)

Element Concept

Global Summary: This swamp-loosestrife pond association is found in the southeastern United States from North Carolina south to Florida, east to Alabama, and north to Kentucky and possibly Indiana. The wetland vegetation is dominated by *Decodon verticillatus* (swamp-loosestrife), typically in peaty backwater or depression situations. Few other species are present because the *Decodon* (decodon) is extremely dense; typically the only other woody species that are common are *Cephalanthus occidentalis* (common buttonbush) and possibly *Itea virginica* (Virginia sweetspire). Some examples occur in depression ponds (these at least primarily Interior Highlands), while others may be found in floodplain pools and lakeshores (e.g., the Coastal Plain and related examples).

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This swamp-loosestrife pond shrubland was sampled twice on Cumberland Island on a flat bottomland and a narrow swale between old dunes that is permanently saturated. Soils are somewhat poorly to very poorly drained muck. Disturbance at one site includes ditches and canals throughout area.

Global Environment: Some examples occur in depression ponds, while others may be found in floodplain pools and lakeshores. At Reelfoot Lake, Tennessee (a natural earthquake-formed lake in the Mississippi River Alluvial Plain), dense stands of *Decodon* occupy the margins of open water basins, as well as sloughs and ditches. These areas may be essentially linear, or they may be wider and more extensive.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dominance of *Decodon verticillatus* (swamp-loosestrife) in the moderate to dense (60-80% cover) herbaceous and short-shrub layers define this community. In addition, there may be a very sparse (0-5% cover) emergent tree canopy, 15-20 m tall, and very sparse (0-10%) subcanopy (10-15 m) of *Nyssa biflora* (swamp tupelo), *Acer rubrum* (red maple), *Ilex cassine* (dahoon), *Morella cerifera* (wax-myrtle), and *Salix caroliniana* (coastal plain willow). The sparse (20-30%) tall-shrub layer (5-10 m) is dominated by *Morella cerifera* (wax-myrtle), *Salix caroliniana* (coastal plain willow), and *Salix nigra* (black willow). Additional tall and short shrubs include *Cephalanthus occidentalis* (common buttonbush) and *Persea palustris* (swamp bay). Other common and/or dominant herbs include *Bacopa monnieri* (herb of grace), *Bidens laevis* (smooth beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Hydrocotyle umbellata* (manyflower marshpennywort), *Rhynchospora corniculata* (shortbristle horned beaksedge), *Saururus cernuus* (lizard's-tail), *Kosteletzkya virginica* (Virginia saltmarsh mallow), and *Typha latifolia* (broadleaf cattail). Vines include *Ampelopsis arborea* (peppervine), *Mikania scandens* (climbing hempvine), and *Smilax laurifolia* (laurel greenbrier). *Parthenocissus quinquefolia* (Virginia creeper), *Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier), and *Vitis rotundifolia* (muscadine) climb into the tree and shrub layers. In addition, this community supports state-vulnerable *Limnobium spongia* (American spongeplant).

Global Vegetation: This wetland vegetation is dominated by *Decodon verticillatus* (swamp-loosestrife), typically in peaty backwater or depression situations. Few other species are present because the *Decodon* (decodon) is extremely dense; typically the only other woody species that are common are *Cephalanthus occidentalis* (common buttonbush) and possibly *Itea virginica* (Virginia sweetspire). On the Osceola National Forest (Florida), an example in a backwater area of a creek is strongly dominated by *Decodon verticillatus* (swamp-loosestrife), and contains *Dulichium arundinaceum* (threeway sedge), *Juncus repens* (lesser creeping rush), *Polygonum* (knotweed) sp., *Smilax walteri* (coral greenbrier), *Sphagnum* (sphagnum) sp., and *Tillandsia usneoides* (Spanish moss). On Cumberland Island National Seashore (southeastern Georgia), a relatively sparse cover of *Decodon verticillatus* can allow for greater diversity, including *Bacopa monnieri* (herb of grace),

Bidens laevis (smooth beggarticks), *Boehmeria cylindrica* (small-spike false nettle), *Hydrocotyle umbellata* (manyflower marshpennywort), *Rhynchospora corniculata* (shortbristle horned beaksedge), *Saururus cernuus* (lizard's-tail), *Kosteletzkya virginica* (Virginia saltmarsh mallow), and *Typha latifolia* (broadleaf cattail).

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree subcanopy	Broad-leaved deciduous tree	*Salix caroliniana* (coastal plain willow)
Tree subcanopy	Broad-leaved evergreen tree	*Morella cerifera* (wax-myrtle)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Salix nigra* (black willow)
Tall shrub/sapling	Broad-leaved deciduous shrub	*Salix caroliniana* (coastal plain willow)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Short shrub/sapling	Broad-leaved deciduous shrub	*Decodon verticillatus* (swamp-loosestrife)
Herb (field)	Vine/Liana	*Ampelopsis arborea* (peppervine), *Mikania scandens* (climbing hempvine)
Herb (field)	Forb	*Bacopa monnieri* (herb of grace), *Bidens laevis* (smooth beggarticks), *Saururus cernuus* (lizard's-tail)
Herb (field)	Graminoid	*Rhynchospora corniculata* (shortbristle horned beaksedge)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Decodon verticillatus* (swamp-loosestrife)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Alternanthera philoxeroides (alligatorweed)	Medium	exotic
Echinochloa muricata var. *muricata* (rough barnyardgrass)	–	exotic

Other Plant Species	GRank	Note
Limnobium spongia (American spongeplant)	G4	state-vulnerable

Conservation Status Rank

Global Rank & Reasons: G4 (11-Aug-1997).

Classification

Status: Standard

Classification Confidence: 3 - Weak

Cumberland Island National Seashore and Fort Frederica National Monument Comments: One of the plots classified to this association (CUIS.036) is a disturbed variant of this community.

Global Comments: A number of associations may be needed to reflect the disparate hydrologic and floristic situations in which Decodon dominates. Examples of Decodon-dominated vegetation are known from Paynes Prairie State Park, Florida, Reelfoot Lake, Tennessee, waterfowl impoundments in South Carolina, swamps on Fort Benning, Georgia, as well as from Arkansas. In Indiana, at least one pond is completely covered with Decodon (M. Homoya pers. comm. 2000). On the Osceola National Forest (Florida), a stand of this association is documented in a small backwater area (Robinson Creek.

Global Similar Associations:

- Carex comosa - Carex decomposita - Dulichium arundinaceum - Lycopus rubellus Herbaceous Vegetation (CEGL002413)
- Cephalanthus occidentalis / Hibiscus moscheutos ssp. moscheutos Depression Pond Shrubland (CEGL004742)
- Decodon verticillatus Semipermanently Flooded Shrubland (CEGL005089)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: On Cumberland Island, this association is found along edges of open freshwater wetlands, such as Lake Whitney, and in narrow swales between the oldest backdunes where soil saturation is sufficient to support wetland shrub species. It is also found adjacent to the large wetland-agricultural complex near the center of the island, and is likely to occur around Lake Johnson and Ashley Pond.

Global Range: This vegetation is known in the outer Atlantic Coastal Plain of North and South Carolina, peninsular Florida, and the northern Mississippi River Alluvial Plain. It is found in Alabama, Arkansas, Florida, Georgia, Indiana, North Carolina, South Carolina, Tennessee, Kentucky, and possibly others.

Nations: US
States/Provinces: AL, AR, FL, GA, IN, KY, NC, SC, TN
TNC Ecoregions: 42:C, 43:C, 44:P, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 222E:PP, 231B:CC, 232Bf:CCC, 232Cb:CCC, 232Ce:CCC, 234An:CCC
Federal Lands: DOD (Fort Benning); NPS (Cumberland Island); USFS (Osceola); USFWS (Reelfoot)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.036, CUIS.107.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: M. Pyne, mod. H. Summer
References: Homoya pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data

Vitis rotundifolia - Ampelopsis arborea - Campsis radicans Seasonally Flooded Vine-Shrubland Alliance (A.993)

Alliance Concept

Summary: This wetland vegetation develops following blowdowns, clearcut logging, thermal pollution, and possibly other disturbance. This alliance potentially is widespread and occurs throughout the Coastal Plain. It is dominated by *Vitis rotundifolia* (muscadine), *Ampelopsis arborea* (peppervine), and *Campsis radicans* (trumpet creeper). Other species that may be present include *Polygonum* (knotweed) spp., *Cyperus* (flatsedge) spp., *Toxicodendron radicans ssp. radicans* (eastern poison-ivy), *Salix* (willow) spp., and *Morella cerifera* (wax-myrtle).

Classification Comments: In the Arkansas Coastal Plain and Mississippi River Alluvial Plain (White River NWR and Sugarberry RNA); community stable for 50-60 years (T. Foti pers. comm.).

Alliance Distribution

Range: This alliance potentially is widespread and occurs throughout the Coastal Plain. It is found in Alabama, Arkansas, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, and possibly Florida, North Carolina, and Texas.

Nations: US
SubNations: AL, AR, FL?, GA, LA, MS, NC?, SC, TN, TX?
TNC Ecoregions: 38:P, 40:P, 41:?, 42:C, 43:C, 44:C, 53:C, 56:C, 57:C
USFS Ecoregions: 231Bi:CCC, 232Bs:CCC, 232Ce:CCC, 234Aa:CCC, 234Ac:CCC, 234Ag:CCC, 234An:CCC

Federal Lands: DOE (Savannah River Site); NPS (Congaree Swamp, Cumberland Island, Natchez Trace); USFWS (White River NWR)

(CEGL004620) Grapevine - Peppervine - Trumpetvine Thicket

Vitis rotundifolia - Ampelopsis arborea - Campsis radicans Vine-Shrubland
Muscadine - Peppervine - Trumpetvine Vine-Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	*Vitis rotundifolia - Ampelopsis arborea - Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)
Alliance (English name)	Muscadine - Peppervine - Trumpetvine Seasonally Flooded Vine-Shrubland Alliance
Association	*Vitis rotundifolia - Ampelopsis arborea - Campsis radicans* Vine-Shrubland
Association (English name)	Muscadine - Peppervine - Trumpetvine Vine-Shrubland
Association (Common name)	Grapevine - Peppervine - Trumpetvine Thicket
Ecological System(s):	East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)
	South-Central Interior Small Stream and Riparian (CES202.706)
	Mississippi River High Floodplain (Bottomland) Forest (CES203.196)

Element Concept

Global Summary: This association includes vine-dominated vegetation that develops following clearcut logging, blowdowns, and possibly other disturbance in wetlands. *Vitis rotundifolia - Ampelopsis arborea - Campsis radicans* Vine-Shrubland is dominated by the nominal species. Other species that are present in the vine/liana stratum include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans ssp. radicans* (eastern poison-ivy), *Bignonia capreolata* (crossvine), *Smilax rotundifolia* (roundleaf greenbrier), *Berchemia scandens* (Alabama supplejack), and likely others. There may exist a limited canopy of *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Celtis laevigata* (sugarberry), *Salix* (willow) spp., and likely other species. Often the weight of the vine coverage will break the stems of woody species before they attain 5 m in height. A limited shrub stratum that contains canopy species as well as *Arundinaria gigantea* (giant cane), *Ilex decidua* (possum-haw), *Lindera benzoin* (northern spicebush), *Morella cerifera* (wax-myrtle), and others may be present. *Carex abscondita* (thicket sedge), *Arisaema dracontium* (green dragon), *Eupatorium capillifolium* (dogfennel), *Boehmeria cylindrica* (small-spike false nettle), *Cryptotaenia canadensis* (Canadian honewort), *Carex retroflexa* (reflexed sedge), *Carex lupulina* (hop sedge), *Polygonum* (knotweed) spp., *Cyperus* (flatsedge) spp., and other species are present in the sparse herbaceous layer.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This grapevine - greenbrier thicket was sampled twice on Cumberland Island on mesic flats with

somewhat poorly drained sandy loam soil. The unvegetated surface is dominated by leaf litter (93% cover) with some wood (5%) and bare soil (2%). Evidence of disturbance includes grazing by horses and cattle, past logging, and large canopy gaps in the area (possibly the result of wind damage).

Global Environment: This association develops on seasonally and temporarily flooded sites where the canopy and subcanopy layers have been removed by disturbance, including clearcut logging, blowdowns, and possibly other kinds of disturbance.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is defined by the moderate to dense cover (70-90%) of vines, including *Bignonia capreolata* (crossvine), *Smilax auriculata* (earleaf greenbrier), *Smilax glauca* (cat greenbrier), and *Vitis rotundifolia* (muscadine), that have climbed into the short-shrub (1-5 m tall) and other layers. One stand has a very sparse (10%) emergent tree canopy (20-35%) of *Pinus elliottii* (slash pine) (with *Vitis rotundifolia* (muscadine) growing up into it). In addition, there is a sparse (10-40%) emergent tall-shrub layer (2-10 m) that may include *Morella cerifera* (wax-myrtle), *Rhus copallinum* (flameleaf sumac), and/or *Serenoa repens* (saw palmetto). Shrubs occurring in the short-shrub layer include *Lyonia lucida* (fetterbush lyonia), *Morella cerifera* (wax-myrtle), *Rubus argutus* (sawtooth blackberry), *Sabal palmetto* (cabbage palmetto), and *Serenoa repens* (saw palmetto).

Global Vegetation: This vine-shrubland is dominated by *Vitis rotundifolia* (muscadine), *Ampelopsis arborea* (peppervine), and *Campsis radicans* (trumpet creeper). Other species that are present in the vine/liana stratum include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans ssp. radicans* (eastern poison-ivy), *Bignonia capreolata* (crossvine), *Smilax rotundifolia* (roundleaf greenbrier), *Berchemia scandens* (Alabama supplejack), and likely others. There may exist a limited canopy of *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Celtis laevigata* (sugarberry), *Salix* (willow) spp., and likely other species. A limited shrub stratum that contains canopy species, as well as *Arundinaria gigantea* (giant cane), *Ilex decidua* (possum-haw), *Lindera benzoin* (northern spicebush), *Morella cerifera* (wax-myrtle), and others, may be present. *Carex abscondita* (thicket sedge), *Arisaema dracontium* (green dragon), *Eupatorium capillifolium* (dogfennel), *Boehmeria cylindrica* (small-spike false nettle), *Cryptotaenia canadensis* (Canadian honewort), *Carex retroflexa* (reflexed sedge), *Carex lupulina* (hop sedge), *Polygonum* (knotweed) spp., *Cyperus* (flatsedge) spp., and other species are present in the sparse herbaceous layer. The exotic vine *Lonicera japonica* (Japanese honeysuckle), the exotic shrub *Ligustrum sinense* (Chinese privet), and the exotic herb *Murdannia keisak* (wartremoving herb) may be present in occurrences of this vine-shrubland.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Serenoa repens* (saw palmetto)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus argutus* (sawtooth blackberry)
Herb (field)	Vine/Liana	*Smilax auriculata* (earleaf greenbrier), *Smilax glauca* (cat greenbrier), *Vitis rotundifolia* (muscadine)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Vitis rotundifolia* (muscadine)

Other Noteworthy Species

Global

Exotic and Invasive Species	I-Rank	Note
Ligustrum sinense (Chinese privet)	High/ Medium	exotic
Lonicera japonica (Japanese honeysuckle)	High/ Medium	exotic
Murdannia keisak (wartremoving herb)	Medium/ Low	exotic

Conservation Status Rank

Global Rank & Reasons: GNA (modified/managed) (11-May-1998). This vegetation likely is readily restorable by time or management. Examples are created through various kinds of natural or anthropogenic disturbance (TNC 1998b).

Classification

Status: Standard

Classification Confidence: 3 - Weak

Global Comments: On Congaree Swamp National Monument, South Carolina, many examples of this vegetation were apparently caused by intense wind disturbance events associated with Hurricane Hugo in September 1989 (TNC 1998b).

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is scattered across the oak and oak-pine forests of Cumberland Island in canopy gaps, and is frequently observed in open areas adjacent to *Spartina bakeri*-dominated wetlands. Not all canopy gaps are dominated by this vine-shrubland.

Global Range: This successional association could be found anywhere in the southeastern United States from Virginia to Texas, in the coastal plain or adjacent ecoregions.

Nations: US

States/Provinces: AL, AR, FL?, GA, LA, MS, NC?, SC, TN, TX?
TNC Ecoregions: 40:P, 41:?, 42:C, 43:C, 44:C, 53:C, 56:C, 57:C
USFS Ecoregions: 231Bi:CCC, 232Bs:CCC, 232Ce:CCC, 234Aa:CCC, 234Ac:CCC, 234Ag:CCC, 234An:CCC

Federal Lands: DOE (Savannah River Site); NPS (Congaree Swamp, Cumberland Island, Natchez Trace); USFWS (White River NWR)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.103, CUIS.165.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: S. Landaal
References: Peet et al. unpubl. data 2002, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC 1998b

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

Baccharis halimifolia - Iva frutescens Tidal Shrubland Alliance (A.1023)

Alliance Concept

Summary: This alliance includes maritime scrub communities typically dominated by *Iva frutescens* (Jesuit's bark) or *Baccharis halimifolia* (eastern baccharis) 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* (eastern baccharis), *Iva frutescens* (Jesuit's bark), *Rosa carolina* (Carolina rose), *Spartina patens* (saltmeadow cordgrass), and *Panicum virgatum* (switchgrass).

Similar Alliances:

- *Baccharis halimifolia* Saturated Shrubland Alliance (A.1015)
- *Panicum virgatum* Tidal Herbaceous Alliance (A.1476)

Related Concepts:

- *Baccharis halimifolia* (Klemas et al. 1973) ?
- *Iva frutescens-Baccharis halimifolia* (Good 1965) ?
- *Iva frutescens* (Klemas et al. 1973) ?
- Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001) ?
- Estuarine scrub-shrub wetland (Tiner 1985b) ?
- Salt Shrub (Schafale and Weakley 1990) I
- Salt bush - salt meadow marsh (Daiber et al. 1976) ?
- Salt marsh community (Hill 1986) I
- Salt marsh complex, marsh-upland border (Breden 1989) ?
- Salt shrub (Reschke 1990) ?
- Tidal Marsh (FNAI 1992a) I
- salt grass - marsh elder savanna (Martin 1959b) ?
- salt marsh and upper border (Barry 1980) ?
- saltbush zone (Boule 1979) ?
- shrub succession community (Higgins et al. 1971) I
- swamp thicket (Klotz 1986) I

Alliance Description

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.

Vegetation: This alliance includes maritime scrub communities typically dominated by *Iva frutescens* (Jesuit's bark) or *Baccharis halimifolia* (eastern baccharis) or both, growing in association with salt marshes. Characteristic species include *Baccharis halimifolia* (eastern baccharis), *Iva frutescens* (Jesuit's bark), *Rosa carolina* (Carolina rose), *Spartina patens* (saltmeadow cordgrass), and *Panicum virgatum* (switchgrass).

Dynamics: Storm-induced disturbance causes periodic die-back of the shrubs restricting the extent of their spread.

Alliance Distribution
Range: This alliance is found throughout the eastern United States from Maine to Florida and west to Texas.

Nations: US
SubNations: 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, 221Ak:CCC, 221Dc:CPP, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bb:CC?, 232Bc:CCP, 232Bd:CCP, 232Br:CCC, 232Bt:CCC, 232Bx:CCC, 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 255Dc:CCC

Federal Lands: NPS (Assateague Island, Boston Harbor Islands, Cape Cod, Cape Hatteras, Colonial, Cumberland Island, Fire Island, Fort Pulaski, Gateway, George Washington Birthplace, Timucuan?); USFS (Croatan); USFWS (Anahuac, Aransas, Back Bay?, Big Boggy, Bon Secour, Brazoria, Chesapeake Marshlands, Chincoteague, Matagorda Island, McFaddin, Monomoy?, Parker River, Prime Hook, San Bernard)

(CEGL003920) Coastal Salt Shrub Thicket
Baccharis halimifolia - Iva frutescens - Morella cerifera - (Ilex vomitoria) Shrubland
Groundsel-tree - Maritime Marsh-elder - Wax-myrtle - (Yaupon) Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Tidal cold-deciduous shrubland (III.B.2.N.h.)
Alliance	*Baccharis halimifolia - Iva frutescens* Tidal Shrubland Alliance (A.1023)
Alliance (English name)	Groundsel-tree - Maritime Marsh-elder Tidal Shrubland Alliance

NVC Classification (continued)

Classification Level	Observed Classification
Association	*Baccharis halimifolia - Iva frutescens - Morella cerifera - (Ilex vomitoria)* Shrubland
Association (English name)	Groundsel-tree - Maritime Marsh-elder - Wax-myrtle - (Yaupon) Shrubland
Association (Common name)	Coastal Salt Shrub Thicket
Ecological System(s):	Central Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)

Element Concept

Global Summary: This shrubland 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* (eastern baccharis), *Morella cerifera* (wax-myrtle), *Iva frutescens ssp. frutescens* (Jesuit's bark), *Yucca gloriosa* (moundlily yucca), *Juniperus virginiana var. silicicola*, *Lycium carolinianum* (Carolina desert-thorn), *Baccharis angustifolia* (saltwater false willow), and *Ilex vomitoria* (yaupon). Other species which may be present include *Borrichia frutescens* (bushy seaside-tansy), *Fimbristylis castanea* (marsh fimbry), *Limonium carolinianum* (Carolina sealavender), and *Solidago sempervirens* (seaside goldenrod).

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This salt shrub thicket was sampled once on Cumberland Island on a tidal flat with somewhat poorly drained sand soil. The unvegetated surface is dominated by leaf litter (93% cover) with some wood (5%) and bare soil (2%). Evidence of disturbance includes heavy horse grazing.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is dominated by a dense (80% cover) herbaceous layer of *Distichlis spicata* (inland saltgrass), *Fimbristylis castanea* (marsh fimbry), and *Spartina bakeri* (sand cordgrass). In addition, there is a very sparse (5%) emergent tall-shrub layer (2-5 m) of *Juniperus virginiana var. silicicola* (southern redcedar) and *Sabal palmetto* (cabbage palmetto) and a moderate (40%) short-shrub layer (1-2 m) dominated by *Iva frutescens* (Jesuit's bark). Additional herbs include small amounts of *Juncus effusus* (common rush), *Juncus roemerianus* (needlegrass rush), *Limonium carolinianum* (Carolina sealavender), and *Samolus valerandi ssp. parviflorus* (seaside brookweed).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved shrub	*Juniperus virginiana* var. *silicicola* (southern redcedar)
Tall shrub/sapling	Broad-leaved evergreen shrub	*Sabal palmetto* (cabbage palmetto)
Short shrub/sapling	Broad-leaved deciduous shrub	*Iva frutescens* (Jesuit's bark)
Herb (field)	Graminoid	*Distichlis spicata* (inland saltgrass), *Fimbristylis castanea* (marsh fimbry), *Spartina bakeri* (sand cordgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Iva frutescens* (Jesuit's bark)

Conservation Status Rank

Global Rank & Reasons: G4? (11-Aug-1997).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Cumberland Island National Seashore and Fort Frederica National Monument Comments: This plot (CUIS.137) is considered a variant of this community, dominated by *Iva frutescens* and *Spartina bakeri*.

Global 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.).

Global Similar Associations:

- *Baccharis halimifolia - Iva frutescens / Panicum virgatum* Shrubland (CEGL003921)--is potentially overlapping in some areas.
- *Iva frutescens / Spartina patens* Shrubland (CEGL006848)

Global Related Concepts:

- Salt Shrub (Inland High Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled at the mouth of a tidal creek on Cumberland Island, near to where it opens onto the marsh off of the main road inside the wilderness boundary. The association marks a transition from marsh community to the adjacent upland. This community likely occurs elsewhere at the upper edge of tidally flooded creeks on the marsh side of Cumberland Island.

Global Range: This shrubland is found throughout much of the East Gulf, South Atlantic, and Mid-Atlantic coastal plains.

Nations: US
States/Provinces: AL, FL, GA, LA, MS, NC, SC
TNC Ecoregions: 53:C, 55:?, 56:C, 57:C
USFS Ecoregions: 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC

Federal Lands: NPS (Cape Hatteras, Cumberland Island, Fort Pulaski, Timucuan?); USFS (Croatan); USFWS (Bon Secour)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.137.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors:
References: Coulling pers. comm., FNAI 1992a, Fleming pers. comm., Govus 1998, Lea 2002b, Schafale 2000, Schotz pers. comm., Southeastern Ecology Working Group n.d., Wolfe 1990

Borrichia frutescens Tidal Shrubland Alliance (A.1026)

Alliance Concept

Summary: This alliance includes tidal areas in upper marsh edges and flats dominated by *Borrichia frutescens* (bushy seaside-tansy). It occurs at spatial scales ranging from narrow bands to flats in excess of 500 ha; it often occurs either just below *Iva frutescens* (Jesuit's bark) or *Baccharis halimifolia* (eastern baccharis), or just above *Juncus roemerianus* (needlegrass rush) or *Spartina alterniflora* (smooth cordgrass). Other characteristic species include *Spartina patens* (saltmeadow cordgrass), *Iva frutescens ssp. frutescens* (Jesuit's bark), *Iva frutescens ssp. oraria* (Jesuit's bark), and *Limonium carolinianum* (Carolina sealavender). In Texas, the composition of this low-diversity, irregularly tidally flooded shrubland is variable and can include *Spartina spartinae* (gulf cordgrass), *Sporobolus virginicus* (seashore dropseed), *Monanthochloe littoralis* (shoregrass), *Sarcocornia perennis* (chickenclaws), *Limonium carolinianum* (Carolina sealavender), *Lycium carolinianum var. quadrifidum* (Carolina desert-thorn), *Rayjacksonia phyllocephala* (camphor daisy), and *Batis maritima* (turtleweed). Here, these communities often occur just above the lower tidal flat communities *Batis maritima - Sarcocornia perennis* Dwarf-shrubland (CEGL003956) or *Sarcocornia perennis - (Batis maritima*, *Distichlis spicata)* Dwarf-shrubland (CEGL002278).

Classification Comments: Consideration should be given to placement of this alliance in Class IV. Dwarf-shrubland. Although stature can be more than 0.5 m, it is typically 0.3-0.5 m in height.

Related Concepts:

- Glasswort-Saltwort Series (Diamond 1993) I
- Salt Shrub (Schafale and Weakley 1990) I
- Tidal Marsh (FNAI 1990) ?

Alliance Description

Environment: This alliance occurs along upper marsh edges and in tidal flats ranging in scale from narrow bands to hundreds of hectares. It is found along mainland shores and the bayside of barrier islands.

Vegetation: This alliance is dominated by *Borrichia frutescens* (bushy seaside-tansy), often in monospecific stands. Other characteristic species may include *Spartina patens* (saltmeadow cordgrass), *Spartina spartinae* (gulf cordgrass), *Sporobolus virginicus* (seashore dropseed), *Monanthochloe littoralis* (shoregrass), *Iva frutescens ssp. frutescens* (Jesuit's bark), *Iva frutescens ssp. oraria* (Jesuit's bark), *Limonium carolinianum* (Carolina sealavender), *Sarcocornia perennis* (chickenclaws), *Lycium carolinianum var. quadrifidum* (Carolina desert-thorn), *Rayjacksonia phyllocephala* (camphor daisy), and *Batis maritima* (turtleweed).

Alliance Distribution

Range: This alliance is found throughout the southeastern United States.
Nations: US
SubNations: AL, FL, GA, LA?, MS, NC, SC, TX, VA?
TNC Ecoregions: 31:C, 53:C, 55:C, 56:C, 57:C, 58:C
USFS Ecoregions: 231Fb:CCC, 232Cb:CC?, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 232Gb:CCC, 255Dc:CCC

Federal Lands: NPS (Canaveral, Cape Lookout, Cumberland Island, Fort Pulaski, Timucuan?); USFS (Croatan); USFWS (Anahuac, Aransas, Back Bay?, Big Boggy, Brazoria, Laguna Atascosa, Matagorda Island, McFaddin, San Bernard, Texas Point)

(CEGL003924) Seaside-tansy Tidal Shrub Flat

Borrichia frutescens / (Spartina patens, Juncus roemerianus) Shrubland
Bushy Seaside-tansy / (Saltmeadow Cordgrass, Black Needlerush) Shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Tidal cold-deciduous shrubland (III.B.2.N.h.)
Alliance	*Borrichia frutescens* Tidal Shrubland Alliance (A.1026)
Alliance (English name)	Bushy Seaside-tansy Tidal Shrubland Alliance
Association	*Borrichia frutescens / (Spartina patens, Juncus roemerianus)* Shrubland

NVC Classification (continued)

Classification Level	Observed Classification
Association (English name)	Bushy Seaside-tansy / (Saltmeadow Cordgrass, Black Needlerush) Shrubland
Association (Common name)	Seaside-tansy Tidal Shrub Flat
Ecological System(s):	Central Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)
	Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
	Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)
	Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh (CES203.468)

Element Concept

Global Summary: This association includes upper marsh edges and flats strongly dominated by *Borrichia frutescens* (bushy seaside-tansy), ranging in size from narrow bands to flats in excess of 500 ha. It is broadly described to include vegetation ranging from the Mid- and South Atlantic Coast to the West Gulf Coast of the United States. It may occur just below *Iva frutescens* (Jesuit's bark) or *Baccharis halimifolia* (eastern baccharis) shrublands and just above marshes dominated by *Juncus roemerianus* (needlegrass rush) or *Spartina alterniflora* (smooth cordgrass). Other characteristic species may include *Spartina patens* (saltmeadow cordgrass), *Iva frutescens* (Jesuit's bark), and *Limonium carolinianum* (Carolina sealavender). In Texas, the composition of this low-diversity, irregularly tidally flooded shrubland is variable and can include *Distichlis spicata* (inland saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Sporobolus virginicus* (seashore dropseed), *Monanthochloe littoralis* (shoregrass), *Atriplex matamorensis* (Matamoros saltbush) (in south Texas), *Sarcocornia pacifica* (Pacific swampfire), *Limonium carolinianum* (Carolina sealavender), *Lycium carolinianum var. quadrifidum* (Carolina desert-thorn), *Rayjacksonia phyllocephala* (camphor daisy), *Prosopis reptans* (tornillo) (in south Texas), and *Batis maritima* (turtleweed). Here, this community often occurs just above the lower tidal flat communities *Batis maritima - Sarcocornia pacifica* Dwarf-shrubland (CEGL003956) or *Sarcocornia pacifica - (Batis maritima*, *Distichlis spicata)* Dwarf-shrubland (CEGL002278).

This shrubland usually occurs as a very narrow band adjacent and below tidal shrublands. Two large examples of this association at Fort Pulaski, Georgia, are extensive enough to map and occur on tidal flats adjacent the extensive salt marsh communities of eastern Cockspur Island. Typically this community is monospecific, being made up almost exclusively of *Borrichia frutescens* (bushy seaside-tansy).

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This seaside-tansy shrubland was sampled at three locations on Cumberland Island on tidally flooded flats. Soils are very poorly to poorly drained sand. The unvegetated surface is made up of leaf litter

(20-55% cover), wood (0-1%), bare soil (0-60%), and standing water (0-80%). There is very little evidence of disturbance other than nearby horse trails.

Global Environment: This association occurs along upper marsh edges and in tidal flats ranging in scale from narrow bands to hundreds of hectares. It is found along mainland shores and the bayside of barrier islands. In south Texas, it can also occur around the base of lomas.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dominant vegetation is the moderate (40-60% cover) herbaceous layer of the subshrub *Borrichia frutescens* (bushy seaside-tansy). There may also be a moderate (40%) tall-shrub layer (1-5 m) and sparse (20%) short-shrub layer (0.5-1 m) of *Iva frutescens* (Jesuit's bark) and *Sabal palmetto* (cabbage palmetto). Additional species found in the herbaceous layer include *Batis maritima* (turtleweed), *Distichlis spicata* (inland saltgrass), *Fimbristylis castanea* (marsh fimbry), *Iva frutescens* (Jesuit's bark), *Limonium carolinianum* (Carolina sealavender), *Sarcocornia pacifica* (Pacific swampfire), *Schoenoplectus pungens var. pungens* (common threesquare), and *Stenotaphrum secundatum* (St. Augustine grass). This community also supports state-vulnerable *Cynanchum angustifolium* (gulf coast swallow-wort).

Global Vegetation: This community is strongly dominated by *Borrichia frutescens* (bushy seaside-tansy). Other characteristic species may include *Spartina patens* (saltmeadow cordgrass), *Iva frutescens* (Jesuit's bark), *Distichlis spicata* (inland saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Sporobolus virginicus* (seashore dropseed), *Monanthochloe littoralis* (shoregrass), *Sarcocornia pacifica* (Pacific swampfire), *Limonium carolinianum* (Carolina sealavender), *Lycium carolinianum var. quadrifidum* (Carolina desert-thorn), *Rayjacksonia phyllocephala* (camphor daisy), and *Batis maritima* (turtleweed). In Texas, *Spartina patens* (saltmeadow cordgrass) is a less important component of this community, but it often forms a fringe along the upper margin.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Iva frutescens* (Jesuit's bark)
Short shrub/sapling	Broad-leaved evergreen shrub	*Batis maritima* (turtleweed), *Borrichia frutescens* (bushy seaside-tansy)
Herb (field)	Forb	*Limonium carolinianum* (Carolina sealavender), *Sarcocornia pacifica* (Pacific swampfire)
Herb (field)	Graminoid	*Fimbristylis castanea* (marsh fimbry), *Stenotaphrum secundatum* (St. Augustine grass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Borrichia frutescens* (bushy seaside-tansy)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Cynanchum angustifolium (gulf coast swallow-wort)	G5	state-vulnerable

Global

Other Plant Species	GRank	Note
rus americana (whooping crane)	G1	Federally listed endangered; globally critically imperiled

Conservation Status Rank

Global Rank & Reasons: G4 (10-Oct-1997). This is a common tidal flat community along the Gulf and Middle and South Atlantic coasts of the United States.

Classification

Status: Standard

Classification Confidence: 1 - Strong

Global Comments: The relationship between this community and similar *Borrichia frutescens / Spartina spartinae* Shrubland (CEGL004617) is poorly documented. The ranges of these two communities overlap along the middle and south Texas coast where *Borrichia frutescens / Spartina spartinae* Shrubland (CEGL004617) dominates less saline, higher ground than this community (CEGL003924).

NatureServe identified the perennial glasswort plants at Fort Pulaski as *Sarcocornia pacifica* using the recent key in Weakley (2007), which follows Flora of North America (FNA Editorial Committee 2003). The perennial glassworts on the U.S. East Coast have been called *Sarcocornia perennis* in the past (Kartesz 1999), and their taxonomy remains unsettled. For the time being, NatureServe will continue to follow the Kartesz (1999) nomenclature in our global descriptions and U.S. National Vegetation Classification association names.

Global Similar Associations:

- *Borrichia frutescens / Spartina spartinae* Shrubland (CEGL004617)

Global Related Concepts:

- Glasswort-Saltwort Series (Diamond 1993) B
- Salt Shrub (Low Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is found in wide bands at the upper side of the salt panne marsh on the south side of Cumberland Island, adjacent to *Juncus roemerianus* herbaceous marsh and *Sarcocornia pacifica* herbaceous marsh. It was also sampled along the marsh-side perimeter of a dredge-spoil island, and likely occurs in additional bands in shallow salt marsh along the southeastern side of the island.

Global Range: This association is found in coastal areas from North Carolina to Texas.
Nations: US
States/Provinces: AL, FL, GA, LA?, MS, NC, SC, TX, VA?
TNC Ecoregions: 31:C, 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 231Fb:CCP, 232Cb:CC?, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 232Gb:CCC, 255Dc:CPP

Federal Lands: NPS (Canaveral, Cape Lookout, Cumberland Island, Fort Pulaski, Timucuan?); USFS (Croatan); USFWS (Anahuac, Aransas, Back Bay?, Big Boggy, Brazoria, Laguna Atascosa, Matagorda Island, McFaddin, San Bernard, Texas Point)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.041, CUIS.090, CUIS.093.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley
References: Diamond 1993, FNA Editorial Committee 2003, FNAI 1990, FNAI 1992a, Govus 1998, Kartesz 1999, McAlister and McAlister 1993, McAlister and McAlister 1995, Peet et al. unpubl. data 2002, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., Weakley 2007

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.041, CUIS.090, CUIS.093.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley
References: Diamond 1993, FNA Editorial Committee 2003, FNAI 1990, FNAI 1992a, Govus 1998, Kartesz 1999, McAlister and McAlister 1993, McAlister and McAlister 1995, Peet et al. unpubl. data 2002, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., Weakley 2007

Dwarf-shrubland (IV.)

Tidal needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.2.N.c.)

Batis maritimaTidal Dwarf-shrubland Alliance (A.1111)

Alliance Concept

Summary: This alliance consists of small to large tidal flats dominated by *Batis maritima* (turtleweed), typically with saltwater-tidal irregularly flooded hydrology. Other species can include *Sarcocornia perennis* (chickenclaws), *Sporobolus virginicus* (seashore dropseed), *Borrichia frutescens* (bushy seaside-tansy), *Suaeda linearis* (annual seepweed), *Lycium carolinianum* (Carolina desert-thorn), *Spartina spartinae* (gulf cordgrass), *Monanthochloe littoralis* (shoregrass), *Sesuvium portulacastrum* (shoreline seapurslane), and *Blutaparon vermiculare* (silverhead). This alliance occurs especially in salt panne situations, where tidal saltwater evaporates, augmenting salinity. This is a subtropical alliance, which ranges northwards into the warmest portions of the temperate southeastern United States (e.g., Florida and Texas). This community may occur in areas up to at least 100 hectares.

Similar Alliances:

- *Sarcocornia pacifica - (Distichlis spicata, Spartina alterniflora)* Tidal Dwarf-shrubland Alliance (A.1705)--ranges from the Gulf Coast to the northern Atlantic coast of the United States, and though *Batis maritima* is a component in this alliance, it would only dominate small patches within occurrences.

Similar Alliance Comments: This is a subtropical alliance, dominated by *Batis maritima*, which ranges northwards into the warmest portions of the temperate southeastern United States. It is not regarded as occurring in the South Atlantic Coastal Plain. It is best developed in the United States in Florida and the south-central coast of Texas and may be distinguished from the similar alliance (A.1705) by the dominance of *Batis maritima*. These two alliances can be difficult to distinguish along the upper Texas coast where their ranges overlap.

Related Concepts:

- *Batidion maritimae* Alliance (Borhidi 1991) ?
- *Batis-Salicornia-Sesuvium* (Olmsted et al. 1981) ?
- Glasswort-Saltwort Series (Diamond 1993) I
- Saltwort Scrub -- 11.4 (Dansereau 1966) ?

Alliance Description

Environment: This alliance occurs in lower tidal flats and low areas of higher tidal flats, within the reach of regular high tides. It is regularly to irregularly flooded by shallow brackish waters. As these waters evaporate, high concentrations of salt accumulate, producing hypersaline conditions.

Vegetation: This alliance is dominated by *Batis maritima* (turtleweed) sometimes in association with *Sarcocornia perennis* (chickenclaws), *Sporobolus virginicus* (seashore dropseed), *Borrichia frutescens* (bushy seaside-tansy), *Suaeda linearis* (annual seepweed), *Lycium carolinianum* (Carolina desert-thorn), *Spartina spartinae* (gulf cordgrass), *Sesuvium portulacastrum* (shoreline seapurslane),

and *Blutaparon vermiculare* (silverhead). Algal mats of blue-green and sometimes green algae are characteristically present, visible even in densely vegetated pannes.

Alliance Distribution

Range: This is a subtropical alliance, which ranges northwards into the warmest portions of the temperate southeastern United States. This alliance is found in Florida, Texas, and possibly in Alabama, Louisiana, Mississippi, and the Mexican state of Tamaulipas. It is also found in the Caribbean in Puerto Rico, the Bahamas, Cuba, Jamaica, Martinique, and elsewhere in the West Indies and other tropical countries.

Nations: BS, CU, JM, MQ, MX, PR, US, XB
SubNations: AL?, FL, GA, LA?, MS?, MXTM?, TX
TNC Ecoregions: 30:C, 31:C, 53:C, 54:C, 55:C, 56:C
USFS Ecoregions: 231Fb:CCC, 232Ce:CCC, 232Da:CCC, 232Dc:CCC, 232De:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCC, 255Dc:CCC, 315F:CC, 411Ae:CCC, 411Af:CCC, 411Ag:CCC, M411A:CC

Federal Lands: DOD (Guantanamo Bay); NPS (Canaveral, Everglades, Fort Frederica?, Fort Matanzas, Fort Pulaski, Timucuan?); USFWS (Aransas, Big Boggy, Brazoria, Laguna Atascosa, Matagorda Island, San Bernard)

(CEGL003956) Turtleweed - Swampfire Dwarf-shrubland
Batis maritima - Sarcocornia pacifica Dwarf-shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.)
Physiognomic Subgroup	Natural/Semi-natural extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.N.)
Formation	Tidal needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.2.N.c.)
Alliance	*Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)
Alliance (English name)	Turtleweed Tidal Dwarf-shrubland Alliance; Planta de Sal Dwarf-shrubland Alliance
Association	*Batis maritima - Sarcocornia pacifica* Dwarf-shrubland
Association (English name)	Turtleweed - Swampfire Dwarf-shrubland
Ecological System(s):	South Texas Salt and Brackish Tidal Flat (CES301.461)
	Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)
	Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508)

Element Concept

Global Summary: This association includes regularly to irregularly flooded tidal areas dominated (often with 95% or more cover) by *Batis maritima* (turtleweed). Other species can include *Sarcocornia pacifica* (Pacific swampfire), *Sporobolus virginicus* (seashore dropseed), *Borrichia frutescens* (bushy seaside-tansy), *Suaeda* (seepweed) sp., *Lycium carolinianum* (Carolina desert-thorn), *Spartina spartinae* (gulf cordgrass), *Monanthochloe littoralis* (shoregrass), *Sesuvium portulacastrum* (shoreline seapurslane), and *Blutaparon vermiculare* (silverhead). This community generally lacks trees, though scattered individuals of *Avicennia germinans* (black mangrove) can occur in Florida and southern Texas. It may occur as a narrow band or occupy areas up to at least 100 hectares. This is generally a subtropical community, which also ranges northwards into the warmest portions of the temperate southeastern United States.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Environment: This association occurs in lower tidal flats and low areas of higher tidal flats, within the reach of regular high tides. It is regularly to irregularly flooded by shallow brackish waters. As these waters evaporate, high concentrations of salt accumulate, producing hypersaline conditions.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Vegetation: This community is dominated by *Batis maritima* (turtleweed) sometimes in association with *Sarcocornia pacifica* (Pacific swampfire), *Sporobolus virginicus* (seashore dropseed), *Borrichia frutescens* (bushy seaside-tansy), *Suaeda linearis* (annual seepweed), *Suaeda conferta* (beach seepweed) (in southern Texas), *Lycium carolinianum* (Carolina desert-thorn), *Spartina spartinae* (gulf cordgrass), *Sesuvium portulacastrum* (shoreline seapurslane), and *Blutaparon vermiculare* (silverhead). Algal mats of blue-green and sometimes green algae are characteristically present, visible even in densely vegetated pannes.

Other Noteworthy Species

Global

Animal Species	I-Rank	Note
Grus americana (whooping crane)	G1	Federally listed endangered; globally critically imperiled

Conservation Status Rank

Global Rank & Reasons: G5 (15-May-1995). This is a common tidal flat community along the Gulf Coast of Texas and Florida. It may occur as a narrow band or occupy areas up to at least 100 hectares.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: This association is currently known only from Florida, Georgia and the southern coast of Texas and may be distinguished from *Sarcocornia pacifica - (Batis maritima, Distichlis spicata)* Dwarf-shrubland (CEGL002278) by the dominance of *Batis maritima*. *Sarcocornia pacifica - (Batis maritima, Distichlis spicata)* Dwarf-shrubland (CEGL002278) ranges along the Gulf Coast of the United States, and though *Batis maritima* is a component in this association, it is rarely dominant, and then only at small scales. These two associations can be difficult to distinguish along the middle and upper Texas coast where their ranges overlap.

NatureServe identified the perennial glasswort plants at Fort Pulaski as *Sarcocornia pacifica* using the recent key in Weakley (2007), which follows Flora of North America (FNA Editorial Committee 2003). The perennial glassworts on the U.S. East Coast have been called *Sarcocornia perennis* in the past (Kartesz 1999), and their taxonomy remains unsettled. For the time being, NatureServe will continue to follow the Kartesz (1999) nomenclature in our global descriptions and U.S. National Vegetation Classification association names.

Global Similar Associations:

- *Salicornia (virginica, bigelovii, maritima) - Spartina alterniflora* Herbaceous Vegetation (CEGL004308)
- *Sarcocornia pacifica* - (*Batis maritima, Distichlis spicata*) Dwarf-shrubland (CEGL002278)

Global Related Concepts:

- Glasswort-Saltwort Series (Diamond 1993) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Range: This association is currently only known from Texas, Georgia and Florida. It may also occur in Alabama, Mississippi, and Louisiana, and the Mexican state of Tamaulipas. It does not extend to South Carolina.

Nations: MX?, US
States/Provinces: AL?, FL, GA, LA?, MS?, MXTM?, TX
TNC Ecoregions: 30:C, 31:C, 53:C, 54:C, 55:C, 56:C
USFS Ecoregions: 231Fb:CCC, 232Ce:CCC, 232Da:CCC, 232Dc:CCC, 232De:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCC, 255Dc:CCC, 315F:CC, 411Ae:CCC, 411Af:CCC, 411Ag:CCC, M411:C

Federal Lands: NPS (Canaveral, Everglades, Fort Frederica?, Fort Matanzas, Fort Pulaski, Timucuan?); USFWS (Aransas, Big Boggy, Brazoria, Laguna Atascosa, Matagorda Island, San Bernard)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: A.S. Weakley and K.D. Patterson
References: Diamond 1993, FNA Editorial Committee 2003, FNAI 1992a, Govus 1998, Johnston 1952, Kartesz 1999, McAlister and McAlister 1993, McAlister and McAlister 1995, Schotz pers. comm., Southeastern Ecology Working Group n.d., Weakley 2007

Sarcocornia pacifica - (Distichlis spicata, Spartina alterniflora) Tidal Dwarf-shrubland Alliance (A.1705)

Alliance Concept

Summary: Tidally flooded hypersaline flats or very shallow depressions, dominated by halophytic herbs, including *Sarcocornia perennis* (chickenclaws), *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), *Distichlis spicata* (inland saltgrass), and stunted *Spartina alterniflora* (smooth cordgrass). Total vegetative cover is quite variable in pannes, from near total absence of vascular plants to a dense cover of *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), *Sarcocornia perennis* (chickenclaws), or *Spartina alterniflora* (smooth cordgrass). *Limonium carolinianum* (Carolina sealavender) is another common associate. In the southern portions of its distribution, *Monanthochloe littoralis* (shoregrass) and *Batis maritima* (turtleweed) can be major components. Algal mats are characteristically present, visible even in densely vegetated pannes. Blue-green algae are an important component of this community, in some cases contributing significantly more biomass than do vascular species. The following algae were noted to occur in association with *Spartina alterniflora* (smooth cordgrass) in the littoral zone of a Massachusetts salt marsh: *Oscillatoria subuliformis*, *Oscillatoria amphibia*, *Lyngbea* spp., *Microcoleus chthonoplastes*, *Nodularia harveyana*, *Hydrocoleum lyngbyaceum*, *Symploca* spp. (Webber 1967). Diagnostic species are *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), and *Sarcocornia perennis* (chickenclaws). Vegetation of this alliance 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, or by mosquito ditch levees which create small impoundments. This community is regularly to irregularly flooded by nearby brackish water. Bare peat and/or mucky soils are prevalent (up to 85% bare soils), and standing water covers this community at high tide.

Similar Alliances:

- *Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)

Similar Alliance Comments: This is a temperate alliance, dominated by the perennial glasswort *Sarcocornia perennis*. It is best developed in the United States in the Gulf and upper to mid Atlantic

coasts and may be distinguished from the similar alliance (A.1111) by the lack of dominance of *Batis maritima*. These two alliances can be difficult to distinguish along the upper Texas coast where their ranges overlap.

Related Concepts:

- Glasswort-Saltwort Series (Diamond 1993) ?
- Salt Flat (Wieland 1994b) ?
- Salt Flat (Nelson 1986) ?
- Salt Flat (Schafale and Weakley 1990) ?

Alliance Description

Environment: Tidally flooded hypersaline flats or very shallow depressions, dominated by halophytic herbs. Vegetation of this alliance 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, or by mosquito ditch levees which create small impoundments. This community is regularly to irregularly flooded by nearby brackish water. Bare peat and/or mucky soils are prevalent (up to 85% bare soils), and standing water covers this community at high tide.

Vegetation: Tidally flooded hypersaline flats or very shallow depressions, dominated by halophytic herbs, including *Sarcocornia perennis* (chickenclaws), *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), *Distichlis spicata* (inland saltgrass), and stunted *Spartina alterniflora* (smooth cordgrass). Total vegetative cover is quite variable in pannes, from near total absence of vascular plants to a dense cover of *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), *Sarcocornia perennis* (chickenclaws), or *Spartina alterniflora* (smooth cordgrass). *Limonium carolinianum* (Carolina sealavender) is another common associate. In the southern portions of its distribution, *Monanthochloe littoralis* (shoregrass) and *Batis maritima* (turtleweed) can be major components. Algal mats are characteristically present, visible even in densely vegetated pannes. Blue-green algae are an important component of this community, in some cases contributing significantly more biomass than do vascular species. The following algae were noted to occur in association with *Spartina alterniflora* (smooth cordgrass) in the littoral zone of a Massachusetts salt marsh: *Oscillatoria subuliformis*, *Oscillatoria amphibia*, *Lyngbea* spp., *Microcoleus chthonoplastes*, *Nodularia harveyana*, *Hydrocoleum lyngbyaceum*, *Symploca* spp. (Webber 1967). Diagnostic species are *Salicornia bigelovii* (dwarf saltwort), *Salicornia virginica* (Virginia glasswort), and *Sarcocornia perennis* (chickenclaws).

Alliance Distribution

Range: This alliance is found in the southern United States and adjacent Mexico, ranging from South Carolina to Florida, west to Texas and Tamaulipas, Mexico.

Nations: CA?, MX, US
SubNations: AL, FL, GA, LA, MS, MXTM, SC, TX

TNC Ecoregions: 30:P, 31:C, 41:P, 53:C, 54:P, 55:C, 56:C, 57:C, 58:C, 62:C, 63:C
USFS Ecoregions: 212C:PP, 212Db:PPP, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ae:CC?, 221Ak:CCC, 221B:CC, 221Dc:CPP, 231Fb:CCC, 232Aa:CCC, 232Ab:CCC, 232Ac:CCC, 232Bb:CCP, 232Bc:CCP, 232Bd:CCP, 232Bx:CC?, 232Bz:CCC, 232Cb:CC?, 232Ce:CCC, 232Ch:CCP, 232Ci:CCP, 232Db:CC?, 232Dc:CCC, 232Dd:CCC, 232De:CCC, 232Eb:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCC, 255Da:CCC, 255Dc:CCC, 315F:PP

Federal Lands: NPS (Acadia, Assateague Island, Canaveral, Cumberland Island, Fort Frederica?, Fort Pulaski, Gulf Islands, Timucuan); USFWS (Anahuac, Aransas, Brazoria, Matagorda Island, McFaddin, San Bernard, Texas Point)

(CEGL002278) Salt Flat (Swampfire Type)
Sarcocornia pacifica - (Batis maritima, Distichlis spicata) Dwarf-shrubland
Swampfire - (Turtleweed, Inland Saltgrass) Dwarf-shrubland

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.)
Physiognomic Subgroup	Natural/Semi-natural extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.N.)
Formation	Tidal needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.2.N.c.)
Alliance	*Sarcocornia pacifica - (Distichlis spicata, Spartina alterniflora)* Tidal Dwarf-shrubland Alliance (A.1705)
Alliance (English name)	Swampfire - (Inland Saltgrass, Smooth Cordgrass) Tidal Dwarf-shrubland Alliance
Association	*Sarcocornia pacifica* - (*Batis maritima, Distichlis spicata*) Dwarf-shrubland
Association (English name)	Swampfire - (Turtleweed, Inland Saltgrass) Dwarf-shrubland
Association (Common name)	Salt Flat (Swampfire Type)
Ecological System(s):	Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
	Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471)
	South Texas Salt and Brackish Tidal Flat (CES301.461)
	Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)
	Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh (CES203.468)

Element Concept

Global Summary: This is one of several associations found in tidally influenced hypersaline areas along the southern Atlantic Coast and Gulf of Mexico region. In contrast to other tidal salt flats or pannes of this region, examples attributable to this type are dominated by the succulent dwarf-shrub

Sarcocornia pacifica (Pacific swampfire) while stands dominated by *Batis* (turtleweed) or *Salicornia* (pickleweed) are accommodated by other associations [see *Batis maritima* - *Sarcocornia pacifica* Dwarf-shrubland (CEGL003956) and *Salicornia (virginica*, *bigelovii*, *maritima)* - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308), respectively]. Examples of this association may occur in patches throughout this relatively large range. They vary somewhat locally in expression, but all tend to exhibit low vascular plant diversity, dominated by halophytic species. In addition to *Sarcocornia pacifica* (Pacific swampfire), other commonly encountered species may include *Salicornia bigelovii* (dwarf saltwort), *Distichlis spicata* (inland saltgrass), and sometimes stunted *Spartina alterniflora* (smooth cordgrass). Other typical species can include *Batis maritima* (turtleweed), *Suaeda* (seepweed) spp., *Sporobolus virginicus* (seashore dropseed), *Sesuvium portulacastrum* (shoreline seapurslane), and *Limonium carolinianum* (Carolina sealavender). Total vegetative cover is quite variable, from near total absence of vascular plants to a dense cover of the nominal species. Algal mats are characteristically present, visible even in densely vegetated pannes. Blue-green algae may contribute significantly more biomass than vascular species.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This swampfire salt flat dwarf-shrubland was sampled once on Cumberland Island. The site is tidally flooded and has very poorly drained sand soil. The unvegetated surface is dominated by bare soil (95% cover) with some leaf litter (5%). A jetty is located nearby.

Global Environment: Typically, this vegetation tends to develop in lower tidal flats and shallow depressions within upper tidal flats and high salt marshes where drainage is poor. These areas flood during high tides, and salt accumulates as the water evaporates during low tides, producing hypersaline conditions, forming salt pannes.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is strong dominated by *Sarcocornia pacifica* (Pacific swampfire) in the moderately dense (70% cover) herbaceous layer. Additional taxa found in lesser amounts include *Borrichia frutescens* (bushy seaside-tansy), *Distichlis spicata* (inland saltgrass), *Limonium carolinianum* (Carolina sealavender), *Salicornia bigelovii* (dwarf saltwort), and *Spartina alterniflora* (smooth cordgrass). This constitutes all the plant species in the sampled plot.

Global Vegetation: This community is dominated by the halophytic, succulent dwarf-shrub *Sarcocornia pacifica* (Pacific swampfire) and other halophytes, including *Salicornia bigelovii* (dwarf saltwort), *Distichlis spicata* (inland saltgrass), and sometimes stunted *Spartina alterniflora* (smooth cordgrass). Other typical species can include *Suaeda* (seepweed) spp., *Sporobolus virginicus* (seashore dropseed), *Sesuvium portulacastrum* (shoreline seapurslane), and *Limonium carolinianum* (Carolina sealavender). Algal mats are characteristically present, visible even in densely vegetated pannes. Blue-green algae may contribute significantly more biomass than vascular species. Texas examples, of alternately wet and dry saline soils along the Gulf Coast, may contain *Monanthochloe littoralis* (shoregrass), *Rayjacksonia phyllocephala* (camphor daisy), *Borrichia frutescens* (bushy

seaside-tansy), *Maytenus phyllanthoides* (Florida mayten), *Suaeda* (seepweed) spp., *Sesuvium portulacastrum* (shoreline seapurslane), and *Sporobolus virginicus* (seashore dropseed).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Borrichia frutescens* (bushy seaside-tansy)
Herb (field)	Forb	*Limonium carolinianum* (Carolina sealavender), *Sarcocornia pacifica* (Pacific swampfire)
Herb (field)	Graminoid	*Distichlis spicata* (inland saltgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Distichlis spicata* (inland saltgrass), *Sarcocornia pacifica* (Pacific swampfire)

Conservation Status Rank

Global Rank & Reasons: G4 (15-Dec-1994). This is a common tidal flat community along the Gulf and South Atlantic coasts of the United States.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: This association is dominated by *Sarcocornia pacifica* and may be distinguished from *Batis maritima - Sarcocornia pacifica* Dwarf-shrubland (CEGL003956) by the lack of dominance by *Batis maritima*. These two associations can be difficult to distinguish along the middle and upper Texas coast where their ranges overlap. A similar community, *Salicornia (virginica, bigelovii, maritima) - Spartina alterniflora* Herbaceous Vegetation (CEGL004308), occurs along the mid- and northern Atlantic Coast.

NatureServe identified the perennial glasswort plants at Fort Pulaski as *Sarcocornia pacifica* using the recent key in Weakley (2007), which follows Flora of North America (FNA Editorial Committee 2003). The perennial glassworts on the U.S. East Coast have been called *Sarcocornia perennis* in the past (Kartesz 1999), and their taxonomy remains unsettled. For the time being, NatureServe will continue to follow the Kartesz (1999) nomenclature in our global descriptions and U.S. National Vegetation Classification association names.

Global Similar Associations:

- *Batis maritima - Sarcocornia pacifica* Dwarf-shrubland (CEGL003956)
- *Salicornia (virginica, bigelovii, maritima) - Spartina alterniflora* Herbaceous Vegetation (CEGL004308)--similar habitat with a more northerly range along the mid and northern Atlantic coasts.

Global Related Concepts:

- Glasswort-Saltwort Series (Diamond 1993) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This community forms a wide swath on the salt panne on the south side of Cumberland Island to the west of the jetty. Here it is a remarkably intact representation of this community type. It also likely occurs further east within the marsh south of Dungeness, in the vicinity of the dredge-spoil islands and Raccoon Keys. This association was not documented at Fort Frederica as part of this project, although it is likely that it does occur at the park.

Global Range: This community ranges from the Atlantic Coast of South Carolina across the Gulf of Mexico region of the United States into Mexico.

Nations: MX, US
States/Provinces: AL:S1, FL, GA, LA, MS, MXTM, SC, TX
TNC Ecoregions: 31:C, 53:C, 55:C, 56:C, 57:?
USFS Ecoregions: 231Fb:CCC, 232Ce:CCC, 232Db:CC?, 232Dc:CCC, 232Dd:CCC, 232De:CCC, 232Eb:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCC, 255Da:CCC, 255Dc:CCC, 315F:PP

Federal Lands: NPS (Canaveral, Cumberland Island, Fort Frederica?, Fort Pulaski, Gulf Islands, Timucuan); USFWS (Anahuac, Aransas, Brazoria, Matagorda Island, McFaddin, San Bernard, Texas Point)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.016.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: R.E. Evans
References: Diamond 1993, FNA Editorial Committee 2003, Govus 1998, Kartesz 1999, Peet et al. unpubl. data 2002, Schotz pers. comm., Southeastern Ecology Working Group n.d., Weakley 2007, Wieland 1994a, Wieland 1994b, Wieland 2000b

Herbaceous Vegetation (V.)

Medium-tall sod tropical or subtropical grassland (V.A.1.N.b.)

Stenotaphrum secundatum Herbaceous Alliance (A.1139)

Alliance Concept

Summary: This alliance is comprised of planted or semi-natural grasslands of *Stenotaphrum secundatum* (St. Augustine grass), occurring either as a monoculture or with a mix of native and non-native species.

Related Concepts:

- St. Augustine Grass Sward -- 49.6 (Dansereau 1966) ?

Alliance Description

Vegetation: Stands of this alliance are dominated by *Stenotaphrum secundatum* (St. Augustine grass), either as a monoculture or with a mix of native and non-native species.

Alliance Distribution

Range: This alliance is found in Puerto Rico, the Bahamas, Florida and possibly Georgia.
Nations: BS, PR, US
SubNations: FL, GA?
TNC Ecoregions: 54:C, 55:C, 56:P
USFS Ecoregions: 232Ce:CPP, 232Gb:CCC, M411A:CC
Federal Lands: NPS (Canaveral, Castillo de San Marcos, Fort Frederica, Timucuan?)

(CEGL004883) St. Augustine Grass Herbaceous Vegetation

Stenotaphrum secundatum Herbaceous Vegetation [Provisional]

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Tropical or subtropical grassland (V.A.1.)
Physiognomic Subgroup	Natural/Semi-natural tropical or subtropical grassland (V.A.1.N.)
Formation	Medium-tall sod tropical or subtropical grassland (V.A.1.N.b.)
Alliance	*Stenotaphrum secundatum* Herbaceous Alliance (A.1139)
Alliance (English name)	St. Augustine Grass Herbaceous Alliance
Association	*Stenotaphrum secundatum* Herbaceous Vegetation [Provisional]
Association (English name)	St. Augustine Grass Herbaceous Vegetation

Element Concept

Global Summary: This association consists of planted or semi-natural grasslands dominated by *Stenotaphrum secundatum* (St. Augustine grass) with varying degrees of native composition

remaining, on a wide variety of soils and sites occurring in Florida and possibly in other states and ecoregions.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Environment: This association consists of planted or semi-natural grasslands of *Stenotaphrum secundatum*.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Vegetation: This association is dominated by *Stenotaphrum secundatum* (St. Augustine grass) occurring either as a monoculture or with a mix of native and non-native species, including the native species *Ambrosia artemisiifolia* (annual ragweed), *Drymaria cordata* (whitesnow), and *Hydrocotyle umbellata* (manyflower marshpennywort), and exotic species *Cynodon dactylon* (Bermudagrass), *Medicago lupulina* (black medick), *Oxalis corniculata* (creeping woodsorrel), *Paspalum notatum* (bahiagrass), and *Poa annua* (annual bluegrass).

Other Noteworthy Species

Global

Exotic and Invasive Species	I-Rank	Note
Cynodon dactylon (Bermudagrass)	Medium /Low	exotic
Medicago lupulina (black medick)	Medium/ Insignificant	exotic
Oxalis corniculata (creeping woodsorrel)	-	exotic
Paspalum notatum (bahiagrass)	Insignificant	exotic
Poa annua (annual bluegrass)	Medium /Insignificant	exotic

Conservation Status Rank

Global Rank & Reasons: GNA (modified/managed) (4-Jan-2008).

Classification

Status: Provisional

Classification Confidence: –

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur at Fort

Frederica. Patches of *Stenotaphrum secundatum* are frequent in low, open areas along roads and trails.

Global Range: These planted or semi-natural grasslands occur in Florida and possibly Georgia in the U.S., as well as the Bahamas and Puerto Rico.

Nations: BS, PR, US
States/Provinces: FL, GA?
TNC Ecoregions: 55:C, 56:P
USFS Ecoregions: 232Ce:CPP, 232Gb:CCC, M411A:CC
Federal Lands: NPS (Canaveral, Castillo de San Marcos, Fort Frederica?, Timucuan?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: H. Summer
References: Areces-Mallea et al. 1999, Southeastern Ecology Working Group n.d.

Tall sod temperate grassland (V.A.5.N.a.)

Uniola paniculata Temperate Herbaceous Alliance (A.1199)

Alliance Concept

Summary: This alliance includes dune grasslands, typically with scattered shrubs and forbs, of the southeastern Coastal Plain, with *Uniola* (sea-oats) dominant or codominant. The cover varies from sparse on foredunes and on actively moving sand areas to fairly dense on more stable dunes. In the northern portion of the distribution of this alliance (northern North Carolina and Virginia), *Ammophila breviligulata* (American beachgrass) may be present, indicating a transition towards the V.A.5.N.c *Ammophila breviligulata* (American beachgrass) Herbaceous Alliance (A.1207). On the Chandeleurs and related islands of coastal Louisiana, *Spartina patens* (saltmeadow cordgrass) replaces *Uniola paniculata* (sea-oats) (which is present in small amounts) as the dominant grass. Other typical species of this alliance include *Andropogon* (bluestem) spp., *Cakile* (searocket) spp., *Cenchrus* (sandbur) spp., *Chamaesyce* (sandmat) spp., *Croton punctatus* (gulf croton), *Hydrocotyle bonariensis* (largeleaf pennywort), *Iva imbricata* (seacoast marshelder), *Physalis walteri* (Walter's groundcherry), *Spartina patens* (saltmeadow cordgrass), and *Strophostyles helvula* (trailing fuzzybean). In the southern part of the range, additional forbs and vines include *Helianthus debilis* (cucumberleaf sunflower), *Ipomoea pes-caprae* (bayhops), *Ipomoea imperati* (beach morning-glory), and *Sesuvium* (seapurslane) spp. Oceanwards are the annual-dominated, unstable, upper beach communities, often with trailing vines. Landwards are shrub-dominated communities or grasslands dominated by species other than *Uniola* (sea-oats), such as *Spartina patens* (saltmeadow cordgrass) or *Muhlenbergia filipes* (gulfhairawn muhly). This dune grassland community occurs almost exclusively on sandy, unstable, droughty substrates (Typic Quartzipsamments) 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. The effects of nearly continuous salt spray exclude most other species and maintain the vegetation type.

Similar Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Paspalum monostachyum - (Panicum amarum, Schizachyrium littorale)* Herbaceous Alliance (A.1200)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

Similar Alliance Comments: The boundary and relationship between this alliance (A.1199) and the similar alliance (A.1153) needs to be assessed. To the north of this alliance, dune grasslands are dominated by *Ammophila breviligulata*. L. Smith (pers. comm.) states that "very few if any dunes in Louisiana are dominated by, or even have, *Uniola paniculata*." On the Chandeleurs and related islands of coastal Louisiana, *Spartina patens* replaces *Uniola paniculata* as the dominant grass [also see *Paspalum monostachyum - (Panicum amarum, Schizachyrium littorale)* Herbaceous Alliance (A.1200)]. In the northern portion of the distribution of this alliance (northern North Carolina and

Virginia), *Ammophila breviligulata* may be present, indicating a transition towards the *Ammophila breviligulata* Herbaceous Alliance (A.1207).

Related Concepts:

- Beach Dune (FNAI 1990) ?
- Beach Dune (FNAI 1992a) ?
- Dune Grass (Schafale and Weakley 1990) I
- Maritime Grassland (Nelson 1986) I
- Sea Oats-Bitter Panicum Series (Diamond 1993) ?

Alliance Description

Environment: This dune grassland community occurs almost exclusively on sandy, unstable, droughty substrates (Typic Quartzipsamments) 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. The effects of nearly continuous salt spray exclude most other species and maintain the vegetation type.

Vegetation: Dune grasslands, typically with scattered shrubs and forbs, of the southeastern Coastal Plain, with *Uniola* (sea-oats) dominant or codominant. The cover varies from sparse on foredunes and on actively moving sand areas to fairly dense on more stable dunes. In the northern portion of the distribution of this alliance (northern North Carolina and Virginia), *Ammophila breviligulata* (American beachgrass) may be present, indicating a transition towards the V.A.5.N.c *Ammophila breviligulata* (American beachgrass) Herbaceous Alliance (A.1207). On the Chandeleurs and related islands of coastal Louisiana, *Spartina patens* (saltmeadow cordgrass) replaces *Uniola paniculata* (sea-oats) (which is present in small amounts) as the dominant grass. Other typical species include *Andropogon* (bluestem) spp., *Cakile* (searocket) spp., *Cenchrus* (sandbur) spp., *Chamaesyce* (sandmat) spp., *Croton punctatus* (gulf croton), *Hydrocotyle bonariensis* (largeleaf pennywort), *Iva imbricata* (seacoast marshelder), *Physalis walteri* (Walter's groundcherry), *Spartina patens* (saltmeadow cordgrass), and *Strophostyles helvula* (trailing fuzzybean). In the southern part of the range, additional forbs and vines include *Helianthus debilis* (cucumberleaf sunflower), *Ipomoea pes-caprae* (bayhops), *Ipomoea imperati* (beach morning-glory), and *Sesuvium* (seapurslane) spp. Oceanwards are the annual-dominated, unstable, upper beach communities, often with trailing vines. Landwards are shrub-dominated communities or grasslands dominated by species other than *Uniola* (sea-oats), such as *Spartina patens* (saltmeadow cordgrass) or *Muhlenbergia filipes* (gulfhairawn muhly).

Alliance Distribution

Range: This alliance is found in coastal areas of the southeastern U.S.
Nations: US
SubNations: AL, FL, GA, MS, NC, SC, TX, VA
TNC Ecoregions: 30:P, 31:C, 41:P, 53:C, 54:P, 55:C, 56:C, 57:C, 58:P

USFS Ecoregions: 231Fb:CCC, 232Bg:C??, 232Bz:C??, 232Cb:CCC, 232Ce:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Dd:CCP, 232De:CCC, 232Eb:CCC, 232Ed:CCC, 232Ee:CCC, 232Gb:CCC, 255Dc:CCC

Federal Lands: DOD (Tyndall); NPS (Cape Hatteras, Cape Lookout, Cumberland Island, Fort Matanzas, Fort Sumter, Padre Island, Timucuan); USFWS (Back Bay, Bon Secour, Cape Romain, Matagorda Island)

(CEGL004234) Seaside Greenbrier / Camphorweed - Trailing Wild Bean - (Sea-oats) Herbaceous Vegetation
Smilax auriculata / Heterotheca subaxillaris - Strophostyles helvula - (Uniola paniculata) Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tall sod temperate grassland (V.A.5.N.a.)
Alliance	*Uniola paniculata* Temperate Herbaceous Alliance (A.1199)
Alliance (English name)	Sea-oats Temperate Herbaceous Alliance
Association	*Smilax auriculata / Heterotheca subaxillaris - Strophostyles helvula - (Uniola paniculata)* Herbaceous Vegetation
Association (English name)	Seaside Greenbrier / Camphorweed - Trailing Wild Bean - (Sea-oats) Herbaceous Vegetation
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Element Concept

Global Summary: This coastal grassland community occurs in northeastern Florida, ranging from Volusia County, Florida, northwards into Georgia and South Carolina. In Florida, this community occurs "primarily on the broader barrier islands such as Amelia, Little Talbot, and Anastasia islands" (Johnson and Muller 1993), and "only on prograding coasts" (Johnson and Muller 1993b). The dominance of woody vines and forbs and relative rarity of grasses (*Uniola* (sea-oats) only in 4 of 10 stands, *Spartina patens* (saltmeadow cordgrass) in 2 of 10 stands in northeastern Florida) may separate these communities from related communities in the Carolinas. Other characteristic species recorded from Florida include *Triplasis purpurea* (purple sandgrass), *Sideroxylon tenax* (tough bully), *Yucca gloriosa* (moundlily yucca), *Morella cerifera* (wax-myrtle), *Ipomoea imperati* (beach morning-glory), *Uniola paniculata* (sea-oats), *Spartina patens* (saltmeadow cordgrass), *Hydrocotyle bonariensis* (largeleaf pennywort), *Opuntia pusilla* (cockspur pricklypear), *Opuntia stricta* (erect pricklypear). This community differs from the less woody dune community in the same geographic area, the *Uniola paniculata - Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004040).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This coastal grassland community occurs in northeastern Florida, ranging from Volusia County, Florida, northwards into Georgia and South Carolina. In Florida, this community occurs "primarily on the broader barrier islands such as Amelia, Little Talbot, and Anastasia islands" (Johnson and Muller 1993), and "only on prograding coasts" (Johnson and Muller 1993b).

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: This community is dominated by woody vines and forbs, including *Smilax auriculata* (earleaf greenbrier), *Heterotheca subaxillaris* (camphorweed), *Opuntia pusilla* (cockspur pricklypear), *Opuntia stricta* (erect pricklypear), *Sideroxylon tenax* (tough bully), *Forestiera segregata* (Florida swamp-privet), *Morella cerifera* (wax-myrtle), and *Ipomoea imperati* (beach morning-glory). It is distinguished from *Uniola paniculata - Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004040), a less woody dune community in the same geographic area, by the lack of dominance of *Uniola paniculata* (sea-oats).

Conservation Status Rank

Global Rank & Reasons: G2G3 (13-Aug-1997).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: See Johnson and Muller (1993a, 1993b). Estimated extent of about 1300 acres remaining in Florida. This community extends northward from Florida into Georgia and South Carolina.

Global Similar Associations:

- *Uniola paniculata - Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004040)

Global Related Concepts:

- Dune Grass (Florida Vine Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This coastal grassland community occurs in northeastern Florida, ranging from Volusia County, Florida, northwards into Georgia and South Carolina.

Nations: US
States/Provinces: FL, GA, SC
TNC Ecoregions: 55:C, 56:C
USFS Ecoregions: 232Cb:CCC, 232Ce:CCC, 232Ci:CCP, 232Gb:CCC
Federal Lands: NPS (Cumberland Island?, Fort Sumter, Timucuan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: A.S. Weakley, mod. H. Summer
References: Johnson and Muller 1993a, Johnson and Muller 1993b, Peet et al. unpubl. data 2002, Schafale 2000, Southeastern Ecology Working Group n.d.

(CEGL004040) Sea-oats Dune Grassland
Uniola paniculata - Hydrocotyle bonariensis Herbaceous Vegetation
Sea-oats - Beach Marsh-pennywort Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tall sod temperate grassland (V.A.5.N.a.)
Alliance	*Uniola paniculata* Temperate Herbaceous Alliance (A.1199)
Alliance (English name)	Sea-oats Temperate Herbaceous Alliance
Association	*Uniola paniculata - Hydrocotyle bonariensis* Herbaceous Vegetation
Association (English name)	Sea-oats - Beach Marsh-pennywort Herbaceous Vegetation
Association (Common name)	Sea-oats Dune Grassland
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Element Concept

Global Summary: This dune grassland is the characteristic foredune vegetation along the southern Atlantic Coast, from the northeastern coast of Florida (Fort Matanzas National Monument) ranging northward into coastal North Carolina, east of the range of *Schizachyrium maritimum* (gulf bluestem), and north of the tropical species of southern Florida. *Uniola paniculata* (sea-oats) is the dominant grass. Other characteristic species include *Hydrocotyle bonariensis* (largeleaf pennywort),

Iva imbricata (seacoast marshelder), *Spartina patens* (saltmeadow cordgrass), and *Ipomoea imperati* (beach morning-glory).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This sea-oats dune grassland was sampled twice on Cumberland Island: one site is located in flat behind the foredunes; the other is on a moderate northeast-facing dune slope. These sites are xeric with rapidly drained sand soil. The unvegetated surface is dominated by bare soil/sand (90% cover) with some leaf litter (10%). No disturbance is evident.

Global Environment: This sea-oats beach dune community occurs along the southern Atlantic Coast, from the northeastern coast of Florida (Fort Matanzas National Monument) ranging northward into coastal North Carolina.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate to dense (50-80% cover) herbaceous layer, 1-2 m tall, is strongly dominated by *Uniola paniculata* (sea-oats); additional species may include *Andropogon glomeratus* (bushy bluestem), *Cenchrus* (sandbur) spp., *Cirsium horridulum* (yellow thistle), *Croton punctatus* (gulf croton), *Hydrocotyle bonariensis* (largeleaf pennywort), *Oenothera humifusa* (seabeach evening-primrose), *Panicum amarum* (bitter panicgrass), *Spartina patens* (saltmeadow cordgrass), *Triplasis purpurea* (purple sandgrass), and others. In addition, this community supports state-critically imperiled *Eragrostis secundiflora* (red lovegrass).

Global Vegetation: *Uniola paniculata* (sea-oats) is the dominant grass in this beach dune community. Other characteristic species include *Hydrocotyle bonariensis* (largeleaf pennywort), *Iva imbricata* (seacoast marshelder), *Spartina patens* (saltmeadow cordgrass), *Ipomoea imperati* (beach morning-glory), *Heterotheca subaxillaris* (camphorweed), and *Panicum amarum* (bitter panicgrass).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Forb	*Croton punctatus* (gulf croton), *Oenothera humifusa* (seabeach evening-primrose)
Herb (field)	Graminoid	*Andropogon glomeratus* (bushy bluestem), *Panicum amarum* (bitter panicgrass), *Spartina patens* (saltmeadow cordgrass), *Uniola paniculata* (sea-oats)

Chacteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Uniola paniculata* (sea-oats)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Phyllanthus tenellus (Mascarene Island leaf-flower)	-	exotic

Other Plant Species	GRank	Note
Eragrostis secundiflora (red lovegrass)	G5	state-critically imperiled

Conservation Status Rank

Global Rank & Reasons: G3? (30-Jan-2001). This association is limited to dynamic coastal dunes of the south Atlantic Coastal Plain. It is fairly restricted geographically, and many occurrences have been destroyed or altered by coastal development. Beach driving also impacts these communities.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: Based on Johnson and Muller (1993a). Estimated extent of about 2200 acres remaining in Florida. Distribution in South Carolina needs verification. Characteristic and dominant species all listed for Maritime Grassland (Nelson 1986).

Global Similar Associations:

- *Smilax auriculata / Heterotheca subaxillaris - Strophostyles helvula - (Uniola paniculata)* Herbaceous Vegetation (CEGL004234)
- *Uniola paniculata - (Panicum amarum) - Croton punctatus* Herbaceous Vegetation (CEGL002218)
- *Uniola paniculata - Panicum amarum var. amarulum - Iva imbricata* Herbaceous Vegetation (CEGL004041)--of Panhandle Florida.

Global Related Concepts:

- Beach Dune (FNAI 1990) B
- Northeast Florida beach dune community (Johnson and Muller 1993b) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This grassland association is a dominant feature lining the foredunes of Cumberland Island, ranging from the northern to southern tips of the island.

Global Range: This beach dune vegetation occurs along the southern Atlantic Coast, from the northeastern coast of Florida (Fort Matanzas National Monument) ranging northward into coastal North Carolina.

Nations: US

States/Provinces: FL, GA, NC, SC
TNC Ecoregions: 55:C, 56:C, 57:P
USFS Ecoregions: 232Ce:CCC, 232Gb:CCC

Federal Lands: NPS (Cumberland Island, Fort Matanzas, Fort Sumter, Timucuan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.018, CUIS.115.

Local Description Authors: M.J. Russo and H. Summer, mod. L. Kruse
Global Description Authors: A.S. Weakley and K.D. Patterson, mod. H. Summer
References: FNAI 1990, FNAI 1992a, Johnson and Muller 1993a, Johnson and Muller 1993b, Nelson 1986, Peet et al. unpubl. data 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)

Muhlenbergia filipes Herbaceous Alliance (A.1217)

Alliance Concept

Summary: This alliance includes moist interdune flats dominated or codominated by *Muhlenbergia filipes* (gulfhairawn muhly), from around Nags Head, Dare County, North Carolina, south and west at least to the western coast of peninsular Florida; limits westward not known (the species goes to Texas). These communities are saturated at times, but the coarse sandy substrate drains quickly and are thus placed in upland. A widespread association is codominated by *Muhlenbergia filipes* (gulfhairawn muhly), *Spartina patens* (saltmeadow cordgrass), and *Eustachys petraea* (pinewoods fingergrass). Examples on Cayo Costa and North Captiva islands, Lee County, Florida, are dominated by *Bouteloua hirsuta* (hairy grama), with *Muhlenbergia filipes* (gulfhairawn muhly), *Uniola paniculata* (sea-oats), and more typical southeastern Coastal Plain coastal species. Other characteristic species may include *Ernodea littoralis*, *Chiococca parvifolia* (pineland milkberry), *Lantana depressa var. sanibelensis* (Sanibel shrubverbena), *Trichostema* (bluecurls) [*sp. nov. ined.*], *Ambrosia hispida* (coastal ragweed), *Coccoloba uvifera* (seagrape), *Smilax auriculata* (earleaf greenbrier), *Phyllanthus abnormis* (Drummond's leaf-flower), and *Panicum amarum var. amarulum* (bitter panicgrass).

Classification Comments: Nomenclatural notes on *Muhlenbergia* (C. Nordman/M. Pyne 10-07): NatureServe Ecology varies from Kartesz (1999) on the nomenclature of three related southeastern *Muhlenbergia* taxa. The names in Kartesz (1999) for these plants are *Muhlenbergia capillaris* (Lam.) Trin. var. *capillaris*; *Muhlenbergia capillaris* (Lam.) Trin. var. *filipes* (M.A. Curtis) Chapman ex Beal; and *Muhlenbergia capillaris* (Lam.) Trin. var. *trichopodes* (Ell.) Vasey. We have chosen to treat all three of these at the specific level, as (respectively) *Muhlenbergia capillaris* Lam.; *Muhlenbergia filipes* M.A. Curtis; and *Muhlenbergia expansa* (Poir.) Trin. A more recent innovation, which we will adopt at some point, is the recent recognition that *Muhlenbergia sericea* (Michx.) P.M. Peterson is the correct name (based on nomenclatural priority) for the plant formerly known as *Muhlenbergia filipes* M.A. Curtis (= *Muhlenbergia capillaris var. filipes*) (Gustafson and Peterson 2007).

Similar Alliances:

- *Muhlenbergia capillaris* Herbaceous Alliance (A.1216)

Related Concepts:

- Coastal Berm (FNAI 1992a) ?
- Coastal Berm, *Bouteloua* Savanna subtype (FNAI 1992b) ?
- Maritime Wet Grassland (Schafale and Weakley 1990) I
- Southwest Florida coastal grassland (Johnson and Muller 1992) ?

Alliance Description

Environment: This alliance includes moist interdune flats dominated or codominated by *Muhlenbergia filipes*, from around Nags Head, Dare County, North Carolina, south and west at least

to the western coast of peninsular Florida; limits westward not known (the species goes to Texas). These communities are saturated at times, but the coarse sandy substrate drains quickly and are thus placed in upland.

Vegetation: A widespread association in this alliance is codominated by *Muhlenbergia filipes* (gulfhairawn muhly), *Spartina patens* (saltmeadow cordgrass), and *Eustachys petraea* (pinewoods fingergrass). Examples on Cayo Costa and North Captiva islands, Lee County, Florida, are dominated by *Bouteloua hirsuta* (hairy grama), with *Muhlenbergia filipes* (gulfhairawn muhly), *Uniola paniculata* (sea-oats), and more typical southeastern Coastal Plain coastal species. Other characteristic species may include *Ernodea littoralis* (coughbush), *Chiococca parvifolia* (pineland milkberry), *Lantana depressa var. sanibelensis* (Sanibel shrubverbena), *Trichostema* (bluecurls) [*sp. nov. ined.*], *Ambrosia hispida* (coastal ragweed), *Coccoloba uvifera* (seagrape), *Smilax auriculata* (earleaf greenbrier), *Phyllanthus abnormis* (Drummond's leaf-flower), and *Panicum amarum var. amarulum* (bitter panicgrass).

Alliance Distribution

Range: This alliance is known from around Nags Head, Dare County, North Carolina, south and west at least to the western coast of peninsular Florida; limits westward are not known (the species goes to Texas). It is found in Florida, Georgia, North Carolina, and South Carolina.

Nations: US
SubNations: FL, GA, NC, SC
TNC Ecoregions: 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Ce:CCC, 232Ci:CCC, 232Dc:CC?, 232De:CCC
Federal Lands: NPS (Cape Hatteras, Cape Lookout, Cumberland Island, Timucuan)

(CEGL004051) Southern Hairgrass - Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation
Muhlenbergia filipes - Spartina patens - Eustachys petraea Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	*Muhlenbergia filipes* Herbaceous Alliance (A.1217)
Alliance (English name)	Southern Hairgrass Herbaceous Alliance
Association	*Muhlenbergia filipes - Spartina patens - Eustachys petraea* Herbaceous Vegetation

NVC Classification (continued)

Classification Level	Observed Classification
Association (English name)	Southern Hairgrass - Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation
Ecological System(s):	Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Element Concept

Global Summary: This association represents moist interdune flats codominated by some combination of *Muhlenbergia filipes* (gulfhairawn muhly), *Spartina patens* (saltmeadow cordgrass), and *Eustachys petraea* (pinewoods fingergrass). In Florida this community occurs in narrow bands or swales alternating with higher ridges. These often fill with standing water after rains. In North Carolina and Georgia, it may occupy broader grassy flats between the outer dunes and the salt marsh on the inland side of barrier islands, as well as narrow dune swales. Succession to woody vegetation is indicated by increasing cover of *Morella cerifera* (wax-myrtle) or *Salix caroliniana* (coastal plain willow).

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This southern hairgrass - dune fingergrass herbaceous vegetation was sampled at four locations on Cumberland Island in interdunal flats with moderately well- to well-drained sand soil. The unvegetated surface is dominated by leaf litter (70-90% cover) with some wood (0-1%) and bare soil/sand (10-30%). Evidence of disturbance includes horse trails and grazing and the presence of exotic plant species.

Global Environment: This association represents moist interdune flats dominated (or codominated) by *Muhlenbergia filipes* occurring on sandy or sandy loam soils along the Atlantic Coast from North Carolina south to Florida.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This is a species-rich community defined by the moderate to dense (40-80% cover) herbaceous layer dominated by *Andropogon glomeratus* (bushy bluestem), *Andropogon virginicus* (broomsedge bluestem), and/or *Muhlenbergia filipes* (gulfhairawn muhly). Other common herbs include *Aristida purpurascens* (arrowfeather threeawn), *Cirsium horridulum* (yellow thistle), *Conyza canadensis* (Canadian horseweed), *Cyperus polystachyos* (manyspike flatsedge), *Cyperus retrorsus* (pine barren flatsedge), *Dichanthelium aciculare* (needleleaf rosette grass), *Dichanthelium sabulorum var. thinium* (hemlock rosette grass), *Diodia virginiana* (Virginia buttonweed), *Eragrostis elliottii*, *Eupatorium capillifolium* (dogfennel), *Euthamia caroliniana* (slender goldentop), *Fimbristylis caroliniana* (Carolina fimbry), *Hydrocotyle bonariensis* (largeleaf pennywort), *Hypericum gentianoides* (orangegrass), *Juncus* (rush) spp., *Ludwigia maritima* (seaside primrose-willow), *Paspalum setaceum* (thin paspalum), *Phyla nodiflora* (turkey tangle fogfruit), *Physalis walteri* (Walter's groundcherry), and *Polypremum procumbens* (juniper leaf). In areas undergoing succession to woody vegetation, there may also be a sparse (30%) emergent tree canopy (10-15 m) and very

sparse (5%) subcanopy (5-10 m) of *Pinus taeda* (loblolly pine), as well as a very sparse (5-10%) tall-shrub layer (2-5 m) and very sparse to moderately sparse (5-40%) short-shrub layer (0.5-1 m) most often composed of *Morella cerifera* (wax-myrtle), and occasionally includes *Ilex vomitoria* (yaupon), *Rubus argutus* (sawtooth blackberry), *Salix nigra* (black willow), and *Sideroxylon tenax* (tough bully) (state-vulnerable). Vines of *Smilax auriculata* (earleaf greenbrier) and *Smilax bona-nox* (saw greenbrier) are also common and can form dense clambering masses over short shrubs. In addition, this community supports state-critically imperiled *Eragrostis secundiflora* (red lovegrass).

Global Vegetation: Vegetation is a sparse to very dense (20-100% cover) herbaceous layer (typically 0.5-1 m tall) dominated by native grasses *Muhlenbergia filipes* (gulfhairawn muhly), *Spartina patens* (saltmeadow cordgrass), and *Eustachys petraea* (pinewoods fingergrass) (state-vulnerable). Additional graminoids may include lesser amounts of *Andropogon glomeratus* (bushy bluestem), *Eragrostis spectabilis* (purple lovegrass), *Eremochloa ophiuroides* (centipede grass) (exotic), *Juncus megacephalus* (bighead rush), *Schizachyrium littorale* (shore little bluestem), and *Uniola paniculata* (sea-oats). Forbs may include *Centella erecta* (erect centella), *Gaillardia pulchella* (firewheel), *Heterotheca subaxillaris* (camphorweed), *Phyla nodiflora* (turkey tangle fogfruit), *Sisyrinchium atlanticum* (eastern blue-eyed grass), and *Solidago sempervirens* (seaside goldenrod). A sparse (0-10%) layer of emergent shrubs, including *Baccharis halimifolia* (eastern baccharis), *Morella cerifera* (wax-myrtle), *Sideroxylon tenax* (tough bully), *Smilax bona-nox* (saw greenbrier), and *Smilax auriculata* (earleaf greenbrier), may also be present. This community also supports other species, including *Scleria verticillata* (low nutrush), *Chamaesyce bombensis* (dixie sandmat), *Iva imbricata* (seacoast marshelder), *Mitreola petiolata* (lax hornpod), *Opuntia pusilla* (cockspur pricklypear), *Phyla lanceolata* (lanceleaf fogfruit), *Physalis walteri* (Walter's groundcherry), *Scleria verticillata* (low nutrush), and *Spiranthes vernalis* (spring ladies'-tresses). In Florida, species associates of *Muhlenbergia filipes* (gulfhairawn muhly) include *Eragrostis* (lovegrass) spp., *Andropogon virginicus* (broomsedge bluestem), *Andropogon glomeratus* (bushy bluestem), *Juncus scirpoides* (needlepod rush), and *Fuirena scirpoidea* (southern umbrella-sedge). In addition, *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass) often occupies the deeper portions of the swales. Some examples in North Carolina may also lack *Eustachys petraea* (pinewoods fingergrass) (M. Schafale pers. comm.), and on Cumberland Island in southeastern Georgia, it is infrequent in this community. There may actually be 12 different dominants.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Needle-leaved tree	*Pinus taeda* (loblolly pine)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Ilex vomitoria* (yaupon), *Morella cerifera* (wax-myrtle), *Sideroxylon tenax* (tough bully)
Herb (field)	Vine/Liana	*Smilax auriculata* (earleaf greenbrier), *Smilax bona-nox* (saw greenbrier)

Cumberland Island National Seashore and Fort Frederica National Monument (continued)

Stratum	Lifeform	Species
Herb (field)	Forb	*Eupatorium capillifolium* (dogfennel), *Phyla nodiflora* (turkey tangle fogfruit)
Herb (field)	Graminoid	*Andropogon glomeratus* (bushy bluestem), *Andropogon virginicus* (broomsedge bluestem), *Dichanthelium aciculare* (needleleaf rosette grass), *Muhlenbergia filipes* (gulf hairawn muhly)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Muhlenbergia filipes* (gulf hairawn muhly)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Eremochloa ophiuroides (centipede grass)	–	exotic
Phyllanthus tenellus (Mascarene Island leaf-flower)	–	exotic
Sacciolepis indica (glenwoodgrass)	–	exotic

Other Plant Species	GRank	Note
Eragrostis secundiflora (red lovegrass)	G5	state-critically imperiled

Conservation Status Rank

Global Rank & Reasons: G2 (7-Jan-2000). The range of this association is limited to the southeastern U.S., and it is restricted to coastal habitats. It is threatened by coastal development.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Cumberland Island National Seashore and Fort Frederica National Monument Comments: One of the plots classified here (CUIS 017) is a variant of this association with *Andropogon glomeratus* dominant instead of *Muhlenbergia*.

Global Comments: Nomenclatural notes on *Muhlenbergia* (C. Nordman/M. Pyne 10-07): NatureServe Ecology varies from Kartesz (1999) on the nomenclature of three related southeastern *Muhlenbergia* taxa. The names in Kartesz (1999) for these plants are *Muhlenbergia capillaris* (Lam.) Trin. var. *capillaris*; *Muhlenbergia capillaris* (Lam.) Trin. var. *filipes* (M.A. Curtis) Chapman ex

Beal; and *Muhlenbergia capillaris* (Lam.) Trin. var. *trichopodes* (Ell.) Vasey. We have chosen to treat all three of these at the specific level, as (respectively) *Muhlenbergia capillaris* Lam.; *Muhlenbergia filipes* M.A. Curtis; and *Muhlenbergia expansa* (Poir.) Trin. A more recent innovation, which we will adopt at some point, is the recent recognition that *Muhlenbergia sericea* (Michx.) P.M. Peterson is the correct name (based on nomenclatural priority) for the plant formerly known as *Muhlenbergia filipes* M.A. Curtis (= *Muhlenbergia capillaris var. filipes*) (Gustafson and Peterson 2007). In Florida *Eustachys petraea* is seldom found in dune swales associated with *Muhlenbergia filipes* (A. Johnson pers. comm.?).

Global Similar Associations:

- *Panicum hemitomon - (Cladium mariscus ssp. jamaicense, Muhlenbergia filipes)* Herbaceous Vegetation (CEGL007716)

Global Related Concepts:

- Maritime Wet Grassland (Southern Hairgrass Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association is abundant in sandy soils of the backdune flats and interdune swales on the ocean side of Cumberland Island.

Global Range: In Florida this community is found on prograding barrier islands around the state from Amelia Island (Nassau County) to Cape Canaveral (Brevard County) on the Atlantic Coast, from Dog Island (Gulf County) to Shell Island (Bay County) on the panhandle Gulf Coast, and from Caladesi Island (Pinellas County) to Sanibel Island (Lee County) on the southwest Gulf Coast (FNAI database 1999). *Muhlenbergia filipes* has not been reported from coastal swales on Santa Rosa Island, Okaloosa and Santa Rosa counties, Florida (Johnson et al. 1992a), or from South Padre Island, Texas (Lonard and Judd 1980). It is also known from the Outer Banks of North Carolina, South Carolina, and Cumberland Island, Georgia.

Nations: US
States/Provinces: FL, GA, NC, SC
TNC Ecoregions: 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232Ce:CCC, 232Ci:CCC
Federal Lands: NPS (Cape Hatteras, Cape Lookout, Cumberland Island, Timucuan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.007, CUIS.017, CUIS.052, CUIS.088.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: R.E. Evans, mod. C.W. Nordman and M.J. Russo
References: FNAI 1990, FNAI 1992b, Johnson 1997, Johnson et al. 1992a, Lonard and Judd 1980, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)

Cladium mariscus ssp. jamaicense Seasonally Flooded Temperate Herbaceous Alliance (A.1369)

Alliance Concept

Summary: This alliance consists of marshes dominated by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass) in temperate regions of the southeastern United States. Other typical species include *Woodwardia virginica* (Virginia chainfern), *Morella cerifera* (wax-myrtle), *Toxicodendron radicans* (eastern poison-ivy), and *Persea palustris* (swamp bay). Some communities of this alliance are now often being invaded by the alien tree *Triadica sebifera* (tallowtree).

Similar Alliances:

- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Tropical Herbaceous Alliance (A.1157)--is tropical, being found in the United States only in southern Florida.
- *Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)

Alliance Description

Environment: Stands of this alliance occur in broad to narrow interdune depressions on the Gulf Coast of the United States, in association with "spring-run" streams in peninsular Florida, and freshwater marsh complexes of the St. John region of Florida. Another possible example maybe "sawgrass head," a broad streamhead community with emergent trees on the Osceola National Forest (NatureServe Ecology unpubl. data).

Vegetation: This alliance is dominated by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass). Other typical species include *Woodwardia virginica* (Virginia chainfern), *Morella cerifera* (wax-myrtle), *Toxicodendron radicans* (eastern poison-ivy), and *Persea palustris* (swamp bay). Some communities of this alliance are now often being invaded by the alien tree *Triadica sebifera* (tallowtree).

Alliance Distribution

Range: This alliance is found in Alabama and Florida.
Nations: US
SubNations: AL, FL, GA
TNC Ecoregions: 53:C, 55:C, 56:C
USFS Ecoregions: 232Bf:CCC, 232Ca:CCC, 232Ce:CCC, 232Dc:CCC, 232Ga:CCC, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island); USFS (Ocala, Osceola); USFWS (Bon Secour)

(CEGL004949) Sawgrass Head

Cladium mariscus ssp. jamaicense - Woodwardia virginica Herbaceous Vegetation
Jamaica Swamp Sawgrass - Virginia Chainfern Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Cladium mariscus ssp. jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
Alliance (English name)	Jamaica Swamp Sawgrass Seasonally Flooded Temperate Herbaceous Alliance
Association	*Cladium mariscus ssp. jamaicense* - *Woodwardia virginica* Herbaceous Vegetation
Association (English name)	Jamaica Swamp Sawgrass - Virginia Chainfern Herbaceous Vegetation
Association (Common name)	Sawgrass Head
Ecological System(s):	Southeastern Coastal Plain Interdunal Wetland (CES203.258)

Element Concept

Global Summary: This fresh marsh association dominated by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass) occurs in interdune depressions of the Alabama Gulf Coast and related areas of the Georgia Atlantic Coast, as well as open, streamhead and flatwoods environments in northern Florida. Other typical species include *Woodwardia virginica* (Virginia chainfern), *Morella cerifera* (wax-myrtle), *Toxicodendron radicans* (eastern poison-ivy), *Osmunda regalis var. spectabilis* (royal fern), *Sagittaria lancifolia* (bulltongue arrowhead), *Centella erecta* (erect centella), and *Persea palustris* (swamp bay). Although this is essentially an herbaceous type, shrubs (especially *Morella cerifera* (wax-myrtle) and *Cephalanthus occidentalis* (common buttonbush)) may sometimes have substantial cover. All of these are treated here, even examples with scattered to open shrub cover.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This freshwater marsh association was sampled twice on Cumberland Island in temporarily or permanently flooded depressions with very poorly drained muck soils. It is associated with *Spartina bakeri* freshwater marsh in Lake Whitney and seems to occupy slightly shallower portions of the lake than the *Spartina* association. The unvegetated surface of one site is dominated by leaf litter (90% cover) with some and bare soil (10%), while the other is dominated by standing water (70%) with some leaf litter (30%). Evidence of disturbance includes possible fire suppression.

Global Environment: This community occurs in broad to narrow interdune depressions as well as open, streamhead and flatwoods environments of the South Atlantic Coastal Plain of the United States (NatureServe Ecology unpubl. data). On Cumberland Island, Georgia, this type is found in a

marsh complex that extends along the eastern two-thirds of the island, lying just behind the secondary dunes (Davison 1984). Areas supporting this community hold standing water throughout most years, drying down only during severe droughts when they may be subject to fire.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dense (70-80% cover) herbaceous layer, 1-2 m tall, is codominated almost exclusively by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass) and *Woodwardia virginica* (Virginia chainfern). Additional species include scattered *Acer rubrum* (red maple) and *Nyssa biflora* (swamp tupelo) tall shrubs, *Carex verrucosa* (warty sedge), *Ludwigia* (primrose-willow) sp., and *Spartina bakeri* (sand cordgrass). *Sagittaria latifolia* (broadleaf arrowhead) and *Pontederia cordata* (pickerelweed) were observed on the margins of the community. This constitutes the entire floristic composition of the sampled plot.

Global Vegetation: This association is dominated by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass). Other typical species include *Woodwardia virginica* (Virginia chainfern), *Morella cerifera* (wax-myrtle), *Toxicodendron radicans* (eastern poison-ivy), *Osmunda regalis var. spectabilis* (royal fern), *Sagittaria lancifolia* (bulltongue arrowhead), *Centella erecta* (erect centella), and *Persea palustris* (swamp bay). Shrubs (especially *Morella cerifera* (wax-myrtle) and *Cephalanthus occidentalis* (common buttonbush)) may sometimes have substantial cover. Examples of this association along the Gulf Coast are now often being invaded by the alien tree *Triadica sebifera* (tallowtree). An example in the South Atlantic Coastal Plain (Osceola National Forest) has an emergent layer of *Taxodium ascendens* (pond-cypress) and *Pinus elliottii* (slash pine) above a fairly species-rich ground cover which includes *Ludwigia pilosa* (hairy primrose-willow), *Panicum hemitomon* (maidencane), *Panicum rigidulum* (redtop panicgrass), and several *Rhynchospora* (beaksedge) spp. (NatureServe Ecology unpubl. data).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Cladium mariscus* ssp. *jamaicense* (Jamaica swamp sawgrass)
Herb (field)	Fern or fern ally	*Woodwardia virginica* (Virginia chainfern)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Cladium mariscus* ssp. *jamaicense* (Jamaica swamp sawgrass), *Woodwardia virginica* (Virginia chainfern)

Conservation Status Rank

Global Rank & Reasons: G2? (28-Mar-2003). This type has a relatively narrow geographic range in which it appears to be relatively uncommon and confined to small patches. Extant examples are threatened by fire suppression which allows shrub species to invade. As these shrubs become

established, the hydrology of the community may become altered and eventually drier than herbaceous-dominated forms. Some stands are also threatened by the invasion of the exotic species *Triadica sebifera* which, if well-established, may also cause extirpation of this type.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Similar Associations:

- *Cladium mariscus ssp. jamaicense - Typha domingensis - Fimbristylis caroliniana - Bacopa monnieri* Herbaceous Vegetation (CEGL008591)--occurs farther south.
- *Cladium mariscus ssp. jamaicense* Herbaceous Vegetation (CEGL003940)--occurs as nearly monospecific stands of sawgrass.
- *Panicum hemitomon - (Cladium mariscus ssp. jamaicense, Muhlenbergia filipes)* Herbaceous Vegetation (CEGL007716)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: Wide expanses of this association occur on Cumberland Island in Lake Whitney, and it also probably occurs in other freshwater marshes and wet interdune swales, especially on the north side of the island.

Global Range: This association is found in coastal/maritime-influenced habitats along the coast of Georgia and Alabama, with some inland examples known from northeastern Florida.

Nations: US
States/Provinces: AL, FL, GA
TNC Ecoregions: 53:C, 55:?, 56:C
USFS Ecoregions: 232Ca:CCC, 232Ce:CCC, 232Dc:CCC
Federal Lands: NPS (Cumberland Island); USFS (Osceola); USFWS (Bon Secour)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.121, CUIS.126.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: R.E. Evans
References: Davison 1984, NatureServe Ecology - Southeastern U.S. unpubl. data, Schotz pers. comm., Southeastern Ecology Working Group n.d.

Fimbristylis castanea - Schoenoplectus pungens Seasonally Flooded Herbaceous Alliance (A.1372)

Alliance Concept

Summary: Wetlands dominated or codominated by *Fimbristylis castanea* (marsh fimbry) 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*

(common threesquare) (up to 80% cover). When *Schoenoplectus pungens* (common threesquare) is not as dense, it is most often associated with an even mixture of *Spartina patens* (saltmeadow cordgrass) or *Fimbristylis castanea* (marsh fimbry). In spring, *Schoenoplectus pungens* (common threesquare) is generally dominant with few other associates except *Eleocharis* (spikerush) spp., imparting a distinct aerial photo signature. By late summer a number of other species, such as *Fimbristylis castanea* (marsh fimbry) and *Sabatia stellaris* (rose of Plymouth), contribute more substantial cover. Other herbs are sparse and contribute very little to the overall vegetative cover. These associated species include *Andropogon virginicus* (broomsedge bluestem), *Eleocharis rostellata* (beaked spikerush), *Phragmites australis* (common reed), *Pluchea foetida* (stinking camphorweed), *Juncus scirpoides* (needlepod rush), *Hydrocotyle umbellata* (manyflower marshpennywort), *Eleocharis parvula* (dwarf spikerush), *Panicum amarum var. amarulum* (bitter panicgrass), *Fimbristylis autumnalis* (slender fimbry), *Sabatia stellaris* (rose of Plymouth), *Ptilimnium capillaceum* (herbwilliam), and *Juncus canadensis* (Canadian rush). Diagnostic species are *Schoenoplectus pungens* (common threesquare), *Fimbristylis castanea* (marsh fimbry), *Eleocharis* (spikerush) spp., and *Juncus* (rush) 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* (marsh fimbry), sometimes monospecific, sometimes intermixed with *Triglochin striata* (threerib arrowgrass), *Sesuvium portulacastrum* (shoreline seapurslane), and *Lilaeopsis carolinensis* (Carolina grasswort).

Similar Alliances:

- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Triglochin maritima* Semipermanently Flooded Herbaceous Alliance (A.1681)

Similar Alliance Comments: Additional consideration should be given to the close relationship between this alliance and its component associations and the *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390).

Related Concepts:

- *Juncus scirpoides-Scirpus pungens* interdunal wetland association (McAvoy and Clancy 1994) ?
- *Scirpus-Hydrocotyle* community (Tyndall and Levy 1978) ?
- *Spartina-Scirpus* community (Tyndall and Levy 1978) ?
- Fresh marsh community (Hill 1986) I
- Maritime Wet Grassland (Schafale and Weakley 1990) I
- fresh marsh community (Higgins et al. 1971) I
- wet community of barrier flats? (Travis and Godfrey 1976) ?

Alliance Description

Environment: 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. 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*.

Vegetation: This alliance includes wetlands dominated or codominated by *Fimbristylis castanea* (marsh fimbry) that often occur in interdune swales. *Fimbristylis castanea* (marsh fimbry) ranges along coasts from North Carolina (Au 1974) south to Florida, Texas, Mexico (Gulf and Pacific coasts), and the West Indies (Sauer 1967). This alliance is documented from Assateague Island National Seashore, where it is typically characterized by dense *Schoenoplectus pungens* (common threesquare) (up to 80% cover). When *Schoenoplectus pungens* (common threesquare) is not as dense, it is most often associated with an even mixture of *Spartina patens* (saltmeadow cordgrass) or *Fimbristylis castanea* (marsh fimbry). In spring, *Schoenoplectus pungens* (common threesquare) is generally dominant with few other associates except *Eleocharis* (spikerush) spp., imparting a distinct aerial photo signature. By late summer a number of other species, such as *Fimbristylis castanea* (marsh fimbry) and *Sabatia stellaris* (rose of Plymouth), contribute more substantial cover. Other herbs are sparse and contribute very little to the overall vegetative cover. These associated species include *Andropogon virginicus* (broomsedge bluestem), *Eleocharis rostellata* (beaked spikerush), *Phragmites australis* (common reed), *Pluchea foetida* (stinking camphorweed), *Juncus scirpoides* (needlepod rush), *Hydrocotyle umbellata* (manyflower marshpennywort), *Eleocharis parvula* (dwarf spikerush), *Panicum amarum var. amarulum* (bitter panicgrass), *Fimbristylis autumnalis* (slender fimbry), *Sabatia stellaris* (rose of Plymouth), *Ptilimnium capillaceum* (herbwilliam), and *Juncus canadensis* (Canadian rush). Diagnostic species are *Schoenoplectus pungens* (common threesquare), *Fimbristylis castanea* (marsh fimbry), *Eleocharis* (spikerush) spp., and *Juncus* (rush) 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* (marsh fimbry), sometimes monospecific, sometimes intermixed with *Triglochin striata* (threerib arrowgrass), *Sesuvium portulacastrum* (shoreline seapurslane), and *Lilaeopsis carolinensis* (Carolina grasswort).

Alliance Distribution

Range: This alliance is found in Florida, Delaware, Georgia, Maryland, North Carolina, and Virginia. Its status in South Carolina is unclear.

Nations: US
SubNations: FL, GA?, MD, NC, SC?, VA
TNC Ecoregions: 53:C, 54:P, 55:P, 56:P, 57:C, 58:C
USFS Ecoregions: 232Bz:CCC, 232Cb:CC?, 232Ce:CCP, 232Ch:CC?, 232Ci:CCC, 232Db:CC?, 232Dc:CCC, 232De:CC?, 232Gb:C??

Federal Lands: NPS (Assateague Island, Cape Hatteras, Cumberland Island?); USFWS (Back Bay?)

(CEGL003790) Chestnut Fimbry - Common Threesquare Seasonally Flooded Herbaceous Vegetation
*Fimbristylis castanea - Schoenoplectus pungens S*easonally Flooded Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)
Alliance (English name)	Chestnut Fimbry - Common Threesquare Seasonally Flooded Herbaceous Alliance
Association	*Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Vegetation
Association (English name)	Chestnut Fimbry - Common Threesquare Seasonally Flooded Herbaceous Vegetation
Ecological System(s):	Southeastern Coastal Plain Interdunal Wetland (CES203.258)

Element Concept

Global Summary: This interdunal pond or wet swale community represents vegetation dominated by *Fimbristylis castanea* (marsh fimbry) and *Schoenoplectus pungens* (common threesquare) although relative dominance varies seasonally complicating characterization of this type. Characteristic species include *Schoenoplectus pungens* (common threesquare) in association with *Spartina patens* (saltmeadow cordgrass) and *Fimbristylis castanea* (marsh fimbry). There is usually standing water present in these swales in the spring, when *Schoenoplectus pungens* (common threesquare) is generally dominant with few other associates except species of *Eleocharis* (spikerush). By late summer other species such as *Fimbristylis castanea* (marsh fimbry) contribute more substantial cover. Diagnostic species are *Schoenoplectus pungens* (common threesquare), *Fimbristylis castanea* (marsh fimbry), and *Spartina patens* (saltmeadow cordgrass).

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This vegetation is found in interdunal swales.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: Characteristic species include *Schoenoplectus pungens* (common threesquare) in association with *Spartina patens* (saltmeadow cordgrass) and *Fimbristylis castanea* (marsh fimbry). There is usually standing water present in these swales in the spring, when *Schoenoplectus pungens* (common threesquare) is generally dominant with few other associates except species of *Eleocharis* (spikerush). By late summer other species such as *Fimbristylis castanea* (marsh fimbry) contribute more substantial cover. Diagnostic species are *Schoenoplectus pungens* (common threesquare), *Fimbristylis castanea* (marsh fimbry), and *Spartina patens* (saltmeadow cordgrass). Relative dominance of the dominant species varies from season to season, complicating characterization of this type.

Conservation Status Rank

Global Rank & Reasons: GNR (21-May-2002).

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: This type may possibly occur at Onslow County pond (M. Schafale pers. comm.).

Global Similar Associations:

- *Fimbristylis castanea - Paspalum distichum* Herbaceous Vegetation (CEGL004110)--of Florida.
- *Schoenoplectus pungens - Fimbristylis (castanea, caroliniana)* Herbaceous Vegetation (CEGL004117)--of Chesapeake and Delaware drainages to the north.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: *Fimbristylis castanea* ranges along coasts from North Carolina (Au 1974) south to Florida, Texas, Mexico (Gulf and Pacific coasts), and the West Indies (Sauer 1967). This placeholder would cover the range between Virginia and Florida (i.e., Georgia and the Carolinas).

Nations: US
States/Provinces: GA?, NC, SC?
TNC Ecoregions: 56:P, 57:C
USFS Ecoregions: 232Ce:CCP, 232Ci:CCC
Federal Lands: NPS (Cape Hatteras, Cumberland Island?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: M. Pyne
References: Au 1974, Sauer 1967, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

Juncus effusus Seasonally Flooded Herbaceous Alliance (A.1375)

Alliance Concept

Summary: This alliance includes wetland herbaceous vegetation dominated or codominated by *Juncus effusus* (common rush). These communities are most characteristically seasonally flooded, but in some cases, examples may have temporarily or semipermanently flooded hydrologies. Still, all these are conceptually placed in this alliance, at least until more detailed information is available. These marshy communities vary greatly in size, situation, geographical location, species composition, and naturalness. Some are beaver-made or human-made impoundments. It should be noted that this species has a very wide ecological amplitude, and additional alliances with different hydrologies may need to be defined.

Classification Comments: There are several varieties. The nominate variety (*Juncus effusus var. effusus*) is more northern in its distribution, ranging south only to Idaho and Michigan. *Juncus effusus var. brunneus* and *Juncus effusus var. gracilis* are restricted to the Pacific coast. The southeastern plants are probably *Juncus effusus var. solutus* (Kartesz 1999). There are additional varieties in the southwestern and northeastern states. In Cades Cove (Great Smoky Mountains), *Juncus effusus* codominates with *Andropogon glomeratus*. On Arnold Air Force Base, Tennessee, vegetation dominated by *Juncus effusus* is maintained by mowing. *Juncus effusus*-dominated vegetation is also found along the border of Woods Reservoir at Arnold Air Force Base, where it is often encountered as the first zone of vegetation along the water's edge. This zone stays inundated with water for the majority of the year. *Juncus effusus* and *Scirpus cyperinus* usually dominate and can form thick stands. Other species include *Cyperus* spp., *Typha latifolia*, and *Galium aparine*.

Related Concepts:

- *Juncus effusus* herbaceous alliance (Hoagland 1998a) ?
- Depression Meadow (Nelson 1986) I
- Piedmont/Mountain Semipermanent Impoundment (Schafale and Weakley 1990) I
- Rush-Sedge Series (Diamond 1993) I

Alliance Description

Environment: These marshy communities vary greatly in size, situation, geographical location, species composition, and naturalness. Some are beaver-made or human-made impoundments.

Vegetation: This alliance is currently broadly and literally defined, based on dominance by *Juncus effusus* (common rush). In various parts of its broad range, associated species may include *Andropogon glomeratus* (bushy bluestem), *Cyperus* (flatsedge) spp., *Typha latifolia* (broadleaf cattail), *Scirpus cyperinus* (woolgrass), *Triadenum walteri* (greater marsh St. Johnswort), *Apios americana* (groundnut), and *Galium aparine* (stickywilly).

Dynamics: It should be noted that *Juncus effusus* has a very wide ecological amplitude, and additional alliances with different hydrologies may need to be defined.

Alliance Distribution

Range: This alliance is found in the Southeast states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and elsewhere. The full range in North America is incomplete, but it also includes the Pacific Northwest from British Columbia south to California. The species is widespread in the United States and Canada, including most states and provinces, including Alaska.

Nations: CA, US
SubNations: AL, AR, CA, FL, GA, KY, LA, MS, NC, OK, OR, SC, TN, TX, VA, WA
TNC Ecoregions: 2:C, 14:P, 15:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:P, 56:P, 57:P, 58:C, 59:C
USFS Ecoregions: 222C:CC, 222D:CC, 222Eb:CCC, 222F:CC, 222H:CC, 231Bi:CCC, 231Ca:CCP, 231Cd:CCP, 231Db:CCC, 232Ce:PPP, 242A:CC, 263A:CC, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); DOD (Arnold, Fort Benning); NPS (Blue Ridge Parkway, Carl Sandburg Home, Chickamauga-Chattanooga?, Cumberland Gap, Cumberland Island?, Great Smoky Mountains, Natchez Trace, Point Reyes, Santa Monica Mountains); USFS (Bankhead, Chattahoochee, Cherokee?, Oconee?, Talladega)

(CEGL004112) Rush Marsh
Juncus effusus Seasonally Flooded Herbaceous Vegetation
Common Rush Seasonally Flooded Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
Alliance (English name)	Soft Rush Seasonally Flooded Herbaceous Alliance
Association	*Juncus effusus* Seasonally Flooded Herbaceous Vegetation
Association (English name)	Common Rush Seasonally Flooded Herbaceous Vegetation
Association (Common name)	Rush Marsh
Ecological System(s):	East Gulf Coastal Plain Depression Pondshore (CES203.558)
	East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
	South-Central Interior Small Stream and Riparian (CES202.706)

NVC Classification

Classification Level	Observed Classification
Ecological System(s) (continued):	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)
	Southern and Central Appalachian Bog and Fen (CES202.300)

Element Concept

Global Summary: This broadly defined type represents freshwater marsh vegetation dominated by *Juncus effusus* (common rush). Additional types may be developed as more information becomes available. This vegetation may occur in natural or artificial ponds, including beaver-enhanced ones. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus* (bushy bluestem), *Cyperus* (flatsedge) spp., *Typha latifolia* (broadleaf cattail), *Scirpus cyperinus* (woolgrass), *Triadenum walteri* (greater marsh St. Johnswort), *Apios americana* (groundnut), and *Galium aparine* (stickywilly). This type includes seasonally to temporarily flooded vegetation dominated or codominated by *Juncus effusus* (common rush) in the central and southern Appalachians.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This is a seasonally (to temporarily) flooded marsh vegetation type; it may occur in natural or artificial ponds, including beaver-enhanced ponds, artificial waterways (wet ditches), and disturbed wet fields.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: This type is currently broadly and literally defined, based on dominance by *Juncus effusus* (common rush). In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus* (bushy bluestem), *Carex* (sedge) spp., *Cyperus* (flatsedge) spp., other *Juncus* (rush) spp., *Typha latifolia* (broadleaf cattail), *Scirpus cyperinus* (woolgrass), *Triadenum walteri* (greater marsh St. Johnswort), *Apios americana* (groundnut), and *Galium aparine* (stickywilly). In Georgia, Wharton (1978) cites *Carex rostrata* (beaked sedge), *Carex stipata* (owlfruit sedge), *Schoenoplectus pungens* (common threesquare), and *Sagittaria latifolia* (broadleaf arrowhead) as associates of beaver pond vegetation containing *Juncus effusus* (common rush).

Most Abundant Species

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Juncus effusus* (common rush)

Characteristic Species

Global: *Juncus effusus* (common rush)

Conservation Status Rank

Global Rank & Reasons: G5 (28-Mar-2001). This is a broadly defined, widely distributed, and reasonably secure vegetation type.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: Though this association was not seen at the Bankhead National Forest, it is expected to occur there.

Global Related Concepts:

- Beaver Dam Type (Wharton 1978) ?
- IID6a. Natural Impoundment Pond (Allard 1990) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: The range of this broadly defined association has not been fully described. It is confirmed as occurring in the Central Appalachians and is thought to occur in the Interior Low Plateau, Cumberland Plateau, Southern Ridge and Valley, Southern Blue Ridge, Piedmont, Chesapeake Bay Lowlands, and the Coastal Plain from the Mid-Atlantic to the Upper East Gulf Coastal Plain.

Nations: US
States/Provinces: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA
TNC Ecoregions: 43:C, 44:C, 50:P, 51:C, 52:P, 53:P, 56:P, 57:P, 58:P, 59:C
USFS Ecoregions: 222Eb:CCC, 231Bi:CCC, 231Ca:CPP, 231Cd:CPP, 231Db:CCC, 232Ce:PPP, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); DOD (Arnold, Fort Benning); NPS (Blue Ridge Parkway?, Carl Sandburg Home, Chickamauga-Chattanooga?, Cumberland Island?, Great Smoky Mountains, Natchez Trace); USFS (Bankhead, Cherokee?, Oconee?, Talladega, Talladega (Oakmulgee), Talladega (Talladega)?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: Southeastern Ecology Group
References: Allard 1990, Fleming et al. 2001, Hoagland 1998c, Hoagland 2000, Peet et al. unpubl. data 2002, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC 1998a, Wharton 1978

Panicum hemitomon Seasonally Flooded Temperate Herbaceous Alliance (A.1379)

Alliance Concept

Summary: This alliance encompasses a variety of temperate wetland communities dominated by *Panicum hemitomon* (maidencane), 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.

Classification 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.

Similar Alliances:

- *Aristida palustris - Andropogon (capillipes, glaucopsis) - Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Dichanthelium (erectifolium, wrightianum) - Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance (A.1162)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Alliance (A.1383)

Similar Alliance Comments: These alliances dominated by other taxa are typically more diverse and of lower stature than alliances dominated by *Panicum hemitomon*. There are both tropical and temperate examples of *Panicum hemitomon*-dominated vegetation which are classified separately.

Related Concepts:

- Basin Marsh (FNAI 1992a) I
- Depression Meadow (Nelson 1986) I
- Flatwoods Pond (Smith 1996a) I
- Flatwoods Pond (Smith 1996b) I
- IIE1f. Coastal Plain Small Depression Pond Complex (Allard 1990) I

- Small Depression Pond (Schafale and Weakley 1990) I

Alliance Description

Environment: This alliance occurs in temperate wetlands including various ponds, lakes, depression meadows, flatwoods ponds, pineland ponds, interdune swales, etc.

Vegetation: Stands of this alliance are dominated by *Panicum hemitomon* (maidencane). Common genera in many associations of this alliance include *Eleocharis* (spikerush), *Rhynchospora* (beaksedge), *Xyris* (yelloweyed grass), *Juncus* (rush), *Carex* (sedge), *Typha* (cattail), *Hydrocotyle* (marsh-pennywort), *Cladium* (sawgrass) and *Ludwigia* (primrose-willow).

Alliance Distribution

Range: This alliance is found in Alabama, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Texas, and possibly Virginia.

Nations: US
SubNations: 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, 232Ce: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); NPS (Cumberland Island?, Timucuan); USFS (Angelina, Apalachicola, Conecuh, Croatan, De Soto, Ocala, Osceola); USFWS (Eufaula, McFaddin)

(CEGL007792) Outer Coastal Plain Maidencane Pond

Panicum hemitomon - Pluchea (camphorata, rosea) - Ludwigia spp. Herbaceous Vegetation
Maidencane - (Marsh-fleabane, Rosy Camphorweed) - Seedbox species Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
Alliance (English name)	Maidencane Seasonally Flooded Temperate Herbaceous Alliance

NVC Classification (continued)

Classification Level	Observed Classification
Association	*Panicum hemitomon - Pluchea (camphorata, rosea) - Ludwigia* spp. Herbaceous Vegetation
Association (English name)	Maidencane - (Marsh-fleabane, Rosy Camphorweed) - Seedbox species Herbaceous Vegetation
Association (Common name)	Outer Coastal Plain Maidencane Pond
Ecological System(s):	Central Florida Herbaceous Pondshore (CES203.890)
	East Gulf Coastal Plain Depression Pondshore (CES203.558)
	Southeastern Coastal Plain Natural Lakeshore (CES203.044)

Element Concept

Global Summary: This vegetation represents ponds, or zones of ponds, dominated by *Panicum hemitomon* (maidencane) and various perennial grasses and forbs in the East Gulf Coastal Plain and adjacent ecoregions. This broadly defined association was described to cover shallow ponds (or shallow zones of variable ponds) of the East Gulf Coastal Plain, including limesink ponds and other types. *Pluchea* (camphorweed) spp. (*Pluchea camphorata* (camphor pluchea), *Pluchea rosea* (rosy camphorweed)) are characteristic. Other characteristic species include *Saccharum* (sugarcane) spp., *Scirpus cyperinus* (woolgrass), *Dichanthelium* (rosette grass) spp., *Panicum* (panicgrass) spp., and *Rhynchospora* (beaksedge) spp. in outer zones of shorter hydroperiod, and shorter-stature graminoids and forbs such as *Centella erecta* (erect centella), *Ludwigia* (primrose-willow) spp., *Xyris* (yelloweyed grass) spp., *Hydrocotyle* (marsh-pennywort) spp., *Eleocharis* (spikerush) spp., and *Juncus* (rush) spp. in zones of longer hydroperiod. Some stands may contain *Woodwardia virginica* (Virginia chainfern).

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: This vegetation represents ponds, or zones of ponds, dominated by *Panicum hemitomon* and various perennial grasses and forbs in the East Gulf Coastal Plain and adjacent ecoregions. This broadly defined association was described to cover shallow ponds of the East Gulf Coastal Plain, including limesink ponds and other types. Some stands on the Ocala and Osceola national forests may contain *Woodwardia virginica* and various woody plants. These ponds may be peatier or shadier than some other examples.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: Stands of this vegetation are dominated by *Panicum hemitomon* (maidencane) and various perennial grasses and forbs. *Pluchea* (camphorweed) spp. (*Pluchea camphorata* (camphor pluchea), *Pluchea rosea* (rosy camphorweed)) are characteristic. Other characteristic species include *Saccharum* (sugarcane) spp., *Scirpus cyperinus* (woolgrass), *Dichanthelium* (rosette grass) spp., *Panicum* (panicgrass) spp., and *Rhynchospora* (beaksedge) spp. in outer zones of shorter hydroperiod, and shorter-stature graminoids and forbs such as *Centella erecta* (erect centella), *Ludwigia* (primrose-willow) spp., *Xyris* (yelloweyed grass) spp., *Hydrocotyle* (marsh-pennywort) spp., *Eleocharis* (spikerush) spp., and *Juncus* (rush) spp. in zones of longer hydroperiod. Ponds seen on the De Soto National Forest (Jones and Perry counties, Mississippi) have two distinct zones; one (cf. CEGL007792) is dominated by *Panicum hemitomon* (maidencane) with other grasses and graminoids such as *Saccharum giganteum* (sugarcane plumegrass), *Saccharum brevibarbe*, *Scirpus cyperinus* (woolgrass), *Dichanthelium scabriusculum* (woolly rosette grass), *Panicum rigidulum* (redtop panicgrass), *Leersia* (cutgrass) sp., and *Rhynchospora glomerata* (clustered beaksedge). In addition, *Fuirena breviseta* (saltmarsh umbrella-sedge), *Ludwigia pilosa* (hairy primrose-willow), and *Pluchea rosea* (rosy camphorweed) are also found there. A less diverse zone of longer hydroperiod (cf. CEGL004127) is dominated by low graminoids and forbs. *Eleocharis robbinsii* (Robbins' spikerush) and *Eleocharis melanocarpa* (blackfruit spikerush) may exhibit heavy dominance; *Carex glaucescens* (southern waxy sedge), *Juncus repens* (lesser creeping rush), and *Proserpinaca pectinata* (combleaf mermaidweed) are also typically present. Limesink ponds in the Conecuh National Forest (Alabama) are dominated by *Panicum hemitomon* (maidencane) with *Polygonum hirsutum* (hairy smartweed), *Sagittaria isoetiformis* (quillwort arrowhead), *Centella erecta* (erect centella), *Eupatorium capillifolium* (dogfennel), *Pluchea rosea* (rosy camphorweed), *Ludwigia peploides* (floating primrose-willow), *Hypericum fasciculatum* (peelbark St. Johnswort)?, *Ludwigia* (primrose-willow) sp., *Xyris* (yelloweyed grass) sp., *Hydrocotyle* (marsh-pennywort) sp., *Eleocharis* (spikerush) sp., and *Juncus* (rush) spp. Ponds on the Osceola National Forest (Florida) contain *Panicum hemitomon* (maidencane), *Andropogon glaucopsis* (purple bluestem), *Andropogon virginicus var. virginicus* (broomsedge bluestem), *Eupatorium capillifolium* (dogfennel), *Pluchea rosea* (rosy camphorweed), *Eleocharis* (spikerush), sp. *Bidens mitis* (smallfruit beggarticks), *Cyperus lecontei* (Le Conte's flatsedge), *Ludwigia maritima* (seaside primrose-willow), *Polypremum procumbens* (juniper leaf), *Xyris jupicai* (Richard's yelloweyed grass), *Symphyotrichum lateriflorum var. lateriflorum* (calico aster), *Senna obtusifolia* (Java-bean), *Centella erecta* (erect centella), *Hydrocotyle umbellata* (manyflower marshpennywort), *Lycopus rubellus* (taperleaf water horehound), and *Mikania scandens* (climbing hempvine). Some stands on the Ocala and Osceola national forests which are apparently less diverse may contain *Woodwardia virginica* (Virginia chainfern) and various woody plants (e.g., *Cephalanthus occidentalis* (common buttonbush), *Litsea aestivalis* (pondspice), *Hypericum fasciculatum* (peelbark St. Johnswort), *Hypericum tetrapetalum* (fourpetal St. Johnswort), *Leucothoe racemosa* (swamp doghobble), and *Lyonia lucida* (fetterbush lyonia).

Other Noteworthy Species

Global

Other Plant Species	GRank	Note
Litsea aestivalis (pondspice)	G3	–

Conservation Status Rank

Global Rank & Reasons: G3 (15-Oct-2002). This seasonally flooded herbaceous association is found in the emergent zones of ponds in the southern Coastal Plain. It is restricted in distribution and extent. The total number of occurrences is not known. Many examples have been altered or destroyed, for example converted to farm ponds or affected by erosion from adjoining agricultural lands. Only a few extensive, high-quality examples remain. Remaining unprotected examples are vulnerable to damage from off-road vehicles, local hydrologic changes (ditching and draining), and land-use change (including residential development and shore conversion). Many examples have been degraded, converted, or destroyed. Some examples are in areas of extensive human population growth, and the best hope for conservation is on public lands (e.g., military bases).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: Ponds seen on the De Soto National Forest (Jones and Perry counties, Mississippi) have two distinct zones; one (cf. CEGL007792) is dominated by *Panicum hemitomon*, with other grasses and graminoids such as *Saccharum giganteum, Saccharum brevibarbe, Scirpus cyperinus, Dichanthelium scabriusculum, Panicum rigidulum, Leersia* sp., and *Rhynchospora glomerata*; *Fuirena breviseta, Ludwigia pilosa*, and *Pluchea rosea* are also found here. A less diverse zone of longer hydroperiod (cf. CEGL004127) is dominated by low graminoids and forbs. *Eleocharis robbinsii* and *Eleocharis melanocarpa* may exhibit heavy dominance; *Carex glaucescens, Juncus repens*, and *Proserpinaca pectinata* are also typically present. Limesink ponds in the Conecuh National Forest (Alabama) are dominated by *Panicum hemitomon*, with *Polygonum hirsutum, Sagittaria isoetiformis, Centella erecta, Eupatorium capillifolium, Pluchea rosea, Ludwigia peploides, Hypericum fasciculatum*?, *Ludwigia* sp., *Xyris* sp., *Hydrocotyle* sp., *Eleocharis* sp., and *Juncus* spp. One example of a maidencane pond at Fort Benning, Georgia (L6 Pond, 232Bq), has seasonal codominance by *Eleocharis robbinsii* and *Eleocharis tricostata*. It is probably best placed with CEGL004127, but placement between CEGL004127 and CEGL007792 is somewhat problematic because the two associations are not perfectly distinguished from one another.

Global Similar Associations:

- *Panicum hemitomon - Eleocharis equisetoides - Rhynchospora inundata* Herbaceous Vegetation (CEGL004127)--primarily of the Atlantic Coastal Plain is also attributed to the East Gulf Coastal Plain; it may represent a regional or zonal variant.
- *Panicum hemitomon - Eriocaulon compressum - Rhynchospora corniculata* Herbaceous Vegetation (CEGL004578)--of the West Gulf Coastal Plain.

Global Related Concepts:

- IIE1f. Coastal Plain Small Depression Pond Complex (Allard 1990) B
- Limnetic Zone, Limesink Lake (Ambrose 1990a) ?
- Littoral Zone, Limesink Lake (Ambrose 1990a) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This vegetation is found in the East Gulf Coastal Plain and adjacent ecoregions from Mississippi to Georgia.

Nations: US
States/Provinces: AL, FL, GA, LA?, MS
TNC Ecoregions: 43:?, 53:C, 55:C, 56:C
USFS Ecoregions: 232Ba:CCP, 232Bb:CCP, 232Bc:CCP, 232Be:CCP, 232Bf:CCC, 232Bi:CCP, 232Bj:CCC, 232Bk:CCC, 232Bl:CCP, 232Bm:CCP, 232Bn:CCP, 232Bo:CCP, 232Bq:CCC, 232Ca:CCC, 232Ce:CCC, 232Dc:CPP

Federal Lands: DOD (Fort Benning); NPS (Cumberland Island?, Timucuan); USFS (Conecuh, De Soto, Ocala, Osceola); USFWS (Eufaula)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: M. Pyne
References: ALNHP 2002, Allard 1990, Allard et al. 1990, Ambrose 1990a, FNAI 1992a, NatureServe Ecology - Southeastern U.S. unpubl. data, Schotz pers. comm., Southeastern Ecology Working Group n.d.

Spartina bakeri Seasonally Flooded Herbaceous Alliance (A.1389)

Alliance Concept

Summary: This alliance consists of seasonally flooded wetlands dominated by *Spartina bakeri* (sand cordgrass), or at least with substantial cover of it. Seasonally flooded coastal interdunal swales of the Florida peninsula dominated by *Spartina bakeri* (sand cordgrass) may also contain *Muhlenbergia filipes* (gulfhairawn muhly) (which may be codominant), *Andropogon glomeratus* (bushy bluestem), *Aristida* (threeawn) sp., *Rhynchospora colorata* (starrush whitetop), *Sagittaria lancifolia* (bulltongue arrowhead), *Eupatorium mikanioides* (semaphore thoroughwort), *Setaria magna* (giant bristlegrass), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Phyla nodiflora* (turkey tangle fogfruit), *Sabatia stellaris* (rose of Plymouth), and *Pluchea rosea* (rosy camphorweed). Additional herbaceous species in South Carolina *Spartina bakeri* (sand cordgrass) ponds may include *Woodwardia virginica* (Virginia chainfern), *Hibiscus moscheutos* (crimsoneyed rosemallow), *Juncus effusus* (common rush), *Saccharum giganteum* (sugarcane plumegrass),

Panicum virgatum (switchgrass), *Cyperus odoratus* (fragrant flatsedge), and *Juncus roemerianus* (needlegrass rush). *Hibiscus grandiflorus* (swamp rosemallow) is reported from some associations. These areas are not tidally flooded, but are apparently maintained as marsh by occasional flooding by brackish water during severe storm tides in hurricane events. These storm-flooding events maintain brackish soil conditions.

Classification Comments: These areas are not tidally flooded but are apparently maintained as marsh by occasional flooding by brackish water during severe storm tides (in hurricane events). These storm flooding events maintain brackish soil conditions.

Similar Alliances:

- *Spartina bakeri - (Spartina patens)* Tidal Herbaceous Alliance (A.1479)--includes tidally flooded *Spartina bakeri* communities.

Related Concepts:

- Coastal Interdunal Swale (FNAI 1992a) I

Alliance Description

Environment: This alliance consists of seasonally flooded wetlands and seasonally flooded coastal interdunal swales. These areas are not tidally flooded, but are apparently maintained as marsh by occasional flooding by brackish water during severe storm tides in hurricane events. These storm-flooding events maintain brackish soil conditions. Interdunal ponds.

Vegetation: This alliance consists of seasonally flooded wetlands dominated by *Spartina bakeri* (sand cordgrass), or at least with substantial cover of it. Seasonally flooded coastal interdunal swales of the Florida peninsula dominated by *Spartina bakeri* (sand cordgrass) may also contain *Muhlenbergia filipes* (gulfhairawn muhly) (which may be codominant), *Andropogon glomeratus* (bushy bluestem), *Aristida* (threeawn) sp., *Rhynchospora colorata* (starrush whitetop), *Sagittaria lancifolia* (bulltongue arrowhead), *Eupatorium mikanioides* (semaphore thoroughwort), *Setaria magna* (giant bristlegrass), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Phyla nodiflora* (turkey tangle fogfruit), *Sabatia stellaris* (rose of Plymouth), and *Pluchea rosea* (rosy camphorweed). Additional herbaceous species in South Carolina *Spartina bakeri* (sand cordgrass) ponds may include *Woodwardia virginica* (Virginia chainfern), *Hibiscus moscheutos* (crimsoneyed rosemallow), *Juncus effusus* (common rush), *Saccharum giganteum* (sugarcane plumegrass), *Panicum virgatum* (switchgrass), *Cyperus odoratus* (fragrant flatsedge), and *Juncus roemerianus* (needlegrass rush). *Hibiscus grandiflorus* (swamp rosemallow) is reported from some associations.

Alliance Distribution

Range: Vegetation of this alliance has been documented from peninsular Florida and the ACE Basin of South Carolina, and Georgia.

Nations: US
SubNations: FL, GA, SC
TNC Ecoregions: 53:P, 54:P, 55:C, 56:C, 57:P
USFS Ecoregions: 232Bf:CCC, 232Ce:CCC, 232Db:CCC, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral); NPS (Canaveral, Cumberland Island, Timucuan); USFS (Ocala?)

(CEGL004511) Sand Cordgrass Interdune Swale

Spartina bakeri - Muhlenbergia filipes - Andropogon glomeratus - Rhynchospora colorata Herbaceous Vegetation

Sand Cordgrass - Southern Hairgrass - Bushy Bluestem - Star-rush Whitetop Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
Alliance (English name)	Sand Cordgrass Seasonally Flooded Herbaceous Alliance
Association	*Spartina bakeri - Muhlenbergia filipes - Andropogon glomeratus - Rhynchospora colorata* Herbaceous Vegetation
Association (English name)	Sand Cordgrass - Southern Hairgrass - Bushy Bluestem - Star-rush Whitetop Herbaceous Vegetation
Association (Common name)	Sand Cordgrass Interdune Swale
Ecological System(s):	Southeastern Coastal Plain Interdunal Wetland (CES203.258)
	Floridian Highlands Freshwater Marsh (CES203.077)

Element Concept

Global Summary: These seasonally flooded coastal interdunal swales and related depressions occur in Florida and possibly southeastern Georgia, and are dominated by *Spartina bakeri* (sand cordgrass), or at least with substantial cover of it. *Muhlenbergia filipes* (gulfhairawn muhly) may be codominant; *Andropogon glomeratus* (bushy bluestem) and *Aristida* (threeawn) sp. are occasionally present. A variety of wetland herbs are present in the wetter swales, including *Rhynchospora colorata* (starrush whitetop), *Sagittaria lancifolia* (bulltongue arrowhead), *Eupatorium mikanioides* (semaphore thoroughwort) (a Florida endemic), *Setaria magna* (giant bristlegrass), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Phyla nodiflora* (turkey tangle fogfruit), *Sabatia stellaris* (rose of Plymouth), and *Pluchea rosea* (rosy camphorweed). *Nostoc*, a cyanobacterium, forms a wet, slippery, dark green ground cover during wet periods and a thick, black crust during dry spells. An alga, *Chara* sp., is also present in pools in wet swales. Exotic species found in some swales include *Schinus terebinthifolius* (Brazilian peppertree) and *Catharanthus roseus* (Madagascar periwinkle).

Environmental Concept

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Environment: These are seasonally flooded coastal interdunal swales in Florida and possibly southeastern Georgia.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: Stands of this type are dominated by *Spartina bakeri* (sand cordgrass), or at least with substantial cover of it. *Muhlenbergia filipes* (gulfhairawn muhly) may be codominant; *Andropogon glomeratus* (bushy bluestem) and *Aristida* (threeawn) sp. are occasionally present. A variety of wetland herbs are present in the wetter swales, including *Rhynchospora colorata* (starrush whitetop), *Sagittaria lancifolia* (bulltongue arrowhead), *Eupatorium mikanioides* (semaphore thoroughwort) (a Florida endemic), *Setaria magna* (giant bristlegrass), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Phyla nodiflora* (turkey tangle fogfruit), *Sabatia stellaris* (rose of Plymouth), and *Pluchea rosea* (rosy camphorweed). *Nostoc*, a cyanobacterium, forms a wet, slippery, dark green ground cover during wet periods and a thick, black crust during dry spells. An alga, *Chara* sp., is also present in pools in wet swales. Exotic species found in some swales include *Schinus terebinthifolius* (Brazilian peppertree) and *Catharanthus roseus* (Madagascar periwinkle). A stand assigned here in the Ocala National Forest (Farles Prairie) is strongly dominated by *Spartina bakeri* (sand cordgrass), with *Ludwigia suffruticosa* (shrubby primrose-willow), *Amphicarpum muehlenbergianum* (Muhlenberg maidencane), *Dichanthelium* (rosette grass) sp., *Smilax pumila* (sarsparilla vine), *Centella erecta* (erect centella), *Rhexia mariana* (Maryland meadowbeauty), *Pluchea rosea* (rosy camphorweed), *Andropogon brachystachyus* (shortspike bluestem), *Andropogon capillipes* (chalky bluestem), and *Ludwigia repens* (creeping primrose-willow). The shrubs *Vaccinium darrowii* (Darrow's blueberry) and *Hypericum myrtifolium* (myrtleleaf St. Johnswort) are present here at low cover values. In fire-suppressed examples, there may be a very sparse tree layer (5-10 m tall) of *Pinus elliottii* (slash pine), *Pinus taeda* (loblolly pine), and *Salix caroliniana* (coastal plain willow). There may also be a sparse shrub layer (1-2 m) of these same species, as well as *Diospyros virginiana* (common persimmon) and *Sabal palmetto* (cabbage palmetto).

Other Noteworthy Species

Global

Other Plant Species	GRank	Note
Eupatorium mikanioides (semaphore thoroughwort)	G3?	–

Conservation Status Rank

Global Rank & Reasons: G3? (13-Aug-1997).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: These areas are not tidally flooded but are apparently maintained as marsh by occasional flooding by brackish water during severe storm tides (in hurricane events). These storm flooding events maintain brackish soil conditions. Exotic species found in some swales include *Schinus terebinthifolius* and *Catharanthus roseus*.

Global Similar Associations:

- *Spartina bakeri - Woodwardia virginica - Saccharum giganteum* Herbaceous Vegetation (CEGL007713)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This association is found in Florida and possibly southeastern Georgia.
Nations: US
States/Provinces: FL, GA?
TNC Ecoregions: 55:C, 56:C
USFS Ecoregions: 232Bf:CCC, 232Ce:CCC, 232Db:CCC, 232Gb:CCC

Federal Lands: DOD (Cape Canaveral); NPS (Canaveral, Cumberland Island?, Timucuan); USFS (Ocala?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: M. Pyne
References: FNAI 1992a, Southeastern Ecology Working Group n.d.

(CEGL007713) South Atlantic Coastal Pond

Spartina bakeri - Woodwardia virginica - Saccharum giganteum Herbaceous Vegetation
Sand Cordgrass - Virginia Chainfern - Giant Plumegrass Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)

NVC Classification (continued)

Classification Level	Observed Classification
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
Alliance (English name)	Sand Cordgrass Seasonally Flooded Herbaceous Alliance
Association	*Spartina bakeri - Woodwardia virginica - Saccharum giganteum* Herbaceous Vegetation
Association (English name)	Sand Cordgrass - Virginia Chainfern - Giant Plumegrass Herbaceous Vegetation
Association (Common name)	South Atlantic Coastal Pond
Ecological System(s):	Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Element Concept

Global Summary: These seasonally flooded wetlands are dominated by *Spartina bakeri* (sand cordgrass), or at least with substantial cover of it. Circular ponds in which *Spartina bakeri* (sand cordgrass) is typically the dominant species are found on marsh islands of the South Atlantic Coastal Plain of South Carolina and Georgia. Herbaceous dominants also include *Woodwardia virginica* (Virginia chainfern), *Hibiscus moscheutos* (crimsoneyed rosemallow), *Juncus effusus* (common rush), and *Saccharum giganteum* (sugarcane plumegrass). Additional herbaceous species may include *Panicum virgatum* (switchgrass), *Cyperus odoratus* (fragrant flatsedge), and *Juncus roemerianus* (needlegrass rush). Scattered trees and shrubs also occur, including *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Pinus taeda* (loblolly pine), *Pinus serotina* (pond pine), *Morella cerifera* (wax-myrtle), *Salix nigra* (black willow), *Diospyros virginiana* (common persimmon), *Cephalanthus occidentalis* (common buttonbush), *Persea palustris* (swamp bay), and the exotic *Triadica sebifera* (tallowtree). Disturbance of these ponds may result in a reduction to less than 50% cover of *Spartina bakeri* (sand cordgrass). Fire is probably an infrequent event.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This coastal pond community was sampled at six locations on Cumberland Island. Sites are in temporarily or semipermanently flooded depressions. Soils are either poorly drained sandy loam or very poorly drained muck. The unvegetated surface is dominated by leaf litter (70-99% cover) with some wood (0-1%), bare soil (0-15%), and standing water (0-30%). This is no apparent disturbance at these sites, although build-up of thick *Spartina bakeri* thatch at some sites could indicate fire suppression.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is defined by a moderately dense to total cover of *Spartina bakeri* (sand cordgrass)

in the 1- to 2-m tall herbaceous layer. In some stands *Panicum hemitomon* (maidencane) or *Panicum verrucosum* (warty panicgrass) codominates. Additional herbs found in small amounts include *Andropogon glaucopsis* (purple bluestem), *Decodon verticillatus* (swamp-loosestrife), *Juncus effusus* (common rush), *Mikania scandens* (climbing hempvine), *Sacciolepis striata* (American cupscale), and *Woodwardia virginica* (Virginia chainfern). Scattered trees (up to 15 m tall), including *Acer rubrum* (red maple), *Nyssa biflora* (swamp tupelo), and *Pinus serotina* (pond pine), and shrubs such as *Cephalanthus occidentalis* (common buttonbush), *Ilex glabra* (inkberry), and *Persea palustris* (swamp bay) may also occur. In addition, this community supports state-critically imperiled *Rhynchospora decurrens* (swampforest beaksedge) and state-vulnerable *Limnobium spongia* (American spongeplant).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Decodon verticillatus* (swamp-loosestrife)
Herb (field)	Graminoid	*Andropogon glaucopsis* (purple bluestem), *Juncus effusus* (common rush), *Panicum hemitomon* (maidencane), *Panicum verrucosum* (warty panicgrass), *Spartina bakeri* (sand cordgrass)
Herb (field)	Fern or fern ally	*Woodwardia virginica* (Virginia chainfern)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Spartina bakeri* (sand cordgrass), *Woodwardia virginica* (Virginia chainfern)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Limnobium spongia (American spongeplant)	G4	state-vulnerable
Rhynchospora decurrens (swampforest beaksedge)	G3G4	state-critically imperiled

Conservation Status Rank

Global Rank & Reasons: G3? (14-Dec-1998). This type is poorly understood but appears to be of limited occurrence within the range of *Spartina bakeri*. Threats are few. These ponds are readily recognizable on infrared aerial photos as circular white areas within marsh islands. Disturbance of

these ponds may result in a reduction to less than 50 percent cover of *Spartina bakeri*. Fire is probably an infrequent event.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: These ponds are readily recognizable on infrared aerial photos as circular white areas within marsh islands. These communities are not tidal marshes as they are not tidally flooded but are found in the interior of uplands. These areas are certainly affected by salt spray (but only during extreme storm events) and/or tidal flooding during extreme high tides. These infrequent tidal or storm flooding events maintain brackish soil conditions.

Global Similar Associations:

- *Spartina bakeri - Muhlenbergia filipes - Andropogon glomeratus - Rhynchospora colorata* Herbaceous Vegetation (CEGL004511)--of interdune swales in Florida.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: These *Spartina bakeri* ponds are frequent occurrences on the northern end of Cumberland Island. It is the dominant association of Lake Whitney and was observed within adjacent wetlands. Smaller ponds occur sporadically within Wet Pond Pine Flatwoods (CEGL004791) around Bunkley Trail and the west side of North Cut Road.

Global Range: These seasonally flooded wetlands are restricted to marsh islands of the South Atlantic Coastal Plain of South Carolina and Georgia.
Nations: US
States/Provinces: GA, SC
TNC Ecoregions: 56:C
USFS Ecoregions: 232Ce:CCC
Federal Lands: NPS (Cumberland Island)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.021, CUIS.025, CUIS.032, CUIS.080, CUIS.127, CUIS.180.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: M. Pyne
References: Aulbach-Smith pers. comm., Southeastern Ecology Working Group n.d.

Spartina patens Seasonally Flooded Herbaceous Alliance (A.1390)

Alliance Concept
Summary: This alliance consists of seasonally flooded (non-tidal) wetlands dominated by *Spartina patens* (saltmeadow cordgrass), occurring from northeastern United States south and west to Tamaulipas, Mexico.

Similar Alliances: *Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)

Related Concepts: Maritime Wet Grassland (Schafale and Weakley 1990) I

Alliance Distribution

Range: This alliance is found along the eastern United States coast from Rhode Island to Florida to Texas, and possibly in Tamaulipas, Mexico.

Nations: MX?, US
SubNations: AL, DE, FL, GA, LA, MA, MD, MXTM?, NH, NJ, NY, SC?, TX, VA?
TNC Ecoregions: 31:C, 53:C, 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 221Ab:CCC, 221Ac:CCC, 221Ak:CCC, 231Fb:CCC, 232Aa:CCC, 232Ac:CCC, 232Bz:CCC, 232Ce:CCC, 232Ci:CCC, 232Dc:CCC, 232Eb:CCC, 255Dc:CCC

Federal Lands: NPS (Cape Cod, Cumberland Island, Fire Island, Gateway, Padre Island); USFWS (Aransas, Bon Secour, Brazoria?, Laguna Atascosa, Matagorda Island, Monomoy?, Sabine, St. Marks, St. Vincent)

(CEGL004254) Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation

Spartina patens - Panicum spp. Brackish Herbaceous Vegetation [Provisional]

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	*Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
Alliance (English name)	Saltmeadow Cordgrass Seasonally Flooded Herbaceous Alliance
Association	*Spartina patens - Panicum* spp. Brackish Herbaceous Vegetation [Provisional]
Association (English name)	Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation

Element Concept

Global Summary: This association consists of brackish herbaceous wetlands dominated by *Spartina patens* (saltmeadow cordgrass) and *Panicum dichotomiflorum* (fall panicgrass) and is described from Cumberland Island National Seashore, Georgia.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: Saltmeadow cordgrass - panicgrass brackish herbaceous vegetation was sampled once on Cumberland Island in a semipermanently flooded slough with very poorly drained muck soil. The

unvegetated surface is made up of leaf litter (30% cover), bare soil (30%) and standing water (40%). No evidence of disturbance was reported.

Global Environment: This herbaceous wetland association occurs on poorly drained muck soils on Cumberland Island National Seashore, Georgia.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The dense (90% cover) herbaceous layer (0.5-1 m tall) is codominated by *Panicum dichotomiflorum var. bartowense* (fall panicgrass), *Panicum dichotomiflorum var. dichotomiflorum* (fall panicgrass), *Pluchea camphorata* (camphor pluchea), and *Spartina patens* (saltmeadow cordgrass). Additional species found in small amounts include *Bacopa monnieri* (herb of grace), *Cyperus* (flatsedge) spp., *Echinochloa walteri* (coast cockspur grass), *Eupatorium capillifolium* (dogfennel), *Oldenlandia uniflora* (clustered mille graines), *Ludwigia palustris* (marsh seedbox), *Sacciolepis striata* (American cupscale), *Schoenoplectus pungens var. pungens* (common threesquare), *Setaria magna* (giant bristlegrass), and *Verbena scabra* (sandpaper vervain). In addition, this community supports state-vulnerable *Aeschynomene indica* (Indian jointvetch).

Global Vegetation: This herbaceous wetland community is described from Cumberland Island National Seashore and has a dense herbaceous layer codominated by *Panicum dichotomiflorum var. bartowense* (fall panicgrass), *Panicum dichotomiflorum var. dichotomiflorum* (fall panicgrass), *Pluchea camphorata* (camphor pluchea), and *Spartina patens* (saltmeadow cordgrass). Additional species found in small amounts include *Bacopa monnieri* (herb of grace), *Cyperus* (flatsedge) spp., *Echinochloa walteri* (coast cockspur grass), *Eupatorium capillifolium* (dogfennel), *Oldenlandia uniflora* (clustered mille graines), *Ludwigia palustris* (marsh seedbox), *Sacciolepis striata* (American cupscale), *Schoenoplectus pungens var. pungens* (common threesquare), *Setaria magna* (giant bristlegrass), and *Verbena scabra* (sandpaper vervain).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Forb	*Bacopa monnieri* (herb of grace), *Eupatorium capillifolium* (dogfennel), *Pluchea camphorata* (camphor pluchea)
Herb (field)	Graminoid	*Panicum dichotomiflorum* var. *bartowense* (fall panicgrass), *Panicum dichotomiflorum* var. *dichotomiflorum* (fall panicgrass), *Spartina patens* (saltmeadow cordgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Panicum dichotomiflorum* var. *bartowense* (fall panicgrass), *Panicum dichotomiflorum* var. *dichotomiflorum* (fall panicgrass), *Spartina patens* (saltmeadow cordgrass)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Aeschynomene indica (Indian jointvetch)	G5	state-vulnerable

Conservation Status Rank

Global Rank & Reasons: GNR (25-Jul-2008).

Classification

Status: Provisional

Classification Confidence:

Cumberland Island National Seashore and Fort Frederica National Monument Comments: This provisional association was created based on data from one plot on Cumberland Island, and it should be re-examined when additional data are available.

Global Comments: This provisional association was created based on data from one plot on Cumberland Island, and it should be re-examined when additional data are available.

Element Concept

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled within the brackish marsh complex on the southeastern tip of Cumberland Island.

Global Range: This brackish herbaceous vegetation is currently only known from Cumberland Island, Georgia.

Nations: US
States/Provinces: GA
TNC Ecoregions: 56:C
USFS Ecoregions: 232Ce:CCC
Federal Lands: NPS (Cumberland Island)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.035.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: H. Summer
References: Southeastern Ecology Working Group n.d.

Semipermanently flooded temperate or subpolar grassland (V.A.5.N.I.)

Typha (*angustifolia, latifolia*) - (*Schoenoplectus spp.*) Semipermanently Flooded Herbaceous Alliance (A.1436)

Alliance Concept

Summary: This alliance, found in virtually every state in the United States and probably most Canadian provinces, contains stands dominated by *Typha angustifolia* (narrowleaf cattail) and/or *Typha latifolia* (broadleaf cattail), either alone or in combination with other tall emergent marsh species. 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* (narrowleaf cattail) can grow in deeper water compared to *Typha latifolia* (broadleaf cattail), although both species reach maximum growth at a water depth of 50 cm. *Typha* (cattail) often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes. *Lythrum salicaria* (purple loosestrife), an exotic species from Europe, has become a common associate of many eastern *Typha* (cattail) 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* (broadleaf cattail). 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. Associated species vary widely; in the Midwest they include many sedges such as *Carex aquatilis* (water sedge), *Carex rostrata* (beaked sedge), *Carex pellita* (woolly sedge), bulrushes such as *Schoenoplectus americanus* (chairmaker's bulrush), *Schoenoplectus acutus* (hardstem bulrush), and *Schoenoplectus heterochaetus* (slender bulrush), and broad-leaved herbs such as *Thelypteris palustris* (eastern marsh fern), *Asclepias incarnata* (swamp milkweed), *Impatiens capensis* (jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Hibiscus moscheutos* (crimsoneyed rosemallow), and *Verbena hastata* (swamp verbena). Floating aquatics such as *Lemna minor* (common duckweed) may predominate in deeper zones.

Classification 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 *Phragmites australis* Semipermanently Flooded

Herbaceous Alliance (A.1431), the *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443), the *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432), and the *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441). In shallow flooded conditions this alliance grades into the *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394), as well as the *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.

Similar Alliances:

- *Carex* spp. - *Typha* spp. Saturated Herbaceous Alliance (A.1465)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus robustus* Semipermanently Flooded Herbaceous Alliance (A.1434)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)
- *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441)

Related Concepts:

- *Typha (angustifolia, latifolia)* herbaceous alliance (Hoagland 1998a) ?
- *Typha latifolia* Habitat Type (Hansen et al. 1995) ?
- *Typha latifolia* herbaceous alliance (Hoagland 2000) ?
- Cat-tail marsh (Fike 1999) ?
- Cattail Marsh (Foti 1994b) I
- Cattail Series (Sawyer and Keeler-Wolf 1995) I
- L5D2aI2a. *Typha latifolia* (Foti et al. 1994) ?
- P5A4bII2a. *Typha latifolia* (Foti et al. 1994) ?
- Robust Emergent Marsh (Smith 1991) I

Alliance Description

Environment: This alliance is found most commonly along lake or pond margins, slow-moving ditches, in shallow basins, adjacent to stream or river channels in wet mud, oxbows, and occasionally in river backwaters. Elevations range from near sea level to around 2000 m in Colorado. Sites where this alliance occurs are typically semipermanently flooded, inundated with 30-100 cm of water throughout the year. 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 (Grace and Wetzel 1981). Soils are characterized by accumulations of organic matter over deposits of fine silt and clay (Hansen et al. 1995), or loams, sandy loams, or coarse sand (Jones and Walford 1995, Bundy et al. 1996). *Typha* often occurs in pure stands, and can colonize areas recently exposed by either natural or human causes.

Adjacent herbaceous wetland vegetation types can be dominated by species of *Scirpus* and/or *Schoenoplectus, Carex*, or *Eleocharis*. Riparian shrublands or forests include those dominated by species of *Salix, Fraxinus*, or *Populus*.

Vegetation: This alliance, is found at low to moderate elevations in virtually every state in the United States and probably most Canadian provinces. It contains stands dominated by *Typha angustifolia* (narrowleaf cattail) and/or *Typha latifolia* (broadleaf cattail), either alone or in combination with other tall emergent marsh species. Associated species vary widely; in the central and western United States, they include many sedges such as *Carex aquatilis* (water sedge), *Carex rostrata* (beaked sedge), *Carex pellita* (woolly sedge), and bulrushes such as *Schoenoplectus americanus* (chairmaker's bulrush), *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), and *Schoenoplectus heterochaetus* (slender bulrush). Other graminoids can include *Juncus* (rush) spp., *Eleocharis* (spikerush) spp., or *Glyceria* (mannagrass) spp. In the central and eastern parts of its range, broad-leaved herbs such as *Thelypteris palustris* (eastern marsh fern), *Asclepias incarnata* (swamp milkweed), *Impatiens capensis* (jewelweed), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Hibiscus moscheutos* (crimsoneyed rosemallow), and *Verbena hastata* (swamp verbena), may be present. In the west, forbs may include *Mentha arvensis* (wild mint), *Polygonum amphibium* (water knotweed), *Epilobium ciliatum* (fringed willowherb) and many others. Floating aquatics such as *Lemna minor* (common duckweed) may predominate in deeper zones (Anderson 1982, MNNHP 1993, Hansen et al. 1995).

Dynamics: *Typha angustifolia* occupies inundated and disturbed grounds and can tolerate deeper water and higher alkalinity levels than *Typha latifolia* (Great Plains Flora Association 1986). *Typha* species are prolific seed producers, spreading rapidly to become the early colonizers of wet mineral soil and will persist under wet conditions (Hansen et al. 1995). Roots and lower stems are well-adapted to prolonged submergence, but periods of draw-down are required for seed germination to occur (Hansen et al. 1995). These are important wetland communities for many species of birds and

waterfowl. Hansen et al. (1995) report that in Montana heavy livestock use may convert stands to *Carex nebrascensis*-dominated communities.

Alliance Distribution

Range: This alliance is found in virtually every state in the United States and is likely to be found in most Canadian provinces.

Nations: CA, US
SubNations: AB, AL, AR, AZ, BC, CA, CO, CT, DC?, 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: 1:C, 2:C, 4:P, 5:P, 6:C, 7:C, 8:P, 10:C, 11:C, 12:C, 13:C, 14:C, 15:C, 17:C, 18:P, 19:C, 20:C, 21:P, 22:P, 23:C, 25:C, 26:C, 27:C, 28:C, 31:C, 32:C, 33:C, 34:C, 35:C, 36:C, 37:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:P, 51:C, 52:C, 53:C, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C, 68:P

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:CCC, 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:CCP, 221Ab:CCC, 221Ac:CC?, 221Ad:CC?, 221Ae:CCP, 221Af:CC?, 221Ag:CC?, 221Ah:CC?, 221Ai:CCC, 221Ak:CC?, 221Al:CCC, 221Am:CC?, 221Ba:CCP, 221Bb:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Db:CC?, 221Dc:CC?, 221Ea:CC?, 221Eb:CC?, 221Ec:CCC, 221Eg:CCC, 221Fa:CCC, 221Fb:CC?, 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:CCC, 222Ic:CCC, 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:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CC?, 232Bc:C??, 232Bd:C??, 232Br:C??, 232Ce:CCC, 232Ch:CC?, 232Cj:CC?, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 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, 315B:CC, 322B:CC, 331C:CC, 331F:CP, 331H:CC, 331I:CC, 332A:CP, 332B:C?, 332C:CC, 332D:CP, 332E:CC, 341B:CC, 341C:CC, 342:C, M212Aa:CP?, M212Ab:CP?, M212Ac:CP?, M212Ad:CP?, M212Ba:CC?, M212Bb:CCC, 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, Agate Fossil Beds, Badlands, Blue Ridge Parkway?, Boston Harbor Islands, C&O Canal?, Cape Cod, Capitol Reef, Chickamauga-Chattanooga?, Cumberland Island, Delaware Water Gap, Fort Laramie, Great Sand Dunes, Indiana Dunes, Isle Royale, Johnstown Flood, Lake Meredith, Mammoth Cave, Minute Man, National Capital-East?, Ninety Six, Pictured Rocks, Saint-Gaudens, Saratoga, Scotts Bluff, Sleeping Bear Dunes, Theodore Roosevelt, Upper Delaware, Voyageurs, Wind Cave, Yosemite); PC (Waterton Lakes); USFS (Allegheny, Black Hills, Chequamegon, Chequamegon-Nicolet, Chippewa, Daniel Boone?, Green Mountain, Hiawatha, Huron, Huron-Manistee, Kisatchie, Manistee, Monongahela?, Nantahala, Nicolet, Oconee?, Ottawa?, Ouachita, Ozark, Pisgah?, Superior, Talladega?, Tuskegee?, Wallowa-Whitman, White Mountain?); USFWS (Anahuac, Aroostook, Assabet River, Brazoria, Carlton Pond?, Erie, Great Meadows, Great Swamp, Iroquois, Kofa, Lacreek, Little River, Montezuma, Moosehorn, Nomans Land Island, Nulhegan Basin, Ouray, Oxbow, Pondicherry?, Prime Hook, Rachel Carson?, Reelfoot, San Bernard)

(CEGL004150) Southern Cattail Marsh
Typha latifolia Southern Herbaceous Vegetation
Broadleaf Cattail Southern Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Semipermanently flooded temperate or subpolar grassland (V.A.5.N.I.)
Alliance	*Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
Alliance (English name)	(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Semipermanently Flooded Herbaceous Alliance

NVC Classification (continued)

Classification Level	Observed Classification
Association	*Typha latifolia* Southern Herbaceous Vegetation
Association (English name)	Broadleaf Cattail Southern Herbaceous Vegetation
Association (Common name)	Southern Cattail Marsh
Ecological System(s):	East Gulf Coastal Plain Depression Pondshore (CES203.558)
	East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)
	Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)
	Laurentian-Acadian Freshwater Marsh (CES201.594)
	Red River Large Floodplain Forest (CES203.065)
	Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
	Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)
	West Gulf Coastal Plain Large River Floodplain Forest (CES203.488)

Element Concept

Global Summary: This association is a semi-natural type, consisting of *Typha latifolia* (broadleaf cattail) as an essentially monospecific stand, especially in artificial wetlands, such as borrow pits or ponds. The water table is at or above the soil surface for at least part of the growing season. The dominant species, *Typha latifolia* (broadleaf cattail), often forms dense, almost monotypic stands. *Carex* (sedge) spp. and *Schoenoplectus* (bulrush) spp. are often found in this community, especially on the margins. Other co-occurring species of this association are not fully understood. It is a widespread type. In the Interior Low Plateau of Tennessee, *Typha latifolia* (broadleaf cattail) is commonly found with *Scirpus cyperinus* (woolgrass) in roadside ditches and on the margins of ponds and reservoirs.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This cattail marsh community was sampled once on Cumberland Island in a semipermanently flooded backdune swale that is part of a large wetland complex at Lake Whitney. The soil is very poorly drained muck. The unvegetated surface is dominated by leaf litter (70% cover) with standing water (30%). No evidence of disturbance is apparent.

Global Environment: This type is found especially in artificial wetlands, such as borrow pits or ponds. The water table is at or above the soil surface for at least part of the growing season.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association is essentially a monospecific stand of moderately dense (70% cover) *Typha latifolia*

(broadleaf cattail), 1-2 m tall. Small amounts of *Decodon verticillatus* (swamp-loosestrife), *Limnobium spongia* (American spongeplant) (state-vulnerable), and *Spartina bakeri* (sand cordgrass) can also be found.

Global Vegetation: Stands of this association consist of *Typha latifolia* (broadleaf cattail) as an essentially monospecific stand. *Carex* (sedge) spp. and *Schoenoplectus* (bulrush) spp. are often found in this community, especially on the margins. Other co-occurring species of this association are not fully understood. In the Interior Low Plateau of Tennessee, *Typha latifolia* (broadleaf cattail) is commonly found with *Scirpus cyperinus* (woolgrass). In addition, *Juncus effusus* (common rush) and an occasional *Alnus serrulata* (hazel alder) are also present.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Decodon verticillatus* (swamp-loosestrife)
Herb (field)	Forb	*Limnobium spongia* (American spongeplant)
Herb (field)	Graminoid	*Spartina bakeri* (sand cordgrass), *Typha latifolia* (broadleaf cattail)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Typha latifolia* (broadleaf cattail)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Limnobium spongia (American spongeplant)	G4	state-vulnerable

Conservation Status Rank

Global Rank & Reasons: G5 (14-Jun-2001). This is a wide-ranging type that includes naturally occurring and artificial wetlands.

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Comments: This community is a common element found in many Southeastern wetland systems, but little work has been done to determine its diagnostic features and component species. The variability of this association across its range and its relation to adjacent types in this and related alliances are not fully understood. At Arnold Air Force Base, Coffee and Franklin counties,

Tennessee, this vegetation is found scattered along the border of Woods Reservoir. It appears to be a component of a mosaic of communities which form bands from the edge of the reservoir to the surrounding forest. The band found at the reservoir's edge is dominated by *Typha latifolia* and *Scirpus cyperinus*. *Juncus* sp., grasses, and an occasional *Alnus serrulata* are also present. The *Typha latifolia* grows patchily, being concentrated in dense clumps throughout the outer band.

Global Similar Associations:

- *Scirpus cyperinus* Seasonally Flooded Southern Herbaceous Vegetation (CEGL003866)
- *Typha (angustifolia, domingensis, latifolia) - Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Herbaceous Vegetation (CEGL006153)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389)

Global Related Concepts:

- IID6a. Natural Impoundment Pond (Allard 1990) B
- L5D2aI2a. *Typha latifolia* (Foti et al. 1994) ?
- P5A4bII2a. *Typha latifolia* (Foti et al. 1994) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: Bands of this *Typha latifolia* association can be seen adjacent to deeper sections of Lake Whitney on Cumberland Island, along the transition to *Spartina bakeri*-dominated marsh, and it probably also occurs elsewhere in freshwater marsh especially on the northern end of Cumberland Island.

Global Range: This vegetation is possible throughout the southeastern United States.
Nations: US
States/Provinces: AL, AR, FL?, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV
TNC Ecoregions: 31:C, 38:C, 39:C, 41:C, 42:C, 43:C, 44:C, 50:P, 52:?, 53:P, 56:C, 57:P, 59:C
USFS Ecoregions: 221:C, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Cf:CCP, 222Cg:CCP, 222Eb:CCC, 222Eg:CCP, 222Eh:CCP, 231A:C?, 231Fb:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Ce:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 251:P, 255Da:CCC, 255Dc:CCC, M221:C, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

Federal Lands: DOD (Arnold, Fort Benning); NPS (Chickamauga-Chattanooga?, Cumberland Island, Mammoth Cave, Ninety Six); USFS (Daniel Boone?, Kisatchie, Oconee?, Ouachita, Ouachita (Mountains), Ozark, Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?); USFWS (Anahuac, Brazoria, Reelfoot, San Bernard)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.031.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: L.M. Smith, A.S. Weakley and J.E. Mohan, mod. K.D. Patterson
References: Allard 1990, Blair and Hubbell 1938, Foti 1994b, Foti et al. 1994, Grace and Wetzel 1981, Hoagland 2000, McCoy 1958, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, TNC 1998a

Tidal temperate or subpolar grassland (V.A.5.N.n.)

Cladium mariscus ssp. jamaicense Tidal Temperate Herbaceous Alliance (A.1473)

Alliance Concept

Summary: This alliance includes tidal sawgrass marshes, where alkaline chemistry comes from brackish water, rather than from underlying calcareous rock as in the Everglades sawgrass marshes. These communities occur inland from *Juncus roemerianus* (needlegrass rush) or *Typha angustifolia* (narrowleaf cattail) marshes.

Similar Alliances:

- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)--includes similar freshwater vegetation.
- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Tropical Herbaceous Alliance (A.1157)--includes similar freshwater vegetation.

Related Concepts:

- Brackish Marsh (Schafale and Weakley 1990) I
- Brackish Marsh (Nelson 1986) I
- Tidal Marsh (FNAI 1992a) I

Alliance Distribution

Range: This alliance occurs in the southeastern Coastal Plain from North Carolina south to Florida and west to Mississippi. It may also possibly extend north into Virginia.

Nations: US
SubNations: AL, FL, GA, LA, MS, NC, SC, VA?
TNC Ecoregions: 53:C, 55:C, 56:C, 57:C
USFS Ecoregions: 232B:C?, 232Ce:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Eb:CCC, 232G:CP

Federal Lands: NPS (Cape Hatteras, Cape Lookout, Fort Caroline, Fort Frederica?, Timucuan); USFS (Croatan)

(CEGL004178) Tidal Sawgrass Marsh

Cladium mariscus ssp. jamaicense Tidal Herbaceous Vegetation
Jamaica Swamp Sawgrass Tidal Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)

NVC Classification (continued)

Classification Level	Observed Classification
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tidal temperate or subpolar grassland (V.A.5.N.n.)
Alliance	*Cladium mariscus ssp. jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
Alliance (English name)	Jamaica Swamp Sawgrass Tidal Temperate Herbaceous Alliance
Association	*Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation
Association (English name)	Jamaica Swamp Sawgrass Tidal Herbaceous Vegetation
Association (Common name)	Tidal Sawgrass Marsh
Ecological System(s):	Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
	Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)
	Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Element Concept

Global Summary: This association is a brackish marsh of the northern Gulf of Mexico and Atlantic Coast. Examples are dominated by *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass) in often dense stands. Additional species may include *Juncus roemerianus* (needlegrass rush), *Osmunda regalis* (royal fern), *Polygonum hydropiperoides* (swamp smartweed), *Spartina alterniflora* (smooth cordgrass), *Spartina bakeri* (sand cordgrass), *Typha domingensis* (southern cattail), *Amaranthus australis* (southern amaranth), *Amaranthus cannabinus* (tidalmarsh amaranth), *Hibiscus* (rosemallow) sp., *Solidago sempervirens var. mexicana* (seaside goldenrod), and *Woodwardia virginica* (Virginia chainfern), among others. In addition, there may be a sparse tree layer (10-15 m tall) of *Acer rubrum* (red maple), *Juniperus virginiana var. silicicola* (southern redcedar), and *Sabal palmetto* (cabbage palmetto). There may also be a very sparse to moderate shrub layer (2-5 m) of *Acer rubrum* (red maple), *Baccharis angustifolia* (saltwater false willow), *Morella cerifera* (wax-myrtle), and *Salix caroliniana* (coastal plain willow), among others. In addition, the noxious exotic *Triadica sebifera* (tallowtree) could be present.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Environment: In Florida this association occurs along the Gulf of Mexico and the Atlantic Coast in tidally influenced, upper reaches of river mouths where estuarine (salt) marshes blend with freshwater marshes (FNAI 1990). At this juncture, salinity levels are greatly diminished, allowing *Cladium mariscus ssp. jamaicense* (which is relatively salt intolerant) to form dense stands.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Vegetation: Stands are typically dominated by a very dense herbaceous layer of *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass). Additional species may include *Juncus roemerianus* (needlegrass rush), *Osmunda regalis* (royal fern), *Polygonum hydropiperoides* (swamp smartweed), *Spartina alterniflora* (smooth cordgrass), *Spartina bakeri* (sand cordgrass), *Typha domingensis* (southern cattail), *Amaranthus australis* (southern amaranth), *Amaranthus cannabinus* (tidalmarsh amaranth), *Hibiscus* (rosemallow) sp., *Solidago sempervirens var. mexicana* (seaside goldenrod), and *Woodwardia virginica* (Virginia chainfern), among others. In addition, there may be a sparse tree layer (10-15 m tall) of *Acer rubrum* (red maple), *Juniperus virginiana var. silicicola* (southern redcedar), and *Sabal palmetto* (cabbage palmetto). There may also be a very sparse to moderate shrub layer (2-5 m) of *Acer rubrum* (red maple), *Baccharis angustifolia* (saltwater false willow), *Morella cerifera* (wax-myrtle), and *Salix caroliniana* (coastal plain willow), among others. In addition, the noxious exotic *Triadica sebifera* (tallowtree) could be present.

Conservation Status Rank

Global Rank & Reasons: G4? (13-Aug-1997).

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: This type is found in tidal rivers of southern and central North Carolina, as well as in wind-tidal (microtidal) embayed region. It was reported that this type is not known to occur on the Atlantic Coast of Florida (A. Johnson pers. comm.). However, in a more recent communication with Ann Johnson, she determined that she was mistaken and that brackish sawgrass marshes do occur along the Atlantic Coast of Florida.

Global Related Concepts:

- Tidal Freshwater Marsh (Sawgrass Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Range: This brackish marsh occurs along the northern Gulf of Mexico and southern Atlantic Coast, ranging from Louisiana to Florida and north to North Carolina and possibly Virginia.

Nations: US
States/Provinces: AL, FL, GA, LA, MS, NC, SC, VA?
TNC Ecoregions: 53:C, 55:P, 56:C, 57:C
USFS Ecoregions: 232B:C?, 232Ce:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Eb:CCC, 232G:CP

Federal Lands: NPS (Cape Hatteras, Cape Lookout, Fort Caroline, Fort Frederica?, Timucuan); USFS (Croatan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: A.S. Weakley, mod. M.J. Russo
References: FNAI 1990, FNAI 1992a, Johnson pers. comm., Nelson 1986, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d.

Juncus roemerianus Tidal Herbaceous Alliance (A.1475)

Alliance Concept

Summary: *Juncus roemerianus* (needlegrass rush)-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* (needlegrass rush) with few other associates. Associates which occur at low cover may include *Borrichia frutescens* (bushy seaside-tansy), *Baccharis halimifolia* (eastern baccharis), *Spartina alterniflora* (smooth cordgrass), *Distichlis spicata* (inland saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Symphyotrichum tenuifolium* (perennial saltmarsh aster), and *Symphyotrichum subulatum* (eastern annual saltmarsh aster). 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* (needlegrass rush) is typically found at lower elevation than the associated *Spartina patens* (saltmeadow cordgrass) marshes or mixed marshes. *Juncus roemerianus* (needlegrass rush) generally occurs on sandy substrates. The alliance may more rarely occur in freshwater, wind tidal situations. In these examples, *Juncus roemerianus* (needlegrass rush) is the dominant, but other characteristic species may include *Thelypteris palustris var. pubescens* (eastern marsh fern), *Polygonum punctatum* (dotted smartweed), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Asclepias lanceolata* (fewflower milkweed), *Osmunda regalis var. spectabilis* (royal fern), *Eleocharis fallax* (creeping spikerush), *Boehmeria cylindrica* (small-spike false nettle), 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* (needlegrass rush) alliance.

Classification Comments: Few associations have been described; more may be necessary to accommodate variation in this wide-ranging alliance.

Similar Alliances:

- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance (A.1481)

Related Concepts:

- Brackish Marsh (Nelson 1986) I
- Brackish Marsh (Schafale and Weakley 1990) I
- Brackish Marsh (Wieland 1994b) I
- Brackish Marsh (Smith 1996a) I
- Brackish Marsh (Wieland 1994a) ?
- Smooth Cordgrass Series (Diamond 1993) I
- Tidal Marsh (FNAI 1992a) I

Alliance Description

Environment: *Juncus roemerianus*-dominated marshes with tidal hydrology. Associations in this alliance have a range of water chemistry, including saline, brackish, and (rarely) freshwater. 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.

Vegetation: 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* (needlegrass rush) with few other associates. Associates which occur at low cover may include *Borrichia frutescens* (bushy seaside-tansy), *Baccharis halimifolia* (eastern baccharis), *Spartina alterniflora* (smooth cordgrass), *Distichlis spicata* (inland saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Symphyotrichum tenuifolium* (perennial saltmarsh aster), and *Symphyotrichum subulatum* (eastern annual saltmarsh aster). The alliance may more rarely occur in freshwater, wind tidal situations. In these examples, *Juncus roemerianus* (needlegrass rush) is the dominant, but other characteristic species may include *Thelypteris palustris var. pubescens* (eastern marsh fern), *Polygonum punctatum* (dotted smartweed), *Cladium mariscus ssp. jamaicense* (Jamaica swamp sawgrass), *Asclepias lanceolata* (fewflower milkweed), *Osmunda regalis var. spectabilis* (royal fern), *Eleocharis fallax* (creeping spikerush), *Boehmeria cylindrica* (small-spike false nettle), 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* (needlegrass rush) alliance.

Alliance Distribution

Range: This alliance occurs in the southeastern Coastal Plain from Maryland south to Florida and west to Louisiana and Texas.

Nations: US
SubNations: 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, Canaveral, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Frederica?, Fort Pulaski, Timucuan); USFS (Croatan); USFWS (Anahuac, Back Bay, Big Boggy, Bon Secour, Brazoria, Chesapeake Marshlands, McFaddin, San Bernard, Texas Point)

(CEGL004186) Needlerush High Marsh
Juncus roemerianus Herbaceous Vegetation
Black Needlerush Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tidal temperate or subpolar grassland (V.A.5.N.n.)
Alliance	*Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
Alliance (English name)	Black Needlerush Tidal Herbaceous Alliance
Association	*Juncus roemerianus* Herbaceous Vegetation
Association (English name)	Black Needlerush Herbaceous Vegetation
Association (Common name)	Needlerush High Marsh
Ecological System(s):	Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
	Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
	Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508)
	Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471)
	Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Element Concept

Global Summary: This broad-ranging *Juncus roemerianus* (needlegrass rush) salt marsh community is characterized by discrete, dense patches usually strongly dominated by *Juncus roemerianus* (needlegrass rush), often with few other associates, or with low cover of *Distichlis spicata* (inland saltgrass), *Spartina alterniflora* (smooth cordgrass), *Spartina patens* (saltmeadow cordgrass), and *Limonium carolinianum* (Carolina sealavender). 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* (needlegrass rush) in Florida indicates the prevalence of high marshes (above mean high water). Its hydrology is generally irregularly tidally flooded.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This needlerush high marsh community was sampled at three locations on Cumberland Island. It tends to occur in narrow bands within the salt marsh at higher elevations than *Spartina alterniflora* herbaceous marsh, but below areas dominated by *Borrichia frutescens, Iva frutescens, Spartina patens*, and *Distichlis spicata*. Sites are flat to very gently sloping tidally flooded areas with very poorly drained muck or sand soil. The unvegetated surface is made up of leaf litter (5-40% cover), bare soil (0-95%), standing water (0-60%), and wrack (0-15%). Evidence of disturbance includes horse trails and grazing. This community likely also occurs at Fort Frederica, although no plots were sampled.

Global Environment: Large expanses of this type are found in northwest Florida, where approximately 60% of the salt marshes consist of monospecific stands of this type. These stands extend nearly to the water's edge and may be considered low marsh (Montague and Wiegert 1990). In other regions of Florida, including northeast Florida, Indian River (central Atlantic coast), and south Florida, *Juncus roemerianus* occurs in smaller discrete patches of high marsh (Montague and Wiegert 1990). Presumably, this type also occurs primarily as high salt marsh along the Atlantic coast as well (Hackney and de la Cruz 1982). In Mississippi *Juncus roemerianus* marsh was inundated less than 5.4% of the time that any portion of the marsh was flooded (Eleuterius and Eleuterius 1979). Due to longer and more frequent periods of exposure and resulting evaporation, interstitial water salinity may be higher than more frequently inundated zones. In addition, the interstitial water salinity was generally higher and more stable than flood water (Hackney and de la Cruz 1982). A range of soil conditions may be present in this broadly defined association, but soils are generally poorly to very poorly drained. In some areas, including tall-growth zones, soils were highly organic and peaty (averaging 15 cm in depth?), while shorter zones occurred on sandy soils underlain by clay (Eleuterius and Caldwell 1984). In general, *Juncus roemerianus* occurs on sandy substrates (Penfound 1952). pH at the Mississippi site was 6.2 (Hackney and de la Cruz 1982).

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The moderate to dense (50-90% cover) herbaceous layer, 0.5-2 m tall, is dominated by *Juncus roemerianus* (needlegrass rush), which is frequently in monospecific stands. Stands may be codominated by *Borrichia frutescens* (bushy seaside-tansy) or *Spartina alterniflora* (smooth cordgrass). Additional species include *Distichlis spicata* (inland saltgrass), *Limonium carolinianum* (Carolina sealavender), and *Sarcocornia pacifica* (Pacific swampfire). This constitutes the entire floristic composition for the three sampled plots.

Global Vegetation: The very dense vegetation is typically exclusively codominated by *Juncus roemerianus* (needlegrass rush) and *Spartina alterniflora* (smooth cordgrass). Tall and short growth-form zones have been noted in several areas (Kruczynski et al. 1978, Hackney and de la Cruz 1982, Stout 1984, Montague and Wiegert 1990). Associates that may occur at low cover include *Borrichia frutescens* (bushy seaside-tansy), *Baccharis halimifolia* (eastern baccharis), *Spartina alterniflora* (smooth cordgrass), *Distichlis spicata* (inland saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Limonium carolinianum* (Carolina sealavender), *Symphyotrichum tenuifolium* (perennial saltmarsh aster), *Symphyotrichum subulatum* (eastern annual saltmarsh aster), and (in more southern occurrences) *Ipomoea sagittata* (saltmarsh morning-glory).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved evergreen shrub	*Borrichia frutescens* (bushy seaside-tansy)
Herb (field)	Forb	*Sarcocornia pacifica* (Pacific swampfire)
Herb (field)	Graminoid	*Juncus roemerianus* (needlegrass rush), *Spartina alterniflora* (smooth cordgrass)

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Juncus roemerianus* (needlegrass rush)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Juncus roemerianus* (needlegrass rush)

Global: *Juncus roemerianus* (needlegrass rush)

Other Noteworthy Species

Global

Other Plant Species	GRank	Note
Ptilimnium nodosum (piedmont mock bishopweed)	G2	Federally listed endangered; globally imperiled

Conservation Status Rank

Global Rank & Reasons: G5 (29-Mar-2001). This is a common coastal marsh of the Gulf and Atlantic coasts of the United States.

Classification

Status: Standard

Classification Confidence: 1 - Strong

Global 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. 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).

Global Similar Associations:

- *Spartina alterniflora - Juncus roemerianus - Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190)
- *Spartina patens - Distichlis spicata - (Juncus roemerianus)* Herbaceous Vegetation (CEGL004197)

Global Related Concepts:

- *Juncus roemerianus* Tidal Herbaceous Vegetation (Harrison 2001) =
- *Juncus roemerianus* Herbaceous Vegetation (Bowman 2000) =
- *Juncus roemerianus* Tidal Herbaceous Vegetation (Coulling 2002) =
- *Juncus roemerianus* Tidal Herbaceous Vegetation (VDNH 2003) =
- *Juncus roemerianus* association of the low marsh (Adams 1963) =
- *Juncus* type (Cooper and Waits 1973) =
- *Spartina - Distichlis - Juncus* associes (Penfound 1952) B
- Brackish Marsh (Wieland 1994b) B
- Brackish Marsh (Needlerush Subtype) (Schafale 2000) ?
- Irregularly flooded salt marsh (Jenkins 1974) =
- Lower high marsh (Stalter 1973a) =
- Needlerush - saltmeadow type (Nicholson and Van Deusen 1954) =
- Saline Marsh (Wieland 1994a) B
- Salt marsh (Higgins et al. 1971) B
- Salt marsh community (Hill 1986) B
- Smooth Cordgrass Series (Diamond 1993) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association occurs frequently within the marsh along the eastern and southern sides of Cumberland Island, often forming distinctive bands of vegetation at the transition zone from high marsh to *Spartina alterniflora* herbaceous marsh. This association was not documented at Fort Frederica as part of this project, although it is likely that it does occur at the park. Bands of *Juncus roemerianus* were observed within the marsh adjacent to the upland lawn area.

Global Range: This community is widespread along the Atlantic and Gulf coasts of North America ranging from Delaware south to Florida, and west to Texas.

Nations: US
States/Provinces: AL:S2S3, DE:S2S3, FL, GA, LA?, MD:S4, MS, NC, SC, TX, VA:S5
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, Canaveral, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Frederica?, Fort Pulaski, Timucuan); USFS (Croatan); USFWS (Anahuac, Big Boggy, Bon Secour, Brazoria, Chesapeake Marshlands, McFaddin, San Bernard, Texas Point)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.104, CUIS.111, CUIS.903.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: R.E. Evans, mod. L.A. Sneddon and M. Pyne
References: Adams 1963, Bowman 2000, Cooper and Waits 1973, Coulling 2002, Diamond 1993, Eleuterius and Caldwell 1984, Eleuterius and Eleuterius 1979, Fleming et al. 2001, Govus 1998, Hackney and de la Cruz 1981, Hackney and de la Cruz 1982, Harrison 2001, Harrison 2004, 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. unpubl. data 2002, Penfound 1952, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Schotz pers. comm., Smith 1996a, Southeastern Ecology Working Group n.d., Stalter 1973a, Stalter 1973b, Stout 1984, VDNH 2003, Wieland 1994a, Wieland 1994b, Wieland 2000b

Spartina alterniflora Tidal Herbaceous Alliance (A.1471)

Alliance Concept

Summary: This alliance includes various tidal marshes dominated by *Spartina alterniflora* (smooth cordgrass). 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 mudflat, to 24 m (80 feet) in drowned river valleys. *Spartina alterniflora* (smooth cordgrass) 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 "low salt marsh," occurring as a tall grassland strongly dominated by *Spartina alterniflora* (smooth cordgrass). 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* (salt sandspurry), *Salicornia* (pickleweed) spp., *Suaeda maritima* (herbaceous seepweed), and seaweeds such as *Ulva*

lactuca and other algae such as *Fucus vesiculosus* and *Ascophyllum nodosum*, which grow at the bases of the *Spartina* (cordgrass) plants. Herbs of *Salicornia virginica* (Virginia glasswort) and *Salicornia bigelovii* (dwarf saltwort) can be quite common mixed in with the *Spartina* (cordgrass), often becoming more apparent later in the growing season. *Limonium carolinianum* (Carolina sealavender) 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.

Similar Alliances:

- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance (A.1481)

Related Concepts:

- Brackish Marsh (Nelson 1986) I
- Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001) ?
- Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001) ?
- Saline Marsh (Wieland 1994b) I
- Saline Marsh (Wieland 1994a) I
- Salt Marsh (Smith 1996a) ?
- Salt Marsh (Nelson 1986) ?
- Salt Marsh (Schafale and Weakley 1990) ?
- Smooth Cordgrass Marsh (Wharton 1978) ?
- Smooth Cordgrass Series (Diamond 1993) I
- Tidal Marsh (FNAI 1992a) I

Alliance Description

Environment: 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 mudflat, to 24 m (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).

Vegetation: This community is commonly known as "low salt marsh," occurring as a tall grassland strongly dominated by *Spartina alterniflora* (smooth cordgrass). 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* (salt sandspurry), *Salicornia* (pickleweed) spp., *Suaeda maritima* (herbaceous seepweed), and seaweeds such as *Ulva lactuca* and other algae such as *Fucus vesiculosus* and *Ascophyllum nodosum*, which grow at the bases of the *Spartina* (cordgrass) plants. Herbs of *Salicornia virginica* (Virginia glasswort) and *Salicornia bigelovii* (dwarf saltwort) can be

quite common mixed in with the *Spartina* (cordgrass), often becoming more apparent later in the growing season. *Limonium carolinianum* (Carolina sealavender) is another characteristic herb, but only as scattered individuals.

Alliance Distribution
Range: This alliance is found in coastal areas from Maine to Texas.
Nations: CA, US
SubNations: 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, 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, Boston Harbor Islands, Cape Cod, Cape Hatteras, Cape Lookout, Colonial, Cumberland Island, Fire Island, Fort Frederica?, Fort Pulaski, Gateway, George Washington Birthplace, Muskeget Island, Sagamore Hill, Timucuan); USFS (Croatan); USFWS (Anahuac?, Aransas?, Back Bay?, Big Boggy, Bon Secour, Brazoria, Chesapeake Marshlands, Chincoteague, Matagorda Island, McFaddin, Monomoy, Moosehorn?, Parker River, Prime Hook, Rachel Carson, San Bernard, Texas Point)

(CEGL004191) Southern Atlantic Coast Salt Marsh
Spartina alterniflora Carolinian Zone Herbaceous Vegetation
Smooth Cordgrass Carolinian Zone Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tidal temperate or subpolar grassland (V.A.5.N.n.)
Alliance	*Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
Alliance (English name)	Smooth Cordgrass Tidal Herbaceous Alliance
Association	*Spartina alterniflora* Carolinian Zone Herbaceous Vegetation
Association (English name)	Smooth Cordgrass Carolinian Zone Herbaceous Vegetation

NVC Classification (continued)

Classification Level	Observed Classification
Association (Common name)	Southern Atlantic Coast Salt Marsh
Ecological System(s):	Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
	Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Element Concept

Global Summary: This vegetation includes various tidal marshes dominated by *Spartina alterniflora* (smooth cordgrass), from Cape Hatteras, North Carolina, south to the Atlantic Coast of the Florida peninsula. The hydrology is usually regularly tidally flooded. *Spartina alterniflora* (smooth cordgrass) 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 "low salt marsh," occurring as a tall grassland strongly dominated by *Spartina alterniflora* (smooth cordgrass). There is little variation in vascular plant species composition across the range. *Spartina alterniflora* (smooth cordgrass) occurs in nearly pure stands, occasionally with other low-statured species.

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This smooth cordgrass herbaceous vegetation was sampled at five locations on Cumberland Island on tidal flats with very poorly drained muck soil. The unvegetated surface for two of the sampled plots is dominated by standing water (96-98% cover) with some leaf litter (0-2%) and bare soil (2%). No disturbance is evident.

Global Environment: This vegetation is found along the margins of sounds and estuaries, backs of barrier islands, and old flood tide delates near closed inlets (Schafale and Weakley 1990). These are areas with diurnal salt tides. The hydrology is estuarine, tidally flooded, and euhaline (30-40 ppt). This range is consistent with the "Carolinian Province" of Cowardin et al. (1979).

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This vegetation is a sparse to moderately dense (20-70% cover) monoculture of *Spartina alterniflora* (smooth cordgrass) ranging from 0.5 to 2 m tall. Cover and height of the vegetation, and percent of flowering stems, seem to correlate negatively with inundation duration in sampled plots.

Global Vegetation: This community is commonly known as "low salt marsh," occurring as tall grassland strongly dominated by *Spartina alterniflora* (smooth cordgrass). There is little variation in vascular plant species composition across the range. *Spartina alterniflora* (smooth cordgrass) occurs in nearly pure stands, occasionally with other low-statured species. *Salicornia* (pickleweed) sp. can

be quite common mixed in with the *Spartina* (cordgrass), often becoming more apparent later in the growing season. *Limonium carolinianum* (Carolina sealavender) is another characteristic herb, but only as scattered individuals. More detailed information is needed on the composition of this vegetation and how it differs floristically from its northern equivalent, *Spartina alterniflora / (Ascophyllum nodosum)* Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Spartina alterniflora* (smooth cordgrass)

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Spartina alterniflora* (smooth cordgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Spartina alterniflora* (smooth cordgrass)
Global: *Spartina alterniflora* (smooth cordgrass)

Conservation Status Rank

Global Rank & Reasons: G5 (1-Dec-1997). Since it occurs over large areas, this community is in no danger of disappearing. However, its role in the functioning of ecosystems makes the presence of large areas very important. Losses of this community could have serious consequences for nutrient cycling and reproduction of estuarine and marine organisms (Schafale and Weakley 1990).

Classification

Status: Standard
Classification Confidence: 1 - Strong
Global Similar Associations: *Spartina alterniflora / (Ascophyllum nodosum)* Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192)

Global Related Concepts: Salt Marsh (Carolinian Subtype) (Schafale 2000) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association forms the dominant community type within the salt marsh along the eastern and southern sides of Cumberland Island. It was not documented at Fort Frederica as part of this project, although it is likely that it does occur at the park.

Global Range: This vegetation ranges from Cape Hatteras, North Carolina, south to the Atlantic Coast of the Florida peninsula (Cowardin 1979). The northern 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.

Nations: US
States/Provinces: FL, GA, NC, SC
TNC Ecoregions: 55:P, 56:C, 57:C
USFS Ecoregions: 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC

Federal Lands: NPS (Cape Hatteras, Cape Lookout, Cumberland Island, Fort Frederica?, Fort Pulaski, Timucuan); USFS (Croatan)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.094, CUIS.112, CUIS.113, CUIS.213, CUIS.313.

Local Description Authors: M.J. Russo and H. Summer
Global Description Authors: A.S. Weakley
References: Cowardin et al. 1979, FNA Editorial Committee 2003, FNAI 1992a, Govus 1998, Kartesz 1999, Nelson 1986, Peet et al. unpubl. data 2002, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Weakley 2007

Spartina bakeri - (Spartina patens) Tidal Herbaceous Alliance (A.1479)

Alliance Concept

Summary: Stands of this alliance are tidal marshes dominated by *Spartina bakeri* (sand cordgrass). Other associated species include *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Ipomoea sagittata* (saltmarsh morning-glory), *Mikania scandens* (climbing hempvine), *Vicia floridana* (Florida vetch), *Morella cerifera* (wax-myrtle), and *Baccharis halimifolia* (eastern baccharis). Scattered shrubs are often present (in the absence of fire) and include *Baccharis halimifolia* (eastern baccharis), *Morella cerifera* (wax-myrtle), *Acer rubrum* (red maple), *Salix caroliniana* (coastal plain willow), and *Fraxinus caroliniana* (Carolina ash).

Classification Comments: *Spartina bakeri* forms large tussocky clumps, and this vegetation is readily recognized from aerial photography.

Similar Alliances: *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)

Alliance Description

Vegetation: Stands of this alliance are tidal marshes dominated by *Spartina bakeri* (sand cordgrass). Other associated species include *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Ipomoea sagittata* (saltmarsh morning-glory), *Mikania scandens* (climbing hempvine), *Vicia floridana* (Florida vetch), *Morella cerifera* (wax-myrtle), and *Baccharis halimifolia* (eastern baccharis). Scattered shrubs are often present (in the absence of fire) and include *Baccharis halimifolia* (eastern

baccharis), *Morella cerifera* (wax-myrtle), *Acer rubrum* (red maple), *Salix caroliniana* (coastal plain willow), and *Fraxinus caroliniana* (Carolina ash).

Alliance Distribution

Range: This alliance is currently known from the Coastal Plain of Florida, extending into Georgia and possibly South Carolina.

Nations: US
SubNations: FL, GA, SC?
TNC Ecoregions: 53:P, 54:C, 55:C, 56:C, 57:P
USFS Ecoregions: 232Ce:CCC, 232Db:CCC, 232Dc:CCP, 232De:CCP, 232Gb:CCC, 411A:CC
Federal Lands: NPS (Canaveral, Cumberland Island, Fort Frederica?)

(CEGL004194) Sand Cordgrass - Seashore Mallow Herbaceous Vegetation
Spartina bakeri - Kosteletzkya virginica Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tidal temperate or subpolar grassland (V.A.5.N.n.)
Alliance	*Spartina bakeri - (Spartina patens)* Tidal Herbaceous Alliance (A.1479)
Alliance (English name)	Sand Cordgrass - (Saltmeadow Cordgrass) Tidal Herbaceous Alliance
Association	*Spartina bakeri - Kosteletzkya virginica* Herbaceous Vegetation
Association (English name)	Sand Cordgrass - Seashore Mallow Herbaceous Vegetation
Ecological System(s):	Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)

Element Concept

Global Summary: This community encompasses *Spartina bakeri* (sand cordgrass)-dominated tidal marshes, infrequently inundated by tides. Other associated species include *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Ipomoea sagittata* (saltmarsh morning-glory), *Vicia floridana* (Florida vetch), and *Mikania scandens* (climbing hempvine). Scattered shrubs are often present (in the absence of fire) and include *Baccharis halimifolia* (eastern baccharis), *Morella cerifera* (wax-myrtle), *Acer rubrum* (red maple), *Salix caroliniana* (coastal plain willow), and *Fraxinus caroliniana* (Carolina ash).

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This sand cordgrass herbaceous vegetation was sampled once on Cumberland Island in a tidally flooded channel with very poorly drained sandy loam soil. The unvegetated surface is dominated by leaf litter (93% cover) with some wood (1%), bare soil (1%), and standing water (5%). Evidence of disturbance includes nearby road crossings and changes in hydrology due to a nearby earthen bridge.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: *Spartina bakeri* (sand cordgrass) forms continuous cover (100%) in the herbaceous layer (1-2 m tall). Additional herbs and subshrubs found in small amounts include *Baccharis halimifolia* (eastern baccharis), *Bacopa monnieri* (herb of grace), *Iva frutescens* (Jesuit's bark), *Pluchea* (camphorweed) sp., and *Rubus trivialis* (southern dewberry). In addition, scattered *Juniperus virginiana var. silicicola* (southern redcedar) trees (10-15 m) and shrubs (2-5 m) occur. This community also supports state-critically imperiled *Eleocharis montevidensis* (sand spikerush) and state-vulnerable *Eleocharis albida* (white spikerush).

Global Vegetation: This tidal marsh association is dominated almost exclusively by *Spartina bakeri* (sand cordgrass). Other species that may occur include *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Ipomoea sagittata* (saltmarsh morning-glory), *Vicia floridana* (Florida vetch), *Mikania scandens* (climbing hempvine), and *Iva frutescens* (Jesuit's bark). Scattered shrubs are often present (in the absence of fire) and include *Baccharis halimifolia* (eastern baccharis), *Morella cerifera* (wax-myrtle), *Acer rubrum* (red maple), *Salix caroliniana* (coastal plain willow), and *Fraxinus caroliniana* (Carolina ash). On Cumberland Island in southeastern Georgia, *Juniperus virginiana var. silicicola* (southern redcedar) is an important component.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Spartina bakeri* (sand cordgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Spartina bakeri* (sand cordgrass)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Other Plant Species	GRank	Note
Eleocharis albida (white spikerush)	G4G5	state-vulnerable
Eleocharis montevidensis (sand spikerush)	G5	state-critically imperiled

Conservation Status Rank

Global Rank & Reasons: G3? (31-Jan-2001). The conservation status of this community needs additional assessment. Its distribution is fairly limited, however, and total extent is estimated to be less than 20,000 acres. Conservation status is relatively stable, though it is probably vulnerable to invasion by exotic species, such as *Triadica sebifera* and *Tamarix* spp.

Classification

Status: Standard
Classification Confidence: 1 - Strong
Global Similar Associations: *Spartina bakeri* Herbaceous Vegetation (CEGL003992)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled along a tidal inlet crossed by South Cut Road on the west side of Cumberland Island, and likely occurs occasionally in the park on the upper edges of tidal marsh and along tidal channels. This association was not documented at Fort Frederica as part of this project, although it is likely that it does occur at the park.

Global Range: This tidal marsh association is currently known from the Coastal Plain of Florida, extending into Georgia and possibly South Carolina.

Nations: US
States/Provinces: FL, GA, SC?
TNC Ecoregions: 55:C, 56:C
USFS Ecoregions: 232Ce:CCC, 232Db:CCC, 232Gb:CCC
Federal Lands: NPS (Canaveral, Cumberland Island, Fort Frederica?)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.061.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley
References: Southeastern Ecology Working Group n.d.

Spartina patens - (Distichlis spicata) Tidal Herbaceous Alliance (A.1481)

Alliance Concept

Summary: This alliance comprises "high salt marsh" vegetation dominated or codominated by *Spartina patens* (saltmeadow cordgrass) 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* (saltmeadow cordgrass), *Distichlis spicata* (inland saltgrass), and *Juncus gerardii* (saltmeadow rush) and the presence of more northerly distributed marsh species such as *Puccinellia fasciculata* (saltmarsh alkaligrass), *Plantago maritima* (goose tongue), and *Triglochin maritima* (seaside arrow-grass). In brackish reaches of tidal rivers, this alliance includes *Spartina patens* (saltmeadow cordgrass)-dominated vegetation that may also be characterized by the presence of *Agrostis stolonifera* (creeping bentgrass), *Festuca rubra* (red fescue), *Symphyotrichum novi-belgii* (New York aster), *Hierochloe odorata* (vanilla grass), *Carex paleacea* (chaffy sedge), or *Spartina pectinata* (prairie cordgrass).

From Delaware south to Florida, this high salt marsh coastal community is dominated by *Spartina patens* (saltmeadow cordgrass), forming meadows at slightly higher elevations in relation to the adjacent *Spartina alterniflora* (smooth cordgrass) Tidal Herbaceous Alliance (A.1471). Diagnostic species for this community are *Spartina patens* (saltmeadow cordgrass), *Distichlis spicata* (inland saltgrass), *Borrichia frutescens* (bushy seaside-tansy), *Kosteletzkya virginica* (Virginia saltmarsh mallow), and *Pluchea odorata* (sweetscent). Shrub seedlings such as *Baccharis halimifolia* (eastern baccharis) and *Morella cerifera* (wax-myrtle) may also be present. The associated *Juncus roemerianus* (needlegrass rush) 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* (saltmeadow cordgrass) may strongly dominate, *Distichlis spicata* (inland saltgrass), *Spartina alterniflora* (smooth cordgrass), and *Spartina patens* (saltmeadow cordgrass) may codominate, *Distichlis spicata* (inland saltgrass) may form pure stands, *Paspalum vaginatum* (seashore paspalum) may strongly dominate, or *Spartina patens* (saltmeadow cordgrass) and *Vigna luteola* (hairypod cowpea) may codominate. Other characteristic species include *Juncus roemerianus* (needlegrass rush), *Spartina spartinae* (gulf cordgrass), *Spartina cynosuroides* (big cordgrass) (within its range), *Schoenoplectus robustus* (sturdy bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), *Sagittaria lancifolia* (bulltongue arrowhead), *Phragmites australis* (common reed), and *Eragrostis* (lovegrass) spp. Here, this alliance forms mosaics with *Spartina spartinae* (gulf cordgrass) and *Spartina alterniflora* (smooth cordgrass) marshes and saline herbaceous vegetation.

Western states have a different alliance for inland situations dominated by *Distichlis spicata* (inland saltgrass), the *Distichlis spicata* (inland saltgrass) Intermittently Flooded Herbaceous Alliance (A.1332).

Classification Comments: This may represent multiple zones; more research is needed.
Similar Alliances:

- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Distichlis spicata* Tidal Herbaceous Alliance (A.1882)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)

- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)

Similar Alliance Comments: From Delaware south to Florida, this high salt marsh coastal community, dominated by *Spartina patens*, forms meadows at slightly higher elevations in relation to the adjacent *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471). The associated *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475) occurs as discrete patches which may reach substantial size. Western states have a different alliance for inland situations, the *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332). In coastal Texas and possibly elsewhere along the Gulf coast, the relationship between this alliance and the similar *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007) 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* or *Distichlis spicata*.

Related Concepts:

- Brackish Marsh (Wieland 1994b) I
- Brackish Marsh (Nelson 1986) I
- Estuarine Intertidal: Brackish Tidal Marsh (Swain and Kearsley 2001) ?
- Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001) ?
- Intermediate Marsh (Smith 1996a) ?
- Marshhay Cordgrass Series (Diamond 1993) I
- Salt Marsh (Wieland 1994b) I
- Salt Marsh (Schafale and Weakley 1990) I
- Salt Marsh (Nelson 1986) I
- Salt Marsh (Smith 1996a) I
- Saltgrass-Cordgrass Series (Diamond 1993) ?

Alliance Description

Environment: 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. The substrate is peat of variable depths overlying sand.

Vegetation: 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* (saltmeadow cordgrass), *Distichlis spicata* (inland saltgrass), and *Juncus gerardii* (saltmeadow rush) and the presence of more northerly distributed marsh species such as *Puccinellia fasciculata* (saltmarsh alkaligrass), *Plantago maritima* (goose tongue), and *Triglochin maritima* (seaside arrow-grass). In brackish reaches of tidal rivers, this alliance includes *Spartina patens* (saltmeadow cordgrass)-dominated vegetation that may also be

characterized by the presence of *Agrostis stolonifera* (creeping bentgrass), *Festuca rubra* (red fescue), *Symphyotrichum novi-belgii* (New York aster), *Hierochloe odorata* (vanilla grass), *Carex paleacea* (chaffy sedge), or *Spartina pectinata* (prairie cordgrass). From Delaware south to Florida, this high salt marsh coastal community is dominated by *Spartina patens* (saltmeadow cordgrass), forming meadows at slightly higher elevations in relation to the adjacent *Spartina alterniflora* (smooth cordgrass) Tidal Herbaceous Alliance (A.1471). *Distichlis spicata* (inland saltgrass), *Limonium carolinianum* (Carolina sealavender), *Agalinis maritima* (saltmarsh false foxglove), *Salicornia virginica* (Virginia glasswort), *Sabatia stellaris* (rose of Plymouth), *Borrichia frutescens* (bushy seaside-tansy), *Lythrum lineare* (wand lythrum), *Schoenoplectus pungens* (common threesquare), *Eleocharis rostellata* (beaked spikerush), *Solidago sempervirens* (seaside goldenrod), *Fimbristylis castanea* (marsh fimbry), *Pluchea odorata* (sweetscent), *Hibiscus moscheutos* (crimsoneyed rosemallow), and *Atriplex prostrata* (triangle orache) are characteristic associates. Diagnostic species are *Spartina patens* (saltmeadow cordgrass), *Distichlis spicata* (inland saltgrass), *Borrichia frutescens* (bushy seaside-tansy), *Kosteletzkya virginica* (Virginia saltmarsh mallow), and *Pluchea odorata* (sweetscent). This alliance also includes mesohaline to oligohaline marshes of the Gulf Coast of Texas and Louisiana. In these associations, *Spartina patens* (saltmeadow cordgrass) may strongly dominate, *Distichlis spicata* (inland saltgrass), *Spartina alterniflora* (smooth cordgrass), and *Spartina patens* (saltmeadow cordgrass) may codominate, *Distichlis spicata* (inland saltgrass) may form pure stands, *Paspalum vaginatum* (seashore paspalum) may strongly dominate, or *Spartina patens* (saltmeadow cordgrass) and *Vigna luteola* (hairypod cowpea) may codominate. Other characteristic species include *Juncus roemerianus* (needlegrass rush), *Spartina spartinae* (gulf cordgrass), *Spartina cynosuroides* (big cordgrass) (within its range), *Schoenoplectus robustus* (sturdy bulrush), *Schoenoplectus americanus* (chairmaker's bulrush), *Sagittaria lancifolia* (bulltongue arrowhead), *Phragmites australis* (common reed), and *Eragrostis* (lovegrass) spp. Here, this alliance forms mosaics with *Spartina spartinae* (gulf cordgrass) and *Spartina alterniflora* (smooth cordgrass) marshes and saline herbaceous vegetation.

Dynamics: Dominance patterns are likely related to gradients in salinity and hydrology and are not well understood.

Alliance Distribution

Range: This alliance is found along the Atlantic and Gulf coasts from Maine south to Florida and west to Texas.

Nations: US
SubNations: 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, 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, Boston Harbor Islands, Cape Cod, Cape Hatteras, Cape Lookout, Chincoteague, Cumberland Island, Fire Island, Fort Pulaski, Gateway, Muskeget Island?, Sagamore Hill); USFWS (Anahuac, Back Bay?, Big Boggy, Brazoria, Chesapeake Marshlands, Matagorda Island, McFaddin, Moosehorn, Parker River?, Prime Hook, Rachel Carson, San Bernard, Texas Point)

(CEGL004197) Mid- and Southern Atlantic High Salt Marsh
Spartina patens - Distichlis spicata - (Juncus roemerianus) Herbaceous Vegetation
Saltmeadow Cordgrass - Inland Saltgrass - (Black Needlerush) Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Tidal temperate or subpolar grassland (V.A.5.N.n.)
Alliance	*Spartina patens - (Distichlis spicata)* Tidal Herbaceous Alliance (A.1481)
Alliance (English name)	Saltmeadow Cordgrass - (Inland Saltgrass) Tidal Herbaceous Alliance
Association	*Spartina patens - Distichlis spicata - (Juncus roemerianus)* Herbaceous Vegetation
Association (English name)	Saltmeadow Cordgrass - Inland Saltgrass - (Black Needlerush) Herbaceous Vegetation
Association (Common name)	Mid- and Southern Atlantic High Salt Marsh
Ecological System(s):	Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
	Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

Element Concept

Global Summary: This coastal community is an irregularly tidally flooded high salt marsh of the mid- and southern Atlantic Coast from Delaware south to Florida. It is dominated by *Spartina patens* (saltmeadow cordgrass), 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* (inland saltgrass) can be codominant. Additional associated species that generally occur in low abundance can include *Limonium carolinianum* (Carolina sealavender), *Agalinis maritima* (saltmarsh false foxglove), *Salicornia virginica* (Virginia glasswort), *Juncus roemerianus* (needlegrass rush), *Sabatia stellaris* (rose of Plymouth), *Borrichia frutescens* (bushy seaside-tansy), *Lythrum lineare* (wand

lythrum), *Solidago sempervirens* (seaside goldenrod), *Pluchea odorata* (sweetscent), *Hibiscus moscheutos ssp. moscheutos* (crimsoneyed rosemallow), or *Atriplex prostrata* (triangle orache). Shrub seedlings of *Baccharis halimifolia* (eastern baccharis), *Iva frutescens* (Jesuit's bark), and/or *Morella cerifera* (wax-myrtle) may occur sporadically. Diagnostic species are *Spartina patens* (saltmeadow cordgrass), *Distichlis spicata*, *Borrichia frutescens* (bushy seaside-tansy), *Kosteletzkya virginica* (Virginia saltmarsh mallow), and *Pluchea odorata* (sweetscent). One unusual Virginia occurrence is dominated by *Plantago maritima var. juncoides* (goose tongue).

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This high salt marsh vegetation was sampled once on Cumberland Island on a tidally flooded flat located along a brackish creek that was not under water at the apparent high tide on the day of sampling. The unvegetated surface is dominated by leaf litter (70% cover) with some wood (5%) and bare soil (25%).

Global Environment: This high salt marsh association generally occurs behind barrier beaches, but also in the outer reaches of estuaries, occupying the zone extending from mean high tide landward approximately to the limit of high spring tides. They are often adjacent to low salt marshes dominated by *Spartina alterniflora* (tall form), which are regularly flooded by diurnal tides. *Spartina patens*-dominated high marshes form very dense peat with high organic matter content. Peat forms over sand, silt or bedrock.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is characterized by the dense (80% cover) herbaceous layer codominated by *Distichlis spicata* (inland saltgrass) and *Juncus roemerianus* (needlegrass rush). In addition, there are very sparse (5-10%) tall- (1-2 m) and short-shrub (0.5-1 m) layers of *Iva frutescens* (Jesuit's bark). Additional herbaceous species include *Agalinis maritima* (saltmarsh false foxglove), *Fimbristylis castanea* (marsh fimbry), *Limonium carolinianum* (Carolina sealavender), *Sarcocornia pacifica* (Pacific swampfire), *Spartina bakeri* (sand cordgrass), and *Tillandsia* (airplant) sp. This constitutes the entire floristic composition of the sampled plot.

Global Vegetation: This high salt marsh is dominated by *Spartina patens* (saltmeadow cordgrass) with *Distichlis spicata* (inland saltgrass) occurring as a common associate or a codominant species. Associated species that generally occur in low abundance can include *Limonium carolinianum* (Carolina sealavender), *Agalinis maritima* (saltmarsh false foxglove), *Salicornia virginica* (Virginia glasswort), *Sabatia stellaris* (rose of Plymouth), *Borrichia frutescens* (bushy seaside-tansy), *Lythrum lineare* (wand lythrum), *Juncus roemerianus* (needlegrass rush), *Solidago sempervirens* (seaside goldenrod), *Pluchea odorata* (sweetscent), *Hibiscus moscheutos ssp. moscheutos* (crimsoneyed rosemallow), and/or *Atriplex prostrata* (triangle orache). Shrub seedlings of *Baccharis halimifolia* (eastern baccharis), *Iva frutescens* (Jesuit's bark), and/or *Morella cerifera* (wax-myrtle) may occur sporadically.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Iva frutescens* (Jesuit's bark)
Herb (field)	Graminoid	*Distichlis spicata* (inland saltgrass), *Fimbristylis castanea* (marsh fimbry), *Juncus roemerianus* (needlegrass rush)

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Distichlis spicata* (inland saltgrass), *Spartina patens* (saltmeadow cordgrass)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Distichlis spicata* (inland saltgrass), *Juncus roemerianus* (needlegrass rush)
Global: *Distichlis spicata* (inland saltgrass), *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Pluchea odorata* (sweetscent), *Spartina patens* (saltmeadow cordgrass)

Conservation Status Rank

Global Rank & Reasons: G4G5 (13-May-2002). Although widespread on the eastern seaboard, examples of this community that have not been impacted by ditching, dredging and filling, mosquito spraying, and other activities are relatively uncommon.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Comments: Although *Juncus roemerianus* may not be present or have minor cover in some stands, it is a differential species and was chosen as a nominal of this association to distinguish it from *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation (CEGL006006), which occurs to the north. *Spartina patens - Distichlis spicata - (Juncus roemerianus)* Herbaceous Vegetation (CEGL004197) is differentiated 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 to be *Juncus roemerianus* Herbaceous Vegetation (CEGL004186). Currently, some unusually diverse variants exist in Virginia that may warrant recognition as a separate association.

Global Similar Associations:

- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186)
- *Spartina alterniflora - Distichlis spicata* Tidal Herbaceous Vegetation [Provisional] (CEGL006586)
- *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation (CEGL006006)

Global Related Concepts:

- *Aster tenuifolius - Distichlis spicata - Fimbristylis castanea - Borrichia frutescens - Spartina patens* association (Adams 1963) =
- *Spartina - Distichlis - Juncus* associes (Penfound 1952) =
- *Spartina patens - Distichlis spicata - Sarcocornia perennis - Limonium carolinianum* Herbaceous Vegetation (Coulling 2002) F
- *Spartina patens - Distichlis spicata* Herbaceous Vegetation (Clancy 1996) =
- *Spartina patens - Distichlis spicata* Herbaceous Vegetation (Coulling 2002) F
- *Spartina patens - Distichlis spicata* Herbaceous Vegetation (Harrison 2001) I
- *Spartina patens - Distichlis spicata* high marsh (Clancy 1993b) =
- *Spartina patens* type (Cooper and Waits 1973) =
- Brackish Marsh (Salt Meadow Cordgrass Subtype) (Schafale 2000) ?
- High marsh (Cooper 1974) =
- Salt marsh (Higgins et al. 1971) B
- Salt marsh community (Hill 1986) B

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was sampled along a tidal creek off of the Main Road on Cumberland Island, but likely occurs along the salt marsh across the entire island. It can be expected to occur in narrow bands above the low marsh, adjacent to *Spartina alterniflora* or *Distichlis spicata*, and is frequently associated with *Iva frutescens*- or *Borrichia frutescens*-dominated shrublands.

Global Range: This association occurs along the Atlantic Coast from Delaware to Florida.
Nations: US
States/Provinces: DE, FL, GA, MD, NC, NJ, SC, VA
TNC Ecoregions: 56:C, 57:C, 58:C, 62:C
USFS Ecoregions: 232Br:CCC, 232Bx:CCC, 232Bz:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC

Federal Lands: NPS (Assateague Island, Cape Hatteras, Cape Lookout, Cumberland Island, Fort Pulaski); USFWS (Back Bay?, Chesapeake Marshlands, Chincoteague, Prime Hook)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.037.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: L.A. Sneddon, mod. S.L. Neid
References: Adams 1963, Bowman 2000, Clancy 1993b, Clancy 1996, Cooper 1974, Cooper and Waits 1973, Coulling 2002, Eastern Ecology Working Group n.d., Fleming 2001a, Fleming et al. 2001, Govus 1998, Harrison 2001, Harrison 2004, Higgins et al. 1971, Hill 1986, Nelson 1986, Peet et al. unpubl. data 2002, Penfound 1952, Schafale 2000, Schafale 2003b, Schafale and Weakley 1990

Tidal temperate perennial forb vegetation (V.B.2.N.g.)

Sarcocornia pacifica - (Distichlis spicata, Salicornia spp.) Tidal Herbaceous Alliance (A.1704)

Alliance Concept

Summary:

Classification 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.

Similar Alliances: *Triglochin maritima* Semipermanently Flooded Herbaceous Alliance (A.1681)
Related Concepts: Estuarine Intertidal: Salt Marsh (Swain and Kearsley 2001) ?

Alliance Distribution

Range: This alliance is found throughout the northeastern coastal United States and Canada and possibly in the Pacific Northwest from California to Washington.

Nations: CA, US
SubNations: CA?, CT, DE, GA?, MA, MD, ME, NB, NC, NH, NJ, NS, NY, OR?, RI, SC?, VA, WA?

TNC Ecoregions: 1:C, 14:C, 15:C, 16:C, 56:P, 57:C, 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, 232Ce:CCP, 232Ci:CCC, 261A:CC, 261B:CC, 263A:CC, M242A:CC

Federal Lands: NPS (Assateague Island, Boston Harbor Islands, Cape Cod, Cape Lookout, Fire Island, Fort Frederica?, Gateway); USFWS (Parker River, Prime Hook, Rachel Carson)

(CEGL004308) Salt Panne (Salicornia Type)

Salicornia (virginica, bigelovii, maritima) - *Spartina alterniflora* Herbaceous Vegetation (Virginia Glasswort, Dwarf Saltwort, Slender Grasswort) - Smooth Cordgrass Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Tidal temperate perennial forb vegetation (V.B.2.N.g.)

NVC Classification (continued)

Classification Level	Observed Classification
Alliance	*Sarcocornia pacifica - (Distichlis spicata, Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
Alliance (English name)	Swampfire - (Inland Saltgrass, Saltwort species) Tidal Herbaceous Alliance
Association	*Salicornia (virginica, bigelovii, maritima) - Spartina alterniflora* Herbaceous Vegetation
Association (English name)	(Virginia Glasswort, Dwarf Saltwort, Slender Grasswort) - Smooth Cordgrass Herbaceous Vegetation
Association (Common name)	Salt Panne (Salicornia Type)
Ecological System(s):	Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
	Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)
	Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)
	Acadian Coastal Salt Marsh (CES201.578)

Element Concept

Global Summary: This association represents tidally flooded hypersaline flats or very shallow depressions (pannes) dominated by halophytic herbs, including *Salicornia virginica* (Virginia glasswort), *Salicornia bigelovii* (dwarf saltwort), *Salicornia maritima* (slender grasswort), and stunted *Spartina alterniflora* (smooth cordgrass), that occur in salt marshes of the Atlantic Coast. Vegetation of this association tends to develop in shallow depressions within high or salt marshes where drainage is poor. The depressions are regularly to irregularly 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. 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* (Virginia glasswort), *Salicornia bigelovii* (dwarf saltwort), *Salicornia maritima* (slender grasswort), *Sarcocornia pacifica* (Pacific swampfire), or *Spartina alterniflora* (smooth cordgrass) (short form). Common associates include *Limonium carolinianum* (Carolina sealavender), *Plantago maritima var. juncoides* (goose tongue), *Triglochin maritima* (seaside arrow-grass), *Spartina patens* (saltmeadow cordgrass), *Suaeda maritima* (herbaceous seepweed), and *Atriplex* (saltbush) 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* (dwarf saltwort) and *Salicornia virginica* (Virginia glasswort).

Environmental Description

USFWS Wetland System: Estuarine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Environment: Vegetation of this association tends to develop in shallow depressions in salt marshes where drainage is poor. They tend to occur more frequently on the high marsh but occur within low marsh as well. Pannes form in depressions that range from 2-30 cm lower than the elevation of the marsh. The depressions are regularly to irregularly flooded by tides, and as the water evaporates during low tide, the salinity concentration increases forming "salt pannes." Substrate is soft, silty muck or peat of variable density.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Vegetation: This association includes tidally flooded hypersaline flats or very shallow depressions (pannes) dominated by halophytic herbs. Total vegetative cover is quite variable in pannes, from near total absence of vascular plants to a dense cover of *Salicornia virginica* (Virginia glasswort), *Salicornia bigelovii* (dwarf saltwort), *Salicornia maritima* (slender grasswort), *Sarcocornia pacifica* (Pacific swampfire), or *Spartina alterniflora* (smooth cordgrass) (short form). Common associates include *Limonium carolinianum* (Carolina sealavender), *Plantago maritima var. juncoides* (goose tongue), *Triglochin maritima* (seaside arrow-grass), *Spartina patens* (saltmeadow cordgrass), *Suaeda maritima* (herbaceous seepweed), and *Atriplex* (saltbush) 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. The following algae were noted to occur in association with *Spartina alterniflora* (smooth cordgrass) in the littoral zone of a Massachusetts salt marsh: *Oscillatoria subuliformis*, *Oscillatoria amphibia*, *Lyngbea* spp., *Microcoleus chthonoplastes*, *Nodularia harveyana*, *Hydrocoleum lyngbyaceum*, and *Symploca* spp. (Webber 1967).

Most Abundant Species

Global

Stratum	Lifeform	Species
Herb (field)	Semi-shrub	*Salicornia virginica* (Virginia glasswort), *Sarcocornia perennis* (chickenclaws)
Herb (field)	Forb	*Salicornia bigelovii* (dwarf saltwort)
Herb (field)	Graminoid	*Spartina alterniflora* (smooth cordgrass)

Characteristic Species

Global: Salicornia bigelovii (dwarf saltwort), Salicornia virginica (Virginia glasswort), Sarcocornia perennis (chickenclaws)

Conservation Status Rank

Global Rank & Reasons: G5 (1-Dec-1997).

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global 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.

Global Similar Associations:

- *Batis maritima - Sarcocornia pacifica* Dwarf-shrubland (CEGL003956)
- *Sarcocornia pacifica* - (*Batis maritima, Distichlis spicata*) Dwarf-shrubland (CEGL002278)
- *Spartina alterniflora - Distichlis spicata* Tidal Herbaceous Vegetation [Provisional] (CEGL006586)

Global Related Concepts:

- *Salicornia - Bassia* salt flat (Harvill 1965) =
- *Salicornia europaea - Spartina alterniflora* community (Metzler and Barrett 1992) =
- *Salicornia virginica* Tidal Dwarf Shrubland (VDNH 2003) =
- *Salicornia* tidal flat (Clovis 1968) =
- *Salicornietum ambiguae* (Conard 1935) =
- *Sarcocornia perennis - (Distichlis spicata, Spartina alterniflora)* Dwarf-shrubland (Bartgis 1986) =
- *Spartina alterniflora / Salicornia europaea* community (Clancy 1993b) =
- Pan (Nichols 1920) =
- Panne (Good 1965) =
- Panne marsh (Baumann 1978b) =
- Pans (Hill 1986) =
- Pans (Higgins et al. 1971) =
- Salt Flat (Schafale 2000) =
- Salt Marsh (Rawinski 1984) ?
- Salt Panne (Clancy 1996) =
- Salt marsh complex, pannes (Breden 1989) =
- Salt pan (Klotz 1986) =

- Salt panne (Clancy 1993b) =
- Salt panne (Reschke 1990) =
- Salt panne (Miller and Egler 1950) =
- Stunted *Spartina alterniflora* community (Miller and Egler 1950) =

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur at Fort Frederica.

Global Range: This association occurs along the Mid- and North Atlantic Coast from the Canadian maritime provinces south to North Carolina and possibly South Carolina and Georgia.

Nations: CA, US
States/Provinces: CT, DE:S3, GA?, MA, MD, ME, NB, NC, NH, NJ:S3S4, NS, NY, RI, SC?, VA
TNC Ecoregions: 56:P, 57:C, 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, 232Ce:CCP, 232Ci:CCC

Federal Lands: NPS (Assateague Island, Boston Harbor Islands, Cape Cod, Cape Lookout, Fire Island, Fort Frederica?, Gateway); USFWS (Parker River, Prime Hook)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: S.L. Neid
References: Bartgis 1986, Baumann 1978b, Bell et al. 2002, Berdine 1998, Bertness et al. 1992, Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1993b, Clancy 1996, Clovis 1968, Conard 1935, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fleming 2001a, Fleming et al. 2001, Gawler 2001, Gawler 2002, Godfrey et al. 1978, Good 1965, Harrison 2004, Harvill 1965, Higgins et al. 1971, Hill 1986, Klotz 1986, Metzler and Barrett 1992, Metzler and Barrett 2001, Miller and Egler 1950, NRCS 2001b, Nichols 1920, Niering and Warren 1980, Peet et al. unpubl. data 2002, Rawinski 1984, Redfield 1972, Reschke 1990, Schafale 2000, Schafale and Weakley 1990, Sperduto 2000b, Swain and Kearsley 2001, VDNH 2003, Webber 1967

Seasonally flooded temperate perennial forb vegetation (V.B.2.N.h.)

Polygonum spp. (section Persicaria) Seasonally Flooded Herbaceous Alliance (A.1881)

Alliance Concept

Summary: This alliance covers various wet depressions, lakes, and ponds dominated by various *Polygonum* (knotweed) species (section Persicaria), singly or in combination, or with other obligate wetland plant species. Associations have been described that are dominated by, or contain, *Polygonum amphibium* (water knotweed), *Polygonum densiflorum* (denseflower knotweed), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), and/or related *Polygonum* (knotweed) spp. The many associated species vary with geography and habitat. In western Kentucky, this alliance occurs in marshes associated with the Ohio River in backflood areas around oxbows, beaver-flooded areas, levees, and depressional drainages. Associated species include *Nelumbo lutea* (American lotus), *Cephalanthus occidentalis* (common buttonbush), *Sagittaria brevirostra* (shortbeak arrowhead), *Peltandra virginica* (green arrow-arum), and *Juncus effusus* (common rush). Associates in Oklahoma include *Ammannia coccinea* (valley redstem), *Helianthus annuus* (common sunflower), *Lemna minor* (common duckweed), *Stuckenia pectinata* (sago pondweed), *Spirodela polyrrhiza* (common duckmeat), *Utricularia gibba* (humped bladderwort), and *Xanthium strumarium* (rough cockleburr). In Mississippi, one example of this vegetation is dominated by the perennial *Polygonum densiflorum* (denseflower knotweed); associated species include *Lemna minor* (common duckweed), *Saccharum giganteum* (sugarcane plumegrass), *Hydrocotyle umbellata* (manyflower marshpennywort), *Saururus cernuus* (lizard's-tail), *Carex lupulina* (hop sedge), *Triadenum walteri* (greater marsh St. Johnswort), *Cephalanthus occidentalis* (common buttonbush), *Leersia* (cutgrass) sp., *Ludwigia peploides* (floating primrose-willow), *Boehmeria cylindrica* (small-spike false nettle), *Juncus effusus* (common rush), *Rhynchospora corniculata* (shortbristle horned beaksedge), *Ludwigia decurrens* (wingleaf primrose-willow), *Habenaria repens* (waterspider bog orchid), *Mikania scandens* (climbing hempvine), *Scirpus cyperinus* (woolgrass), and others. It occurs as a band ringing the shores of ponds in the East Gulf Coastal Plain and along the banks of ditches and sloughs in the Mississippi River Alluvial Plain. This alliance also occurs in a wide variety of human- and beaver-created wetlands. Composition is highly variable and re-evaluation may be required as additional data become available. In the western United States and adjacent Canada, this alliance is found primarily over a wide elevational range from near sea level to over 2700 m. Stands are found in permanently flooded depressions such as margins of lake shores and oxbow lakes in river floodplains. The vegetation is characterized by the dominance or codominance of *Polygonum amphibium* (water knotweed). Associates may include species of *Potamogeton* (pondweed) and other aquatic plants.

Similar Alliances:

- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Polygonum* spp. - *Echinochloa* spp. Temporarily Flooded Herbaceous Alliance (A.1348)--vegetation of temporarily flooded playa lakebeds in Kansas and adjacent states that contains *Polygonum* spp., occurs in playa lakebeds that have a thick claypan beneath the soil surface.

Similar Alliance Comments: Alliances dominated by *Polygonum* spp. should be re-evaluated as a group; eventual redivision may be possible once adequate data are available. Hydrology of associations should also be reviewed.

Related Concepts:

- *Persicaria amphibia* Association (Cooper and Severn 1992) ?
- *Polygonum amphibium* herbaceous series (Hoagland 1997) I
- *Polygonum pensylvanicum* herbaceous series (Hoagland 1997) I
- *Polygonum* spp. (section *Persicaria*) herbaceous alliance (Hoagland 1998a) ?
- Freshwater Aquatic Beds (Chappell et al. 1997) ?

Alliance Description

Environment: In the southeastern United States, this alliance occurs in a wide variety of human- and beaver-created wetlands (wet depressions, lakes, and ponds), including a band ringing the shores of ponds in the East Gulf Coastal Plain and in ditches and sloughs in the Mississippi River Alluvial Plain. In the western United States, Great Plains, and one province in Canada, it occurs over a wide elevational range from near sea level to over 2700 m. Stands are found in permanently flooded depressions such as margins of lake shores and oxbow lakes in river floodplains. occurs in shallow water along the edges of ponds and lakes in the western United States. Stands are found in oxbow lakes and backwater areas of the Columbia River floodplain, in glacial ponds, or prairie potholes, in northern Montana, and in shallow lakes in the mountains of Colorado. Stands are located in standing water that is permanent or present at least during the growing season. These ponds have low concentrations of ions and salts and bottoms composed of finer sediments, organic muck, clay, or silt. The elevation of the vegetation in the alliance varies depending on geographical location. Stands on the Columbia River are located just above sea level, in Montana between 640-1080 m, and in Colorado from 2050-2700 m. *Typha latifolia* and *Schoenoplectus acutus* may grow adjacent to the vegetation in this alliance in deeper water, and *Carex aquatilis* grows in shallower water along the shore.

Vegetation: Stands of this alliance are dominated by various *Polygonum* (knotweed) species (section Persicaria), singly or in combination, or with other obligate wetland plant species. Associations have been described that are dominated by, or contain, *Polygonum amphibium* (water knotweed), *Polygonum densiflorum* (denseflower knotweed), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum lapathifolium* (curlytop knotweed), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Polygonum punctatum* (dotted smartweed), and/or related *Polygonum* (knotweed) spp. The many associated species vary with geography and habitat. In western Kentucky, associated species include *Nelumbo lutea* (American lotus), *Cephalanthus occidentalis* (common buttonbush), *Sagittaria brevirostra* (shortbeak arrowhead), *Peltandra virginica* (green arrow-arum), and *Juncus effusus* (common rush). Associates in Oklahoma include *Ammannia coccinea* (valley redstem), *Helianthus annuus* (common sunflower), *Lemna minor* (common duckweed), *Stuckenia pectinata* (sago pondweed), *Spirodela polyrrhiza* (common duckmeat), *Utricularia gibba* (humped bladderwort), and *Xanthium strumarium* (rough cockleburr). In Mississippi, one example of this

vegetation is dominated by the perennial *Polygonum densiflorum* (denseflower knotweed); associated species include *Lemna minor* (common duckweed), *Saccharum giganteum* (sugarcane plumegrass), *Hydrocotyle umbellata* (manyflower marshpennywort), *Saururus cernuus* (lizard's-tail), *Carex lupulina* (hop sedge), *Triadenum walteri* (greater marsh St. Johnswort), *Cephalanthus occidentalis* (common buttonbush), *Leersia* (cutgrass) sp., *Ludwigia peploides* (floating primrose-willow), *Boehmeria cylindrica* (small-spike false nettle), *Juncus effusus* (common rush), *Rhynchospora corniculata* (shortbristle horned beaksedge), *Ludwigia decurrens* (wingleaf primrose-willow), *Habenaria repens* (waterspider bog orchid), *Mikania scandens* (climbing hempvine), *Scirpus cyperinus* (woolgrass), and others. In the western United States and adjacent Canada, stands are characterized by the dominance or codominance of *Polygonum amphibium* (water knotweed). Associates may include species of *Potamogeton* (pondweed) and other aquatic plants. Floating-leaved aquatic forbs cover at least 30% of the water's surface (Kunze 1994). In the western United States, *Polygonum amphibium* (water knotweed) often forms dense, nearly monotypic stands. *Lemna minor* (common duckweed), *Potamogeton natans* (floating pondweed), *Spirodela polyrrhiza* (common duckmeat), and *Wolffia* (watermeal) spp. are occasionally present. In addition, *Typha latifolia* (broadleaf cattail) and *Schoenoplectus acutus* (hardstem bulrush) may grow adjacent to the vegetation in this alliance in deeper water, and *Carex aquatilis* (water sedge) grows in shallower water along the shore.

Alliance Distribution

Range: This alliance is widespread but scattered throughout the eastern and midwestern United States. In the western United States, this alliance is found in California (?), Oregon, Washington, Montana, and Colorado. It also occurs in British Columbia, Canada.

Nations: CA, US
SubNations: AL, AR, BC, CA?, CO, FL?, GA, IA, ID, IL, IN, KY, LA?, MO, MS, MT, NC, NJ, OK, OR, PA, SC, SD, TN, TX?, UT, WA, WI

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 6:C, 10:C, 19:C, 20:C, 26:C, 27:C, 28:P, 32:C, 33:C, 36:C, 37:C, 38:C, 39:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:C, 61:C, 81:C

USFS Ecoregions: 212Ja:PPP, 212Jb:PPP, 212Jc:PPP, 212Je:PPP, 212Jf:PPP, 212Jj:PPP, 212Jl:PPP, 212Jm:PPP, 221Ea:CCC, 221Ha:CCC, 221Hc:CCC, 221Hd:CC?, 221He:CCC, 222Ab:CCC, 222Ag:CCC, 222Aj:CCC, 222Ak:CC?, 222Am:CCC, 222Ce:CCP, 222Cf:CCP, 222Cg:CCC, 222Db:CCC, 222Eb:CCC, 222Eg:CCP, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 222Gc:CCC, 222Jb:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCP, 231Af:CCP, 231Ao:CCC, 231Ba:CCC, 231Bc:CC?, 231Bd:CC?, 231Be:CC?, 231Bi:CCC, 231Bk:CC?, 231Cc:CCC, 231Cd:CCC, 231D:CP, 231E:CP, 231Ga:CCC, 231Gb:CCC, 232Bd:CCC, 232Bj:CCC, 232Bl:CCC, 232Bs:CCC, 232Cb:CCC, 232Ce:CCC, 232D:CP, 232E:CP, 232F:CP, 234An:CCC, 242A:CC, 251Cc:CCC, 251Cd:CC?, 251Cf:CCC, 251Cg:CCC, 251Ck:CCC, 251Eb:CCC, 251F:CC, 255A:CC, 311A:CC, 315B:PP, 315C:PP, 331B:CC, 331D:CC, 331F:CP, 331G:CC, 331I:C?, 332C:CP, 332E:CC, 341C:CC, 342B:CC, 342C:C?, M221Cd:CCC, M222A:??, M231A:??, M242A:CC, M242B:CC, M242C:CC

Federal Lands: COE (Claiborne Lake); DOD (Fort Benning); NPS (Chickamauga-Chattanooga, Cumberland Island, Friendship Hill, Great Sand Dunes, Great Smoky Mountains, Horseshoe Bend, Lake Meredith, Morristown, Natchez Trace, Shiloh); USFS (Bankhead, Bienville, Chequamegon, Chequamegon-Nicolet, Daniel Boone, Francis Marion, Nicolet, Oconee, Oregon Dunes, Siuslaw, Talladega?); USFWS (Lacreek, Ouray, Reelfoot)

(CEGL004249) Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation
Polygonum punctatum - Bidens laevis Herbaceous Vegetation [Provisional]

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Seasonally flooded temperate perennial forb vegetation (V.B.2.N.h.)
Alliance	*Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
Alliance (English name)	Smartweed species Seasonally Flooded Herbaceous Alliance
Association	*Polygonum punctatum - Bidens laevis* Herbaceous Vegetation [Provisional]
Association (English name)	Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation

Element Concept

Global Summary: This provisional association describes herbaceous wetland vegetation dominated by *Bidens laevis* (smooth beggarticks) and *Polygonum punctatum* (dotted smartweed) and is documented only from Cumberland Island National Seashore, Georgia.

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This smartweed - beggarticks herbaceous vegetation was sampled once on Cumberland Island on a temporarily flooded lowland with somewhat poorly drained sandy loam soil. This lowland occurs within a complex of narrow swales and rises in the backdunes, where most swales are undergoing woody succession. The unvegetated surface is dominated by leaf litter (97% cover) with some bare soil (3%). Evidence of disturbance includes nearby trails and roads.

Global Environment: This herbaceous wetland type occurs on poorly drained sandy loam soils on Cumberland Island National Seashore. It occurs within a complex of narrow swales and rises in the backdunes, where most swales are undergoing woody succession.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This community is characterized by a very dense (90% cover) herbaceous layer dominated by *Bidens laevis* (smooth beggarticks), *Phyla nodiflora* (turkey tangle fogfruit), and *Polygonum punctatum* (dotted smartweed). In addition, there is a very sparse (5%) emergent tree canopy of *Sabal palmetto* (cabbage palmetto) and sparse (20%) shrub layer (1-5 m) *Morella cerifera* (wax-myrtle). Other herbs present include *Ampelopsis arborea* (peppervine), *Boehmeria cylindrica* (small-spike false nettle), *Centella erecta* (erect centella), *Mikania scandens* (climbing hempvine), *Panicum dichotomiflorum var. bartowense* (fall panicgrass) (possible new state record), *Pluchea odorata* (sweetscent), *Saccharum giganteum* (sugarcane plumegrass), *Sacciolepis striata* (American cupscale), and *Symphyotrichum subulatum* (eastern annual saltmarsh aster).

Global Vegetation: This community is characterized by a dense herbaceous layer dominated by *Bidens laevis* (smooth beggarticks), *Phyla nodiflora* (turkey tangle fogfruit), and *Polygonum punctatum* (dotted smartweed). In addition, there may be a sparse emergent tree canopy of *Sabal palmetto* (cabbage palmetto) and a sparse shrub layer of *Morella cerifera* (wax-myrtle). Other herbs present include *Ampelopsis arborea* (peppervine), *Boehmeria cylindrica* (small-spike false nettle), *Centella erecta* (erect centella), *Mikania scandens* (climbing hempvine), *Panicum dichotomiflorum var. bartowense* (fall panicgrass), *Pluchea odorata* (sweetscent), *Saccharum giganteum* (sugarcane plumegrass), *Sacciolepis striata* (American cupscale), and *Symphyotrichum subulatum* (eastern annual saltmarsh aster).

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Tree canopy	Broad-leaved evergreen tree	*Sabal palmetto* (cabbage palmetto)
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera* (wax-myrtle)
Herb (field)	Forb	*Bidens laevis* (smooth beggarticks), *Phyla nodiflora* (turkey tangle fogfruit), *Polygonum punctatum* (dotted smartweed)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Bidens laevis* (smooth beggarticks), *Polygonum punctatum* (dotted smartweed)

Conservation Status Rank

Global Rank & Reasons: GNR (25-Jul-2008).

Classification

Status: Provisional

Classification Confidence: –

Cumberland Island National Seashore and Fort Frederica National Monument Comments: This provisional association was created based on one plot at Cumberland Island and should be re-examined based on any future data collected.

Global Comments: This provisional association was created based on one plot at Cumberland Island and should be re-examined based on any future data collected.

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This herbaceous lowland occurs near the complex band of swales and old dunes near Lake Rhetta.

Global Range: This herbaceous vegetation is currently only known from Cumberland Island, Georgia.

Nations: US
States/Provinces: GA
TNC Ecoregions: 56:C
USFS Ecoregions: 232Ce:CCC
Federal Lands: NPS (Cumberland Island)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.001.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: H. Summer and L. Kruse
References: Southeastern Ecology Working Group n.d.

Permanently flooded tropical or subtropical hydromorphic-rooted vegetation (V.C.1.N.a)

Eichhornia crassipes Permanently Flooded Herbaceous Alliance (A.1716)

Alliance Concept

Summary: This alliance contains aquatic ruderal vegetation dominated by the exotic pest plant *Eichhornia crassipes* (common water hyacinth), which can withstand brief periods of freezing. This alliance is primarily limited to tropical Florida, but extends northwards into temperate peninsular and Panhandle Florida. It also occurs sporadically along the Texas coast. The hydrology of these sites is usually permanently or semipermanently flooded, although periodic drying can occur. Other species sometimes occur intermixed with *Eichhornia* (water hyacinth). The more permanent mats may develop a substantial additional flora, including *Habenaria repens* (waterspider bog orchid). Growth rates are very high, and mats can double in size in 11-18 days. Floating or rooted (by stranding) aquatic vegetation in slow-moving or stagnant, usually eutrophic water of lakes, ponds and rivers, dominated by *Eichhornia crassipes* (common water hyacinth), and often essentially monospecific.

Classification Comments: Reported from South Carolina by Aulbach-Smith (pers. comm. 2001) and from Lake Whitney at Cumberland Island National Seashore.

Related Concepts:

- *Eichhornietum crassipedes* Association (Borhidi 1991) ?
- *Eichhornion azureae* (Borhidi et al. 1983) I
- *Eichhornion azureae* Alliance (Borhidi 1991) ?
- *Nymphaea-Nelumbo-Pistia* Alliance (Lindsay and Horwith 1997) I

Alliance Description

Environment: The hydrology of these sites is usually permanently or semipermanently flooded, although periodic drying can occur. Floating or rooted (by stranding) aquatic vegetation in slow-moving or stagnant, usually eutrophic water of lakes, ponds and rivers.

Vegetation: Other species sometimes occur intermixed with *Eichhornia* (water hyacinth). The more permanent mats may develop a substantial additional flora, including *Habenaria repens* (waterspider bog orchid). Growth rates are very high, and mats can double in size in 11-18 days. Floating or rooted (by stranding) aquatic vegetation in slow-moving or stagnant, usually eutrophic water of lakes, ponds and rivers, dominated by *Eichhornia crassipes* (common water hyacinth), and often essentially monospecific.

Alliance Distribution

Range: This alliance is found in the Florida Peninsula but extends northwards into the Panhandle of Florida, Georgia and coastal South Carolina. Along the Gulf Coast it is found in Florida, Alabama, Lousisana, Texas, Mississippi, and Mexico. Also it is found in Puerto Rico, Cuba, Jamaica, Hispaniola, Bahamas, Lesser Antilles, and the Neotropics.

Nations: BS, CU, JM, MX, PR, US, XD, XE
SubNations: AL, FL, GA, LA, MS, NC?, SC, TX

TNC Ecoregions: 29:C, 31:C, 32:P, 40:C, 41:C, 42:C, 43:C, 53:C, 54:C, 55:C, 56:C, 57:P
USFS Ecoregions: 231Bi:CCC, 231Bj:CCC, 231Ea:CCC, 231Ec:CCC, 231Ed:CCC, 231Ef:CCC, 231Eg:CCC, 231Eh:CCC, 231Ei:CCC, 231Ej:CCC, 231Fa:CCC, 231Fb:CCC, 232Ba:CCC, 232Bb:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bs:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Ce:CCC, 232Cf:CCC, 232Da:CCC, 232Db:CCC, 232Dc:CCC, 232Ea:CCC, 232Eb:CCC, 232Fa:CCC, 232Fb:CCC, 232Fc:CCC, 232Fd:CCC, 232Fe:CCC, 232Ga:CCC, 232Gb:CCC, 232Gc:CCC, 232Gd:CCC, 234Aa:CCC, 234Ad:CCC, 234Af:CCC, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CCC, 234An:CCC, 255Ba:CCC, 255Ca:CCC, 255Cc:CCC, 255Cd:CCC, 255Ce:CCC, 255Cf:CCC, 255Da:CCC, 255Db:CCC, 255Dc:CCC, 315D:CC, 411A:CC, M411A:CC

Federal Lands: NPS (Cumberland Island?, Natchez Trace)

(CEGL007671) Water-hyacinth Aquatic Vegetation
Eichhornia crassipes Herbaceous Vegetation
Common Water-hyacinth Herbaceous Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Hydromorphic-rooted vegetation (V.C.)
Physiognomic Group	Tropical or subtropical hydromorphic-rooted vegetation (V.C.1.)
Physiognomic Subgroup	Natural/Semi-natural tropical or subtropical hydromorphic-rooted vegetation (V.C.1.N.)
Formation	Permanently flooded tropical or subtropical hydromorphic-rooted vegetation (V.C.1.N.a.)
Alliance	*Eichhornia crassipes* Permanently Flooded Herbaceous Alliance (A.1716)
Alliance (English name)	Common Water-hyacinth Permanently Flooded Herbaceous Alliance
Association	*Eichhornia crassipes* Herbaceous Vegetation
Association (English name)	Common Water-hyacinth Herbaceous Vegetation
Association (Common name)	Water-hyacinth Aquatic Vegetation

Element Concept

Global Summary: This association includes floating or rooted aquatic vegetation dominated by *Eichhornia crassipes* (common water hyacinth); stands are often essentially monospecific. Other species may include *Paspalidium geminatum* (Egyptian panicgrass), *Lemna* (duckweed) spp., *Azolla caroliniana* (Carolina mosquitofern), *Pistia stratiotes* (water lettuce), *Spirodela polyrrhiza* (common duckmeat), *Salvinia minima* (water spangles).

Environmental Description

USFWS Wetland System: Palustrine

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Vegetation: Stands of this association are often essentially monospecific floating or rooted aquatic vegetation dominated by *Eichhornia crassipes* (common water hyacinth). Other species may include *Paspalidium geminatum* (Egyptian panicgrass), *Lemna* (duckweed) spp., *Azolla caroliniana* (Carolina mosquitofern), *Pistia stratiotes* (water lettuce), *Spirodela polyrrhiza* (common duckmeat), *Salvinia minima* (water spangles).

Conservation Status Rank

Global Rank & Reasons: GNA (invasive) (13-Jan-1998). This vegetation type is dominated by a species native to South America; it is exotic in North America and the Caribbean.

Classification

Status: Standard

Classification Confidence: 1 - Strong

Global Comments: Usually floating but becoming rooted with lowered water table. Not certain if correctly placed here. Reported from South Carolina by Aulbach-Smith (pers. comm. 2001). The species does overwinter in SC - in numerous counties in the Coastal Plain from Orangeburg County to the coast. Reported from Lake Whitney at Cumberland Island National Seashore, Georgia (in National Park Service correspondence dated 1998); it is not known how persistent it is or will become there.

Global Related Concepts:

- *Eichhornietum crassipedis* (Borhidi 1991) ?
- *Eichhornietum crassipedis* (Samek and Moncada 1971) ?
- Vegetazione dei fiume a lento corso (Ciferri 1936) B
- Vegetazione delle Isole galleggianti (Ciferri 1936) B
- Water-hyacinth Mat -- 27.6 (Dansereau 1966) ?

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association was not documented as part of this project, although it is likely that it does occur on Cumberland Island.

Global Range: This association is found in Florida, Georgia, South Carolina, Texas, Mexico, Puerto Rico, Cuba, Jamaica, Hispaniola, Bahamas, Lesser Antilles, and Neotropics.

Nations: BS, CU, JM, MX, PR, US, XD, XE

States/Provinces: AL, FL, GA, LA, MS, NC?, SC, TX
TNC Ecoregions: 29:C, 31:C, 32:P, 40:C, 41:C, 42:C, 43:C, 53:P, 54:C, 55:C, 56:P, 57:P
USFS Ecoregions: 231Bi:CCC, 231Bj:CCC, 231Ea:CCC, 231Ec:CCC, 231Ed:CCC, 231Ef:CCC, 231Eg:CCC, 231Eh:CCC, 231Ei:CCC, 231Ej:CCC, 231Fa:CCC, 231Fb:CCC, 232Ba:CCC, 232Bb:CCC, 232Be:CCC, 232Bf:CCC, 232Bg:CCC, 232Bh:CCC, 232Bi:CCC, 232Bj:CCC, 232Bs:CCC, 232Ca:CCC, 232Cb:CCC, 232Cc:CCC, 232Ce:CCC, 232Cf:CCC, 232Da:CCC, 232Db:CCC, 232Dc:CCC, 232Ea:CCC, 232Eb:CCC, 232Fa:CCC, 232Fb:CCC, 232Fc:CCC, 232Fd:CCC, 232Fe:CCC, 232Ga:CCC, 232Gb:CCC, 232Gc:CCC, 232Gd:CCC, 234Aa:CCC, 234Ad:CCC, 234Af:CCC, 234Ah:CCC, 234Ai:CCC, 234Ak:CCC, 234Al:CCC, 234An:CCC, 255Ba:CCC, 255Ca:CCC, 255Cc:CCC, 255Cd:CCC, 255Ce:CCC, 255Cf:CCC, 255Da:CCC, 255Db:CCC, 255Dc:CCC, 315D:CC, 411A:CC, M411A:CC

Federal Lands: NPS (Cumberland Island?, Natchez Trace)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: None.
Local Description Authors: H. Summer
Global Description Authors: A.S. Weakley
References: Areces-Mallea et al. 1999, Aulbach-Smith pers. comm., Borhidi 1991, Ciferri 1936, Dansereau 1966, FNA Editorial Committee 2002, Samek and Moncada 1971, Southeastern Ecology Working Group n.d.

Sparse Vegetation (VII.)

Sand flats (VII.C.2.N.a)

Cakile edentula Sparsely Vegetated Alliance (A.1861)

Alliance Concept

Summary: 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* (Gulf Coast searocket) 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* (American searocket), as well as *Salsola kali ssp. kali* (Russian thistle), *Chamaesyce polygonifolia* (seaside sandmat), *Honckenya peploides* (seaside sandplant), *Cenchrus tribuloides* (sanddune sandbur), *Amaranthus retroflexus* (redroot amaranth), *Chenopodium album* (lambsquarters), *Erechtites hieraciifolia* (American burnweed), and *Atriplex cristata* (crested saltbush). Associated species include *Ammophila breviligulata* (American beachgrass), *Chamaesyce polygonifolia* (seaside sandmat), *Salsola kali ssp. kali* (Russian thistle), and *Triplasis purpurea* (purple sandgrass). At Assateague Island National Seashore, this alliance is sparsely vegetated with *Cakile edentula ssp. edentula* (American searocket), 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* (seaside sandmat), *Chamaesyce bombensis* (dixie sandmat), *Sesuvium portulacastrum* (shoreline seapurslane), *Salsola kali ssp. kali* (Russian thistle), and the rare *Amaranthus pumilus* (seaside amaranth). 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 var. lacustris* (American searocket).

Similar Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Cakile constricta* Sparsely Vegetated Alliance (A.1860)
- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)

Similar Alliance Comments: This alliance (A.1861) has less perennial species than the related *Cakile constricta* Sparsely Vegetated Alliance (A.1860).

Related Concepts:

- *Cakile edentula-Chenopodium album* community (Metzler and Barrett 1992) ?
- *Cakiletum edentula* (Conard 1935) ?

- Beach community (Johnson 1985b) ?
- Beach community (Hill 1986) ?
- Beach strand community (MENHP 1991) ?
- Eastern Great Lakes Beach (Smith 1991) ?
- Great Lakes Region sparsely vegetated beach (Fike 1999) ?
- Marine intertidal gravel/sand beach community (Breden 1989) ?
- Maritime Beach Strand Community (Swain and Kearsley 2001) ?
- Maritime Grassland (Nelson 1986) I
- Upper Beach (Schafale and Weakley 1990) I
- beach (Fender 1937) ?
- beach (Higgins et al. 1971) ?
- beach (McDonnell 1979) ?
- beach community (Baumann 1978b) ?
- beach vegetation (Moul 1973) ?
- coastal beach strand (Sperduto 1994) ?
- dune and swale community (Stalter 1990) I
- dune community (Jenkins 1974) ?
- dune-strand area (Clovis 1968) ?
- embryo dune (Klotz 1986) ?
- marine sandy beach (Clancy 1993b) ?
- maritime beach (Reschke 1990) ?
- middle beach (Nichols 1920) ?
- middle beach (Shreve et al. 1910) ?
- pioneer beach community (Boule 1979) ?
- sea-strand vegetation, beach formation (Harshberger 1900) ?

Alliance Description

Environment: Annual-dominated sand flats on island end flats and upper ocean beaches, within the reach of storm tides and extreme lunar tides. 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).

Vegetation: 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* (Gulf Coast searocket) 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* (American searocket), as well as *Salsola kali ssp. kali* (Russian thistle), *Chamaesyce polygonifolia* (seaside sandmat), *Honckenya peploides* (seaside sandplant), *Cenchrus tribuloides* (sanddune sandbur), *Amaranthus retroflexus* (redroot amaranth), *Chenopodium album* (lambsquarters), *Erechtites hieraciifolia* (American burnweed), and *Atriplex cristata* (crested saltbush). Associated species include *Ammophila breviligulata* (American beachgrass), *Chamaesyce polygonifolia* (seaside sandmat), *Salsola kali ssp. kali* (Russian thistle), and *Triplasis purpurea* (purple sandgrass). At Assateague Island National Seashore, this alliance is sparsely vegetated with *Cakile edentula ssp. edentula* (American searocket), 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* (seaside sandmat), *Chamaesyce bombensis* (dixie sandmat), *Sesuvium portulacastrum* (shoreline seapurslane), *Salsola kali ssp. kali* (Russian thistle), and the rare *Amaranthus pumilus* (seaside amaranth). 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 var. lacustris* (American searocket).

Alliance Distribution

Range: This alliance is found in coastal areas from Maine to South Carolina, as well as along the Great Lakes; and in Canada in Ontario. It may also be found in Florida and Georgia.

Nations: CA, US
SubNations: CT, DE, FL?, GA, IL, IN, LB?, MA, MD, ME, MI, NB?, NC, NF?, NH, NJ, NS?, NY, OH, ON, PA, PE?, RI, SC, VA, VT, 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:CCC, 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, Boston Harbor Islands, Cape Cod, Cape Hatteras, Cape Lookout, Cumberland Island, Fire Island, Gateway, Muskeget Island, Sagamore Hill, Sleeping Bear Dunes); USFS (Hiawatha, Huron-Manistee, Huron?, Manistee); USFWS (Back Bay, Cape Romain, Chesapeake Marshlands, Monomoy, Parker River, Rachel Carson)

(CEGL004401) South Atlantic Upper Ocean Beach
Cakile edentula ssp. harperi Sparse Vegetation
Harper's Searocket Sparse Vegetation

NVC Classification

Classification Level	Observed Classification
Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Unconsolidated material sparse vegetation (VII.C.)
Physiognomic Group	Sparsely vegetated sand flats (VII.C.2.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated sand flats (VII.C.2.N.)
Formation	Sand flats (VII.C.2.N.a.)
Alliance	*Cakile edentula* Sparsely Vegetated Alliance (A.1861)
Alliance (English name)	American Searocket Sparsely Vegetated Alliance
Association	*Cakile edentula ssp. harperi* Sparse Vegetation
Association (English name)	Harper's Searocket Sparse Vegetation
Association (Common name)	South Atlantic Upper Ocean Beach
Ecological System(s):	Southern Atlantic Coastal Plain Beach (CES203.535)
	Atlantic Coastal Plain Sea Island Beach (CES203.383)

Element Concept

Global Summary: This association is a southern Atlantic Coast upper ocean beach community. It occupies the upper portion of ocean beaches in the southern part (Cape Hatteras, North Carolina, to Cumberland Island, Georgia) of the microtidal region (barrier islands with coastal geomorphology dominated by hurricane overwash rather than tidal energy), as well as vegetation further south to Volusia County, Florida. Characteristic species include mostly annual herbs, such as *Cakile edentula ssp. harperi* (Harper's searocket), *Chamaesyce polygonifolia* (seaside sandmat), *Chamaesyce bombensis* (dixie sandmat), *Sesuvium portulacastrum* (shoreline seapurslane), *Salsola kali ssp. kali* (Russian thistle), and *Amaranthus pumilus* (seaside amaranth). On Cumberland Island National Seashore in southeastern Georgia, perennials such as *Croton punctatus* (gulf croton) and *Uniola paniculata* (sea-oats) also can be important.

Environmental Description

Cumberland Island National Seashore and Fort Frederica National Monument Environment: This upper beach vegetation, occurring above the tidal rack-line but below the upper dune, was sampled twice on Cumberland Island: one site is flat, while the other gently slopes to the west. Soil is xeric rapidly drained sand. The unvegetated surface is dominated by bare sand (98-99% cover) with some leaf litter (1-2%). Disturbance by horses is likely.

Vegetation Description

Cumberland Island National Seashore and Fort Frederica National Monument Vegetation: The very sparse (5-30% cover) herbaceous layer includes *Cakile edentula ssp. harperi* (Harper's searocket), *Croton punctatus* (gulf croton), *Distichlis spicata* (inland saltgrass), *Ipomoea imperati* (beach morning-glory), *Ipomoea pes-caprae* (bayhops), *Panicum amarum* (bitter panicgrass),

Spartina patens (saltmeadow cordgrass), *Uniola paniculata* (sea-oats), and exotic *Salsola kali* (Russian thistle). This constitutes the entire floristic composition.

Most Abundant Species

Cumberland Island National Seashore and Fort Frederica National Monument

Stratum	Lifeform	Species
Herb (field)	Forb	*Cakile edentula* ssp. *harperi* (Harper's searocket), *Croton punctatus* (gulf croton), *Ipomoea pes-caprae* (bayhops)
Herb (field)	Graminoid	*Uniola paniculata* (sea-oats)

Global

Stratum	Lifeform	Species
Herb (field)	Forb	*Cakile edentula* ssp. *harperi* (Harper's searocket)

Characteristic Species

Cumberland Island National Seashore and Fort Frederica National Monument: *Cakile edentula* ssp. *harperi* (Harper's searocket)

Global: *Cakile edentula* ssp. *harperi* (Harper's searocket)

Other Noteworthy Species

Cumberland Island National Seashore and Fort Frederica National Monument

Exotic and Invasive Species	I-Rank	Note
Salsola kali (Russian thistle)	–	exotic

Global

Other Plant Species	GRank	Note
Amaranthus pumilus (seaside amaranth)	G2	Federally listed threatened; globally imperiled
Cakile edentula ssp. *harperi* (Harper's searocket)	G5T4	–

Animal Species	GRank	Note
Caretta caretta (loggerhead)	G3	Federally listed threatened
Charadrius melodus (piping plover)	G3	Federally listed endangered
Dermochelys coriacea (leatherback)	G2	Federally listed endangered; globally imperiled

Conservation Status Rank

Global Rank & Reasons: G3 (23-Jan-2000). This community occurs in narrow linear bands along the oceanward side of barrier islands and barrier spits. It is a very dynamic community, altered by regular and catastrophic storm events. Total areal extent is small; a rough calculation of potential extent (20 m wide by 200 kilometers long) suggests maximum total area as about 400 hectares (1000 acres), much of which is degraded. Community composition, structure, and function are affected detrimentally by development, beach vehicular traffic, and heavy recreational use that occur at most sites. Beach "replenishment" also alters this community extensively, and may improve or maintain some functions, while destroying or degrading others.

Classification

Status: Standard
Classification Confidence: 2 - Moderate
Global Similar Associations: *Cakile edentula ssp. edentula - Chamaesyce polygonifolia* Sparse Vegetation (CEGL004400)

Element Distribution

Cumberland Island National Seashore and Fort Frederica National Monument Range: This association occurs in a narrow band above the rack-line below the dunes, along the entire length of Cumberland Island where dunes are important and the tidal wash not too strong.

Global Range: This association occupies the upper portion of ocean beaches in the southern part (Cape Hatteras, North Carolina, to Cumberland Island, Georgia) of the microtidal region (barrier islands with coastal geomorphology dominated by hurricane overwash rather than tidal energy). It may extend south to Volusia County, Florida.

Nations: US
States/Provinces: FL?, GA, NC, SC
TNC Ecoregions: 56:C, 57:C
USFS Ecoregions: 232Cb:CCP, 232Ce:CCC, 232Ci:CCC
Federal Lands: NPS (Cape Lookout, Cumberland Island); USFWS (Cape Romain)

Element Sources

Cumberland Island National Seashore and Fort Frederica National Monument Plots: CUIS.003, CUIS.116.

Local Description Authors: M.J. Russo, H. Summer and L. Kruse
Global Description Authors: A.S. Weakley

References: Nelson 1986, Peet et al. unpubl. data 2002, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

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Appendix C: Field Key to Vegetation Types

Draft Key to the National Vegetation Classification (NVC) Associations, which occur or potentially occur at Cumberland Island National Seashore.

October 2008

Associations which are documented from Cumberland Island National Seashore are in **bold type**. Associations which may potentially occur, but that were not documented from Cumberland Island National Seashore as part of this project, are in normal type. For each association, the common name is given, with the Element Code in parentheses (CEGL00####) and the Alliance Code in brackets [A.###].

CUMBERLAND ISLAND NATIONAL SEASHORE

KEY TO KEYS

1. Vegetation not dominated by trees; trees absent or sparse **2**

1. Vegetation dominated by trees, forests or woodlands ..... **KEY A – FORESTS & WOODLANDS**

2. Shrub dominated and vine dominated areas, with few or no trees. In fire suppressed or dense scrub areas, tree cover may be as high as 25% and shrubs can reach over 10 m (32 feet) tall; in the salt marsh, shrubs may be less than 0.5 to 1 meter (1.5 to 3.2 feet) tall .....**KEY B – SHRUBLANDS**

2. Vegetation dominated by herbaceous plants, including sparse vegetation of herbaceous plants, such as may occur between the foredunes and the beach, and including herbaceous vegetation intermixed with sparse shrubs.....**KEY C – HERBACEOUS VEGETATION**

KEY A – FORESTS & WOODLANDS

1. Evergreen forest, where canopy species retain their green leaves into the cold season.....**2**

1. Mixed evergreen – cold deciduous forest, where some of the dominant canopy species lose their leaves in the cold season.....**13**

2. Pine (*Pinus* spp.) dominated canopy, broadleaf trees may be present in the canopy but with low cover.....**3**

2. Broadleaf dominated canopy, frequently with coastal red cedar, pine may be present but not composing more than 50% of the canopy.....**7**

3. Wetland or lowland flatwoods; pond pine (*Pinus serotina*) a canopy dominant; understory dominated by shrubs of the heath family (Ericaceous plants) and by wax myrtle (*Morella cerifera*), and frequently with gallberry (*Ilex glabra*) .....
Wet Longleaf Pine - Pond Pine Flatwoods (CEGL004791) [A.785]

3. Upland community; pond pine absent; understory variable **4**

4. Canopy of loblolly pine (*Pinus taeda*) only, not planted in a plantation, found in recently regenerated patches within the surrounding oak forest; shrub and herbaceous layers usually very sparse..... **Mid- to Late-Successional Loblolly Pine - Sweetgum Forest (CEGL008462) [A.130]**

4. Canopy not dominated by loblolly pine (*Pinus taeda*); old growth or old plantation forest; understory layers variable.....**5**

5. Planted pine forest; old growth trees absent; slash pine (*Pinus elliottii*) canopy with trees in rows ...
Mid- to Late-Successional Slash Pine Managed Forest (CEGL7171) [A.123]

5. Naturally generated forest; old growth trees usually present; trees not in rows **6**

6. Longleaf pine (*Pinus palustris*) dominated canopy, live oak (*Quercus virginiana*) absent, turkey oak (*Quercus laevis*) a major component of the understory, community growing on dry (xeric), slightly elevated ridges.....
Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland (CEGL004263) [A.499]

6. Longleaf (*Pinus palustris*) or slash pine (*Pinus elliottii*) dominated canopy, loblolly pine (*Pinus taeda*) and live oak (*Quercus virginiana*) may be present, turkey oak (*Quercus laevis*) absent, community growing in mesic backdunes or mesic upland flats on the north end of the island .....
Maritime Slash Pine (Longleaf Pine) Upland Flatwoods (CEGL004658) [A.520]

7. Saturated wetland forest along stream drains or depressions, canopy dominated by sweetbay (*Magnolia virginiana*) and swamp bay (*Persea palustris*), occasionally with pine (*Pinus* spp.). There is a shrub component dominated by swamp bay (*Persea palustris*), which also likely includes pine

(*Pinus* spp.) and wax myrtle (*Morella cerifera*) .....
Outer Coastal Plain Sweetbay Swamp Forest (CEGL007049) [A.60]

7. Upland or occasionally flooded vegetation.....**8**

8. Vegetation of flat marsh edges or narrow spits within the marsh, just above or near to high tide level; canopy frequently sparse and wind-sheared; live oak (*Quercus virginiana*) and coastal red cedar (*Juniperus virginiana* var. *silicicola*) canopy dominants with cabbage palmetto (*Sabal palmetto*) a strong component; non-vegetative ground cover usually with oyster shells **9**

8. Vegetation of the main island, well above tidal flooding; canopy usually closed and not wind-sheared; oak (*Quercus* spp.) the most dominant canopy component; oyster shells not important in the ground cover **10**

9. Vegetation with indicators of high calcium soils, harboring one or more Georgia state rare species such as climbing buckthorn (*Sageretia minutiflora*), Florida privet (*Forestiera segregata*), wingleaf soapberry (*Sapindus saponaria* var. *saponaria*), or Christmas berry (*Lycium carolinianum*).....
South Atlantic Coastal Shell Midden Woodland (CEGL003525) [A.79]

9. Vegetation composed of locally common flora that can be adapted to high calcium soil but may be more tolerant of salt-water flooding, rare species absent .....
Coastal Red Cedar - Live Oak - Cabbage Palmetto Marsh Hammock (CEGL007813) [A.55]

10. Canopy dominated exclusively by sand live oak (*Quercus geminata*); hydrologic regime is xeric; community occurs along the transition between more mesic maritime live oak forest behind the dunes and the inland sand live oak-myrtle oak scrub on the north end of the island; important understory woody components are devilwood (*Osmanthus americanus*), wax myrtle (*Morella cerifera*), horsesugar (*Symplocos tinctoria*), rusty fetterbush (*Lyonia ferruginea*), and saw palmetto (*Serenoa repens*) ..... **Southeastern Florida Maritime Hammock (CEGL007020) [A.52]**

10. Canopy characteristically dominated by live oak (*Quercus virginiana*), with additional species likely important or dominant; hydrologic regime varies.....**11**

11. Live oak (*Quercus virginiana*) is the only canopy species; vegetation *either* of geographically younger landscapes on the southern and eastern sides of the island, on rolling deep sands of recently colonized old dunes, *or* of a xeric sandridge west of the Lake Whitney complex; canopy may be closed with a sparse herbaceous layer sparse consisting mostly of tree and shrub seedlings, but across the xeric sandridge there are frequent woodland openings with a rich graminoid and reindeer lichen (*Cladonia* spp.) herbaceous layer ..... **Xeric Live Oak Hammock (CEGL007028) [A.55]**

11. Live oak (*Quercus virginiana*) is a canopy dominant with other canopy tree species; vegetation of geographically older, flatter landscapes and not of recently colonized old dunes; herbaceous layer varies from sparse to moderate and can be species rich.....**12**

12. Canopy strongly dominated by live oak (*Quercus virginiana*), frequently with pine (*Pinus* spp.) or Darlington oak (*Quercus hemisphaerica*); hydrology varies from mesic to dry-mesic, understory

and tall shrub layers variable but most frequently with red bay (*Persea borbonia*), sparkleberry (*Vaccinium arboreum*), American holly (*Ilex opaca*), rusty fetterbush (*Lyonia ferruginea*), and cabbage palm (*Sabal palmetto*); mesic-site species such as shining fetterbush (*Lyonia lucida*) can be important components ..... **Maritime Live Oak Hammock (CEGL007032) [A.55]**

12. Canopy may be dominated by live oak (*Quercus virginiana*) and/or Darlington oak (*Quercus hemisphaerica*); Darlington oak (*Quercus hemisphaerica*) is characteristic and water oak (*Quercus nigra*), coastal red cedar (*Juniperus virginiana* var. *silicicola*), and pine (*Pinus* spp.) are common; hydrology varies from dry-mesic to xeric as the vegetation usually grows on slight hammocks or on steep bluffs on the north end of the island; understory and shrub layers variable but yaupon holly (*Ilex vomitoria*) and sparkleberry (*Vaccinium arboreum*) are the strongest components, possibly occurring with saw palmetto (*Serenoa repens*), rusty fetterbush (*Lyonia ferruginea*), cabbage palm (*Sabal palmetto*) and tough bumelia (*Sideroxylon tenax*); mesic-site species absent..... **Dry Live Oak Hammock (CEGL004408) [A.55]**

13. Dry mesic upland forest; canopy dominated by live oak (*Quercus virginiana*) and pignut hickory (*Carya glabra*) with some Darlington oak (*Quercus hemisphaerica*); shrub layer dominated by sparkleberry (*Vaccinium arboreum*) and saw palmetto (*Serenoa repens*), possibly with rusty fetterbush (*Lyonia ferruginea*) and water oak (*Quercus nigra*)..... **Sand Laurel Oak - Mixed Hardwood Upland Forest (CEGL004788) [A.372]**

13. Saturated wetland forest along stream drains or depressions; canopy dominated by various wetland species **14**

14. Canopy dominated by sweetbay (*Magnolia virginiana*) and swamp gum (*Nyssa biflora*), with some red maple (*Acer rubrum*); late-successional stage forest, likely with old growth canopy ..... **Atlantic/East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest (CEGL004722) [A.378]**

14. Canopy dominated by red maple (*Acer rubrum*) and swamp gum (*Nyssa biflora*), with some sweetbay (*Magnolia virginiana*); forest in earlier successional stage generally without old growth canopy ..... **Red Maple - Swamp Tupelo - (Sweetgum, Ash species) Maritime Swamp Forest (CEGL004082) [A.321]**

KEY B - SHRUBLANDS

1. Vegetation associated with wetlands, swales, or low-lying areas.....**2**

1. Vegetation associated with xeric dunes or dry sandy soils.....**9**

2. Tidally flooded shrublands associated with the salt marsh.....**3**

2. Seasonally flooded shrublands in interdune swales, or mesic vegetation in low-lying areas.....**6**

3. Vegetation less than 0.5 meter (1.6 feet) tall; consisting of succulent-leaved, halophytic shrubs on the salt panne of the lower salt marsh **4**

3. Vegetation greater than 0.5 meter (1.6 feet) tall; consisting of various species of shrubs on the upper edges of the high salt marsh.....**5**

4. Community dominated by the dwarf-shrub swampfire (*Sarcocornia pacifica*) .....
Salt Flat (Swampfire Type) (CEGL002278) [A.1705]

4. Community dominated by the dwarf-shrub turtleweed (*Batis maritima*).....
Turtleweed - Swampfire Dwarf-shrubland (CEGL003956) [A.1111]

5. Shrub layer dominated by maritime marsh elder (*Iva frutescens*) with scattered groundsel tree (*Baccharis halimifolia*); herbaceous layer tends to be dense (80% cover), and is dominated by inland saltgrass (*Distichlis spicata*), chestnut fimbry (*Fimbristylis castanea*), and sand cord grass (*Spartina bakeri*) ..... **Coastal Salt Shrub Thicket (CEGL003920) [A.1023]**

5. Shrub layer dominated by seaside tansy (*Borrichia frutescens*), frequently occurring with marsh elder (*Iva frutescens*) and black rush (*Juncus roemerianus*); herbaceous layer tends to be moderate (40-60% cover), and may by dominated by turtleweed (*Batis maritima*), chestnut fimbry (*Fimbristylis castanea*), and St. Augustine grass (*Stenotaphrum secundum*) .....
Seaside Oxeye Tidal Shrub Flat (CEGL003924) [A.1026]

6. Vegetation defined by a moderate to dense cover of vines (70-90%), namely muscadine (*Vitis rotundifolia*), and also cross-vine (*Bignonia capreolata*) and greenbrier species (*Smilax glauca* and *Smilax auriculata*), clambering over shrubs and other layers; generally occurring in mesic to wet gaps caused by disturbance to the surrounding forest.....
Grapevine - Peppervine - Trumpetvine Thicket (CEGL004620) [A.993}

6. Vegetation not defined by clambering vines, although vines may be present; generally occurring in clearly defined swales or wetlands and not associated with recent disturbance.....**7**

7. Shrub layer defined by swamp loosestrife (*Decodon verticillatus*), frequently with willow (*Salix* spp.) or buttonbush (*Cephalanthus occidentalis*), in saturated to flooded sites with mucky or peat soils..... **Swamp-loosestrife Pond (CEGL003905) [A.990]**

7. Shrub layer defined by wax myrtle (*Morella cerifera*), in mesic to saturated swales with sandy soils.....**8**

8. In addition to wax myrtle, sugarberry (*Celtis laevigata*), coastal red cedar (*Juniperus virginiana* var. *silicicola*), and cabbage palm (*Sabal palmetto*) are common shrub layer components; the herbaceous layer is variable dependent upon shrub cover, in open areas it often has abundant graminoids such as broomsedges (*Andropogon* spp.), rushes (*Juncus* spp.), and Carolina fimbry (*Fimbristylis caroliniana*), and forbs such as common frog fruit (*Phyla nodiflora*), dogfennel (*Eupatorium capillifolium*), and manyflower marshpennywort (*Hydrocotyle umbellata*).....
Atlantic Coast Interdune Swale (CEGL003839) [A.1906]

8. In addition to wax myrtle, poison ivy (*Toxicodendron radicans*) and groundsel tree (*Baccharis halimifolia*) are common shrub layer components; sand cordgrass (*Spartina bakeri*), black rush (*Juncus roemerianus*), and Jamaica swamp sawgrass (*Cladium mariscus* spp. *jamaicense*) are frequent in the herbaceous layer .....
South Atlantic Coast Tidal River Shrubland (CEGL004789) [A.806]

9. Scrub vegetation of the geographically younger landscape of dunes and dune edges; live oak (*Quercus virginiana*) is a characteristic dominant **10**

9. Scrub vegetation of the geographically older landscape of sand ridges further inland on the island; sand live oak (*Quercus geminata*) is a characteristic dominant.....**12**

10. Vegetation characterized by a sparse shrub cover (approximately 30%), allowing for a relatively rich herbaceous layer generally dominated by graminoids; important shrub components in addition to live oak (*Quercus virginiana*) include tough bumelia (*Sideroxylon tenax*), red bay (*Persea borbonia*), and wax myrtle (*Morella cerifera*).....
Florida Coastal Strand (Temperate Palmetto Type) (CEGL003812) [A.750]

10. Vegetation typically with a dense shrub or short tree cover (80% or greater), preventing growth of a rich herbaceous layer.....**11**

11. Vegetation of wind-sheared, leading dune edges; dominated by dwarfed live oak (*Quercus virginiana*) and frequently saw palmetto (*Serenoa repens*).....
Live Oak - Saw Palmetto - (Yaupon) Shrubland (CEGL004241) [A.785]

11. Vegetation of relatively sheltered back-dunes, dominated by wax myrtle (*Morella cerifera*) with live oak (*Quercus virginiana*) and cabbage palm (*Sabal palmetto*), occasionally with toothache-tree (*Zanthoxylum clava-herculis*)and sugarberry (*Celtis laevigata*).....
Wax-myrtle - Carolina Laurel Cherry - Toothache-tree Shrubland (CEGL004784) [A.785]

12. The sand live oak (*Quercus geminata*) canopy occurs with a myrtle oak (*Quercus myrtifolia*), saw palmetto (*Serenoa repens*) and heath (Ericaceous spp.) dominated shrub layer; patches of low woody cover are characterized by reindeer lichens (*Cladonia* spp.) and xeric-site species, such as split-beard bluestem (*Andropogon ternarius*), broomsedge (*Andropogon virginicus*), three-awn (*Aristida* spp.),

Elliott's milkpea (*Galactia elliottii*), narrowleaf silkgrass (*Pityopsis graminifolia*), queen's delight (*Stillingia sylvatica*) and purple sandgrass (*Triplasis purpurea*). Devilwood (*Osmanthus americanus*) and coastal red cedar (*Juniperus virginiana* var. *silicicola*) are not present ..... **Xeric Oak Scrubland (CEGL003825) [A.779]**

12. The sand live oak (*Quercus geminata*) canopy occurs with red bay (*Persea borbonia*) in addition to myrtle oak (*Quercus myrtifolia*), saw palmetto (*Sabal palmetto*), and rusty fetterbush (*Lyonia ferruginea*). Devilwood (*Osmanthus americanus*) and coastal red cedar (*Juniperus virginiana* var. *silicicola*) may also occur ..... **Northeast Florida Coastal Scrub (CEGL003821) [A.779]**

KEY C – HERBACEOUS VEGETATION

1. Vegetation of primary dunes and foredunes **2**

1. Vegetation of other habitats, including dune swales and back dunes **4**

2. Sparse vegetation with cover averaging 30% or below that occurs along the foredune, just above the rack line at high tide; southern sea-rocked (*Cakile edentula* var. *harperi*) and railroad vine (*Ipomoea pes-caprae*) are characteristic.....
South Atlantic Upper Ocean Beach (CEGL004401) [A.1861]

2. Moderately dense vegetation with cover averaging 50% or greater that occurs on the primary dunes; sea-oats (*Uniola paniculata*) are characteristic..... **3**

3. Graminoid-dominated dune vegetation strongly dominated by sea-oats (*Uniola paniculata*), other components include broomsedge (*Andropogon virginicus*), saltmeadow cordgrass (*Spartina patens*), and the forb gulf croton (*Croton punctatus)*.....
Sea-oats - Beach Marsh-pennywort Herbaceous Vegetation (CEGL004040) [A.1199]

3. Woody vine and forb-dominated dune vegetation that is not dominated by sea-oats (*Uniola paniculata*) although it may be present; other components include earleaf greenbrier (*Smilax auriculata)*, camphorweed (*Heterotheca subaxillaris)*, beach morning-glory (*Ipomoea imperati*), pricklypear (*Opuntia* spp.), tough bumelia (*Sideroxylon tenax)*, wax myrtle (*Morella cerifera)*, and moundlily yucca (*Yucca gloriosa)* .....
Seaside Greenbrier / Camphorweed - Trailing Wild Bean - (Sea-oats) Herbaceous Vegetation (CEGL004234) [A.1199]

4. Vegetation dominated by forbs **5**

4. Vegetation dominated by graminoids..... **8**

5. Vegetation of the salt panne in the low marsh, tidally flooded; dominated by halophytic herbs, including Virginia glasswort (*Salicornia virginica*), dwarf glasswort (*Salicornia bigelovii*), and/or stunted smooth cordgrass (*Spartina alterniflora*) .....
Salt Panne (Salicornia Type) (CEGL004308) [A.1704]

5. Vegetation of freshwater wetlands or brackish marsh, seasonally flooded..... **6**

6. Vegetation in temporarily flooded or wet dune swales; having a species rich composition which may vary across the season and includes dotted smartweed (*Polygonum punctatum*), common frog fruit (*Phyla nodiflora*), and frequently dense stands of smooth beggarticks (*Bidens laevis*).....
Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation (CEGL004249) [A.1881]

6. Vegetation in ponded or permanently flooded freshwater wetlands; having a generally species poor composition that is static across the season..... **7**

7. Vegetation defined by nearly monospecific stands of broadleaf cattail (*Typha latifolia*).....
Southern Cattail Marsh (CEGL004150) [A.1436]

7. Vegetation defined by nearly monospecific stands of common water hyacinth (*Eichhornia crassipes*).....Water-hyacinth Aquatic Vegetation (CEGL007671) [A.1716]

8. Vegetation associated with wetlands, of wet to flooded sites with poorly drained muck, sandy loam, or sandy soil **9**

8. Vegetation not associated with wetlands, of mesic sites with well-drained sandy soils **20**

9. Vegetation of or adjacent to the salt marsh, tidally flooded **10**

9. Vegetation not associated with the salt marsh, flooding may or may not be influenced by tides....**14**

10. Vegetation composed of monospecific stands of smooth cordgrass (*Spartina alterniflora*); generally occurring in the low salt marsh.....
Southern Atlantic Coast Salt Marsh (CEGL004191) [A.1471]

10. Vegetation composed of species other than smooth cordgrass (*Spartina alterniflora*), although it may be present within the community; occurring above the low marsh **11**

11. Vegetation dominated by black needle rush (*Juncus roemerianus*), frequently in mono-specific bands at the transition from low to high salt marsh .....
Needlerush High Marsh (CEGL004186) [A.1475]

11. Vegetation not dominated by black needle rush (*Juncus roemerianus*), located clearly above the low salt marsh **12**

12. Vegetation of areas where the salt water marsh intergrades with freshwater streams or marsh; dominated by Jamaica swamp sawgrass (*Cladium mariscus* ssp. *jamaicense*).....
Tidal Sawgrass Marsh (CEGL004178) [A.1473]

12. Vegetation of the high salt marsh or upper edges of tidal creeks.....**13**

13. Vegetation dominated nearly exclusively by sand cordgrass (*Spartina bakeri*), frequently with scattered coastal red cedar (*Juniperus virginiana* var. *silicicola*), maritime marsh elder (*Iva frutescens*), groundsel tree (*Baccharis halimifolia*), and coastal water-hyssop (*Bacopa monnieri*).....
Sand Cordgrass - Seashore Mallow Herbaceous Vegetation (CEGL004194) [A.1479]

13. Vegetation dominated by inland saltgrass (*Distichlis spicata*), black needle rush (*Juncus roemerianus*), and possibly saltmeadow cordgrass (*Spartina patens*). Additional species include chestnut fimbry (*Fimbristylis castanea*), maritime marsh elder (*Iva frutescens*), and scattered saltmarsh false foxglove (*Agalinis maritima*), sea lavender (*Limonium carolinianum*), and swamp fire (*Sarcocornia pacifica*)..... **Mid- and Southern Atlantic High Salt Marsh (CEGL004197) [A.1481]**

14. Vegetation associated mainly with freshwater ponds in the interior of the island, although occurrences are possible in freshwater interdune swales; scattered small trees may occur within.....**15**

14. Vegetation associated with brackish to shallow freshwater wetlands, expected in interdune swales or sloughs near to but removed from the salt marsh; trees are generally not present **18**

15. Vegetation of highly disturbed ponds or wetlands in old agricultural areas; generally subjected to heavy grazing and dominated by common rush (*Juncus effusus*).....
Rush Marsh (CEGL004112) [A.1375]

15. Vegetation of essentially undisturbed ponds or wetlands that have not been used for agriculture; graminoid cover not subjected to heavy grazing.....**16**

16. Vegetation likely to occur in small patches in shallow freshwater ponds, dominated strongly by maiden cane (*Panicum hemitomon*).....
Outer Coastal Plain Maidencane Pond (CEGL007792) [A.1379]

16. Vegetation dominant over large areas of Lake Whitney and also occurring across small ponds within pine flatwoods and scrub vegetation on the north end of the island, not dominated by maiden cane (*Panicum hemitomon*) **17**

17. Vegetation dominated strongly by sand cordgrass (*Spartina bakeri*); other frequent herbs are Virginia chain fern (*Woodwardia virginica*), giant silver plume grass (*Saccharum giganteum*), common rush (*Juncus effusus*), and, in deeper ponds, may be bulltongue arrowhead (*Sagittaria lancifolia*) and pickerel weed (*Pontederia cordata*) .....
South Atlantic Coastal Pond (CEGL7713) [A.1389]

17. Vegetation dominated strongly by Jamaica swamp sawgrass (*Cladium mariscus* ssp. *jamaicense*) interspersed with Virginia chain fern (*Woodwardia virginica*).....
Sawgrass Head (CEGL004949) [A.1369]

18. Vegetation found in sloughs near to the salt marsh on the south side of the island; may possibly occur in interdune swales; a species rich community dominated by spreading panic grass (*Panicum dichotomiflorum var. bartowense* and *Panicum dichotomiflorum var. dichotomiflorum*) marsh fleabane (*Pluchea camphorata*), and saltmeadow cordgrass (*Spartina patens*).....
Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation (CEGL004254) [A.1390]

18. Vegetation of interdune swales within the dune complexes along the east side of the island.....**19**

19. Tall graminoid vegetation from 1-2 m (3.2-6.5 ft.), dominated by sand cordgrass (*Spartina bakeri*) and potentially species rich; additional species may include bushy bluestem (*Andropogon glomeratus)*, threeawn (*Aristida* spp.), narrowleaf white-top (*Rhynchospora colorata*), bulltongue arrowhead (*Sagittaria lancifolia*), giant bristlegrass *(Setaria magna)*, Jamaica swamp sawgrass (*Cladium mariscus ssp. jamaicense*), common frog fruit (*Phyla nodiflora*), sea pink (*Sabatia*

stellaris), and camphorweed (*Pluchea* species).....
Sand Cordgrass Interdune Swale (CEGL004511) [A.1389]

19. Low graminoid vegetation less than 1 m tall (3.2 feet), dominated by common three-square (*Schoenoplectus pungens*), chestnut fimbry (*Fimbristylis castanea*), and saltmeadow cordgrass (*Spartina patens*).....
Chestnut Fimbry - Common Threesquare Seasonally Flooded Herbaceous Vegetation (CEGL003790) [A.1372]

20. Species-rich vegetation of well-drained interdune flats, dominated by southern hairgrass (*Muhlenbergia filipes*), frequently with dense stands of bushy bluestem (*Andropogon glomeratus*), broomsedge (*Andropogon virginicus*) and abundant composite and grass species, and frequently interspersed with small shrubs of wax myrtle (*Morella cerifera*).....
Southern Hairgrass – Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation (CEGL004051) [A.1217]

20. Species-poor vegetation of a variety of soil and site types, dominated by St. Augustine grass (*Stenotaphrum secundum*) that may be in monoculture or with scattered native and exotic species .....
St. Augustine Grass Herbaceous Vegetation (CEGL004883) [A.1139]

Appendix D: Photo-Interpretation Guide

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I. Forest

MAP CLASS 1. Atlantic / East Gulf Coastal Plain Sweetbay – Tupelo Streamhead Forest



Figure 12. Photo of Atlantic / East Gulf Coastal Plain Sweetbay – Tupelo Streamhead Forest

Association

Magnolia virginiana – Nyssa biflora / Carpinus caroliniana / Thelypteris noveboracensis – Athyrium filix-femina [Forest]

Abundant species

- *Magnolia virginiana* (sweetbay)
- *Nyssa biflora* (swamp tupelo)
- *Persea palustris* (swamp bay)
- *Morella cerifera* (wax myrtle)
- *Saururus cernuus* (lizard's tail)

Map Class Statistics
Frequency: 7 polygons
Total area: 33.6 ha
Average polygon size: 4.8 ha
Producer's accuracy: 56.5%
User's accuracy: 70.6%

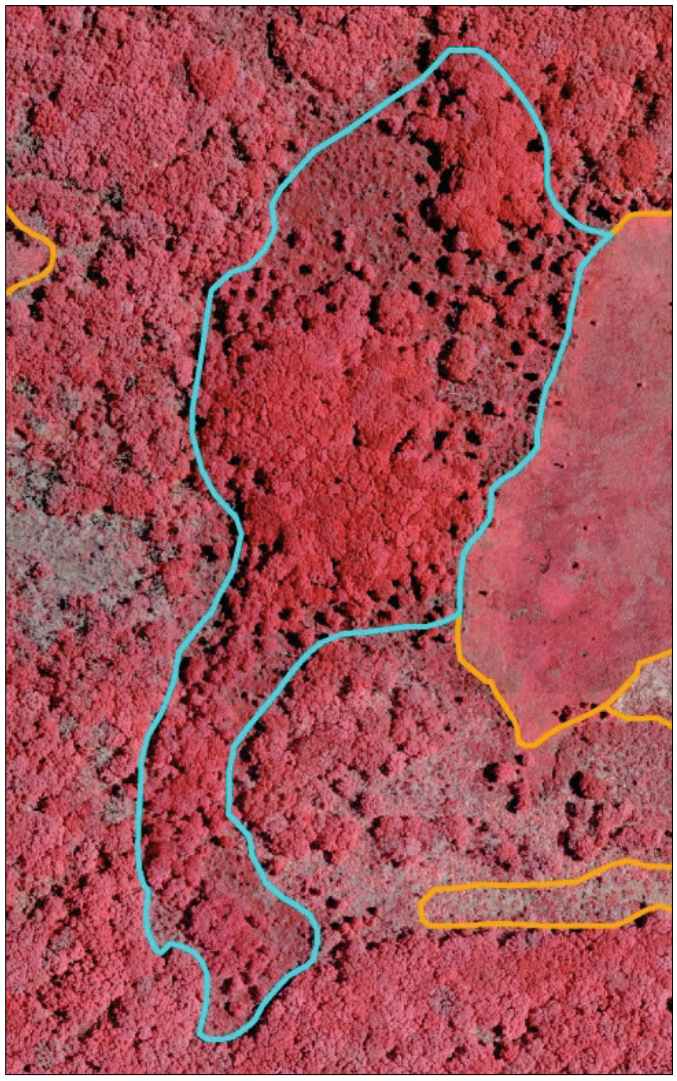


Figure 13. Photo signature of Atlantic / East Gulf Coastal Plain Sweetbay – Tupelo Streamhead Forest

Interpretation
The Atlantic / East Gulf Coastal Plain Sweetbay – Tupelo Streamhead Forest is characterized by tightly grouped circular canopy that appears a bright red to pink color on the imagery. This association occurs in wetland areas.

MAP CLASS 2. Live Oak (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock*



Figure 14. Photo of Live Oak (Cabbage Palmetto) Forest Alliance.

Association
Quercus virginiana (Sabal palmetto) [Forest Alliance]

Abundant Species

- *Tillsandsia usneoides*
- *Quercus virginiana*
- *Sabal minor*
- *Sabal palmetto*
- *Serenoa repens*

Map Class Statistics
Frequency: 101 polygons
Total area: 3,746.6 ha

Average polygon size: 37.1 ha
Producer's accuracy: 94.4%
User's accuracy: 94.9%



Figure 15. Photo signature of Live Oak (Cabbage Palmetto) Forest Alliance.

Interpretation

The Live Oak (Cabbage Palmetto) Forest Alliance is the most prevelant upland association found on Cumberland Island. Is is easily recognizable by a large, assymetric canopy that appears pink in color. Occasional scattered *Pinus* sp. in the canopy are evident by darker purple-brown colored trees.

MAP CLASS 3. Maritime Southern Yellow Pine Forest*
(combined Maritime Slash Pine – Longleaf Pine Upland Flatwoods and Mid – to Late – Successional Loblolly - Sweetgum Forest)



Figure 16. Photo of Maritime Southern Yellow Pine Forest* (combined Maritime Slash Pine – Longleaf Pine Upland Flatwoods and Mid – to Late – Successional Loblolly - Sweetgum Forest).

Association

Pinus elliotti var. *elliotti* – (*Pinus palustris*) / *Ilex vomitoria – Serenoa repens – Morella cerifera* Woodland and *Pinus taeda – Liquidambar styraciflua* Semi-natural Forest

Abundant Species

- *Pinus elliotti*
- *Pinus palutris*
- *Pinus taeda*
- *Quercus hemisphaerica*
- *Quercus virginiana*

- *Morella cerifera*
- *Quercus myrtifolia*

Map Class Statistics
Frequency: 73 polygons
Total area: 517.1 ha
Average polygon size: 7.08 ha
Producer's accuracy: 82.1%
User's accuracy: 82.8%



Figure 17. Photo signature of Maritime Southern Yellow Pine Forest* (combined Maritime Slash Pine – Longleaf Pine Upland Flatwoods and Mid – to Late – Successional Loblolly - Sweetgum Forest).

Interpretation
This combined group is characterized by a dominant conifer presence in the canopy which appears dark purple to brown in color with small,circular crowns. This class occurs on upland sites.

MAP CLASS 4. Outer Coastal Plain Sweetbay Swamp Forest



Figure 18. Photo of Outer Coastal Plain Sweetbay Swamp Forest.

Association
Magnolia virginiana – Persea palustris / Lyonia lucida [Forest]

Abundant Species

- *Persea palustris (*swamp bay*)*
- *Magnolia virginia (*sweetbay*)*
- *Pinus taeda (*loblolly*)*
- *Nyssa biflora (*swamp tupelo*)*
- *Morella cerifera (*wax-myrtle*)*

Map Class Statistics
Frequency: 14 polygons
Total area: 121.1 ha
Average polygon size: 8.27 ha

Producer's accuracy: 0.0%
User's accuracy: 8.3 %

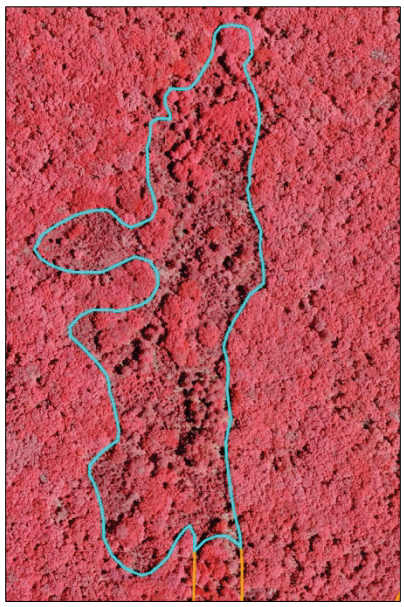


Figure 19. Photo signature of Outer Coastal Plain Sweetbay Swamp Forest.

Interpretation

Outer Coastal Plain Swamp Forest is characterized by a varied canopy (various sized trees) that range in color from light pink to darker purple. This association occurs on wetland sites.

MAP CLASS 5. Red-cedar – Live Oak – Cabbage Palmetto Marsh Hammock



Figure 20. Photo of Red-cedar – Live Oak – Cabbage Palmetto Marsh Hammock.

Association

Juniperus virginiana var. *silicicola – (Quercus virginiana, Sabal palmetto)* [Forest]

Abundant Species

- *Juniperus virginiana* var. *silicicola (*southern redcedar*)*
- *Quercus virginiana (*live oak*)*
- *Sabal palmetto (*cabbage palmetto*)*
- *Tillandsia usneiodes (*Spanish moss*)*
- *Ilex vomitoria (*yaupon*)*

Map Class Statistics

Frequency: 25 polygons
Total area: 4.21 ha
Average polygon size: 105.2ha

Producer's accuracy: 86.0%
User's accuracy: 66.7%

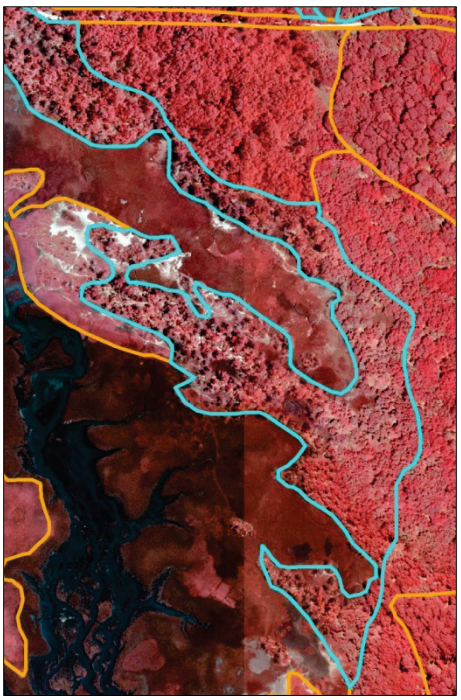


Figure 21. Photo signature of Red-cedar – Live Oak – Cabbage Palmetto Marsh Hammock.

Interpretation

The Red-cedar – Live Oak – Cabbage Palmetto Marsh Hammock typically occurs adjacent to the salt marsh on narrow spits that may occasionally experience tidal overwash. The appearance of red-cedar on the imagery is a main defining feature. It appears dark purple to brown in color and and typically has a narrow crown.

MAP CLASS 6. Red Maple – Tupelo Maritime Swamp Forest



Figure 22. Photo of Red Maple – Tupelo Maritime Swamp Forest.

Association

Acer rubrum – Nyssa biflora – (Liquidambar styraciflua, Fraxinus sp.*)* [Maritime Swamp Forest]

Abundant Species

- *Acer rubrum (*red maple*)*
- *Persea palustris (*swamp bay*)*
- *Nyssa biflora (*swamp tupelo*)*
- *Tillandsia usneiodes (*Spanish moss*)*
- *Magnolia virginiana (*sweetbay*)*

Map Class Statistics

Frequency: 13 polygons
Total area: 80.2 ha
Average polygon size: 6.17 ha

Producer's accuracy: 85.9%
User's accuracy: 66.7%



Figure 23. Photo signature of Red Maple – Tupelo Maritime Swamp Forest.

Interpretation

The Red Maple – Tupelo Maritime Swamp Forest occurs on wetland sites and is characterized by a canopy dominated by red maple, which has a very symmetric crown and a bright red color on the imagery.

MAP CLASS 7. Slash Pine – (Longleaf Pine) Managed Forest



Figure 24. Photo of Slash Pine – (Longleaf Pine) Managed Forest.

Association
Pinus elliotti var. *elliotti – (Pinus palustris)* [Managed Forest]

Abundant Species

- *Pinus elliottii* (slash pine)
- *Liquidambar styraciflua* (sweetgum)
- *Quercus nigra* (water oak)
- *Morella cerifera* (wax-myrtle)
- *Ilex glabra* (inkberry)
- *Persea borbonia* (redbay)

Map Class Statistics
Frequency: 1 polygon

Total area: 5.96 ha
Average polygon size: 5.96 ha
Producer's accuracy: 0%
User's accuracy: 0%



Figure 25. Photo signature of Slash Pine – (Longleaf Pine) Managed Forest.

Interpretation

From the imagery alone, this association is very difficult to distinguish from the Maritime Southern Yellow Pine Forest, since both classes are dominated by conifer species that appear similarly on the imagery. The occurance of this one polygon was determined by ground sampling during the Accuracy Assessment.

II. Woodland

MAP CLASS 8. Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland



Figure 26. Photo of Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland.

Association

Pinus palustris / Quercus (hemisphaerica, laevis) / Morella cerifera / Aristida beyrichiana [Woodland]

Abundant Species

- *Pinus palustris* (longleaf pine)
- *Prunus serotina* (black cherry)
- *Quercus laevis* (turkey oak)
- *Quercus hemisphaerica* (Darlington oak)
- *Vaccinium stamineum* (deerberry)

- *Morella cerifera* (wax-myrtle)

Map Class Statistics
Frequency: 3 polygons
Total area: 8.27 ha
Average polygon size: 24.8 ha
Producer's accuracy: 100%
User's accuracy: 30.8%

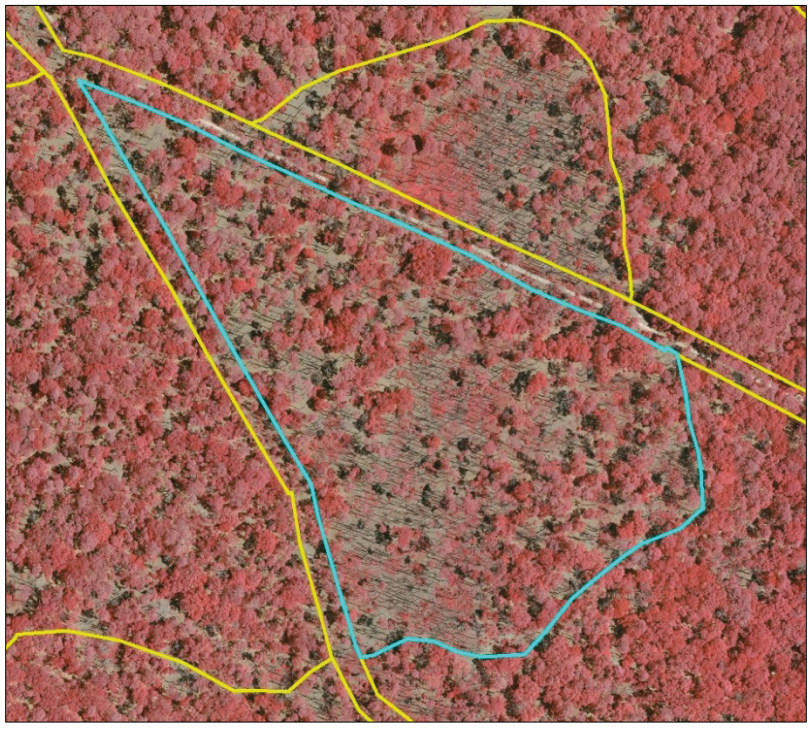


Figure 27. Photo signature of Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland.

Interpretation
The Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland is recognizable on the imagery by the appearance of a sparse canopy with scattered *Pinus* sp. which have a small crown size and appear magenta to purple in color, and scattered *Quercus* sp. which have a larger crown size and are usually bright red in color. Open patches of ground appear gray.

MAP CLASS 9. South Atlantic Coastal Shell Midden Woodland



Figure 28. Photo of South Atlantic Coastal Shell Midden Woodland.

Association

Juniperus virginiana var. *silicicola – Zanthoxylum clava-herculis – Quercus virginiana – (Sabal palmetto) / Sageretia minutifolia – (Sideroxylon tenax)* [Woodland]

Abundant Species

- *Juniperus virginiana* var. *silicicola* (southern redcedar)
- *Celtis laevigata* (sugarberry)
- *Tillsandia usneoides* (Spanish moss)
- *Quercus virginiana* (live oak)
- *Sabal palmetto* (cabbage palmetto)
- *Serenoa repens* (saw palmetto)
- *Forestiera segregata* (Florida swamp-privet)

Map Class Statistics
Frequency: 12 polygons
Total area: 10.0 ha
Average polygon size: 0.83 ha
Producer's accuracy: 0%
User's accuracy: 0%

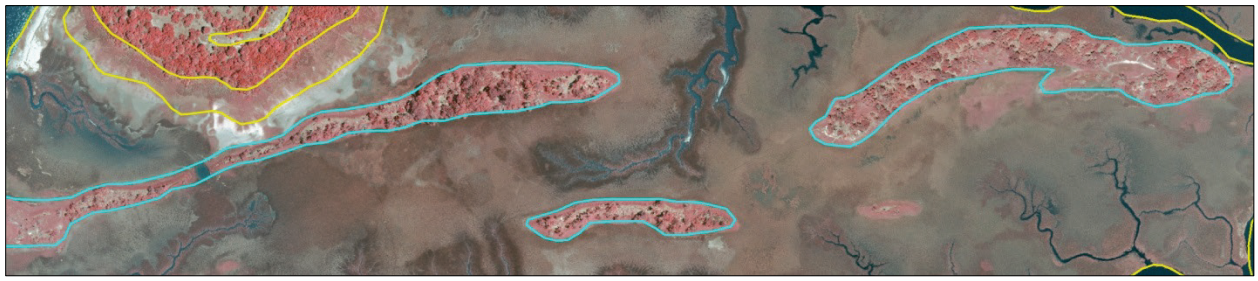


Figure 29. Photo signature of South Atlantic Coastal Shell Midden Woodland.

Interpretation
The South Atlantic Coastal Shell Midden Woodland typically is found on shell middens and natural shell deposits, often within the marsh. On Cumberland, this association is found near Raccoon Keys on the Southern End and Abram's Point on the northern end of the island. Location is a key identifier of this association on the imagery (typically oblong shaped islands in the marsh or forest fringes near tidal edges). Canopy is typically sparse, and southern red cedar is usually fairly obvious as a larger canopy sized tree that appears dark magenta to purple.

MAP CLASS 10. Wet Longleaf – Pond Pine Flatwoods



Figure 30. Photo of Wet Longleaf – Pond Pine Flatwoods.

Association

Pinus palustris – Pinus serotina / Ilex glabra – Lyonia lucida – (Serenoa repens) [Woodland]

Abundant Species

- *Persea palustris* (swamp bay)
- *Pinus elliottii* (slash pine)
- *Pinus serotina* (pond pine)
- *Lyonia ferruginea* (rusty staggerbush)
- *Sabal palmetto* (cabbage palmetto)
- *Ilex glabra* (inkberry)
- *Morella cerifera* (wax-myrtle)

Map Class Statistics
Frequency: 11 polygons
Total area: 224.1 ha
Average polygon size: 20.4 ha
Producer's accuracy: 65.2%
User's accuracy: 56.7%

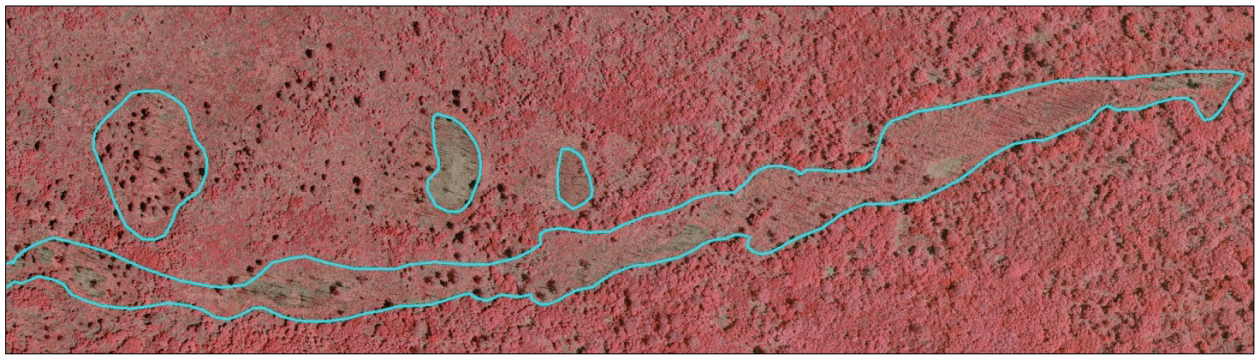


Figure 31. Photo signature of Wet Longleaf – Pond Pine Flatwoods.

Interpretation
The Wet Longleaf – Pond Pine Flatwoods association occurs in wetland areas as is characterized by a very sparse canopy. Scattered *Pinus* sp. can usually be identified in the canopy, which have a small, circular crown. The ground is typically visibile in places and appears a gray to pink color, depending on the amount of ground vegetation present.

MAP CLASS 11. Southern Atlantic Coastal Plain Carolina Willow Dune Swale



Figure 32. Photo of Southern Atlantic Coastal Plain Carolina Willow Dune Swale.

Association

Salix caroliniana / Hibiscus grandifloras / Polygonum punctatum [Woodland]

Abundant Species

- *Salix caroliniana* (coastal plain willow)
- *Hibiscus grandifloras* (swamp rosemallow)
- *Pinus serotina* (pond pine)
- *Lyonia ferruginea* (rusty staggerbush)
- *Sabal palmetto* (cabbage palmetto)
- *Ilex glabra* (inkberry)
- *Morella cerifera* (wax-myrtle)

Map Class Statistics
Frequency: 17 polygons
Total area: 4.91 ha
Average polygon size: 83.4 ha
Producer's accuracy: 98.5%
User's accuracy: 51.9%

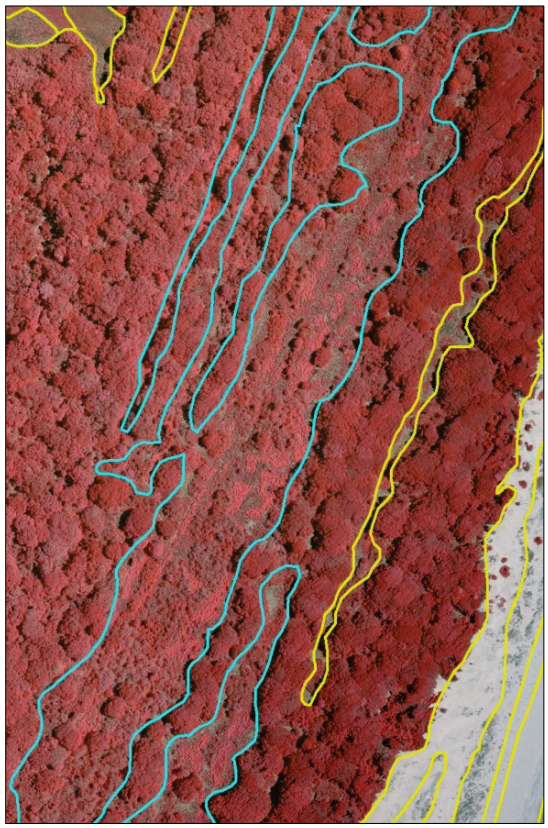


Figure 33. Photo signature of Southern Atlantic Coastal Plain Carolina Willow Dune Swale.

Interpretation
The Southern Atlantic Coastal Plain Carolina Willow Dune Swale, as the name suggests, typically occupies swales in forest dominated dune fields. *Salix caroliniana* (Carolina willow) is a main species of the swale and appears moderately pink on the imagery. Other herbaceous vegetation between canopy species often appears a characteristic bright pink color. Other areas of open ground may appear gray. These depressions are typically adjacent to areas dominated by *Quercus virginiana* (live oak), which appear bright red on the imagery with a circular to slightly assymetric crown shape.

III. Shrubland

MAP CLASS 12. Coastal Salt Shrub Thicket



Figure 34. Photo of Coastal Salt Shrub Thicket.

Association

Baccharis halimifolia – Iva frutescens – Morella cerifera – (Ilex vomitoria) [Shrubland]

Abundant Species

- *Juniperus virginiana* var. *silicicola* (southern redcedar)
- *Sabal palmetto* (cabbage palmetto)
- *Iva frutescens* (Jesuit's bark)
- *Distichlis spicata* (inland saltgrass)
- *Fimbristylis castanea* (marsh fimbry)
- *Spartina bakeri* (sand cordgrass)

Map Class Statistics

Frequency: 6 polygons

Total area: 3.2 ha
Average polygon size: 0.5 ha
Producer's accuracy: 10.7%
User's accuracy: 60.0%

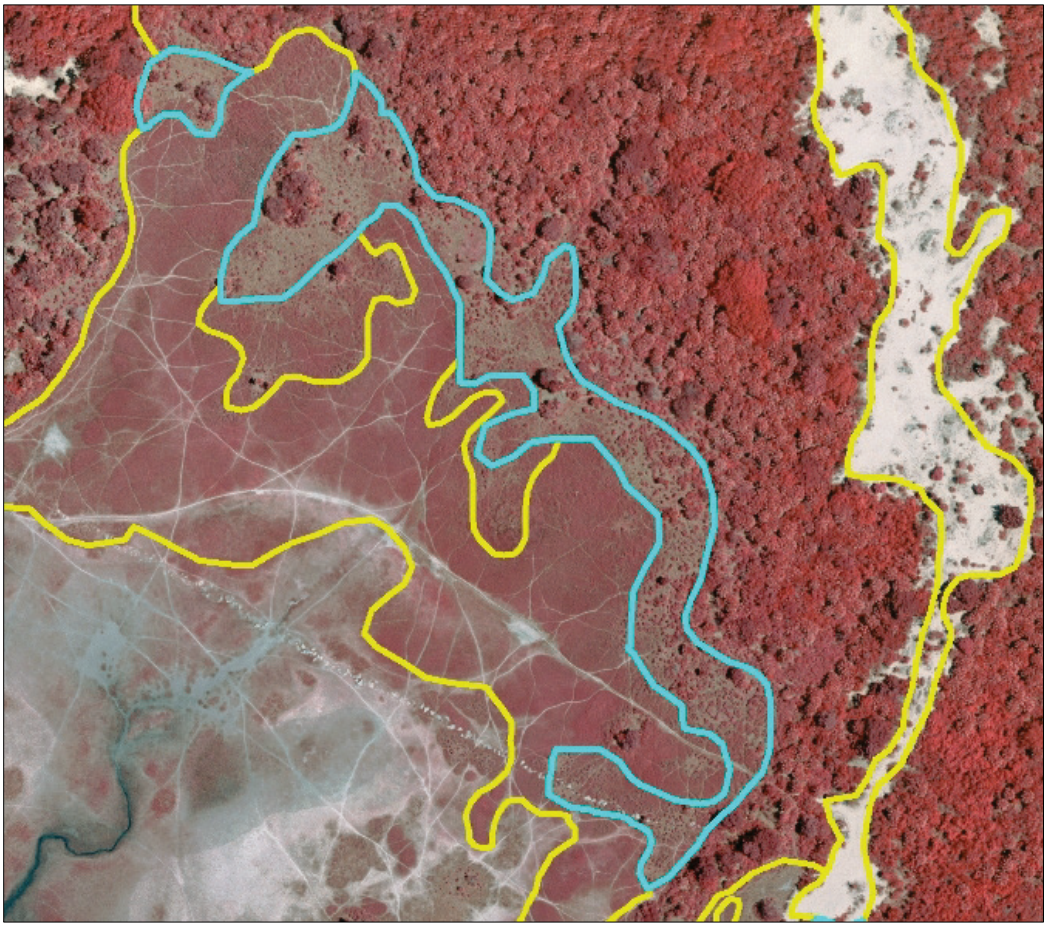


Figure 35. Photo signature of Coastal Salt Shrub Thicket.

Interpretation

The Coastal Salt Shrub Thicket association marks the transition from marsh community and adjancent upland. Coastal Salt Shrub Thicket is often occurs at the upper edge of tidally flooded creeks on the marsh side of Cumberland Island. The appearance on the imagery is often a relatively smooth gray color (the dominance of herbaceous species *Distichlis spicata*, *Fimbristylis castanea*, and *Spartina bakeri*). Emergent tall shrubs such as *Juniperus virginiana var. silicicola* (assymetric and dark purple in color) and *Sabal palmetto* (circular pink with white flecks) are often visible.

MAP CLASS 13. Florida Coastal Strand (Temperate Palmetto Type)



Figure 36. Photo of Florida Coastal Strand (Temperate Palmetto Type)

Association

Serenoa repens – Sabal palmetto – Ilex vomitoria – Sideroxylon tenax [Shrubland]

Abundant Species

- *Sideroxylon tenax* (tough bully)
- *Morella cerifera* (wax-myrtle)
- *Persea borbonia* (redbay)
- *Quercus virginiana* (live oak)
- *Smilax auriculata* (earleaf greenbrier)
- *Spartina bakeri* (sand cordgrass)

Map Class Statistics

Frequency: 16 polygons

Total area: 50.6 ha
Average polygon size: 3.2 ha
Producer's accuracy: 70.1%
User's accuracy: 34.5%

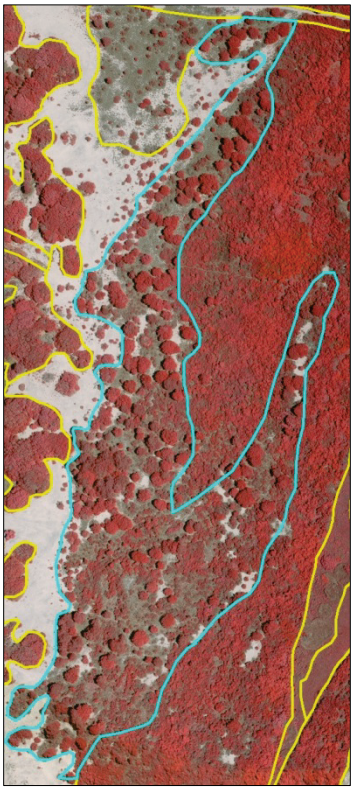


Figure 37. Photo signature of Florida Coastal Strand (Temperate Palmetto Type)

Interpretation

The Florida Coastal Strand (Temperate Palmetto Type) typically occupies locations of Cumberland Island where wind shifting of sand occurs. The unvegetated surface is made up of leaf litter and bare sand which appear gray to white in color (where no leaf litter is present and sand can be seen). Broad-leafed evergreen shrubs are visible scattered throughout and vary in color and shape depending on the species. A defining feature of this shrubland is the sparsity of the shrub layer itself, as compared to other shrublands present on the island.

MAP CLASS 14. Grapevine-Peppervine-Trumpetvine Thicket



Figure 38. Photo of Grapevine-Peppervine-Trumpetvine Thicket.

Association

Vitis rotundifolia – Ampelopsis arborea – Campsis radicans [Vine- Shrubland]

Abundant Species

- *Morella cerifera* (wax-myrtle)
- *Serenoa repens* (saw palmetto)
- *Rubus argutus* (sawtooth blackberry)
- *Smilax auriculata* (earleaf greenbrier)
- *Smilax glauca* (cat greenbrier)
- *Vitis rotundifolia* (muscadine)

Map Class Statistics

Frequency: 7 polygons

Total area: 13.0 ha
Average polygon size: 1.86 ha
Producer's accuracy: 7.7%
User's accuracy: 100%

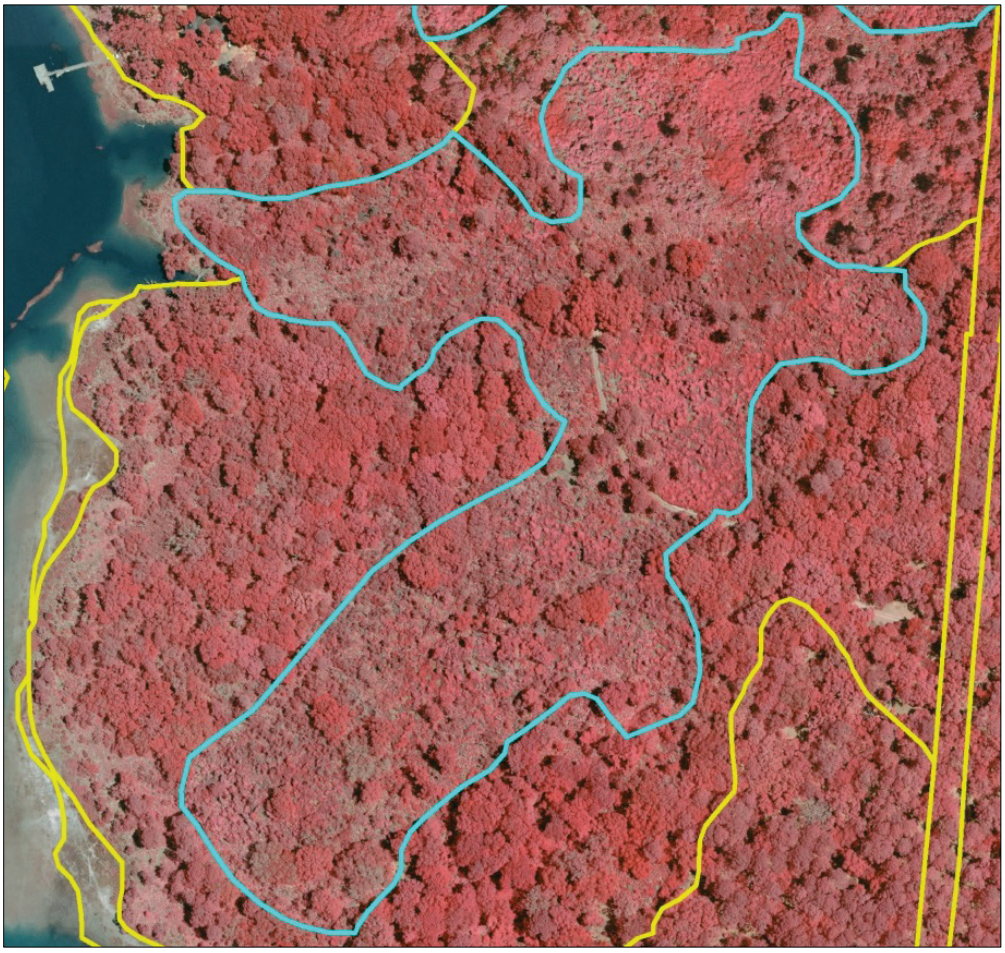


Figure 39. Photo signature of Grapevine-Peppervine-Trumpetvine Thicket.

Interpretation

The Grapevine-Peppervine-Trumpetvine Thicket is a vine-dominated association that develops following clear cut logging, blowdowns, and possibly other disturbances in wetlands. This association's appearance can vary based on the type of species the vines cover and the extent and type(s) of disturbance that have impacted the area. In general, the appearance is that of an open area within a surrounding thicker canopy. Bright pink colors on the ground/shrub layer are indicative of the vine species. Various scattered trees in the canopy may be visible, but typically this is an association that lacks contiguous canopy cover due to the history of disturbance.

MAP CLASS 15. Seaside-tansy Tidal Shrub Flat



Figure 40. Photo of Seaside-tansy Tidal Shrub Flat.

Association
Borrichia frutescens / (Spartina patens, Juncus roemerianus) [Shrubland]

Abundant Species

- *Iva frutescens* (Jesuit's bark)
- *Batis maritima* (turtleweed)
- *Borrichia frutescens* (bushy seaside-tansy)
- *Limonium carolinianum* (Carolina sealavender)
- *Sarcocornia pacifica* (Pacific swampfire)
- *Vitis rotundifolia* (muscadine)

Map Class Statistics
Frequency: 22 polygons

Total area: 30.1 ha
Average polygon size: 1.36 ha
Producer's accuracy: 49.8%
User's accuracy: 61.1%

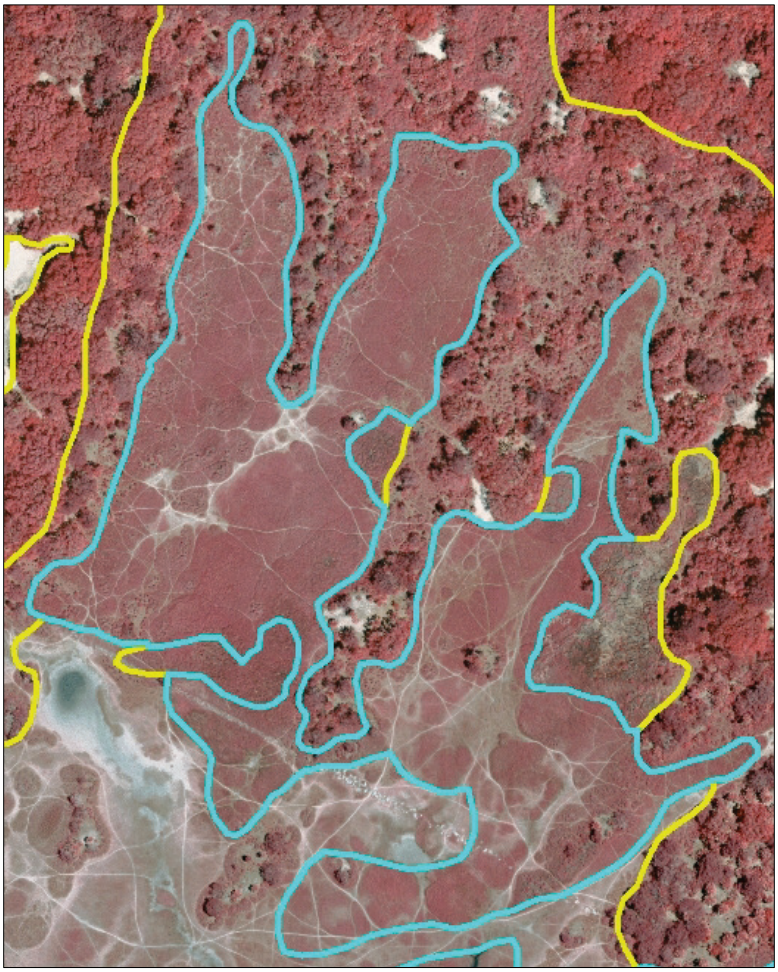


Figure 41. Photo signature of Seaside-tansy Tidal Shrub Flat.

Interpretation

The seaside- tansy tidal shrub flat has a distinct photo-signature of a smooth, velvet-like texture that is dark pink in color. The shrubland typically occurs adjancent and below tidal shrublands.

MAP CLASS 16. Swamp-loosestrife Pond



Figure 42. Photo of Swamp-loosestrife Pond

Association
Decodon verticillatus [Seasonally Flooded Shrubland]

Abundant Species

- *Decodon verticillatus* (swamp- loosestrife)
- *Salix caroliniana* (coastal plain willow)
- *Morella cerifera* (wax-myrtle)
- *Salix nigra* (black willow)
- *Ampelopsis arborea* (peppervine)
- *Mikania scandens* (climbing hempvine)

Map Class Statistics
Frequency: 12 polygons

Total area: 39.3 ha
Average polygon size: 3.27 ha
Producer's accuracy: 54.5%
User's accuracy: 4.8%

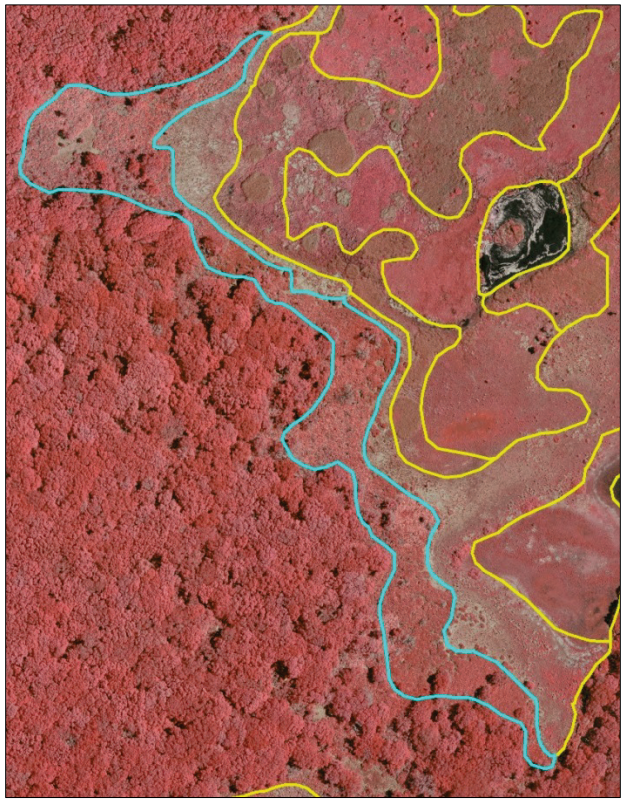


Figure 43. Photo signature of Swamp-loosestrife Pond

Interpretation

On Cumberland Island this association typically is found along edges of open freshwater wetlands, such as Lake Whitney, and in narrow swales between the oldest backdunes. It is also found adjacent to the large wetland-agricultural complex near the center of the island, and near Lake Johnson and Ashley Pond. Swamp loosestrife pond has a bright pink appearance on the imagery with a stipled texture.

MAP CLASS 17. Turtleweed-Swampfire Dwarf-Shrubland



Figure 44. Photo of Turtleweed-Swampfire Dwarf-Shrubland

Association
Batis maritime- Sarcocornia pacifica [Dwarf- Shrubland]

Abundant Species

- *Batis maritima* (turtlweed)
- *Sarcocornia pacifica* (swampfire)

Map Class Statistics
Frequency: 1 polygon
Total area: 0.39 ha
Average polygon size: 0.39 ha
Producer's accuracy: 1.1%
User's accuracy: 100%

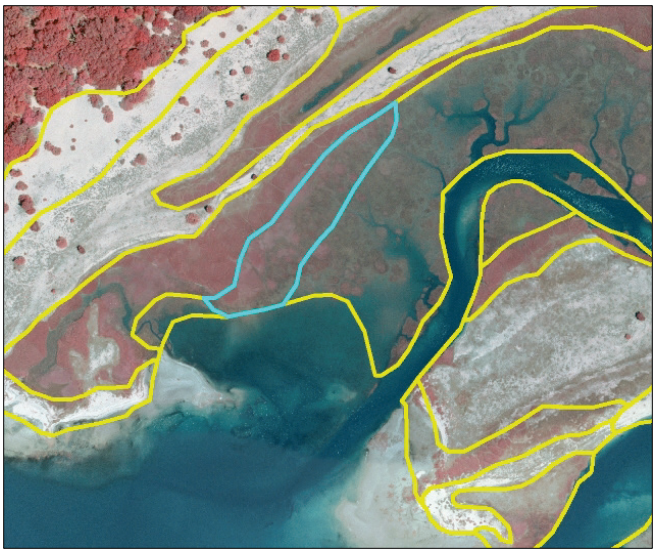


Figure 45. Photo signature of Turtleweed-Swampfire Dwarf-Shrubland

Interpretation

Turtleweed-Swampfire Dwarf-Shrubland occurs in areas that are regularly to irregularly tidally flooded. The photosignature is a smooth, transulecent pink to gray color.

MAP CLASS 18. Xeric Oak Scrubland



Figure 46. Photo of Xeric Oak Scrubland.

Association
Quercus myrtifolia – Quercus geminata– Quercus chapmanii [Shrubland]

Abundant Species

- *Quercus myrtifolia* (myrtle oak)
- *Quercus chapmanii* (Chapman oak)
- *Quercus geminata* (sand live oak)
- *Lyonia ferruginea* (rusty lyonia)

Map Class Statistics
Frequency: 6 polygons
Total area: 63.5 ha
Average polygon size: 10.6 ha
Producer's accuracy: 29.2%

User's accuracy: 100%

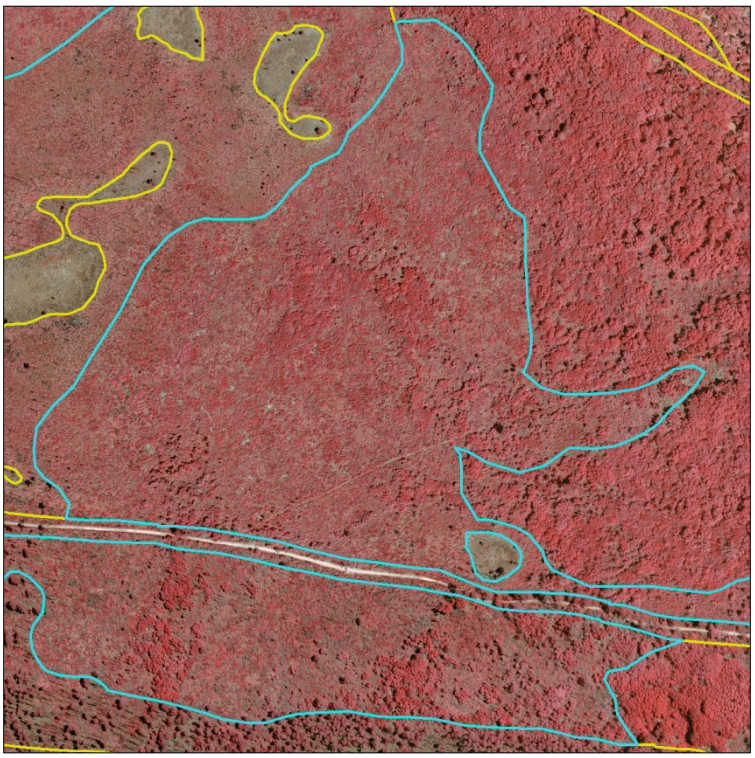


Figure 47. Photo signature of Xeric Oak Scrubland.

Interpretation

Xeric Oak Scrubland occurs on white or light colored sandy soils that extremely well drained and infertile. Main examples of this community are found along North Cut Road. Photo-signature has a scrub-like appearance, meaning it is obvious the association does not have the height of an association dominated by trees in the canopy layer. Colors are pinks and red.

V. Herbaceous

MAP CLASS 19. Dotted Smartweed – Smooth Beggarticks Herbaceous Vegetation



Figure 48. Photo of Dotted Smartweed – Smooth Beggarticks Herbaceous Vegetation.

Association
Polygonum punctatum – Bidens laevis [Herbaceous Vegetation]

Abundant Species

- *Sabal palmetto* (cabbage palmetto)
- *Morella cerifera* (wax myrtle)
- *Bidens laevis* (smooth beggarticks)
- *Phyla nodiflora* (turkey tog tangle)

Map Class Statistics
Frequency: 19 polygons
Total area: 16.3 ha
Average polygon size: 0.9 ha

Producer's accuracy: 47.4%
User's accuracy: 70%

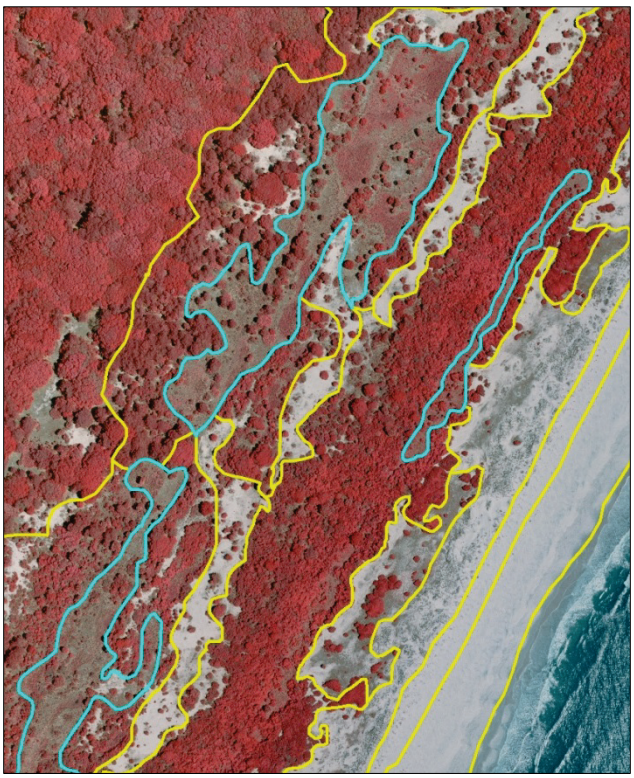


Figure 49. Photo signature of Dotted Smartweed – Smooth Beggarticks Herbaceous Vegetation.

Interpretation

The Dotted Smartweed – Smooth Beggarticks Herbaceous Vegetation is a wetland association that occurs on poorly drained sandy loam soils in the narrow swales foundw in the backdunes. Appearance on the imagery is a smooth gray color, sometimes with intermitten pink. Scattered shrubs are often visible throughout.

MAP CLASS 20. Mid – and Southern Atlantic High Salt Marsh



Figure 50. Photo of Mid – and Southern Atlantic High Salt Marsh.

Association
Spartina patens – Distichlis spicata – (Juncus roemerianus) [Herbaceous Vegetation]

Abundant Species

- *Iva frutescens* (Jesuit's bark)
- *Distichlis spicata* (inland saltgrass)
- *Fimbrystlis castanea* (marsh fimbry)
- *Juncus roemerianus* (needlegrass rush)
- *Spartina patens* (saltmeadow cordgrass)

Map Class Statistics
Frequency: 73 polygons
Total area: 74.3 ha
Average polygon size: 1.01 ha

Producer's accuracy: 47.4%
User's accuracy: 6.2%

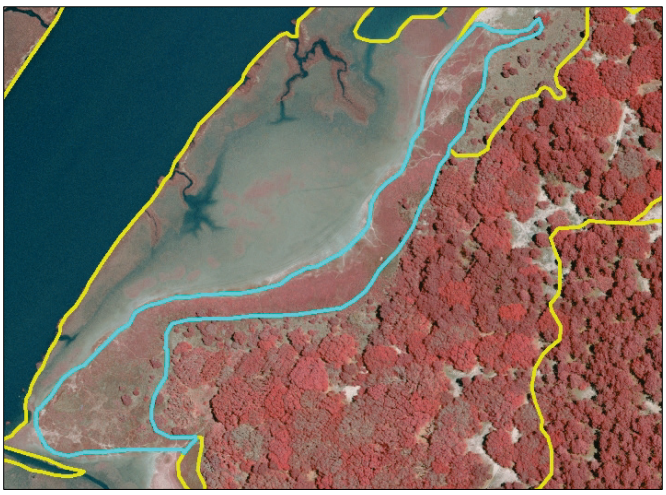


Figure 51. Photo signature of Mid – and Southern Atlantic High Salt Marsh.

Interpretation

The Mid – and Southern Atlantic High Salt Marsh occurs along the salt marsh, often in narrow bands above the low marsh. Appearance is a smooth pink color, sometimes with a few scattered shrubs visible. Open patches of mud or bare ground are often white or gray in color.

MAP CLASS 21. Needlerush High Marsh



Figure 52. Photo of Needlerush High Marsh.

Association
Juncus roemerianus [Herbaceous Vegetation]

Abundant Species

- *Borrichia frutescens* (bushy seaside tansy)
- *Sarcocornia pacifica* (Pacific swampfire)
- *Juncus roemerianus* (needlegrass rush)
- *Spartina alterniflora* (smooth cordgrass)

Map Class Statistics
Frequency: 30 polygons
Total area: 27.5 ha
Average polygon size: 0.90 ha
Producer's accuracy: 21.8%

User's accuracy: 82.4%

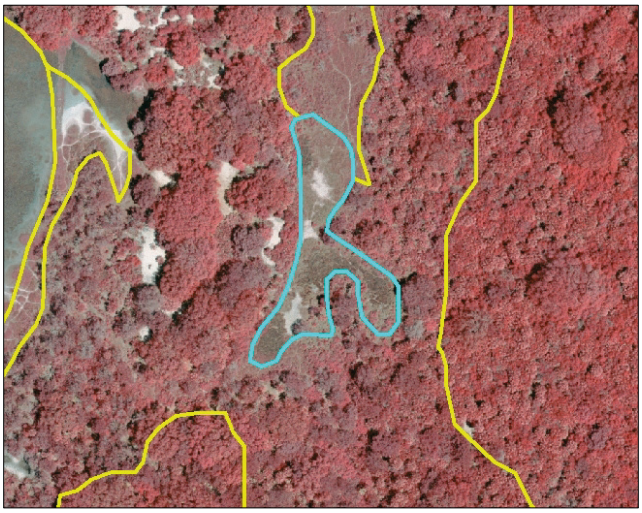


Figure 53. Photo signature of Needlerush High Marsh.

Interpretation

Needlerush High Marsh is found within the salt marsh at Cumberland, at elevations higher than *Spartina alterniflora* dominated marshes, but lower elevations than those sites dominated by *Borrichia frutescens*, *Spartina patens*, *Iva frutescens*, and *Distchlis spicata*. Photo-signature is very characteristic and appears gray to brown in color. Circular pattens are often visible.

MAP CLASS 22. Outer Coastal Plain Maidencane Pond



Figure 54. Photo of Outer Coastal Plain Maidencane Pond.

Association

Panicum hemitomon – Pluchea (camphorata, rosea) – Ludwigia ssp. [Herbaceous Vegetation]

Abundant Species

- *Panicum hemitomon* (maidencane)
- *Pluchea camphorata* (camphor pluchea)
- *Pluchea rosea* (rosy camphorweed)
- *Ludwigia* (primrose-willow) spp.

Map Class Statistics

Frequency: 2 polygons
Total area: 0.31 ha
Average polygon size: 0.16 ha
Producer's accuracy: 64.4%

User’s accuracy: 0%



Figure 55. Photo signature of Outer Coastal Plain Maidencane Pond

Interpretation

The Outer Coastal Plain Maidencane Pond is a wetland herbaceous association that appears smooth gray with light flecks of pink coloration.

MAP CLASS 23. Rush Marsh / Sawgrass Head (combined map class)



Figure 56. Photo of Rush Marsh / Sawgrass Head (combined map class).

Association

Juncus effusus [Seasonally Flooded Herbaceous Vegetation] / *Cladium mariscus* ssp. *Jamaicense* – *Woodwardia virginica* [Herbaceous Vegetation]

Abundant species of Rush Marsh

- *Juncus effusus* (Common Rush Marsh)

Abundant species of Sawgrass Head

- *Cladium mariscus* ssp. *Jamaicense* (Jamaica swamp sawgrass)
- *Woodwardia virginica* (Virginia chainfern)

Map Class Statistics

Frequency: 17 polygons
Total area: 37.8 ha
Average polygon size: 2.23 ha

Producer's accuracy: 70.7%
User's accuracy: 87.0%

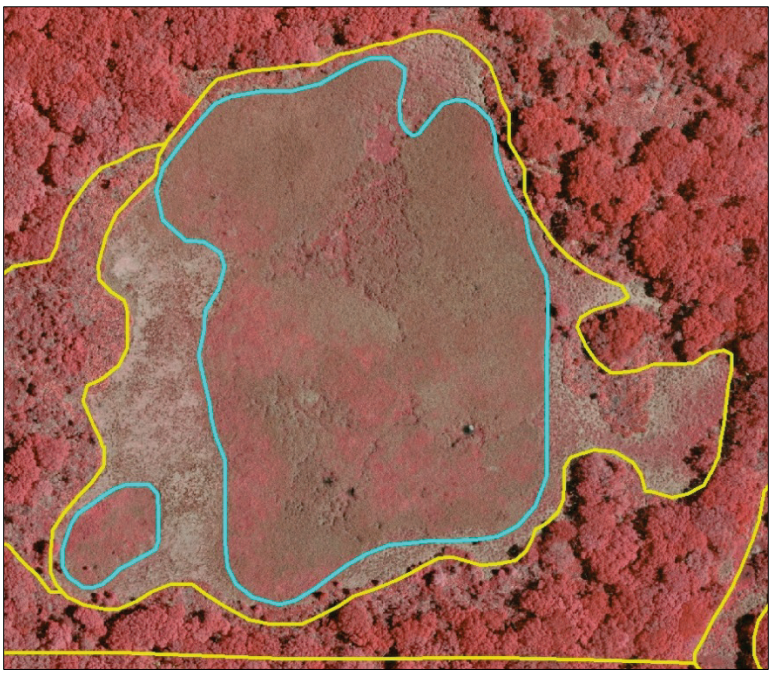


Figure 57. Photo signature of Rush Marsh / Sawgrass Head (combined map class).

Interpretation

These combined freshwater herbaceous associations have a similar appearance on the imagery (hence the need to combine). Characterics include a unique texture that can be described as velvety. Color appearance is a mixture of bright pink interspersed with a brown color. Typically found on temporarily or permanently flooded depressions with very poorly drained muck soils.

MAP CLASS 24. Saltmeadow Cordgrass – Panicgrass species Brackish Herbaceous Vegetation



Figure 58. Photo of Saltmeadow Cordgrass – Panicgrass species Brackish Herbaceous Vegetation.

Association

Spartina patens – Panicum ssp. [Brackish Herbaceous Vegetation]

Abundant Species

- *Bacopa monnieri* (herb of grace)
- *Eupatorium capillifolium* (dogfennel)
- *Pluchea comphorata* (camphor pluchea)
- *Panicum dichotomiflorum* var. *dichotomiflorum* (fall panicgrass)
- *Panicum dichotomiflorum* var. *bartowense* (fall panicgrass)
- *Spartina patens* (saltmeadow cordgrass)

Map Class Statistics
Frequency: 12 polygons
Total area: 9.92 ha
Average polygon size: 0.83 ha
Producer's accuracy: 0%
User's accuracy: 0%



Figure 59. Photo signature of Saltmeadow Cordgrass – Panicgrass species Brackish Herbaceous Vegetation.

Interpretation
The Saltmeadow Cordgrass – Panicgrass species Brackish Herbaceous Vegetation is a brackish herbaceous wetland association. It is not a widespread association on Cumberland Island. Appearance is a smooth gray color with some pink colors interspersed throughout.

MAP CLASS 25. Sand Cordgrass – Seashore Mallow Herbaceous Vegetation



Figure 60. Photo of Sand Cordgrass – Seashore Mallow Herbaceous Vegetation

Association
Spartina bakeri– Kosteletzkya virgininica [Herbaceous Vegetation]

Abundant Species
Spartina bakeri (sand cordgrass)

Map Class Statistics
Frequency: 8 polygons
Total area: 14.3 ha
Average polygon size: 1.79 ha
Producer's accuracy: 33%
User's accuracy: 22.2%



Figure 61. Photo signature of Sand Cordgrass – Seashore Mallow Herbaceous Vegetation

Interpretation

The Sand Cordgrass – Seashore Mallow Herbaceous Vegetation occurs occasionally throughout Cumberland Island on the upper edges of tidal marshes and along tidal channels. Though dominated by sand cordgrass, often scattered shrubs are present, especially in the absence of fire. Appearance on the imagery is a smooth gray color that is overlapped with bright pink shrubs.

MAP CLASS 26. Sea-oats Temperate Herbaceous Alliance



Figure 62. Photo of Sea-oats Temperate Herbaceous Alliance.

Alliance:

Uniola paniculata [Herbaceous Alliance]

Abundant Species

- *Uniola paniculata* (sea oats)
- *Hydrocotyle bonariensis* (largeleaf pennywort)
- *Croton punctatus* (gulf croton)
- *Spartina patens* (saltmeadow cordgrass)
- *Oenethera humifusa* (seabeach evening primrose)
- *Andropogon glomeratus* (bushy bluestem)
- *Panicum amarum* (bitter panicgrass)

Map Class Statistics
Frequency: 44 polygons
Total area: 299.7 ha
Average polygon size: 6.81 ha
Producer's accuracy: 96.6%
User's accuracy: 76.7%

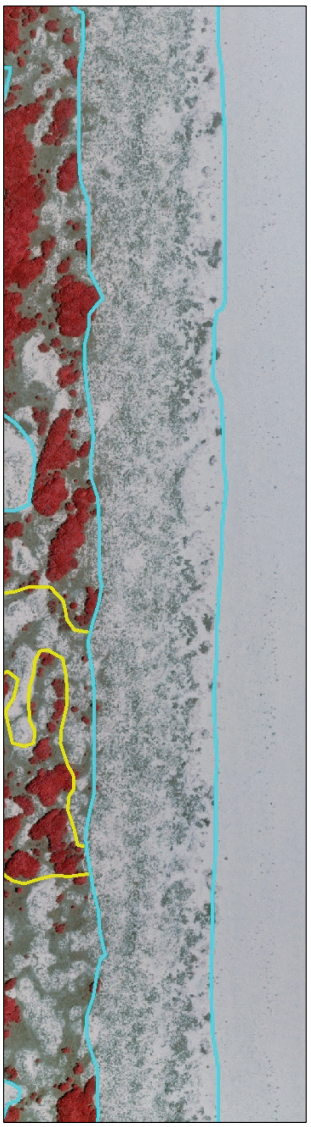


Figure 63. Photo signature of Sea-oats Temperate Herbaceous Alliance

Interpretation
The Sea-oats Temperate Herbaceous Alliance occurs along the entire length of the dunes and foredunes on Cumberland Island. Appearance on the imagery is a mixture of white and stippled gray.

MAP CLASS 27. South Atlantic Coastal Pond



Figure 64. Photo of South Atlantic Coastal Pond.

Association

Spartina bakeri – Woodwardia virginica – Saccharum giganteum [Herbaceous Vegetation]

Abundant Species

- *Decodon verticillatus* (swamp-loosestrife)
- *Andropogon glaucopsis* (purple bluestem)
- *Juncus effusus* (common rush)
- *Panicum hemitomon* (maidencane)
- *Panicum verrucosum* (warty panicgrass)
- *Spartina bakeri* (sand cordgrass)
- *Woodwardia virginica* (Virginia chainfern)

Map Class Statistics
Frequency: 84 polygons
Total area: 111.1 ha
Average polygon size: 1.32 ha
Producer's accuracy: 96.5%
User's accuracy: 85.7%



Figure 65. Photo signature of South Atlantic Coastal Pond.

Interpretation
The South Atlantic Coastal Pond are frequent occurences on the northern end of Cumberland Island. Found near Lake Whitney and within adjacent wetlands. Smaller ponds occur sporadically within Wet Pond Pine Flatwoods around Bunkley Trail and the west side of North Cut Road. Sites are temporarily or semipermanently flooded depressions. On the imagery these ponds have a very light appearance, almost white in some cases to light pink color. Texture is rough to wavy.

MAP CLASS 28. South Atlantic Upper Ocean Beach



Figure 66. Photo of South Atlantic Upper Ocean Beach.

Association
Cakile edentula ssp. *harperi* [Sparse Vegetation]

Abundant Species

- *Cakile edentula* ssp. *harperi* (Harper's searocket)
- *Croton punctatus* (gulf croton)
- *Ipomoea pes-caprae* (bayhops)
- *Uniola paniculata* (sea-oats)

Map Class Statistics
Frequency: 12 polygons
Total area: 24.5 ha
Average polygon size: 2.05 ha
Producer's accuracy: 71.0%

User's accuracy: 100%

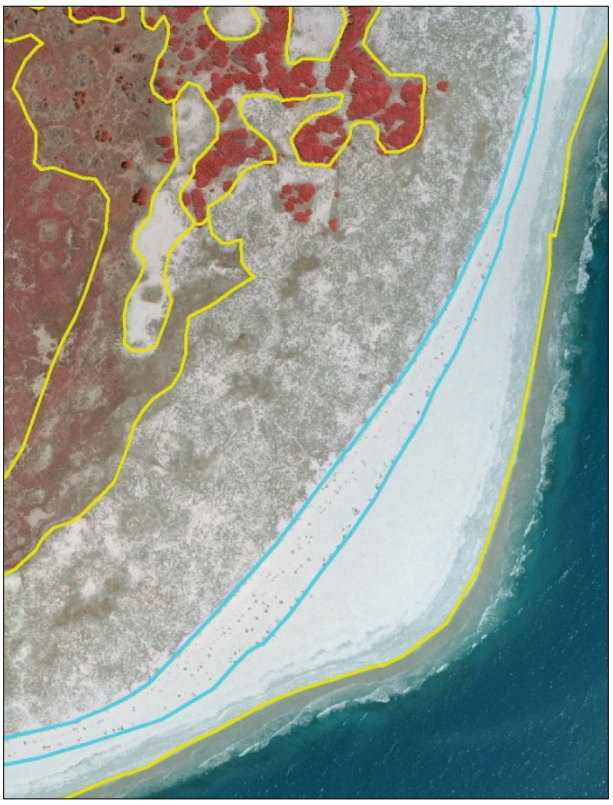


Figure 67. Photo signature of South Atlantic Upper Ocean Beach.

Interpretation

The South Atlantic Upper Ocean Beach association is an upper beach vegetation occurring above the tidal wrack-line but below the upper dune. On the imagery it is characterized by having extremely sparse vegetation in the herbaceous layer. General appearance is white sand with a few speckles of pinks and reds, for whatever vegetation is visible.

MAP CLASS 29. Southern Atlantic Coast Salt Marsh/ Salt Flat (Swampfire Type)



Figure 68. Photo of Southern Atlantic Coast Salt Marsh/ Salt Flat (Swampfire Type).

Association
Spartina alterniflora [Carolinian Zone Herbaceous Vegetation] / *Sarcocornia pacifica* – (*Batis maritima*, *Distichlis spicata*) [Dwarf Shrubland] (combined class)

Abundant species for Southern Atlantic Coast Salt Marsh
Spartina alterniflora (smooth cordgrass)

Abundant species for Salt Flat (Swampfire Type)

- *Borrichia frutescens* (bushy seaside tansy)
- *Limonium carolinianum* (Carolina sealavender)
- *Sarcornia pacifica* (Pacific swampfire)
- *Distichlis spicata* (inland saltgrass)

Map Class Statistics
Frequency: 92 polygons
Total area: 3,678.8 ha
Average polygon size: 40 ha
Producer's accuracy: 99.9%
User's accuracy: 84.8%



Figure 69. Photo signature of Southern Atlantic Coast Salt Marsh/ Salt Flat (Swampfire Type).

Interpretation
The Southern Atlantic Coast Salt Marsh/ Salt Flat (Swampfire Type) combined class is found at the margins of the sounds and estuaries, areas that are impacted with diurnal salt tides. On the imagery, it appears as smooth textured and dark pink to magenta in color.

MAP CLASS 30. Southern Cattail Marsh



Figure 70. Photo of Southern Cattail Marsh.

Association
Typha latifolia [Southern Herbaceous Vegetation]

Abundant Species

- *Decodon verticillatus* (swamp loosestrife)
- *Limnobium spongia* (American spongeplant)
- *Spartina bakeri* (sand cordgrass)
- *Typha latifolia* (broadleaf cattail)

Map Class Statistics
Frequency: 6 polygons
Total area: 12.5 ha
Average polygon size: 2.08 ha
Producer's accuracy: 15.3%

User's accuracy: 12.5%

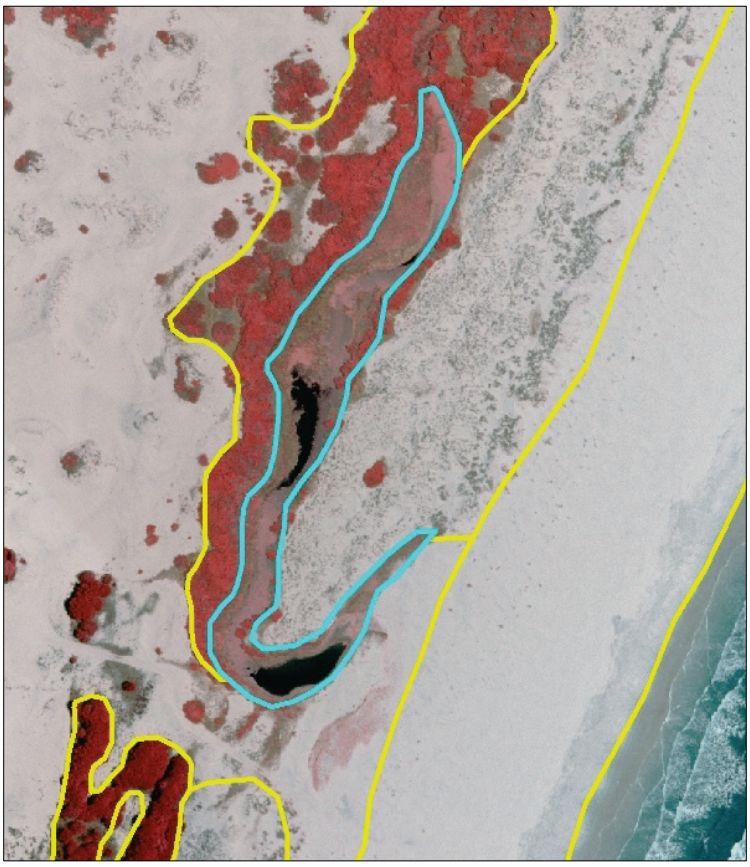


Figure 71. Photo signature of Southern Cattail Marsh.

Interpretation

The Southern Cattail Marsh is found adjacent to deeper sections of Lake Whitney, along the transition to Spartina bakeri dominated marsh, and occurs elsewhere in freshwater marsh settings, especially on the northern end of Cumberland Island. On the imagery it appears as a mixture of smooth pink and gray colors that are interspersed with one another, often with a swirly type texture. Areas of open water that are black can often be seen in various areas within the marsh.

MAP CLASS 31. Southern Hairgrass – Saltmeadow Cordgrass – Dune Fingergrass Herbaceous Vegetation



Figure 72. Photo of Southern Hairgrass – Saltmeadow Cordgrass – Dune Fingergrass Herbaceous Vegetation.

Association

Muhlenbergia filipes – Spartina patens – Eustachys petraea [Herbaceous Vegetation]

Abundant Species

- *Pinus taeda* (loblolly pine)
- *Ilex vomitoria* (yaupon)
- *Morella cerifera* (wax myrtle)
- *Sideroxylon tenax* (tough bully)
- *Eupatorium capillifolium* (dogfennel)
- *Phyla nodiflora* (turkey tangle fogfruit)
- *Andropogon glomeratus* (bushy bluestem)

- *Dichanthelium aciculare* (needleleaf rosette grass)
- *Muhlenbergia filipes* (gulf hairawn muhly)

Map Class Statistics
Frequency: 6 polygons
Total area: 12.5 ha
Average polygon size: 2.08 ha
Producer's accuracy: 52.8%
User's accuracy: 53.3%

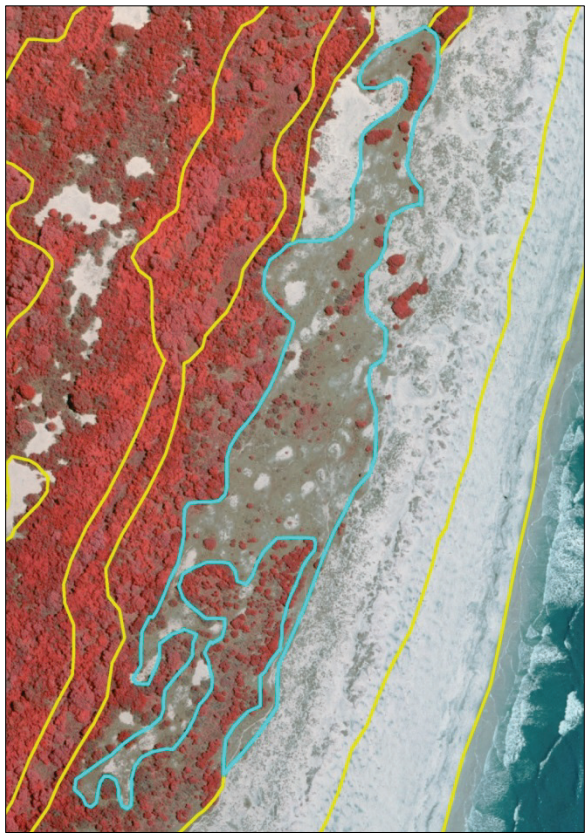


Figure 73. Photo signature of Southern Hairgrass – Saltmeadow Cordgrass – Dune Fingergrass Herbaceous Vegetation.

Interpretation
The Southern Hairgrass – Saltmeadow Cordgrass – Dune Fingergrass Herbaceous Vegetation association is abundant in sandy soils of the backdune flats and interdunal swales on the ocean side of Cumberland Island. Appearance on the imagery is a smooth gray color, with scattered pink to red shrubs often visible. Open patches of white sand are also sometimes visible within the association.

MAP CLASS 32. Water-hyacinth Aquatic Vegetation



Figure 74. Photo of Water-hyacinth Aquatic Vegetation.

Association
Eichhornia crassipes [Herbaceous Vegetation]

Abundant Species
- *Eichhornia crassipes* (water-hyacinth)

Map Class Statistics
Frequency: 4 polygons
Total area: 3.37 ha
Average polygon size: 0.84 ha
Producer's accuracy: 52.8%
User's accuracy: 53.3%

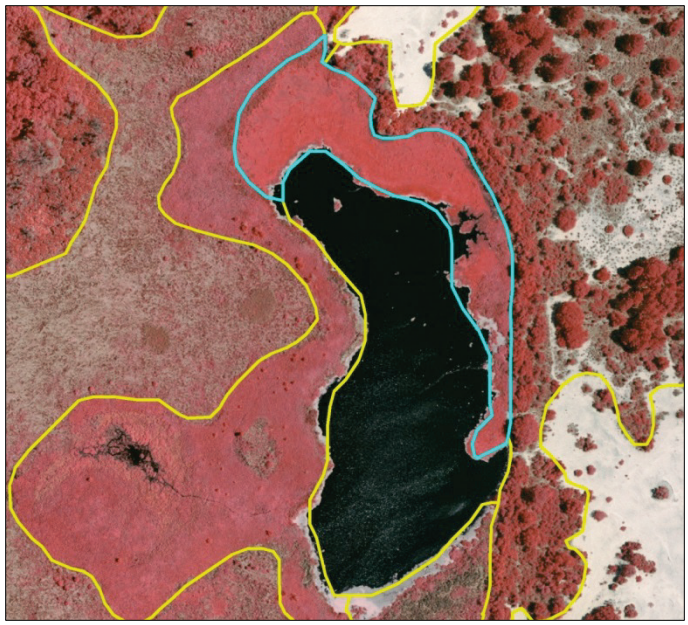
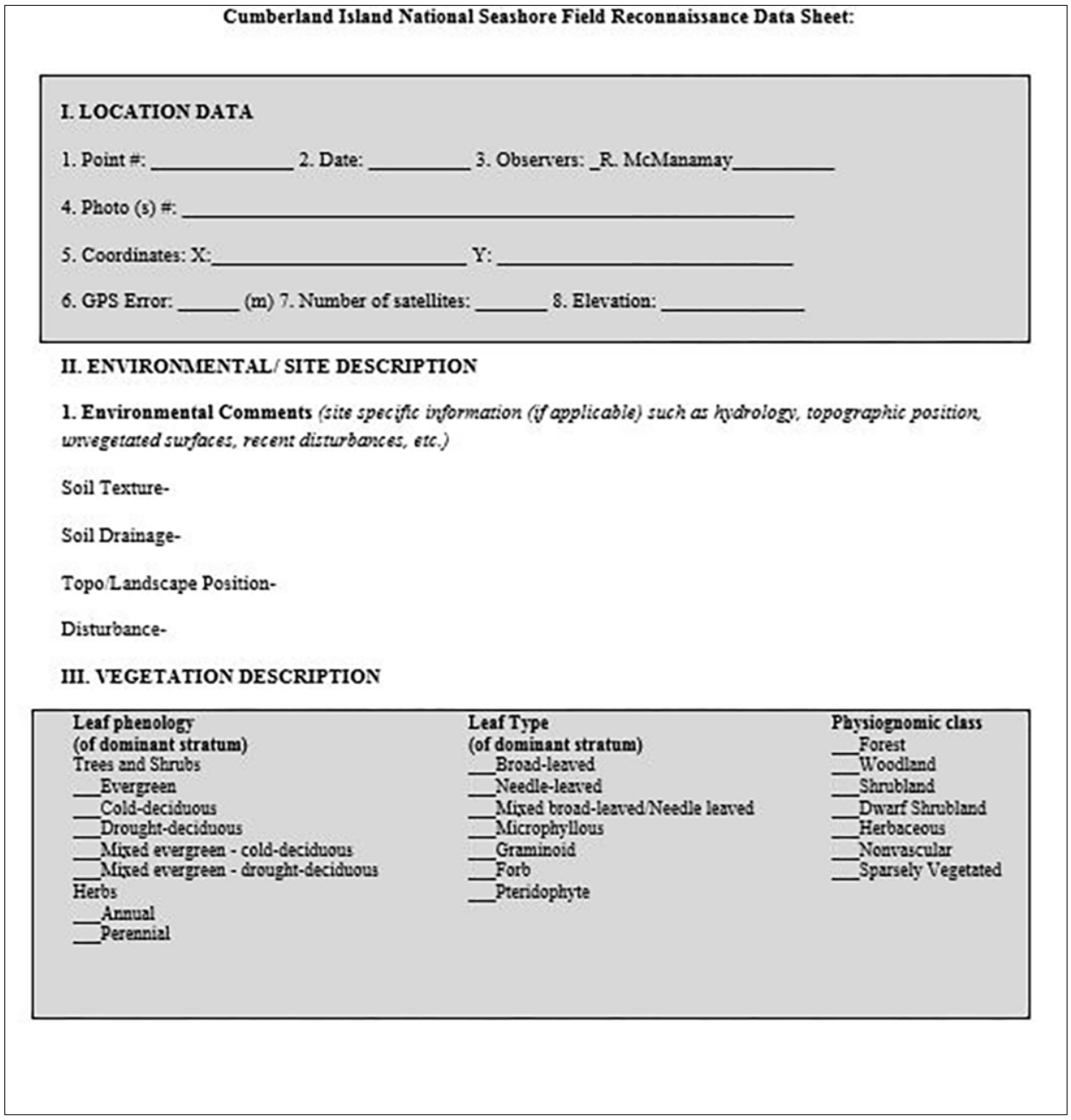


Figure 75. Photo signature of Water-hyacinth Aquatic Vegetation.

Interpretation:

The Water-hyacinth Aquatic Vegetation association is mainly found near the Lake Whitney wetland complex. On the imagery it is often found adjacent to deeper water and is a bright, almost neon pink to red color. Texture is very smooth.

Appendix E: Field Reconnaissance Form



Cumberland Island National Seashore Field Reconnaissance Data Sheet:

I. LOCATION DATA

1. Point #: _____ 2. Date: _____ 3. Observers: _R. McManamay_____

4. Photo (s) #: _____

5. Coordinates: X:_____ Y: _____

6. GPS Error: _____ (m) 7. Number of satellites: _____ 8. Elevation: _____

II. ENVIRONMENTAL/ SITE DESCRIPTION

1. Environmental Comments *(site specific information (if applicable) such as hydrology, topographic position, unvegetated surfaces, recent disturbances, etc.)*

Soil Texture-

Soil Drainage-

Topo/Landscape Position-

Disturbance-

III. VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	**Leaf Type (of dominant stratum)**	**Physiognomic class**
Trees and Shrubs	___Broad-leaved	___Forest
___Evergreen	___Needle-leaved	___Woodland
___Cold-deciduous	___Mixed broad-leaved/Needle leaved	___Shrubland
___Drought-deciduous	___Microphyllous	___Dwarf Shrubland
___Mixed evergreen - cold-deciduous	___Graminoid	___Herbaceous
___Mixed evergreen - drought-deciduous	___Forb	___Nonvascular
Herbs	___Pteridophyte	___Sparsely Vegetated
___Annual		
___Perennial		

Figure E-1. Example of Cumberland Island National Seashore Field Reconnaissance Data Sheet., page 1 of 2.

IV. VEGETATION COMPOSITION *(list dominant species only and indicate which stratum it occurs in by checking the appropriate stratum next to the species name)*

Species	Canopy	Sub-canopy	Shrub	Herb

VI. CLASSIFICATION COMMENTS and Name Assigned *(use this space to provide additional comments about problems or ease in applying the vegetation key at this site, rationale for choice of association if there was doubt, etc.)*

Figure E-2. Example of Cumberland Island National Seashore Field Reconnaissance Data Sheet page 2 of 2.

Appendix F: Accuracy Assessment Form

Accuracy Assessment Form for SECN Parks

I. LOCATION DATA:

1. AA Point Code: _____ 2. Date: _____

3. Observers: _____

4. Photo (s) #: _____

5. Coordinates: X: _____ Y: _____

6. Estimated Accuracy (m): _____ 7. Number of Satellites: _____

II. ENVIRONMENTAL/ SITE DESCRIPTION:

1. Environmental Comments *(site specific information such as hydrology, topographic position, unvegetated surfaces, recent disturbances, etc.*

III. VEGETATION DESCRIPTION:

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class
Trees and Shrubs: ___Evergreen ___Cold-deciduous ___Drought-deciduous ___Mixed evergreen - cold-deciduous ___Mixed evergreen - drought-deciduous Herbs: ___Annual ___Perennial	___Broad-leaved ___Needle-leaved ___Mixed broad-leaved/Needle leaved ___Microphyllous ___Graminoid ___Forb ___Pteridophyte	___Forest ___Woodland ___Shrubland ___Dwarf Shrubland ___Herbaceous ___Nonvascular ___Sparsely Vegetated

IV. VEGETATION COMPOSITION: *(list dominant species only and indicate which stratum it occurs in by checking the appropriate stratum next to the species name)*

Species	Canopy layer	Sub-canopy layer	Shrub layer	Herb layer

V. VEGETATION ASSOCIATION:

1. Primary and secondary (if there is a close call or multiple associations within the same polygon) vegetation classification(s) within radius of observation point, based on field key:

2. Are there other vegetation associations present within the radius observation area in addition to what was listed above?

3. Representativeness: Does the assigned association represent the vegetation well? If not, why? Please rank the fit as "Good" "Fair" or "Poor."

V. SOIL CHARACTERISTICS:

Soil Notes:

_____

_____

_____

VI. CLASSIFICATION COMMENTS *(use this space to provide additional comments about problems or ease in applying the vegetation key at this site, rationale for choice of association if there was doubt, etc.)*

Appendix G: Accuracy Assessment Contingency Table

Explanation of the Contingency Matrices

The accuracy assessment contingency matrix for the Cumberland Island National Seashore vegetation map layer is designed in a row and column format so as to compare the results of the vegetation types represented on the map layer to the vegetation types as verified on the ground. Map-class codes are used to identify vegetation types for ease of comparison during the analysis. (A crosswalk between map classes and vegetation types is provided.)

The sample contingency table provides an initial summary of the AA data by displaying counts of observations, with sample data values (vegetation map classes) as rows and reference data values (vegetation types as identified on the ground) as columns. The values in the shaded cells along the diagonal represent counts for correctly classified observations, where the reference data (column) matches the mapped vegetation type (row). User's accuracy was calculated by dividing the number of samples that agreed with their corresponding map class by the total number of samples in that class. Producer's accuracy was calculated by dividing the number of samples that agreed with their corresponding map class by the total number of samples whose field call belonged to that category.

Measures of accuracy for the AA are defined on the population contingency table. Similar to the sample contingency table, rows in the population contingency table are defined by the sample data values, and the columns are defined by the by the reference data values. Unlike the sample contingency table, the values in each cell are the proportion of the target area in the corresponding true and mapped vegetation classes, rather than the raw counts of observations. The population and sample contingency tables are reported together as a summary of between-class error relationships and class accuracy statistics (Lea and Curtis 2010).

Field Determination

Photointerpreter's Determination

Map Units		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL	Totals	UA (%)	90% CI (%)	
																																										-	+
A		39													1		4																			2				46	85	75	93
B			0					1	1								2	1																						5	0	0	100
C				10		5					1												2										5		3		3			29	34	0	48
D					24																				2										4					30	80	66	94
E				1		34					2																					1			4		1			44	77	65	88
F							1	3				2	4	2									5												1		2	1		21	5	0	15
G								3									1																			1				5	60	14	100
H		1						1	11	3							2																							18	61	39	83
I										1																														1	100	50	100
J						5					16							1					1			1							1	3					2	30	53	37	70
K						5						20											1										2		2					30	67	51	83
L													20	2										1																23	87	73	100
M							1							1		1		1									2			2										8	13	0	38
N		1							1						14	1																								17	84	64	100
O															1	2							6																	9	22	0	51
P									2	4							3																			1				10	30	1	59
Q											1					2		7																						10	70	41	99
R						1												1	0										1											3	0	0	17
S																				4			8												1					13	31	6	56
T						2							2					1			14		4	1											3					27	52	34	70
U																						15																		15	100	97	100
V																							8																	8	100	94	100
W						2																		12											3					17	71	50	92
X					8																		2		17										3					30	57	40	73
Y														2												20	1													23	87	73	100
Z												1											13	3			2						1		3			1		24	8	0	19
AA																												0					4							4	0	0	13
BB													1					2			1								0		1									5	0	0	10
CC																		1								1				24	2									28	86	73	98
DD																														2	0									2	0	0	25
EE								2															1									20			7					30	67	51	83
FF																							1										48		9					58	83	74	92
GG						3					2						1					1												23						30	77	62	91
HH					1																				1								1		56					59	95	89	100
II																																				0				0	0	0	0
JJ																																					0			0	0	0	0
KK																																						0		0	0	0	0
LL																																							0	0	0	0	0
Totals		41	0	11	33	57	2	10	15	8	22	23	27	7	16	6	12	13	0	5	15	16	52	16	19	22	6	0	1	28	3	23	63	26	99	4	6	2	2				
PA(%)		99.9	0.0	70.1	29.2	76.3	54.5	10.7	49.8	1.1	52.8	85.9	69.6	15.3	21.8	33.0	6.2	47.4	0.0	100	98.5	71.0	7.7	56.5	65.2	70.7	64.4	0.0	0.0	96.5	0.0	86.0	82.1	96.6	94.4	0.0	0.0	0.0	0.0		413 Total Correct Points		
	-	97.7	0.0	70.0	28.9	75.8	54.4	10.5	49.7	1.0	52.6	85.7	69.5	15.2	21.6	32.9	3.0	47.3	0.0	99.9	98.3	71.0	7.6	56.4	64.7	70.6	64.3	0.0	0.0	96.4	0.0	85.8	81.6	96.2	93.2	0.0	0.0	0.0	0.0		653 Total Points		
90% CI	+	100	0.0	70.2	29.5	76.7	54.6	10.8	49.9	1.2	53.0	86.0	69.7	15.5	22.0	33.1	9.4	47.5	0.0	100	98.6	71.0	7.8	56.7	65.7	70.7	64.6	0.0	0.0	96.7	0.0	86.1	82.6	97.0	95.6	0.0	0.0	0.0	0.0		Overall Accuracy 83.9% K= 64.2%		

UA—User's Acuracy; PA—Producer's Accuracy; CI—Confidence Interval

Key to Unit (Map Class) Codes

A= Salt Flat (Swampfire Type)/Southern Atlantic Coast Salt Marsh

B= South Atlantic Coastal Shell Midden Woodland

C= Florida Coastal Strand (Temperate Palmetto Type)

D= Xeric Oak Scrubland

E= Atlantic Coast Interdune Swale / Live Oak - Carolina Laurel Cherry - Hercule's Club Shrubland

F= Swamp-loosestrife Pond

G= Coastal Salt Shrub Thicket

H= Seaside-tansy Tidal Shrub Flat

I= Turtleweed-Swampfire Dwarf-Shrubland

J= Southern Hairgrass - Saltmeadow Cordgrass - Dune Fingergrass Herbaceous Vegetation

K= Red Maple - Tupelo Maritime Swamp Forest

L= Rush Marsh / Sawgrass Head

M= Southern Cattail Marsh

N= Needlerush High Marsh

O= Sand Cordgrass - Seashore Mallow Herbaceous Vegetation

P= Mid- and Southern Atlantic High Salt Marsh

Q= Dotted Smartweed - Smooth Beggarticks Herbaceous Vegetation

R= Saltmeadow Cordgrass - Panicgrass species Brackish Herbaceous Vegetation

S= Longleaf Pine / (Sand Laurel Oak, Turkey Oak) / Wax-myrtle / Southern Wiregrass Woodland

T= Southern Atlantic Coastal Plain Carolina Willow Dune Swale

U= South Atlantic Upper Ocean Beach

V= Grapevine - Peppervine - Trumpetvine Thicket

W= Atlantic / East Gulf Coastal Plain Sweetbay - Tupelo Streamhead Forest

X= Wet Longleaf Pine - Pond Pine Flatwoods

Y= Sawgrass Head / Rush Marsh

Z= Outer Coastal Plain Sweetbay Swamp Forest

AA= Slash Pine - (Longleaf Pine) Managed Forest

BB= Water-hyacinth Aquatic Vegetation

CC= South Atlantic Coastal Pond

DD= Outer Coastal Plain Maidencane Pond

EE= Red cedar - Live Oak - Cabbage Palmetto Marsh Hammock

FF= Mid- to Late- Successional Loblolly Pine - Sweetgum Forest / Maritime Slash Pine- Longleaf Pine Upland Flatwoods

GG= Sea-oats Temperate Herbaceous Alliance

HH= Live Oak - (Cabbage Palmetto) Forest Alliance / Southeastern Florida Maritime Hammock

II= Salt Panne (Salicornia Type)

JJ= Live Oak - Saw Palmetto- (Yaupon) Shrubland

KK= South Atlantic Coast Tidal River Shrubland

LL= Chestnut Fimbry – Common Threesquare Seasonally Flooded Herbaceous Vegetation

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior

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